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SAND AND GRAVEL RESOURCES OF CHAMPAIGN COUNTY, ILLINOIS

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ABSTRACT

The sand and gravel deposits of Champaign County were laid down by water flowing from melting glaciers that once covered much of Illinois. The deposits are of three major kinds: outwash plains, valley trains, and kames. Outwash plains are the major commercial sources of sand and gravel in the county, especially in the vicinity of Mahomet. Remnants of valley trains yield sand and gravel in the northeast corner of the county as does a kame near Mira. Areas that merit further prospecting include outwash deposits near Mahomet, southeast of Rantoul, northwest of Rantoul, along Saline Branch, Phinney Branch, and Copper Slough, and kame deposits in the southwest part of the county.

INTRODUCTION

Geologic Setting

The surface features of Champaign County, including the deposits of sand and gravel, are all of glacial origin, either the result of deposition directly by the ice or by meltwater derived from the ice. The former are predominant and consist of hummocky ridges, technically called "end moraines," and less elevated, gently rolling tracts lying behind the end moraines, called "ground moraines." End moraines mark the position of the ice front during a period of stability when the amount of melting at the edge of the ice was balanced by the amount of ice moving in from behind. Thus end moraines consist mostly of deposits of ice-laid pebbly clay, called "till," that was laid down at the front of the ice, whereas ground moraines consist of thinner deposits of till laid down beneath the ice and behind the end moraine.

The oldest surface deposits in the county occur west of the Sangamon River south of Mahomet, and represent ground moraine of the Shelbyville glacier whose end moraine is found about 30 miles farther west. The Shelbyville ground moraine east of the river was overridden and buried by deposits of the Cerro Gordo glacier which built the end moraine lying immediately east of the Sangamon River south of Mahomet and extending southwestward into Piatt County. East of the Cerro Gordo end moraine is an extensive area of ground moraine containing several southwest-northeast-trending minor ridges that may have been deposited during pauses in the retreat of the Cerro Gordo glacier. This ground moraine was in turn overridden and buried by the West Ridge glacier whose end moraine lies a few miles east of the Kaskaskia River. The West Ridge end moraine extends from northwest of Champaign southward into Douglas County.

After depositing the West Ridge end moraine the glacier retreated an unknown distance to the northeast and then readvanced in Champaign County along a somewhat different line of movement and with a consequently different configuration of its front, to build the Champaign end moraine. This prominent ridge trends north-

west from Champaign and overrides, nearly at right angles, both the Cerro Gordo and West Ridge end moraines. From the vicinity of this overriding, a ridge trends northeasterly from the Champaign end moraine to Rantoul and presumably reflects either or both the Cerro Gordo and West Ridge end moraines buried by Champaign ground moraine (Krumbein, 1930, p. 6-7), although it possibly may be the end moraine of a glacial stand between the Champaign and Urbana end moraines.

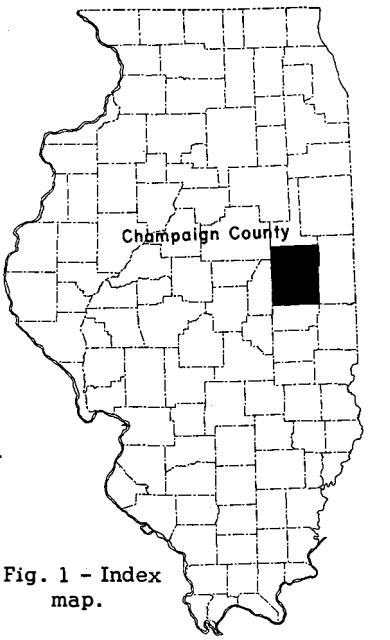

Fig. 1 - Index map.

The Champaign end moraine extends eastward from Champaign to southeastern Urbana, where it is largely overridden by the Urbana end moraine. The prominent ridge, known as Yankee Ridge, that trends south from Urbana to Philo and thence southeast to Block is believed to be the principal part of the Champaign end moraine with the Urbana end moraine superposed. The outer or south one of the two ridges into which Yankee Ridge diverges just east of Block is believed also to be the principal part of the Champaign end moraine. A low ridge that emerges from the west side of Yankee Ridge south of Urbana and trends south and southeast through Bongard and thence eastward to rejoin the principal part of the Champaign end moraine at Broadlands is considered also a part of the Champaign end moraine, representing a relatively brief stand of the margin of the Champaign glacier slightly earlier than its principal stand.

The Urbana end moraine trends north-northeast from Urbana to a point 2 miles southeast of Rantoul and, as the upper part of the Yankee Ridge, trends south and southeast from Urbana to Block. The inner or northern of the two ridges into which Yankee Ridge diverges east of Block is believed to be the continuation of the Urbana end moraine and curves northeasterly to leave the county 1 to 2 miles south of Homer.

North and east of Rantoul both the Champaign and the Urbana ground moraines are buried by the northwest-southeast trending Bloomington end moraine. Bloomington ground moraine extends back to the Vermilion River which marks the outer limit of the succeeding Cropsey moraine whose end moraine crosses the extreme northeast corner of the county.

Drainage

Two sizable streams have their sources in Champaign County, and two others have their headwaters to the north. The Kaskaskia and Embarrass Rivers flow southward from the Champaign end moraine, the Embarrass lying east and the Kaskaskia lying west of the West Ridge end moraine. Together they drain the area lying south of the Champaign end moraine and east of the Cerro Gordo end moraine. The Sangamon River enters the county near the northwestern corner, flows southeastward to a point 4 miles northeast of Fisher and then turns to the southwest, flowing through the Champaign end moraine at Mahomet and passing out of the county about 5 miles southwest of Mahomet. The northeast part of the county is drained by the Vermilion River which flows southeastward between the Bloomington and Cropsey end moraines. Most of the eastern half of the county is drained by the Salt Fork and its two major tributaries, Saline Branch Drainage Ditch heading near Thomasboro and Spoon River heading near Gifford.

The courses of these streams were determined by the topographic slopes uncovered as the glacial ice retreated. Except along the Sangamon and Vermilion Rivers, little postglacial erosion has taken place. Very likely much of the erosion displayed along the Sangamon River, particularly where it cuts through the Champaign end moraine, was accomplished by glacial meltwater derived from the ice front when it lay to the northeast. Both the Vermilion and Sangamon Rivers have floodplains throughout most of their courses in Champaign County, whereas the Kaskaskia, Embarrass, and Salt Fork have floodplains only in their lower reaches within the county. The Sangamon and Vermilion Rivers also are related to the most important sand and gravel deposits in the county.

Methods of Investigation

The sand and gravel resources of Champaign County were investigated by observation of road and stream cuts, gravel pits and other artificial excavations, and by borings from 3 to 12 feet deep with a hand auger. Field observations were supplemented by examination of well logs and the topographic maps of the county on a scale of 1:62,500. Field observation occupied five weeks during the summer of 1959.

Previous Investigations

A reconnaissance investigation of the sand and gravel resources of Champaign County was made by George E. Ekblaw of the Illinois State Geological Survey in 1921. A more detailed investigation, similar to the present one, was made in 1930 by W. C. Krumbein as part of a state-wide study of road-material resources sponsored by the Survey and supervised by Ekblaw, Head of the Section of Engineering Geology. The unpublished maps and report prepared by Krumbein were freely drawn upon in the current investigation. Leverett (1899) gives a general setting for the glacial history of the county. Foster and Buehl (1951) provide information on sand and gravel distribution in the central part of the county. The soils of the county have been described by Hopkins et al. (1918).

Acknowledgements

The writer wishes to thank George E. Ekblaw and J. E. Lamar of the Survey for advice during the course of this study and for critically reading the manuscript.

ORIGIN OF SAND AND GRAVEL DEPOSITS

There are three important types of sand and gravel deposits in Champaign County: outwash plains, valley trains, and kames.

Outwash Plains

Outwash consists of silt, sand, and gravel deposited by meltwater issuing from the front of the ice sheet, having flowed upon, within, or beneath the ice. The meltwater picked up material that the ice had been carrying and redeposited it as an outwash plain extending outward from the ice front. Hence an outwash plain is associated with and extends beyond an end moraine. Outwash deposits tend to be thickest and coarsest in places where the configuration of the ice front serves to concentrate the flow of meltwater. In Champaign County this generally occurs at re-entrants between scallops along the outer edge of the end moraines (fig. 2).

Usually these re-entrants continue back into the moraine as a more or less well defined "subglacial channel" or valley which served as a course of meltwater discharge. Because the amount of meltwater was closely controlled by daily and seasonal variations in temperature, outwash plain deposits are characterized by wide and abrupt variations in textures and bedding, both horizontally and vertically.

Valley Trains

Valley trains consist of silt, sand, and gravel deposited by meltwater along well-defined valleys leading away from the ice front. They tend to merge with the outwash plain at their upper end, although in some instances they can be traced up to and into the moraine of the glacier which served as their source. Except at their source near the moraines they are finer than the deposits of the outwash plain and also become finer in a downstream direction. Like the outwash plain, they are formed because the meltwater received more debris than it could carry (fig. 3A). After the ice retreated, conditions of discharge and load in valleys leading away from the moraines were radically altered, with the result that the valley trains were subject to erosion by streams no longer overloaded (fig. 3B). As erosion proceeded the valley train was partly destroyed, and a floodplain with a veneer of alluvium was formed at a lower level (fig. 3C). The remnants of the valley trains now are found usually as terraces along the river floodplains, which mark the approximate level of the meltwater stream at the time valley-train deposition ceased. Whether valley-train deposits underlie floodplain alluvium depends upon the original thickness of the valley train and the amount of erosion which it has undergone.

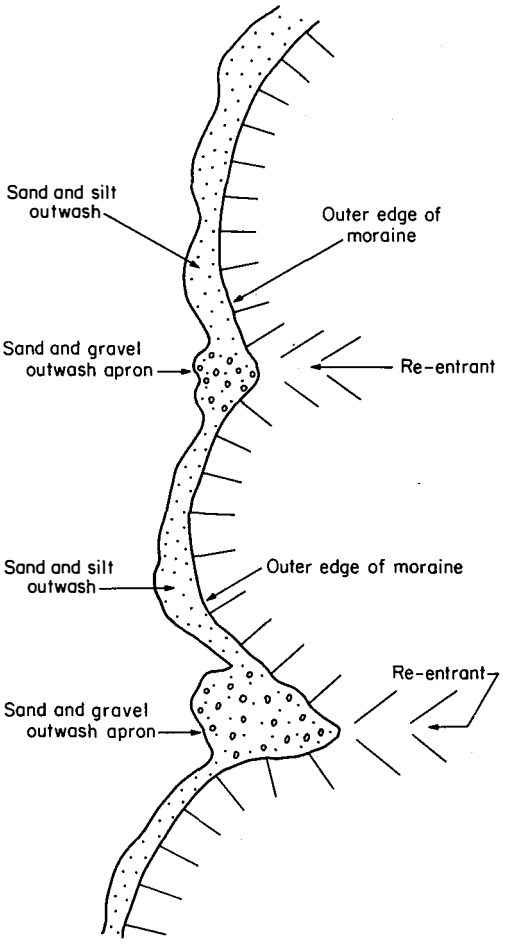

Fig. 2 - Sketch showing sand and gravel deposits in re-entrants in outer edge of an end moraine.

Kames

Kames are conical hills of sand and gravel which commonly occur in end moraines but which also occur in areas of ground moraine. They are meltwater deposits originally formed upon, within, or beneath the glacier. They tend to be coarser than outwash deposits because the flow of the meltwater which formed them was more vigorous. Areally kames are generally small, but some of them may extend laterally under adjacent deposits and below the level of the surrounding area.

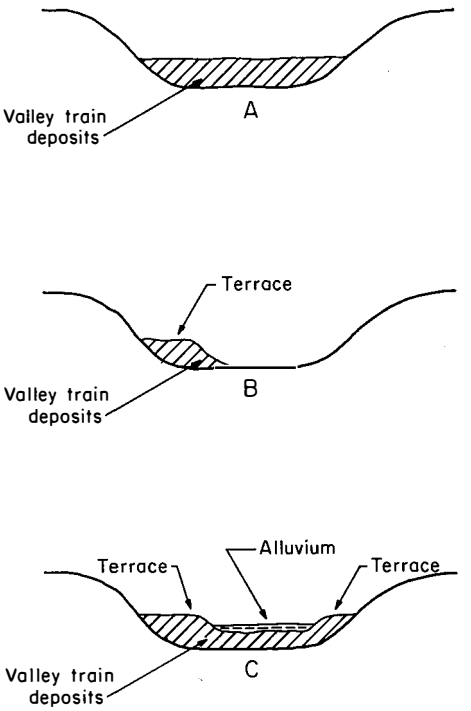

Fig. 3 - History of valley-train deposits

A - Cross section of valley showing valley-train deposits.

B - Erosion has removed most of the valley train except a remnant left as a terrace.

C - Erosion has removed a part of the valley-train deposits leaving terraces. The floodplain consists of silt, sand, or gravel alluvial deposits overlying valley-train material.

SAND AND GRAVEL DEPOSITS

Outwash Plains or Aprons

Outwash deposits occur to a minor degree along the outer edge of most moraines in the county, but only those along the Cerro Gordo and Bloomington moraines can be commercially exploited for sand and gravel. Elsewhere the outwash consists primarily of silt with small areas of sand.

Cerro Gordo Outwash

The gravel deposits along the Sangamon River near Mahomet are considered to be principally outwash from the Cerro Gordo glacier with only minor amounts of Champaign outwash and younger valley-train material. This conclusion is drawn from the following evidence:

1) Auger borings and road cuts show pebbly sand extending southeastward from the Sangamon River to the break in slope at the outer edge of the Cerro Gordo end moraine.

2) The principal deposits are not part of a valley train along the Sangamon River because they do not occur at a uniform elevation and because the surface forms suggest erosion, particularly in secs. 20 and 29, T. 20 N., R. 7 E. At the north end of the gravel pit in the SW$\frac{1}{4}$ sec. 20, T. 20 N., R. 7 E., a lag concentration of boulders at the surface strongly suggests erosion of the deposit.

3) The size of the material does not become smaller in a downstream direction (tables 1 and 2).

South of Mahomet the Cerro Gordo outwash plain does not extend to the northwest much farther than the west bank of the Sangamon River. A road cut and auger hole in the SE$\frac{1}{4}$ sec. 19, T. 20 N., R. 7 E., show more than 6 feet of pebbly sand a quarter of a mile west of the Sangamon Valley. This is probably near the western edge of the Cerro Gordo outwash plain. Cuts where the road crosses a small tributary a third of a mile north and excavations for a small dam in the NW$\frac{1}{4}$ sec. 20 of the same township and excavations for the dam at Spring Lake near the center of the south line of sec. 17, same township, show only till. The log of a well near the northeast end of the Spring Lake dam shows 16 feet of gravel underlying 7 feet of yellow clay. Along the south flank of the Champaign end moraine west of Mahomet isolated areas of gravelly sand were observed as far west as the upper end of Spring Lake, but these surface deposits represent Champaign outwash.

Table 1. - List of Samples

Sample no.	T	R	Sec.	¼	¼	Near	Thickness sampled (feet)	Type of deposit	Remarks
1	20N	7E	20	SE	SW	Mahomet	7	Outwash apron	Gravel pit
2	20N	7E	20	SE	NE	Mahomet	12	Outwash apron	Gravel pit
3	20N	7E	11	NE	SW	Mahomet	21	Outwash apron	Gravel pit
4	20N	7E	2	SW	SE	Mahomet	10	Outwash apron	Gravel pit
5	22N	9E	36	SW	SE	Rantoul	5	Outwash apron	Gravel pit
6	21N	10E	5	NW	SE	Rantoul	-	Outwash apron	Pit run
7	21N	10E	23	SW	SW	Gifford	10	Outwash apron	Gravel pit
8	22N	11E	1	NW	SE	NE of Gifford	10	Terrace	Gravel pit
9	22N	14W	6	SW	NE	NE of Gifford	11	Terrace	Abandoned pit
10	22N	14W	28	NE	SE	Penfield	6	Terrace	Gravel pit
11	19N	9E	23	NW	SE	Mira	7	Kame	Gravel pit
12	19N	8E	20	SW	SE	Bondville	6	Outwash apron	Ditch bank

The deposit continues essentially unchanged north of Mahomet where in pits in the NW¼ sec. 14, and near the center of sec. 11, T. 20 N., R. 7 E., it lies beneath Champaign till. A similar relationship can be seen in a stream cut near the center of sec. 31, T. 20 N., R. 8 E. However, the extent of the Cerro Gordo outwash plain beneath the Champaign moraine cannot be adequately determined. If it maintains the same width as south of the Champaign moraine it should be between 1 and 2 miles wide. Inasmuch as erosion by the Sangamon River has uncovered an area only about half a mile wide, it appears likely that a considerable part of the outwash plain remains buried beneath Champaign till, and judging from the trend of the Cerro Gordo end moraine, most of it probably lies east of the Sangamon River. On the map (pl. 1) an attempt was made to draw the boundary of the prospective gravel deposits where the overburden of till is not more than 10 or 15 feet thick. Within the County Forest Preserve and north to sec. 1, T. 20 N., R. 7 E., on the east side of the river, there is a poorly defined terrace formed during the early stages of the downcutting which has formed the present river floodplain. In places, particularly the SE¼ sec. 2 and the NE¼ sec. 11, T. 20 N., R. 7 E., Champaign till has been completely eroded and the outwash gravel lies at the surface. In other places, particularly the SW¼ sec. 11, T. 20 N., R. 7 E., erosion has not been as complete so that probably 10 to 15 feet of till overlies the gravel.

North of Mahomet the Sangamon River diverges rapidly from the buried Cerro Gordo end moraine and hence it could be expected to be outside the outwash plain within a relatively short distance. On the basis of a basement excavation near the NE corner sec. 35, T. 21 N., R. 7 E., and a stream cut near the center of sec. 31, T. 21 N., R. 8 E., both of which show till overlying pebbly sand, the northeastern boundary of accessible Cerro Gordo outwash is drawn through secs. 25, 26, and 36 of T. 21 N., R. 7 E., and sec. 31, T. 21 N., R. 8 E.

None of the operating pits in Cerro Gordo outwash is located on the present Sangamon floodplain but several of them are excavated below floodplain level. Gravel has been found beneath floodplain alluvium by operators at the Parkhill Gravel Pit (SE¼ sec. 2, T. 20 N., R. 7 E.) and the West Champaign Gravel Company (NE¼ sec. 15, T. 20 N., R. 7 E.). In addition an abandoned gravel pit occurs on the floodplain in the NW¼ sec. 29, T. 20 N., R. 7 E. These observations indicate that the floodplain is underlain by gravel, believed to be part of the Cerro Gordo outwash plain rather than alluvium deposited by the river. The alluvium is black silt probably as much as 8 to 10 feet thick.

Cerro Gordo outwash ranges from pebbly coarse sand to sandy gravel (samples 1 to 4, table 2). Cobbles are common and a minor amount of silt is present. The pebble fractions of three samples counted averaged 53 percent dolomite pebbles, 16 percent sandstone and shale, 15 percent igneous and metamorphic, 10 percent chert, and 5 percent limestone pebbles (table 3). This deposit has less shale than is found in outwash associated with the Bloomington and Cropsey end moraines in the northeast part of the county.

Bloomington Outwash Plain

Throughout its extent in Champaign County the Bloominton moraine is bounded on its outer (southwestern) edge by an outwash plain from about 1 to 4 miles wide. Judging from ditch exposures and auger borings the greater part of this plain is underlain by silt, but in certain favorable locations deposits of sand and gravel occur. The relationships between the outwash aprons of sand and gravel and the morainal re-entrants and subglacial channels are particularly well shown east and southeast of Rantoul. Here each pit (center of north line and SW¼ SE¼ sec. 36, T. 22 N., R. 9 E.; SW¼ sec. 5, SW¼ sec. 23, and NW¼ sec. 26, T. 21 N., R. 10 E.) is associated with a re-entrant and subglacial channel lying to the north or northeast.

The boundary of possible sand and gravel deposits shown on the map (pl. 1) was determined by observations of natural and artificial cuts, auger borings, and topographic expression. It includes only those observations where sand or gravel was seen and where flat outwash topography occurs. As such, the boundary should not be construed as exactly fixed, but rather as a line enclosing areas where the possibilities of finding sand and gravel are greater than in the surrounding areas.

Although the areas east and southeast of Rantoul are the most promising areas for sand and gravel prospecting in Bloomington outwash, possibilities also exist northwest of Rantoul. Auger borings in the NW¼ and SE¼ sec. 13, T. 22 N., R. 8 E., show pebbly sand at shallow depth and serve to outline an area of possible sand and gravel deposits centered in sec. 18, T. 22 N., R. 9 E., and sec. 13, T. 22 N., R. 8 E. This area is limited in extent and is not related to a morainal re-entrant, but rather to two small subglacial channels having their sources in secs. 8 and 9, T. 22 N., R. 9 E. Extensive sand and gravel deposits cannot be anticipated where the source area is so limited.

Farther to the northwest, bordering the county line in the northwest corner of T. 22 N., R. 8 E. and the extreme northeast corner of T. 22 N., R. 7 E., there is a large area having possibilities of sand and gravel deposits. It was delineated on the same basis as those to the southeast, but in addition five well logs reporting sand and gravel (NE¼ sec. 4, NW¼ sec. 7, T. 22 N., R. 8 E.; NE¼ and SE¼ sec. 1, T. 22 N., R. 7 E.) also provided information. There are no operating pits

Table 2. - Sieve Analysis
(Percent retained)

Sieve	Sample number											
	1	2	3	4	5	6	7	8	9	10	11	12
2½-inch	-	-	-	-	-	-	-	-	-	-	-	-
2-inch	1.2	-	0.6	-	-	1.5	-	1.5	-	-	1.6	-
1½-inch	1.4	0.4	0.2	-	-	0.7	-	2.7	-	-	2.3	-
1-inch	2.4	0.9	1.4	Tr	1.6	2.7	-	3.8	1.4	-	2.2	-
3/4-inch	3.3	1.4	1.9	0.5	7.8	3.5	-	3.6	4.5	0.1	3.8	1.6
½-inch	3.6	1.9	3.7	1.8	7.5	4.5	Tr	3.9	3.4	0.6	3.5	2.1
3/8-inch	5.2	3.6	6.4	4.7	8.6	5.8	Tr	5.0	3.6	1.3	5.1	3.5
4-mesh	10.5	9.7	18.6	14.3	17.3	13.2	1.0	14.4	7.2	6.8	11.3	5.6
8-mesh	11.6	14.5	21.8	16.6	9.5	18.9	14.8	13.7	10.0	10.8	16.1	6.1
16-mesh	12.8	18.0	20.4	18.8	7.3	20.8	25.9	15.8	17.2	23.4	17.7	5.6
30-mesh	10.6	11.8	7.5	9.6	5.4	9.7	15.3	6.4	14.4	15.8	11.4	7.9
50-mesh	21.4	17.7	7.2	15.8	10.7	10.8	21.7	5.5	17.0	18.6	13.4	39.7
100-mesh	8.6	12.0	3.3	11.0	5.5	3.2	9.8	2.8	5.5	7.1	2.9	22.2
200-mesh	1.2	2.0	0.9	1.8	3.2	0.5	1.5	1.6	1.4	1.4	0.7	2.0
Pan	6.2	6.2	6.1	5.3	15.6	4.3	10.0	19.3	14.3	14.2	8.2	3.8
Total	100.0	100.1	100.0	100.2	100.0	100.1	100.0	100.0	99.9	100.1	100.2	100.1
+1-inch	5.0	1.3	2.2	Tr	1.6	4.9	0.0	8.0	1.4	0.0	6.1	0.0
+4-mesh	27.6	17.9	32.8	21.3	42.8	31.9	1.0	34.9	20.1	8.8	29.8	12.8
-4-mesh	72.4	82.2	67.2	78.9	57.2	68.2	99.0	65.1	79.8	91.3	70.4	87.3

Table 3. - Pebble Counts from Champaign County Gravel
(In percent)

Lithology	Sample Number										Average			
	2	3	4	5	6	8	9	10	11	12				
	Cerro Gordo outwash			Bloomington outwash		Vermilion River terraces			Mira kame	Champ. out.	2-3-4	5-6	8-9-10	Grand
Dolomite	51.4	64.7	43.6	52.7	49.0	63.8	64.2	50.4	51.4	50.2	53.2	50.9	59.8	53.1
Limestone	4.7	2.6	7.7	4.0	4.0	2.1	1.6	0.0	9.5	7.1	5.0	4.0	1.2	5.4
Total limestone and dolomite	56.1	67.3	51.3	56.7	53.0	65.9	65.8	50.4	60.9	57.3	58.2	54.9	60.8	58.5
Chert	12.8	7.1	11.3	6.0	9.3	4.3	4.3	7.1	3.3	4.7	10.4	7.7	5.2	6.3
Sandstone and shale	14.8	7.1	25.6	28.4	27.8	24.5	22.0	40.4	22.4	18.5	15.8	28.3	29.1	22.8
Metamorphic	3.8	9.6	2.6	3.5	2.0	2.1	1.1	1.4	2.4	6.2	5.7	2.8	2.5	3.7
Granitic (light-colored igneous rocks)	6.2	3.2	4.6	3.0	1.3	1.0	3.3	0.0	6.2	7.6	4.7	2.2	1.4	4.4
Basaltic (dark-colored igneous rocks)	6.2	5.8	3.6	2.5	6.0	2.2	3.2	0.7	3.8	5.7	5.0	4.2	2.1	4.2
Total igneous	12.4	9.0	8.2	5.5	7.3	3.2	6.5	0.7	10.0	13.3	9.7	6.4	3.5	8.6
Total igneous and metamorphic	16.2	18.6	10.8	9.0	9.3	5.3	7.6	2.1	12.4	19.5	15.4	9.2	6.0	12.3

* 100 to 200 pebbles of $\frac{1}{2}$ to 1 inch size were counted.

in this area in Champaign County, but a large pit is currently being worked a quarter of a mile north of the county line in SW¼ sec. 33, T. 23 N., R. 8 E. The coarse-grained outwash in this area is thought to be related to subglacial channels lying to the north, including Dickerson Slough and its tributaries in Ford County. These channels are not related to any marked re-entrants in the moraine front, although the crest of the end moraine is very irregular in southern Ford County. It is possible that some of this material, particularly those deposits along West Branch Creek, was derived from the major re-entrant in the vicinity of Gibson City.

Samples 5 and 6 from pits in Bloomington outwash east and southeast of Rantoul range in size from pebbly coarse sand to sandy gravel. Cobbles are common, and silt is present in varying amounts (table 2). The average of the pebbles counted from the two samples is 51 percent dolomite, 28 percent sandstone and shale, 9 percent igneous and metamorphic, 8 percent chert, and 4 percent limestone (table 3).

Other Outwash

Small areas of coarse-grained outwash occur along the Champaign end moraine west of Champaign. Probably the largest of these deposits is found along Phinney Branch and Copper Slough, extending respectively from SE¼ sec. 16 and from the center of the east line of sec. 21 to the center of sec. 30, T. 19 N., R. 8 E. This deposit is mapped primarily on the basis of exposures along the banks of the artifically deepened ditches. Closely related deposits occur farther up Copper Slough around Clear Lake, a former gravel pit (SW¼ sec. 10, T. 19 N., R. 8 E.), and in the NE¼ sec. 3, T. 19 N., R. 8 E. The latter was delineated solely on the basis of a well log which records sand and gravel. These deposits are not shown as continuous because exposures of till are found close to the axis of the valley in the areas between them. The source of these deposits was meltwater escaping along a subglacial channel heading in the Champaign moraine now occupied by Copper Slough. The outwash was deposited to the south and west through a breach in the older West Ridge end moraine in the SE¼ sec. 20, T. 19 N., R. 8 E. The effect of this barrier upon sedimentation has not been determined, but it may have resulted in thicker deposits immediately upstream.

Sample 12, from the south bank of Phinney Branch in the SE¼ sec. 20, T. 19 N., R. 8 E., was determined to be a pebbly sand with a minor amount of silt and coarse pebbles (table 2). This sample may not represent the deposit as a whole, and coarser material can be expected farther upstream. A pebble count from this sample was quite similar to those from the Mahomet area, indicating that the Champaign ice at this point had moved along a course similar to that of the Cerro Gordo ice.

A small area of possible sand and gravel is indicated 1½ miles southeast of Rising at the point where the outer West Ridge moraine is overridden by the Champaign moraine (NE¼ sec. 5, T. 19 N., R. 8 E.). This area is delineated on the basis of topographic configuration and two well logs recording gravel at shallow depth. Whether it is related to West Ridge or Champaign outwash cannot be determined from the limited information available.

Three isolated occurrences of sand and gravel were noted on the northwest flank of the low ridge west of Rantoul (road cut and auger boring near center of N½ sec. 4 and road cut near NE cor. sec. 7, T. 21 N., R. 9 E., and a road cut in SE¼ sec. 31, T. 22 N., R. 9 E.). These exposures range from fine, silty sand to sandy, fine gravel. Their thickness, continuity, and extent are unknown, but they are probably small.

The genetic relationship of these deposits is not certain. Most probably they are of Champaign age and were deposited in fractures developed in the Champaign glacier where it overrode the Cerro Gordo and/or West Ridge moraines. It is possible they are of Cerro Gordo and/or West Ridge age, in which case either they were never covered by Champaign drift, or, if covered by Champaign drift, they were subsequently exhumed by erosion.

Two well defined subglacial channels occur along the Champaign moraine southeast of Philo, but numerous auger borings failed to locate any coarse-grained outwash. The outwash in this area apparently consists entirely of silt.

Valley-Train Deposits

Vermilion River

The best developed valley-train deposits in Champaign County are found as terrace remnants rising up to 20 feet above the floodplain of the Middle Fork of the Vermilion River. The source for most of this material was the large re-entrant in the Cropsey end moraine in secs. 25 and 26, T. 23 N., R. 10 E., Ford County, two miles north of the county line. Although the terrace remnants lie adjacent to and in places merge with the outer edge of the Cropsey end moraine, only a minor amount of material was derived from these nearby sources. The evidence for this interpretation is as follows:

1) The terrace surface appears to be depositional, and it slopes uniformly in a downstream direction.

2) No well defined re-entrants occur in the moraine front in Champaign County, although a subglacial channel may have made a local contribution in sec. 8, T. 22 N., R. 14 W.

3) Sieve analyses show progressively finer material and also an increase in the uniformity of grain size in a downstream direction.

4) The coarsest and thickest gravel deposit along this segment of the river occurs in the Thomas pit located in the prominent re-entrant 1 mile north of the county line ($NE\frac{1}{4}$ sec. 35, T. 23 N., R. 10 E.).

No direct evidence of sand and gravel beneath floodplain alluvium is available, but in the absence of evidence to the contrary it should remain as a distinct possibility. The chances of finding sand and gravel under the floodplain probably increase in an upstream direction because the thickness of the valley train as a whole and the coarseness of the material comprising it probably increase in that direction.

The texture of the valley train, samples 8, 9, and 10, ranges from sandy, fine gravel in sec. 1, T. 22 N., R. 11 E., to pebbly, medium-grained sand in sec. 28, T. 22 N., R. 14 W. (table 2). Hence coarser material is found upstream, finer material downstream. Probably this simple relationship is locally altered by outwash from adjacent segments of the moraine. Pebble counts of the three samples (table 3) average 59 percent dolomite, 29 percent sandstone and shale, 6 percent crystalline, 5 percent chert, and only 1 percent limestone. This distribution of rock types is similar to that from the Bloomington outwash and indicates that the moraines were deposited by ice moving along similar courses, as is obvious from the proximity and parallel trends of the moraines.

Saline Branch Drainage Ditch

A valley train composed in part of sand and gravel is found along Saline Branch where it crosses the Urbana end moraine just northeast of the city of Urbana. The natural relationships of the stream to its valley have been obscured by artificial

deepening and straightening of the stream. The surface of the valley-train deposits was a part of the floodplain prior to dredging (George E. Ekblaw, personal communication), and although it now stands about 10 feet above water level, it is not a true terrace. The present surface form and gradient of these deposits strongly suggest that they have undergone extensive postglacial erosion. This is particularly apparent when the origin of the valley train is considered. It was deposited by westerly flowing meltwater streams during the time when the ice stood at the Urbana end moraine and during the early phases of eastward retreat from this moraine (George E. Ekblaw, personal communication). Thus originally it must have had a surface gradient to the west. As the ice retreated and uncovered lower ground to the east the drainage was reversed. Much of the erosion accompanying this reversal of drainage may have been accomplished by discharge from a short-lived lake ponded in front of the Urbana moraine and centered around Thomasboro. The existence of this lake is indicated by several exposures of laminated lake silt between Thomasboro and Leverett.

The western end of this valley train reaches Urbana, but beyond this point no gravel was observed. Its downstream boundary is located near the center of sec. 2, T. 19 N., R. 9 E., where the form of the valley becomes broad, lacking well defined sides. Occurrences of sand and gravel are found farther downstream but they are considered limited in extent.

Field observations from pits in the NE$\frac{1}{4}$ sec. 9 and the NE$\frac{1}{4}$ sec. 3, T. 19 N., R. 9 E., indicate that the deposit ranges in texture from sandy, medium-sized gravel to pebbly, medium-grained sand. Probably the thickest and coarsest material is to be found within the Urbana moraine in secs. 3 and 9, T. 19 N., R. 9 E.

Sangamon River

Small deposits of sand and gravel, possibly of valley-train origin, occur at a number of places along the Sangamon River between Wildcat Slough and West Branch Creek. Although these deposits have been exploited for local needs, no pits are operating at present and exposures are poor. Krumbein (1930) had the opportunity to observe several of these pits in operation and has described the deposits in more detail than is possible at present. The largest deposit occurs at the mouth of Wildcat Slough centered near the NE cor. sec. 13, T. 21 N., R. 7 E. As described by Krumbein (1930, p. 13), the gravel is coarse and sandy and reaches a maximum local depth of 27 feet south of Wildcat Slough in NE$\frac{1}{4}$ sec. 13, T. 21 N., R. 7 E. It was suggested (Krumbein, 1930, p. 13) that this deposit is an esker. The deposits directly across Wildcat Slough are much thinner (7 feet) and appear to have a valley-train origin.

Krumbein (1930, p. 12) has also described exposures and pits showing a few feet of gravel overlying till in several places farther upstream: SW$\frac{1}{4}$ sec. 18, SW$\frac{1}{4}$ sec. 17, and SW$\frac{1}{4}$ sec. 32, T. 22 N., R. 8 E. The gravel occurs as a terrace-like veneer and probably also is related to valley-train deposition. However, there are terrace forms along this part of the river that lack a gravel veneer, notably in SW$\frac{1}{4}$ sec. 21 and NW$\frac{1}{4}$ sec. 28, T. 22 N., R. 8 E.

Salt Fork

The situation along the Salt Fork is similar to that along the Sangamon River. Low terraces and small isolated bodies of pebbly sand occur throughout the course of the Salt Fork in Champaign County, although the terraces are best developed downstream from Sidney. All observations indicate that the valley is cut in till and lacks sizable deposits of sand and gravel.

Kaskaskia and Embarrass Rivers

Both the Kaskaskia and Embarrass Rivers carried glacial meltwater, but the outwash consists only of silt and very fine sand. Small, thin, discontinuous lenses of pebbly sand were observed along tributaries of the Embarrass north of Villa Grove in the SW¼ sec. 28 and SW¼ sec. 23, T. 17 N., R. 9 E. These might serve local needs, but there is no indication of larger deposits in the area.

Kames

Kames have been recognized (pl. 1) at the following locations in Champaign County:

1) SW¼ sec. 8, T. 22 N., R. 7 E.
2) SE¼ sec. 14, T. 21 N., R. 8 E.
3) Cen. sec. 23, T. 19 N., R. 9 E.
4) SW¼ sec. 5, T. 22 N., R. 7 E.
5) SW¼ sec. 4, T. 22 N., R. 7 E.
6) NE¼ sec. 22, T. 22 N., R. 9 E.
7) SW¼ sec. 7, T. 18 N., R. 7 E.
8) SW¼ sec. 19, T. 20 N., R. 10 E.
9) Cen. sec. 6, T. 17 N., R. 14 W.
10) Linear belt extending from NE¼ sec. 7, T. 17 N., R. 11 E. through sec. 7, T. 17 N., R. 14 W. into NW¼ sec. 8, T. 17 N., R. 14 W.
11) SE¼ sec. 1, T. 19 N., R. 8 E.
12) Cen. sec. 34, T. 22 N., R. 9 E.
13) SW¼ sec. 26, T. 22 N., R. 9 E.
~~14) SE¼ sec. 1, T. 19 N., R. 8 E.~~

Of these only the first three have been exploited for sand and gravel, and only from the third is gravel currently being produced. A sieve analysis from this pit (sample 11, table 2) shows the material to be a mostly fine-sized gravel with cobbles and some silt.

SAND AND GRAVEL INDUSTRY

Cerro Gordo Outwash

The greatest concentration of gravel pits in the county is found in Cerro Gordo outwash near Mahomet. The following pits are currently in operation:

W. H. Troike Company - NE¼ sec. 20, T. 20 N., R. 7 E.
Mahomet Sand and Gravel Division, Pontiac Stone Company - NW¼ sec. 21, T. 20 N., R. 7 E.
Gibson Brothers - NE¼ sec. 21, T. 20 N., R. 7 E.
West Champaign Gravel Company - NE¼ sec. 15, T. 20 N., R. 7 E.
Parkhill's Gravel Pit - SE¼ sec. 2, T. 20 N., R. 7 E.

These pits exploit gravel generally more than 12 feet thick and ranging up to 25 feet or more in thickness. Silt up to 5 feet thick constitutes the overburden although in places it is absent. Cemented zones occur but they are not hard or thick enough to constitute a serious problem.

Most of the production is run-of-the-pit road or fill gravel, but by the use of suitable equipment for washing, screening, and crushing, a variety of grades is produced ranging from masons sand to "crushed rock."

There is a number of abandoned gravel pits in this area, but in only a few places does it appear as though the gravel supply is locally exhausted. The pits on the east bank of the Sangamon River half a mile east of Mahomet were obviously abandoned because of the increasing thickness of the till overburden as the pits were enlarged to the east.

Bloomington Outwash

Two gravel pits are currently being operated in outwash from the Bloomington moraine in Champaign County:

Rantoul Sand and Gravel Company - SE¼ sec. 36, T. 22 N., R. 9 E.
Howard Thomas Pit - SW¼ sec. 5, T. 21 N., R. 10 E.

The gravel is more than 20 feet thick and has an overburden of up to 5 feet of sandy silt.

Most of the production is road or fill gravel, but the deposit can be processed to produce other grades of sand and gravel as well.

Three abandoned pits are found in Bloomington outwash. The pit at the center of the north line of sec. 36, T. 22 N., R. 9 E. has been used as a dumping ground, and it is not known whether the deposit is exhausted. An abandoned pit, Franzen Fishing Lake, occurs in the SW¼ sec. 5, T. 21 N., R. 10 E. This is directly south of the Howard Thomas Pit, hence gravel is still present in the immediate vicinity. The Eddie Sage gravel pits in the SW¼ sec. 23 and NW¼ sec. 26, T. 21 N., R. 10 E. are not currently operating, although the deposits have not been exhausted.

Kames

The only pit in a kame deposit currently in operation in Champaign County is located near the center of sec. 23, T. 19 N., R. 9 E., three quarters of a mile northeast of Mira. The deposit is more than 15 feet thick and has an overburden of sandy silt about 3 feet thick. The production is exclusively run-of-the-pit road and fill gravel.

Several abandoned pits in kames are found in Champaign County but are probably mined out:

SW cor. sec. 8, T. 22 N., R. 7 E.
SW¼ sec. 8, T. 22 N., R. 7 E.
SE¼ sec. 14, T. 21 N., R. 8 E. (filled)
SE¼ sec. 1, T. 19 N., R. 8 E.

Vermilion River Valley Train

No operating pits were found along the Vermilion River in Champaign County during the summer of 1959, although there are operating pits just to the north in Ford County and to the east in Vermilion County. Some of the pits give the impression of being temporarily idle, and in no place does the gravel supply appear to be exhausted. The overburden in these pits consists generally of less than 5 feet of sandy silt, and the thickness of the gravel is generally greater than 12 feet. The maximum thickness is unknown.

Saline Branch Valley Train

No operating pits were found along Saline Branch during the summer of 1959, but two pits (NE¼ sec. 9 and NE¼ sec. 3, T. 19 N., R. 9 E.) appeared to be only temporarily idle. The overburden consists of 2 to 4 feet of silt, and the greatest observed thickness of gravel is more than 15 feet.

Mining Methods

All of the operating pits and most of the abandoned pits in Champaign County contain water, hence underwater dragline methods of digging are employed. The W. H. Troike pit uses fixed equipment as well as portable draglines. All other pits in the county use portable draglines.

Areas for Prospecting

The Cerro Gordo outwash near Mahomet is being worked as a major source of sand and gravel, but it appears likely that undeveloped deposits exist in that area. Bloomington outwash has been a source of sand and gravel southeast of Rantoul. Prospecting probably will find additional deposits. The outwash northwest of Rantoul is virtually untouched in Champaign County and appears worthy of investigation. Further development of the Saline Branch deposits appears possible, although the deposits are limited in size.

The extent of the deposits along Phinney Branch and Copper Slough southwest of Champaign is unknown. Surface observations are encouraging enough to warrant further prospecting. Likewise well logs suggest the presence of an outwash body of unknown extent $1\frac{1}{2}$ miles southeast of Rising, which should be investigated.

Kame deposits are generally comparatively small in size but are important as local sources of road and fill gravel. The kames merit prospecting in this connection, especially those in the south half of the county where other sources of sand and gravel are absent.

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