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SAND AND GRAVEL RESOURCES OF NORTHEASTERN ILLINOIS

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ABSTRACT

This report summarizes present information on the occurrence of sand and gravel deposits in northeastern Illinois. The distribution of known and inferred deposits is shown graphically on a regional map at a scale of 1 inch = 2 miles.

INTRODUCTION

The area covered by this report is composed of Cook, DuPage, Kane, Kendall, Lake, and McHenry Counties and the north part of Will County. The distribution of sand and gravel deposits in the area as shown on the accompanying map (pl. 1) was determined from physical features, natural exposures, sand and gravel pits, well records, shallow borings with a hand-auger, geological deductions from these data, and a knowledge of the geologic history of the area. Specifically, the map is a compilation (fig. 1) and in some respects an interpretation or modification of maps on a larger scale and usually of greater detail. Many of these maps are available from the Illinois State Geological Survey as published maps or ozalid prints of unpublished maps; others are accessible for reference at the Survey as unpublished maps on open file.

The regional map was prepared in the belief that a single map of the sand and gravel deposits in the area would be of use to the sand and gravel industry and for a variety of other purposes, such as land-use planning, construction, and engineering projects. Present land use is disregarded because it is subject to change. Location and extent of sand and gravel pits, either operating, idle, or abandoned, are not shown because the scale of the map is too small and the pits are locally too numerous. The various areas of deposits are believed to be shown with reasonable accuracy, although because of the scale of the map some small areas are enlarged and very small areas are not shown. Lamar directed the cartography of the map and Ekblaw was responsible for geological interpretations involved in the unification of the source data.

Previous Investigations

The first study reporting the presence of sand and gravel in northeastern Illinois was accomplished about a century ago (Bannister, 1868, 1870; Bradley, 1870). A comprehensive study of the glacial geology (Leverett, 1899) provided the first map and the first detailed descriptions of the sand and gravel deposits in northeastern Illinois. These were supplemented by a study in southeastern Wisconsin (Alden, 1904), which provided some modifications of the maps and interpretations for northeastern Illinois.

The sand and gravel resources in northeastern Illinois were studied in 1919 by M. M. Leighton, assisted by Frank Poulsen and E. L. Wingert. In 1924 Ekblaw began the preparation of a report of the sand and gravel resources of northeastern Illinois, which he completed with accompanying maps on a scale of 1 inch = 4 miles by mid-1927. His manuscript glacial geology map was made available to and was incorporated by Fryxell as the Illinois portion of plate 1 "Glacial Map of the Region of Chicago" in his report of the Chicago Region (1927). The map was also used in plate 2 in XVI International Geological Congress Guidebook 26 (Leighton and Ekblaw, 1932) and in figure 90 of Illinois Geological Survey Bulletin 66 (Willman and Payne, 1942). With revisions it has from time to time been used in several other publications.

Much detailed information about the sand and gravel deposits in northeastern Illinois has been acquired through the study of the geology of most of the quadrangles in the area by Alden, Block, Bretz, Culver, Ekblaw and Powers, Fisher, Leighton, MacClintock, Millington, Powers, Thomas, Trowbridge, and Willman and Payne. The results of some of these studies have been published (see references), but those of the Lombard, Naperville, West Chicago, and Wheaton Quadrangles by Block, the Wilmington by Fisher, the Elgin by Leighton, the Barrington by MacClintock, the Geneva by Powers, and the Grayslake and Waukegan by Millington, Powers, and Thomas are accessible as unpublished reports and maps in the open files of the Illinois State Geological Survey at Urbana, Illinois.

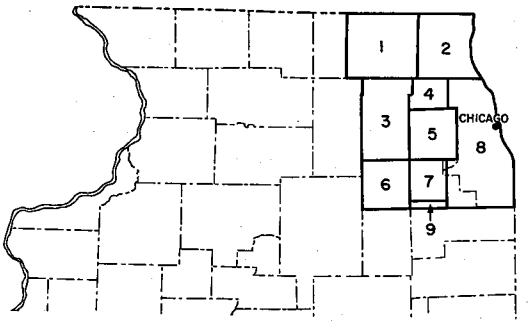

Fig. 1 - Map of northeastern Illinois showing major sources from which plate 1 was compiled. In addition to sources shown, other supplementary source materials were used and data from the indicated maps were modified by use of unpublished data. Numbered areas refer to the following: (1) Anderson and Block, 1962, Sand and gravel resources of McHenry County; (2) Ekblaw and Schaefer, unpublished map, Preliminary map of the sand and gravel resources of Lake County; (3) Block, 1960, Sand and gravel resources of Kane County; (4) Ekblaw, unpublished map, Sand and gravel resources of northwest Cook County, modified from unpublished geologic quadrangle maps by M. M. Leighton, Paul MacClintock, and W. E. Powers, on file at the Illinois State Geological Survey; (5) Ekblaw, unpublished maps, Sand and gravel resources of DuPage County, adapted from figure 8 in Zeizel and others, 1962; (6) Ekblaw, unpublished map, modified from Wascher and Odell, 1952; (7) Fisher, 1925, Geologic map of Joliet Quadrangle; (8) Bretz, 1943 (issued 1955), Quadrangle geologic maps of the Chicago Area; (9) Fisher, unpublished map, Geologic map of Wilmington Quadrangle.

ORIGIN AND CHARACTER OF DEPOSITS

Some sand and gravel deposits in this region are the product of the present streams of the region, of deposition on the present beaches of Lake Michigan, and of sand dunes formed by the action of winds on earlier deposits of sand and gravel. However, the preponderance of sand and gravel in the region was deposited directly or indirectly from the Wisconsinan glacier. This glacier originated in the vicinity of Hudson Bay in Canada and spread southwestward into Illinois to cover roughly the northeast half of the state. However, the movement of the glacier was not a single advance followed by a recession but consisted of a succession of major advances or glacial substages each followed by a major recession culminating in an interglacial substage. Moreover, the advance and recession in each glacial substage was not a single continuous movement but a number of advances, partial recessions, readvances, and terminal recessions.

Fragments of the rocks in the areas over which the glacier passed—such as the igneous rocks in Canada, the shale in the bottom of the depression now occupied by Lake Michigan, and the dolomite in northeastern Illinois—were picked up by and incorporated in the glacier. Thus, they were subjected to all degrees of abrasion and crushing, eventually ranging in size from tiny particles of clay to large boulders. The earth material that the glacier incorporated is known as glacial drift.

When the glacial ice melted, the glacial drift was released. If the melting was slow, so that the drift settled in place, it became a more or less uniform unsorted deposit of clay and silt, with sand, pebbles, and boulders in varying amounts. Such deposits are known as glacial till and constitute the most common surficial material in much of northeastern Illinois. When the advance and the melting of the ice were essentially in balance, so that the front of the glacier remained relatively stationary or moved back and forth within a zone only a few thousand feet or a few miles wide, the drift deposited along the margin of the glacier formed more or less irregular ridges that are termed end moraines. When the melting exceeded the advance, so that the glacial front receded, the drift formed low-relief plains, termed ground moraine. Because of the numerous advances and recessions of the Wisconsinan glacier, it created several end moraines with intervening ground moraine in northeastern Illinois (fig. 2).

As the water from the melting glacier flowed away, it carried with it some of the glacial drift released by the melting. The amount of this water-borne drift, termed outwash, was determined by the amount of meltwater, which in turn was determined by (1) the rate of melting and (2) the area of drainage. The maximum size of rock fragments in the outwash was determined by the velocity and volume of the meltwater. These same factors also served to sort the outwash. The coarsest materials—pebbles, cobbles, and boulders—were deposited nearest the glacier, and the fine and finer materials—sand, silt, and clay—were carried successively farther and farther from it. The sorting was rarely perfect. Hence, gravel deposits contain a considerable amount of sand, and sand deposits contain pebbles and also silt and clay.

The outwash in northeastern Illinois occurs as (1) sheetlike deposits, called outwash plains, spread out in front of the glacier, and (2) elongate deposits, known as valley trains, in the valleys along which the meltwaters were concentrated (pl. 1). In many cases in northeastern Illinois, present-day streams have eroded their valleys in the outwash deposits, especially the valley trains, and the remnants of the deposits constitute more or less continuous terraces along the valleys.

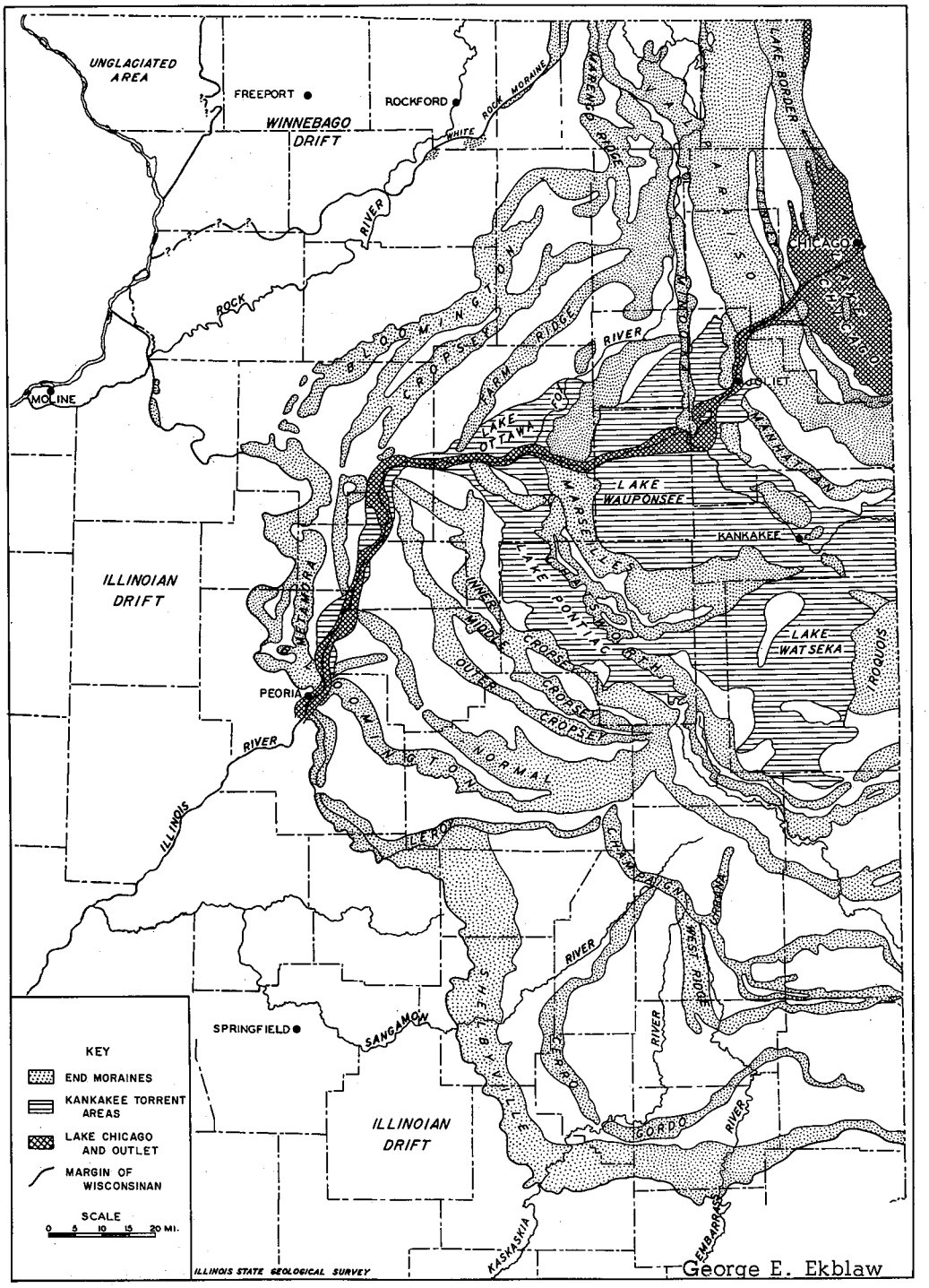

Fig. 2 - Glacial map of northeastern Illinois (revised 1960).

Outwash plains and valley trains are major sources of sand and gravel in northeastern Illinois. Because they were deposited in layers or beds, the materials in them are comparatively uniform laterally but vary vertically.

The areas mapped as outwash plains (sheetlike deposits) on plate 1 include ice-front deltas and slack-water materials that were deposited in temporary glacial lakes. The mapping differentiates the outwash plains into (1) those that contain significant amounts of gravel and (2) those that are principally sand. In the mapped areas, the overburden is believed generally not to exceed 10 feet, but at some places it may be thicker. It is also likely that at some places the outwash deposits may extend laterally beyond the areas mapped into adjacent areas where the overburden exceeds 10 feet. In a few places in DuPage County, the deposits are overlain by a thin layer of till, at other places by lacustrine silt and clay. The deposits range in thickness from a few to nearly 100 feet.

In the elongate areas mapped as valley trains on plate 1, the overburden is also believed generally not to exceed 10 feet, but it may be thicker locally. It is unlikely that the valley trains extend laterally farther than mapped. They range in thickness from a few to 50 feet or more. In northwest Cook County and at some places in Kane County, especially in Fox River Valley, the valley train deposits are hardly more than a veneer on the floors of the valleys. The valley train along Des Plaines River in Lake and Cook Counties rests on an uneven till floor, and consequently the valley train varies considerably in thickness. Also, the surface of this valley train is characterized by low ridges or mounds that were bars in the glacial river that deposited the valley train. The material in these ridges and mounds was generally coarser than in the rest of the train, and for this reason much of this material already has been exploited.

In addition to outwash plains and valley trains, there are in northeastern Illinois kames, or hills, and eskers, or ridges, of sand and gravel. Kames consist of material deposited by glacial meltwater in vertical crevasses or holes in the glacier, generally at or near its front. Eskers consist of material deposited in the beds of streams that flowed under, in, or on top of the glacier. When the ice melted, the kames were left as more or less rounded hills, and the eskers were left as ridges of varying lengths and continuity. The materials in these deposits vary greatly in size and character, but they are a common source of sand and gravel in some parts of the area (pl. 1).

During the latest part of the Wisconsinan Stage, the Lake Michigan basin was occupied by a lake, known as Lake Chicago, which was larger than Lake Michigan. The level of Lake Chicago varied with the advances and recessions of the glacier. At three of its stages, its levels were about 55, 35, and 20 feet above that of Lake Michigan. Each of these stages is marked by beach ridges of gravelly sand that extend generally from northeast to southwest and from southeast to northwest across the Chicago plain (pl. 1). In places the beach sand has been blown into dunes. The beach and dune deposits now occur principally in the south part of the Chicago area, but formerly they occurred at many other parts from which they have been either completely excavated or rendered inaccessible because of houses, stores, or factories. For years these deposits have been used as a commercial source of sand.

A deposit of unusual drift, which consists of clayey gravel, sandy silt, and sand and is exposed in places near Lemont (pl. 1), termed the Lemont drift, has been exploited locally as a source of sand and gravel. Similar material occurs elsewhere in the area and is locally a relatively important source of sand and gravel.

Although much or most alluvium consists of clay and silt mixed with more or less sand and gravel, deposits of sand and gravel of potential significance are known to occur at places in the areas mapped as alluvium in northeastern Illinois (pl. 1). Where the present streams are flowing on or near bedrock, the alluvium may consist of only a few feet of sand and gravel. At some places, alluvium of sand and gravel may overlie similar deposits of outwash and thus render the two sources difficult to distinguish. Peat and muck that may occur locally as part of the alluvium are not differentiated from the sand and gravel deposits.

In the blank areas on plate 1, the usual subsoil material is glacial till, generally barren of sand and gravel in commercial quantities, but as the area has not been completely explored in detail, these areas may at some places include lenses of gravel of sufficient volume to be of commercial significance.

More detailed discussion of the glacial history of northeastern Illinois and of the formation of its sand and gravel deposits is presented in the publications listed in the references and in other publications and other sources cited in these references.

INDUSTRY

Location of Producers

Commercial production of sand and gravel is reported near the following towns in northeastern Illinois (Busch, 1963). The counties shown are those in which the pits are located:

Cook County - Arlington Heights, Bartlett, Elgin, Glenview, Wheeling, Worth.
DuPage County - Lisle, Warrenville, Wayne, Winfield.
Kane County - Aurora, Big Rock, Carpenterville, Dundee, East Dundee, Elburn, Elgin, Hampshire, Montgomery, North Aurora, Pingree Grove, St. Charles, South Elgin, West Dundee.
Kendall County - Oswego, Plano.
Lake County - Antioch, Barrington, Fox Lake, Gurnee, Half Day, Ingleside, Libertyville, Round Lake, Wadsworth, Wauconda, Waukegan.
McHenry County - Algonquin, Cary, Crystal Lake, Fox River Grove, Harvard, Huntley, Island Lake, Marengo, McHenry, Spring Grove, Woodstock.
Will County (northern) - Barbers Corner, Joliet, Lockport, Plainfield, Rockdale.

This list probably does not include all current producers. Many medium- or small-sized sand and gravel operations are scattered throughout northeastern Illinois, especially in Kane, Kendall, Lake, and McHenry Counties.

Type of Deposits Exploited

The larger sand and gravel pits in northeastern Illinois are located mostly in outwash deposits. The thickness of the deposits worked varies but is usually about 25 to 35 feet. However, as much as 65 feet of sand and gravel has been worked at some places. Kames and eskers also are significant sources of sand and gravel at some places.

Current Production

In 1962 more than $7\frac{1}{2}$ million tons of gravel having a value at the pit of over $6,000,000 and more than 5 million tons of sand having a value at the pit of nearly $4,000,000, or a total of more than 12 million tons of sand and gravel valued at more than $10,000,000, were produced in the area.

Future Status

Tremendous tonnages have been produced from northeastern Illinois deposits of sand and gravel, and production is continuing at a high rate. As a result, some of the most accessible and readily worked deposits have been depleted. Although some deposits undoubtedly remain that have not been identified on the map accompanying this report, there is, as is true with all mineral deposits, a limit to the amount of material available for exploitation. The quantity available for future use is being steadily reduced, not only by current production, but also by the expansion of residential and industrial areas and by legal restriction.

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