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STATE OF ILLINOIS
DEPARTMENT OF REGISTRATION AND EDUCATION

MINERAL RESOURCES AND
MINERAL INDUSTRIES OF
THE NORTHEASTERN
ILLINOIS REGION

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MINERAL RESOURCES AND MINERAL INDUSTRIES
OF THE NORTHEASTERN ILLINOIS REGION

Robert L. Major

ABSTRACT

The mineral resources, primary mineral producing operations, and mineral processing facilities in the Northeastern Illinois Region are located and described in this report. The region includes six counties—Cook, DuPage, Kane, Lake, McHenry, and Will.

Value of mineral production in 1966 was \$66.1 million. The minerals and mineral products produced in the region included coal, limestone and dolomite, sand and gravel, and clay products. In addition, the region contains feldspar-bearing sands that are not being used at present but might be usable in the future if certain beneficiation problems are solved.

The Northeastern Illinois Region is the largest and most diversified mineral processing region in the state. A large iron and steel industry is located there plus a number of nonferrous metals smelters. Nonmetallic processors, using imported raw materials, manufacture products from such varied materials as perlite, gypsum, vermiculite, mica, and natural iron oxides. Three lime plants are located in the area. Peat is dug and processed by four firms for use as a soil conditioner. There are three oil refineries operating in the region, plus many miles of pipelines carrying crude petroleum, refined products, and natural gas.

INTRODUCTION

This report is the last in a series of eight dealing with the mineral resources and related mineral industries of Illinois. The series has been prepared by the Mineral Economics Group of the Illinois State Geological Survey, with the assistance of other Survey staff members. All production statistics used, unless otherwise noted, are based on the annual reports on Illinois mineral production published by the Survey. Each report of the series has considered one particular region of the state. This report covers the Northeastern Illinois Region, which comprises Cook, DuPage, Kane, Lake,

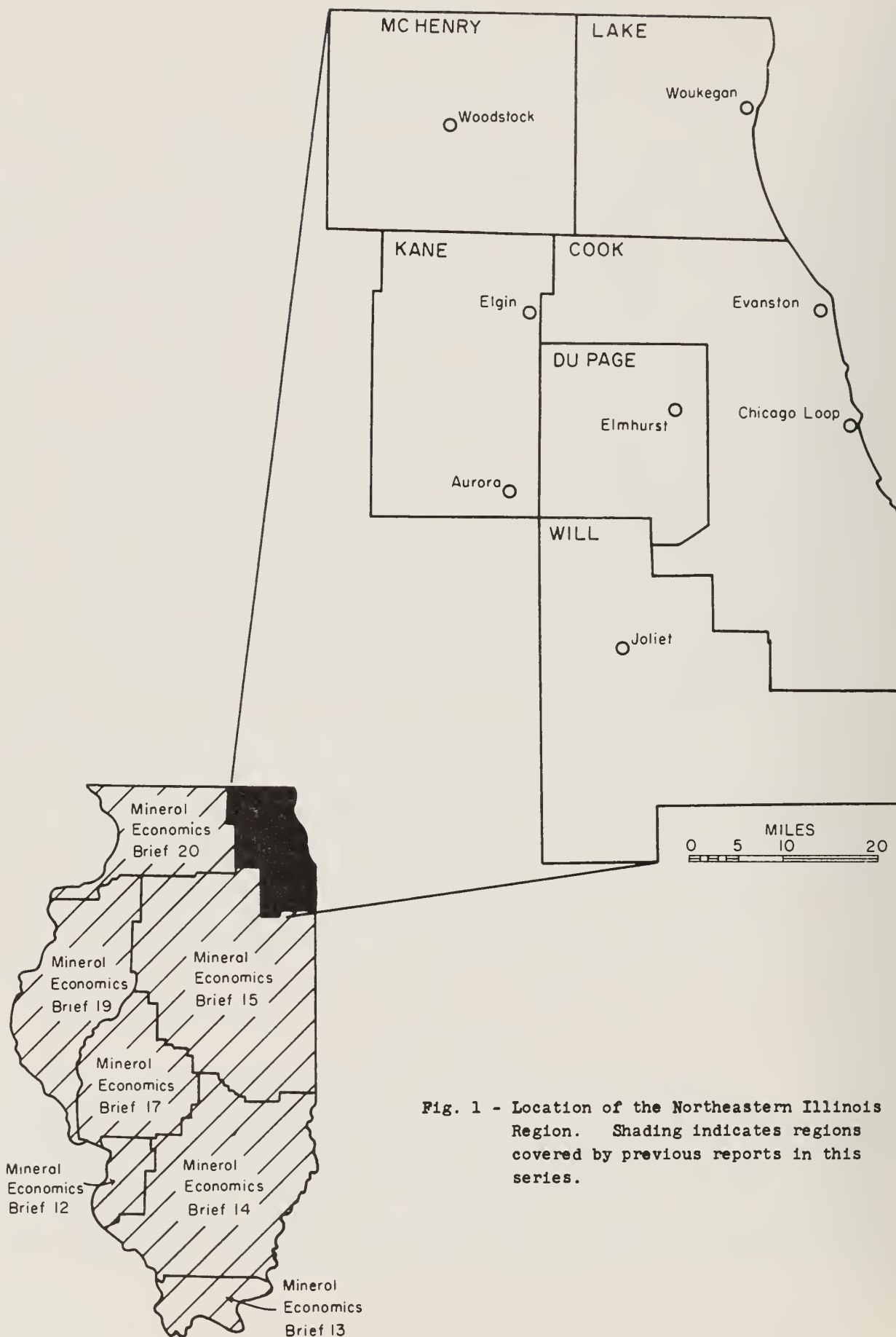


Fig. 1 - Location of the Northeastern Illinois Region. Shading indicates regions covered by previous reports in this series.

McHenry, and Will Counties (fig. 1). The region is synonymous with the Chicago Standard Metropolitan Statistical Area as it is defined by the U. S. Bureau of the Census. It is the most populous region in the state; in 1964 it contained 6.6 million people, or 63 percent of the state's total population.

The relative importance of the region as a producer of various mineral commodities between 1956 and 1966 is shown in figure 2. During this period, the Northeastern Illinois Region averaged 49 percent of the state's production of gravel, 45 percent of the crushed and broken stone, 37 percent of the sand, 32 percent of the clay products, and about 1 percent of the coal. In addition, it is the largest producer of lime in Illinois. The size of the payroll and the number of employees dependent upon the mineral industries in the Northeastern Illinois Region are given on a county basis in table 1.

The value of mineral production in the region (table 2) was \$64.9 million in 1965 and \$66.1 million in 1966, or 10.5 percent and 10.3 percent, respectively, of the state total for each of the two years. The commodities produced, in order of their 1966 value, were stone and lime, clay products, gravel, sand, and coal.

Each of the commodities is discussed in terms of resources, past and present production, and the extent of producing facilities. Undeveloped minerals of potential importance also are considered, as well as the mineral and metal processing facilities.

LIMESTONE, DOLOMITE, AND LIME

In Illinois, the principal products of the stone industry are crushed and broken stone for road surfacing, for agricultural limestone, and for aggregate used in concrete and bituminous roads and in concrete structures. The southern half of the Northeastern Illinois Region possesses rather extensive surface and near-surface deposits of dolomite (fig. 3). The rocks of the Silurian System, the Niagaran Series in particular, are the main source materials for the stone industry. These rocks are dolomite that is quite pure in many areas. Their proximity to the metropolitan Chicago market makes these units the most valuable and most intensively exploited in the state.

The best source of detailed information on the dolomite resources of the Northeastern Illinois Region was a report by Willman (1943, p. 24-52). Sub-surface deposits of dolomite in Lake and McHenry Counties and in part of northeastern Cook County were discussed by Ostrom (1956). An earlier report on the limestone and dolomite resources of all the counties in Illinois was prepared by Krey and Lamar (1925), in which sections pertinent to the Northeastern Illinois Region can be found on pages 97-115, 124-131, 135, 154, 185-196.

Regional production and value of crushed and broken stone and lime from 1956 to 1966 are shown in figure 4. In 1966, 17 quarries in five counties reported production. These quarries, combined with the three lime plants in Cook County, produced \$36.2 million worth of lime and crushed and broken stone in that year. One of the lime plants uses stone from out-of-state sources.

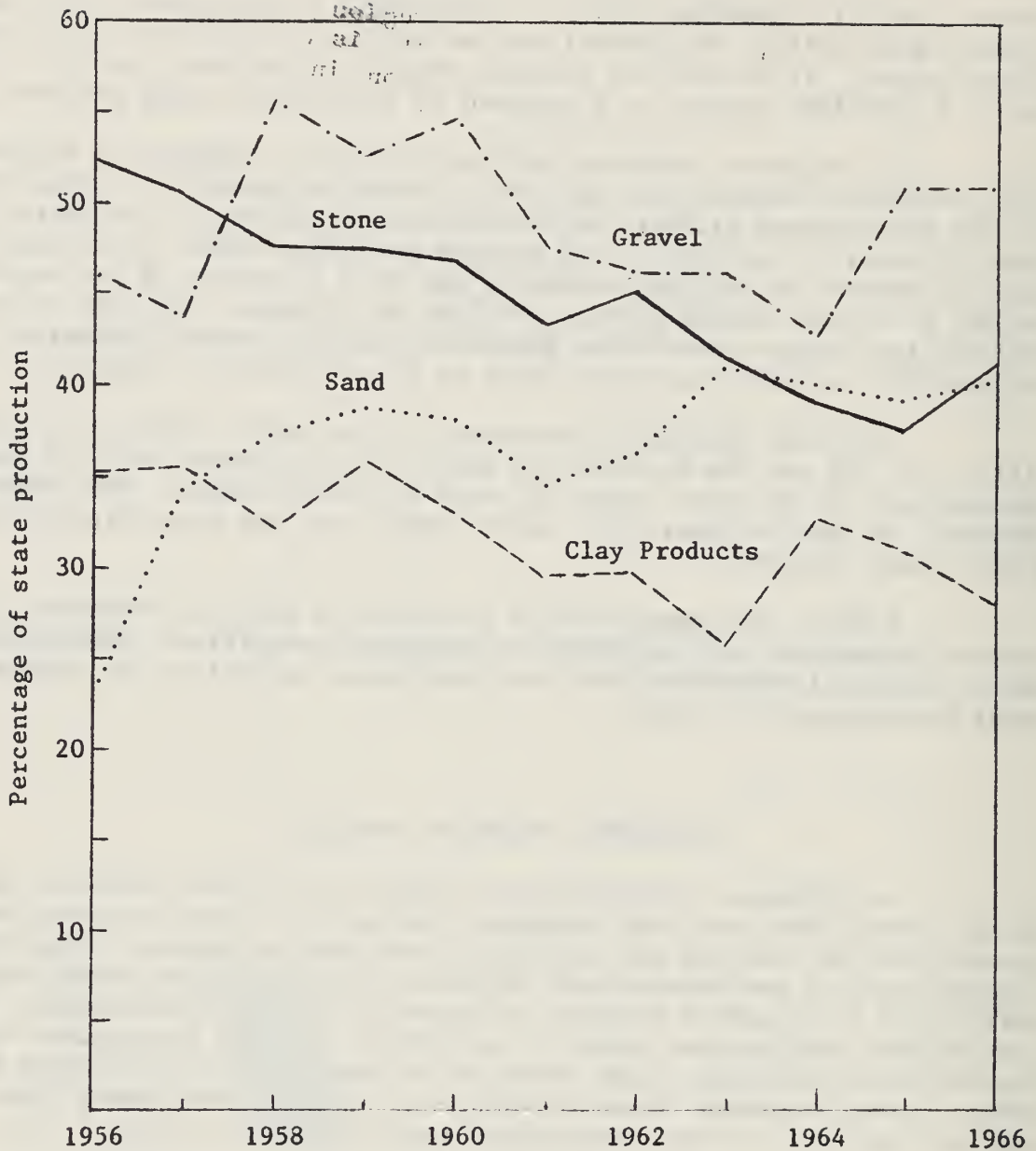


Fig. 2 - Mineral production in the Northeastern Illinois Region shown as a percentage of the total Illinois production for each commodity. Regional coal production is less than 1 percent of the state total and is not shown.

The production values from these plants and quarries must be combined to prevent disclosure of lime data, which is unfortunate because great differences in the magnitude of the tonnages and values are involved. The average per ton value of lime is about 12 times that for crushed and broken stone. In order to illustrate the production and value trends for these commodities from 1956 through 1966, index numbers have been used. Figures 5 and 6 show these trends for lime and crushed and broken stone, respectively. Most of the growth has taken place in the lime industry.

TABLE 1 - EMPLOYMENT AND PAYROLL OF THE MINERAL INDUSTRIES IN THE NORTHEASTERN ILLINOIS REGION*

County	Employees		Payroll (in \$1000)	
	1958	1963	1958	1963
Cook	1,877	2,169	\$ 13,351	\$ 16,023
DuPage	NA	NA	NA	NA
Kane	118	113	633	639
Lake	51	47	266	386
McHenry	219	181	1,483	1,202
Will	550	449	3,393	2,881
Regional total (partial)	2,815	2,959	\$ 19,126	\$ 21,131
State total	27,482	22,675	\$144,359	\$138,394
Regional percentage of state total	10.2	13.0	13.2	15.3

* Source: U. S. Bureau of the Census (1961, 1966).

NA - Data not available in U. S. Census of Mineral Industries (U. S. Bur. Census, 1961, 1966).

TABLE 2 - MINERAL PRODUCTION IN THE NORTHEASTERN ILLINOIS REGION

Commodity	Quantity (tons)	Value	No. of operations	Average value (\$/ton)
<u>1965</u>				
Coal	496,869	\$ 1,858,290	1	3.74
Lime	17,208,605	35,468,243	3	16.01
Crushed and broken stone			19	1.26
Sand	5,275,000	4,289,000	39	0.81
Gravel	9,246,000	7,154,000	39	0.77
Clay products	---	16,161,834	16	---
	Total value	\$64,931,367		
<u>1966</u>				
Coal	567,683	\$ 2,185,580	1	3.85
Lime	18,383,439	36,164,459	3	15.87
Crushed and broken stone			17	1.27
Sand	5,776,000	4,765,000	39	0.82
Gravel	9,674,000	7,626,000	47	0.79
Clay products	---	15,329,044	13	---
	Total value	\$66,070,083		

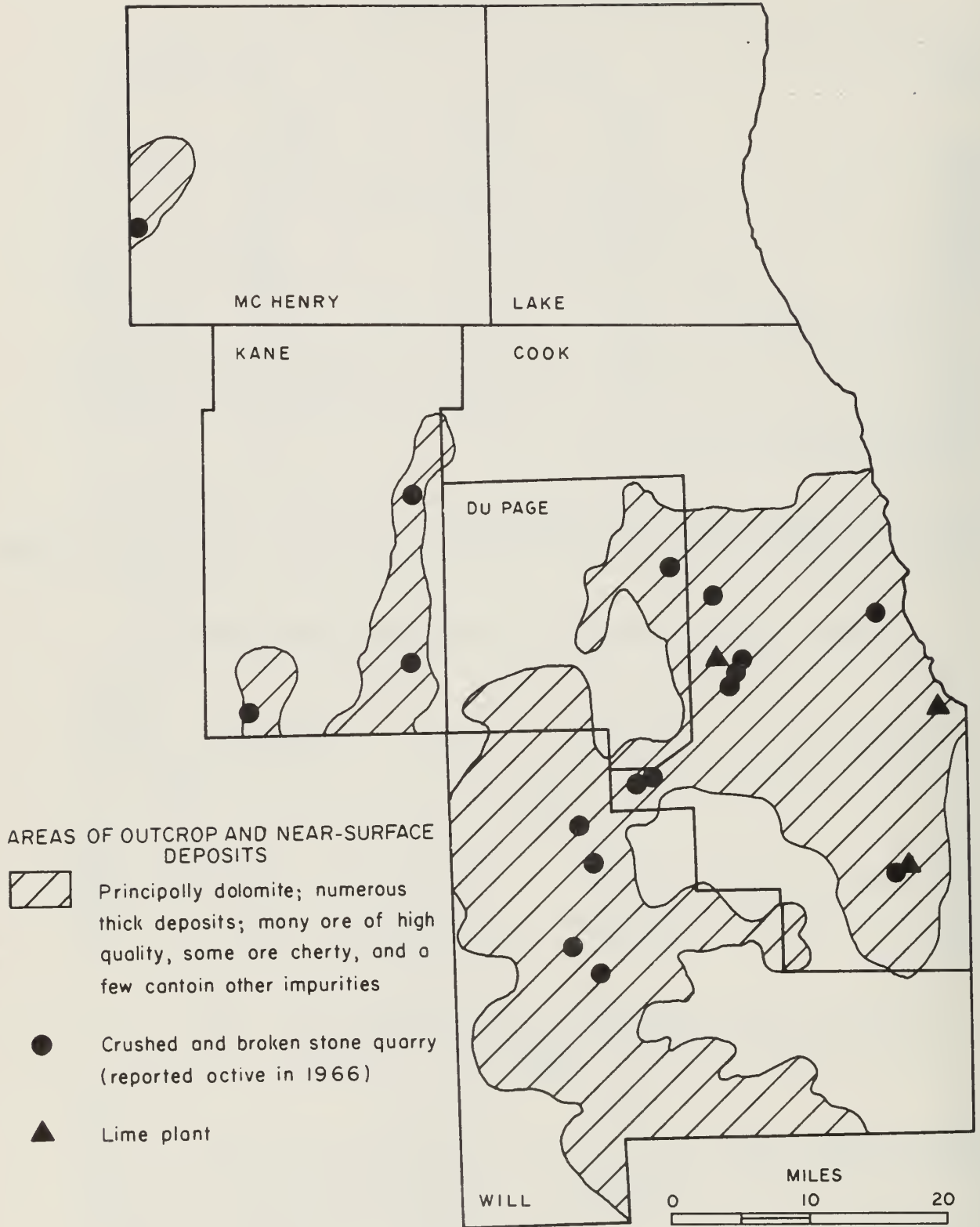


Fig. 3 - Stone resources and operations in the Northeastern Illinois Region. (Adapted from "Preliminary Map of Limestone Outcrops," compiled by Lamar and Schrode (1950) and Suter et al. (1959), p. 18 and 23.)

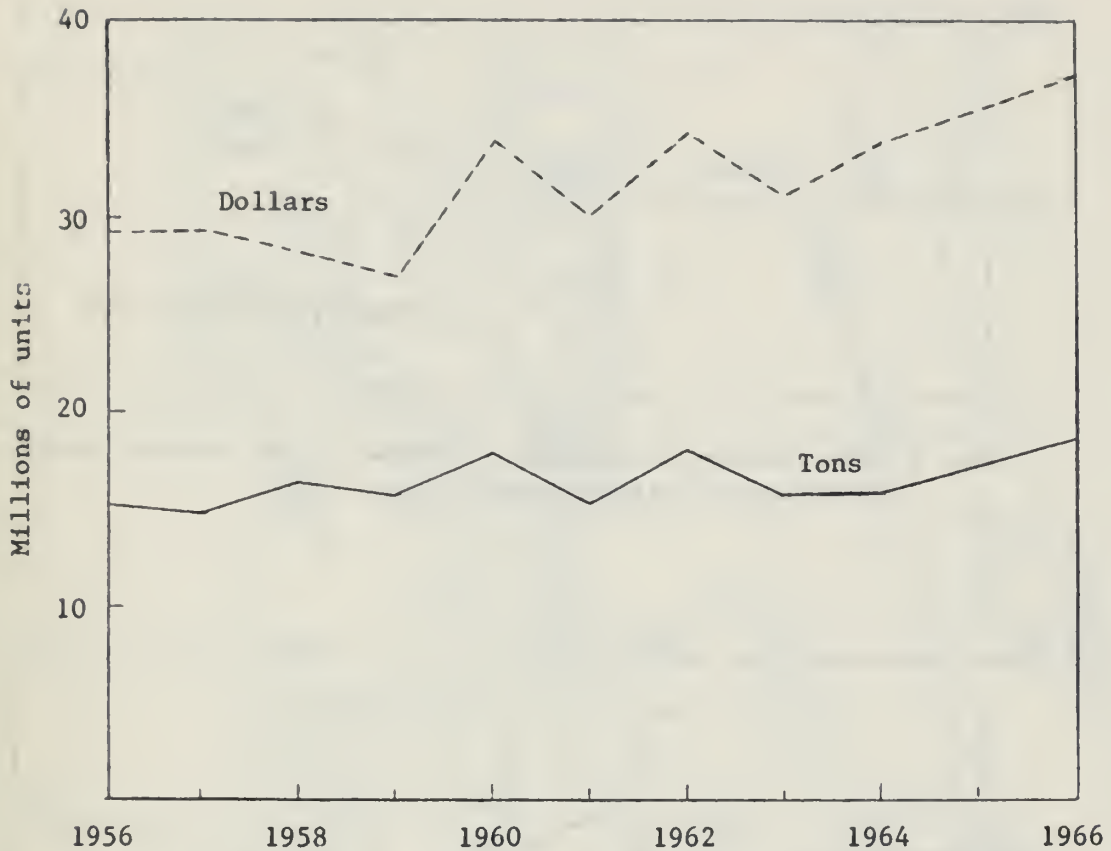


Fig. 4 - Tonnages and values for the combined production of crushed and broken stone and lime in the Northeastern Illinois Region, 1956 to 1966.

SAND AND GRAVEL

Sand and gravel are important natural resources that occur in many places in Illinois. These deposits are, with the exception of a few deposits in extreme southern and western Illinois, related directly or indirectly to past glacial activity. The Illinoian and Wisconsinan glaciations produced most of the economically important sand and gravel deposits in the state. An explanation of the origin of these deposits was prepared by Lamar and Willman (1958). Figure 7 shows the location of the major known sand and gravel resources in the Northeastern Illinois Region.

No meaningful tonnage data on reserves can be given. As sand and gravel are low-value commodities, the market area in which they can compete is usually quite restricted. Transportation costs often represent a greater portion of the delivered price than the initial value of the raw material at the pit site. Because of this, a deposit usually must be quite close to the market area to be economic. To be more specific, a nationwide study of transportation patterns has shown that rail hauls for aggregates average 80 to 90 miles; water hauls average 30 to 35 miles; and truck hauls, accounting for about 80 percent of sand and gravel transportation, probably average well under 30 miles (Davidson, 1965, p. 1). In certain localities, economic conditions permit hauling distances that vary considerably from these national averages. Detailed reports on the sand and gravel resources in McHenry County

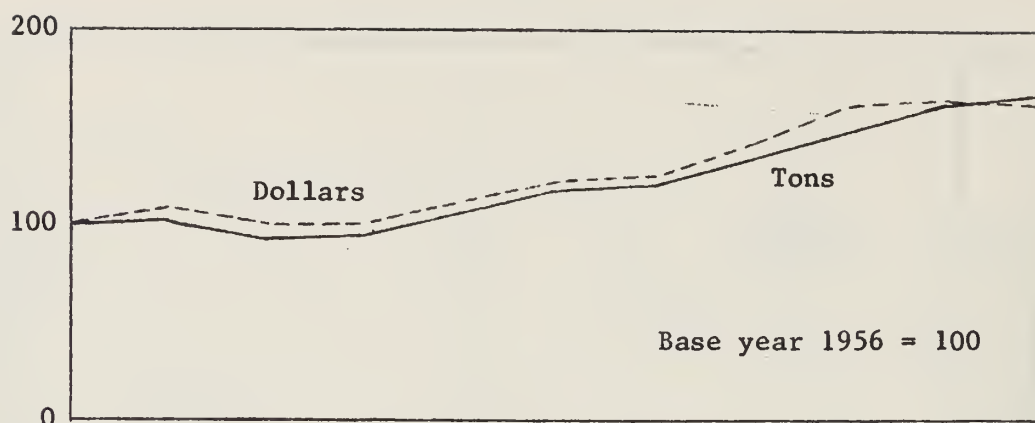


Fig. 5 - Index numbers for tonnages and values of lime produced in the Northeastern Illinois Region, 1956 to 1966.

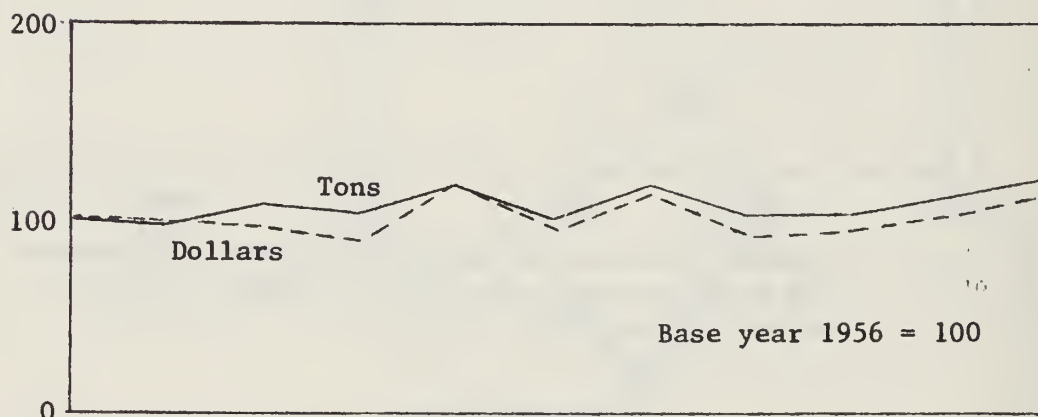


Fig. 6 - Index numbers for tonnages and values of crushed and broken stone, 1956 to 1966.

(Anderson and Block, 1962) and in Kane County (Block, 1960) have been prepared by the Illinois Geological Survey. A summary report on the sand and gravel resources of northeastern Illinois by Ekblaw and Lamar (1964) covers all of the area of this report except the southern half of Will County.

Quantities and values of sand produced in the Northeastern Illinois Region between 1956 and 1966 are shown in figure 8. In 1966, 39 pits in the six counties reported production totaling 5.8 million tons, or 40.2 percent of the state total for the same year. The leading counties, in terms of tonnage produced in 1966, were McHenry, Will, and Kane.

Tonnages and values of gravel produced in the Northeastern Illinois Region between 1956 and 1966 are shown in figure 9. In 1966, 47 pits, located in all six counties of the region, reported a combined tonnage of 9.7 million tons, or 50.8 percent of the Illinois gravel production for that year. The leading counties in terms of tonnage produced in 1966, were McHenry, Kane, and Will.

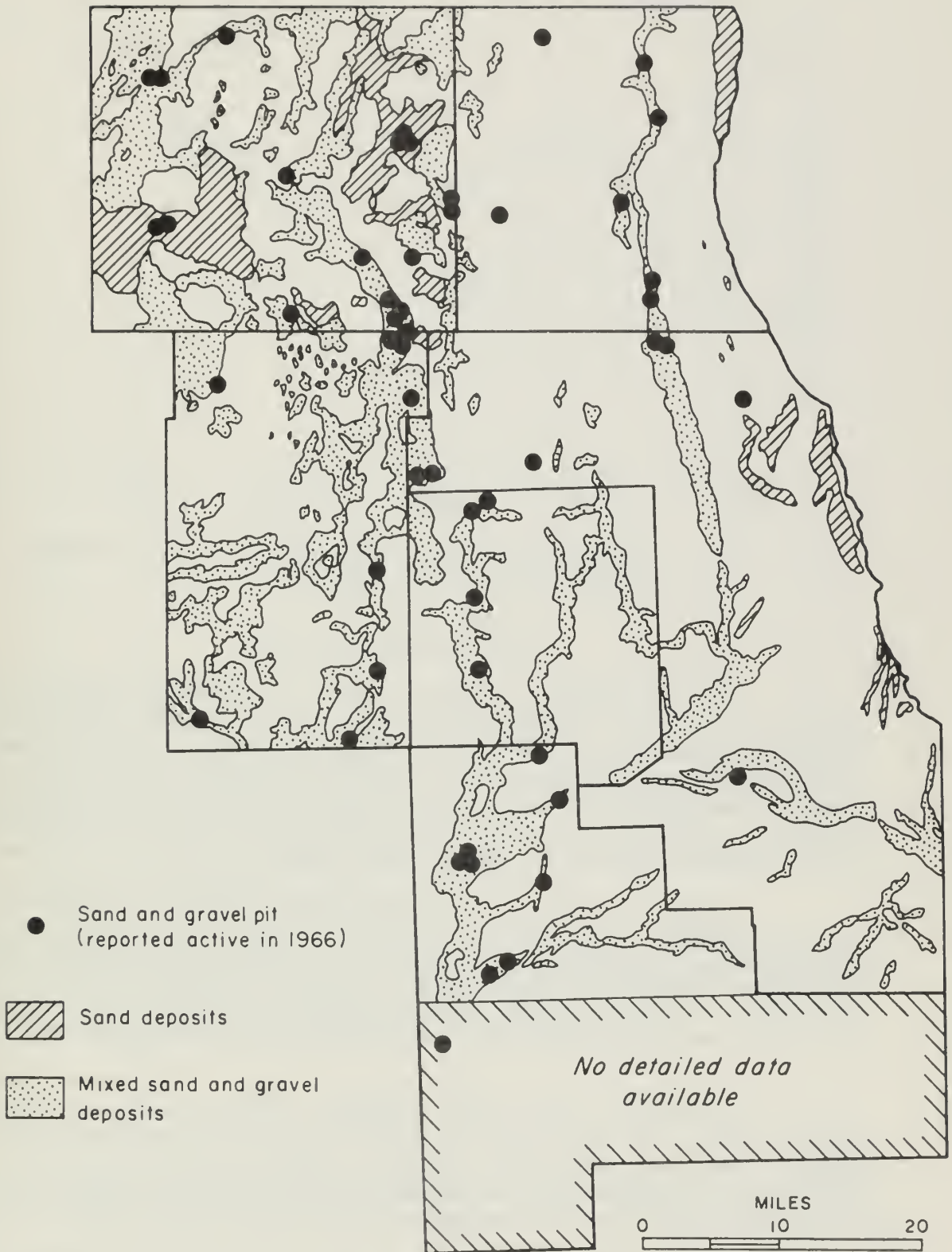


Fig. 7 - Sand and gravel resources and operations in the Northeastern Illinois Region. Resources data adapted from Ekblaw and Lamar (1964).

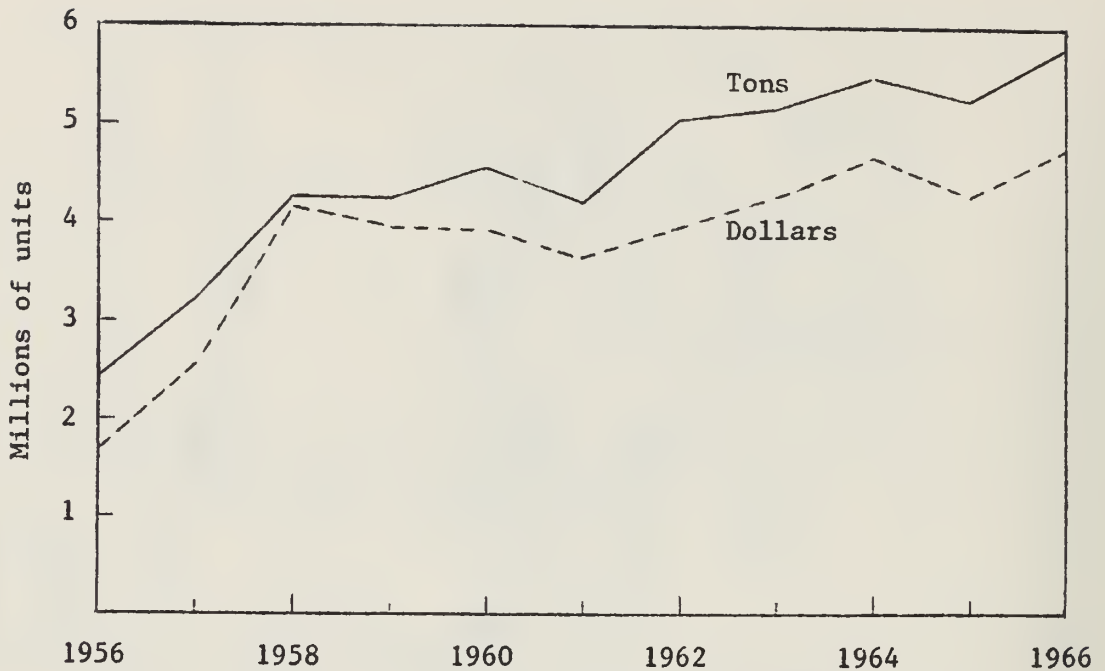


Fig. 8 - Production and value of sand produced in the Northeastern Illinois Region, 1956 to 1966.

CLAY AND CLAY PRODUCTS

The Northeastern Illinois Region is covered by extensive glacial deposits (fig. 10). However, only three of the 13 clay products plants that reported production in 1966 used raw materials from such local sources as lake deposits and glacial till. The other 10 plants in the region made products requiring the use of special clays brought from elsewhere in Illinois or from other states and foreign countries. Five of the plants produced refractories for the large metallurgical plants in the Chicago area.

Figure 11 indicates the approximate limits of strippable refractory clay deposits in the area. The term "strippable" is used rather loosely to indicate areas where the ratio of overburden to clay thickness falls within the generally accepted limits of present mining practices and economics. More detailed information on locations, tonnages, and types of clay resources can be obtained from the Illinois State Geological Survey.

White and Lamar (1960) compiled results of tests on 125 samples of clay that had been run by Survey personnel during a period of years. Of these samples, 10 were collected from localities in the Northeastern Illinois Region. The most frequently suggested products for which these clays could be used were common brick and building and drain tile. These clays could also be used for flower pots and other pottery after the stones are removed.

The production of clay products by Illinois manufacturers has been valued at 50 to 60 million dollars annually. About one-third of the production is in plants located in the Northeastern Illinois Region. In recent years, both the number of manufacturers and the value of their production have declined. The number of plants has dropped from 18 in 1956 to 13 in 1966. Five refractory producers, three common brick manufacturers, one

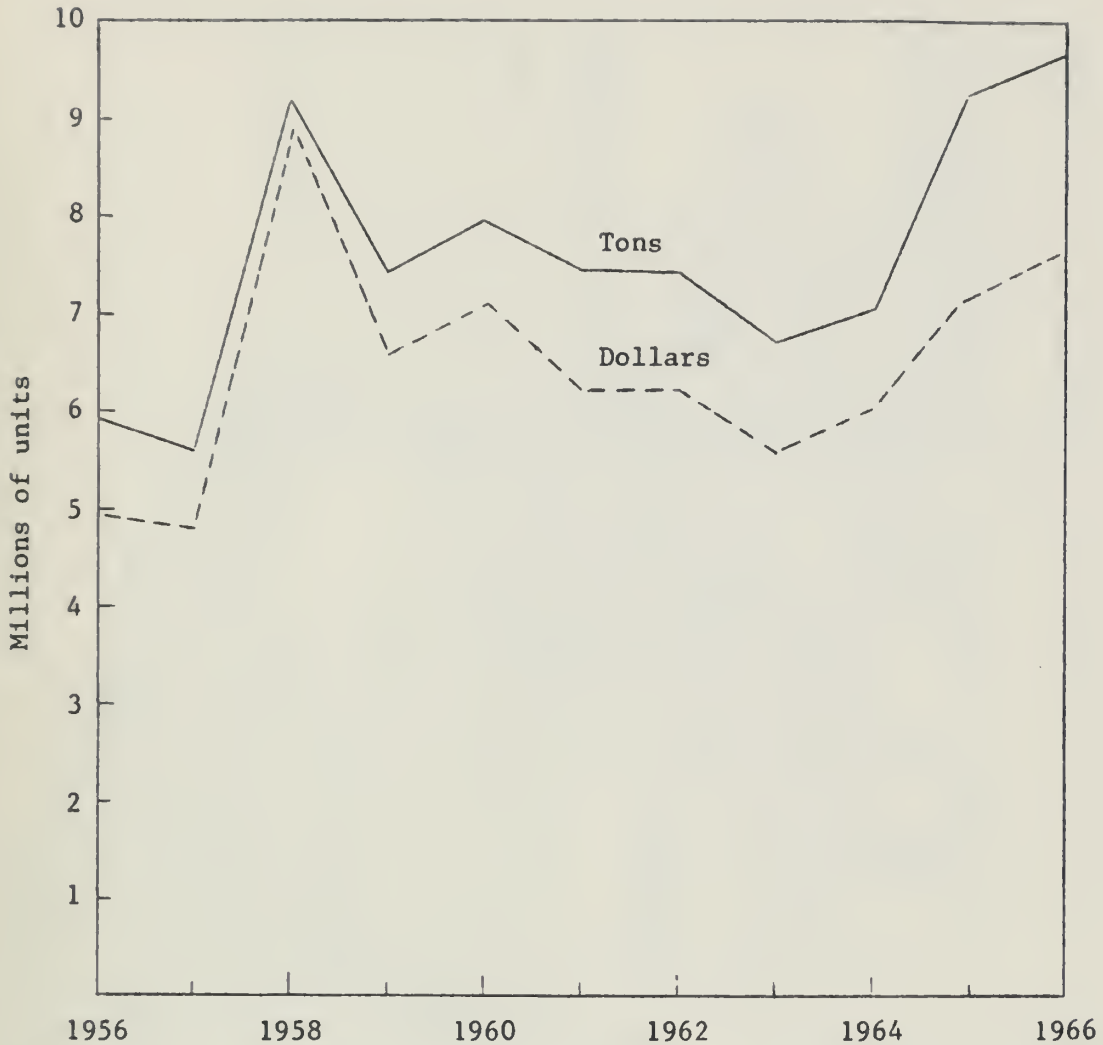


Fig. 9 - Tonnages and values of gravel produced in the Northeastern Illinois Region, 1956 to 1966.

pottery, one whiteware plant, one sewer-pipe maker, and one producer of terra cotta were in operation in 1966. The leading county, by a wide margin, was Cook, followed by Will and Kane. Value of production has ranged from \$21.6 million in 1957 to \$13.8 million in 1963 (fig. 12).

COAL

Although Illinois is abundantly endowed with coal resources, most of them lie to the south of the Northeastern Illinois Region. The northern edge of the coal-bearing rocks of the Pennsylvanian System in Illinois extends into the southern part of Will County (fig. 13). Cady and others (1952) estimated the total minable reserves in Will County as of 1952 at 13.7 million tons. Smith (1968), in evaluating the strippable coal reserves in north-central Illinois, estimated strippable reserves in Will County to be 21.7 million tons and distributed as follows: with 0 to 50 feet of overburden, 6.4 million tons; 50 to 100 feet of overburden, 13.9 million tons; and 100 to 150

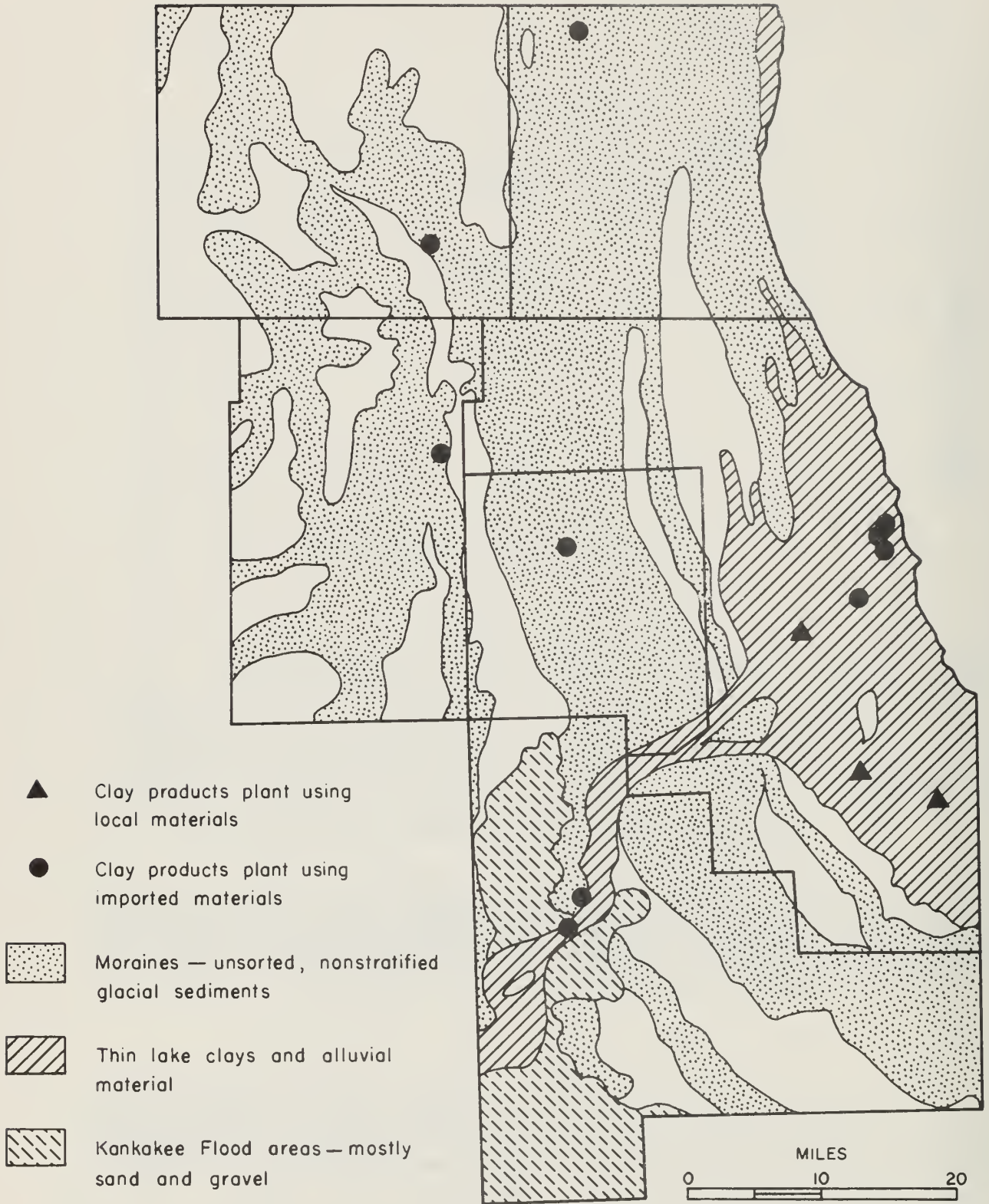


Fig. 10 - Clay resources and clay products operations in the Northeastern Illinois Region. Resource data taken from Ekblaw and Lamar (1964).

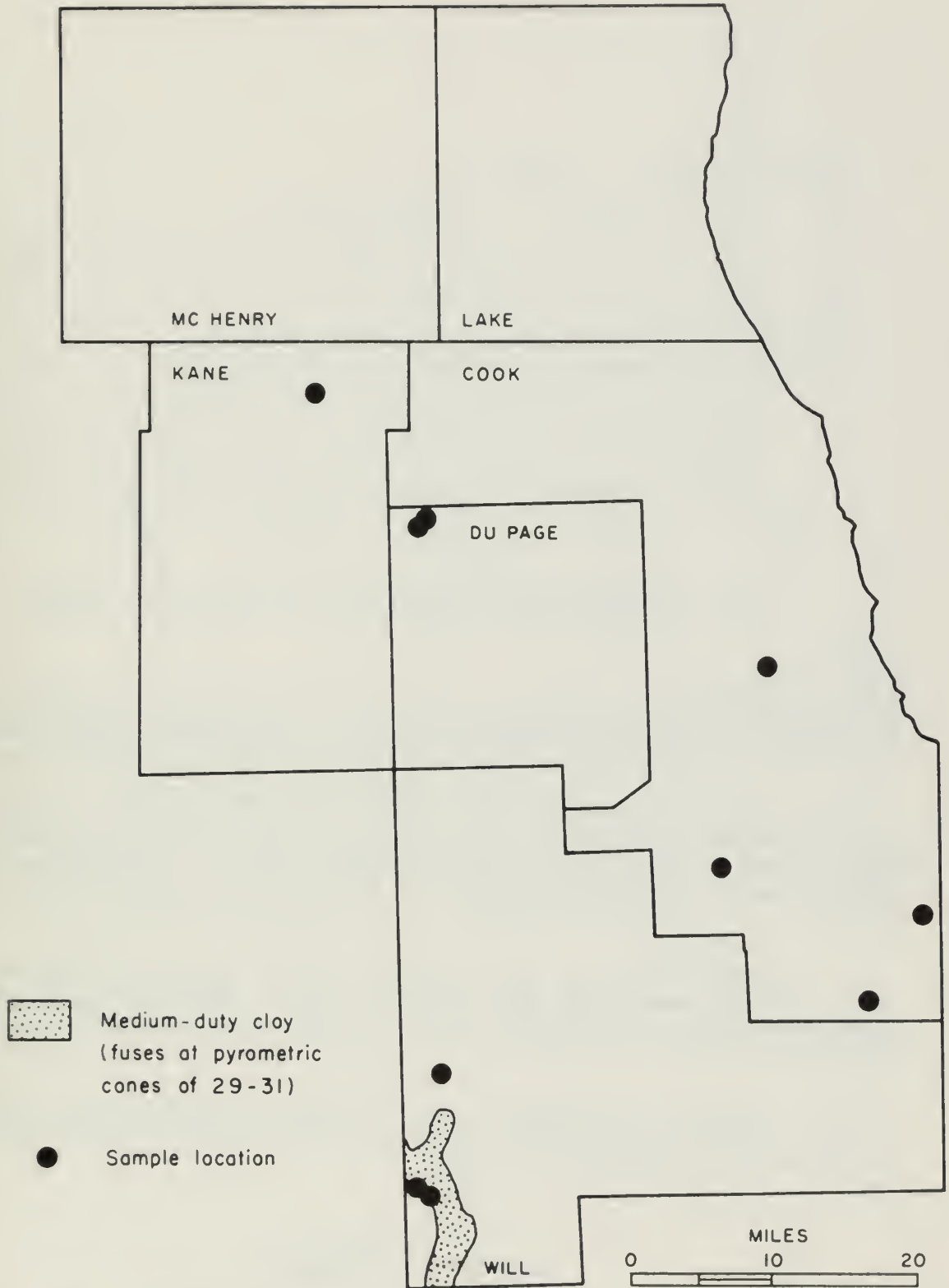


Fig. 11 - Distribution of strippable refractory clays in the Northeastern Illinois Region and location of clays sampled for ceramic testing. (Data from White and O'Brien (1964) and White and Lamar (1960).)

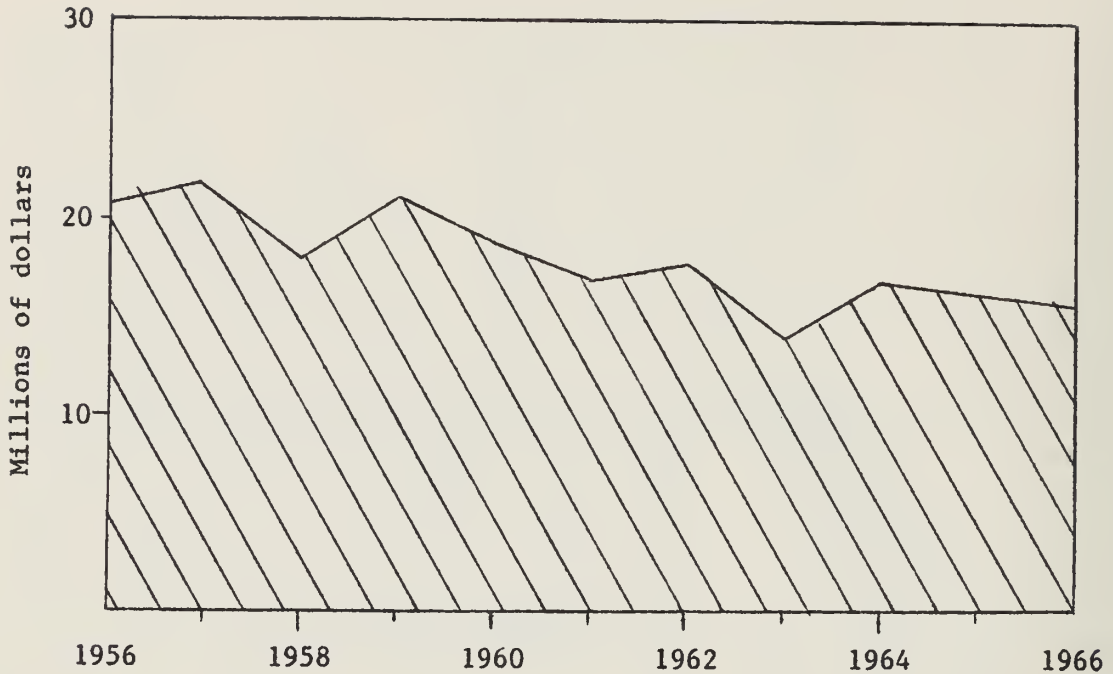


Fig. 12 - Value of clay products made in the Northeastern Illinois Region, 1956 to 1966.

feet of overburden, 1.3 million tons. As all of the coal in Will County is strippable, the reserves tonnage figure is a considerable upward revision of the earlier estimate by Cady, from 13.7 million to 21.7 million tons.

At present only one strip mine is operating in Will County. The coal is prepared and loaded at a preparation plant and tipples located just south of the county line in Kankakee County (fig. 13). Cumulative coal production from Will County, from 1882 to 1966 was 40.7 million tons (Busch, 1968).

The Chicago area is a sizable net importer of coal because of its large electric generation and industrial plants. Figure 13 shows the locations of the many coal handling docks located in the region to serve these markets.

Figure 14 indicates that coal production in the region has grown steadily between 1956 and 1966, when it reached 568,000 tons or 0.9 percent of the state's production of coal.

UNDEVELOPED MINERALS

Feldspar-Bearing Sands

Feldspar, an essential constituent in the manufacture of glass, pottery, and other ceramics, is a mineral occurring in many Illinois sand

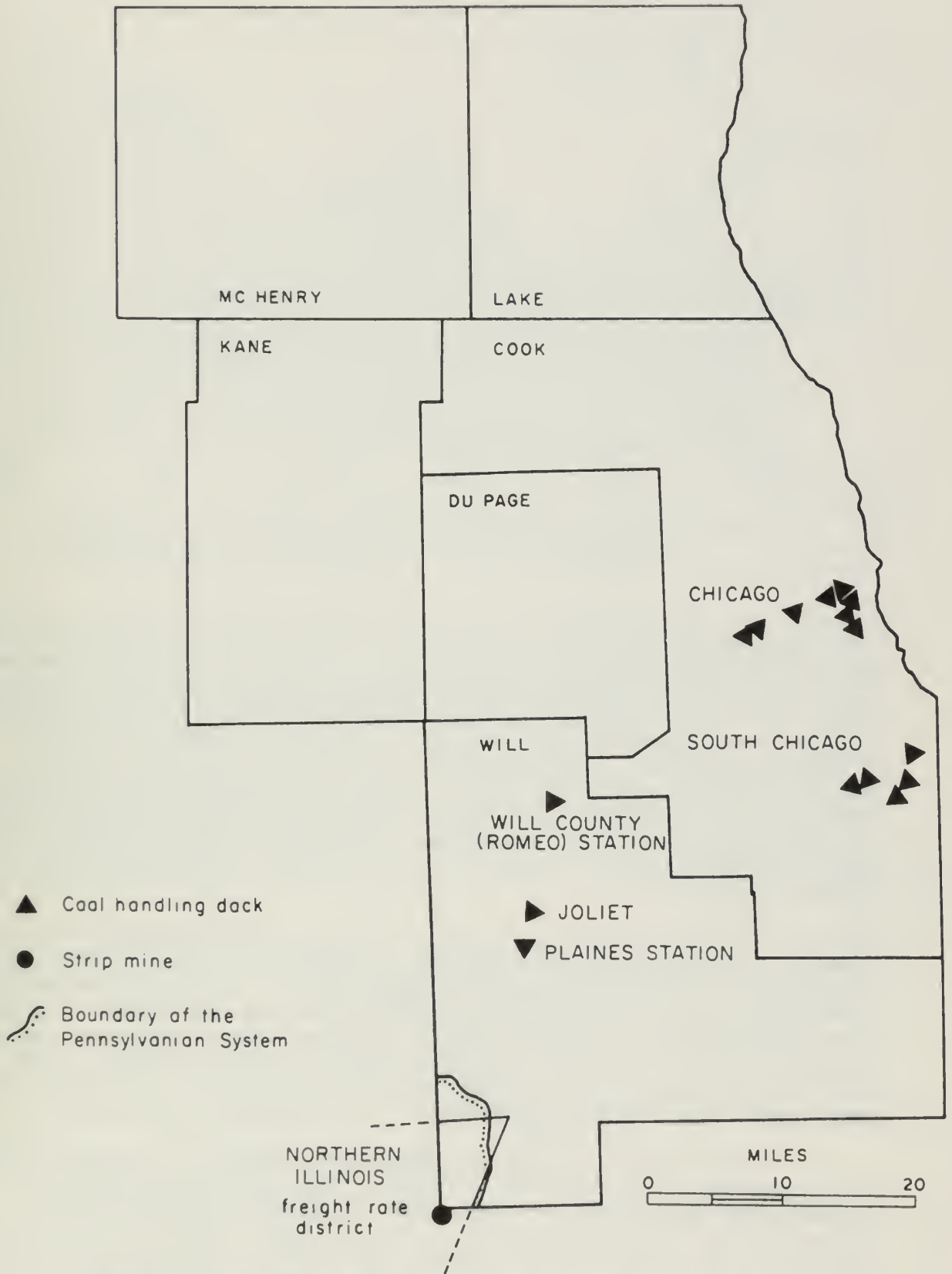


Fig. 13 - Coal resources and operations in the Northeastern Illinois Region. (From Simon, 1966.)

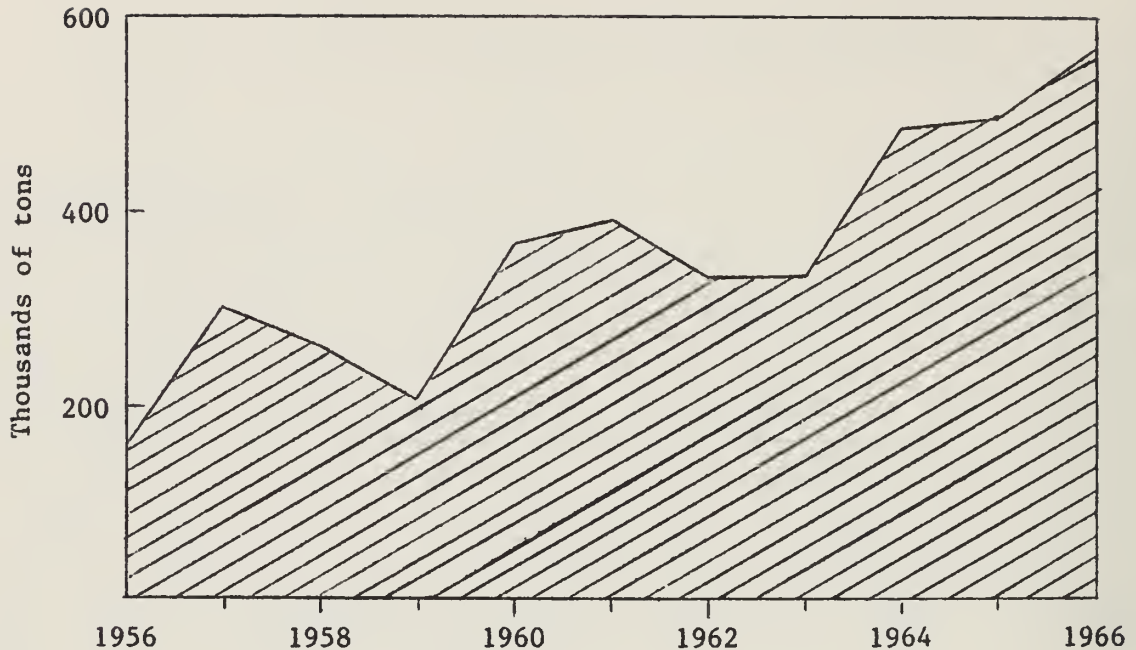


Fig. 14 - Annual coal production in the Northeastern Illinois Region, 1956 to 1966. All of the production was from Will County.

deposits. In 1965 Illinois was the third largest consumer of ground feldspar in the United States, using 66,160 tons, all of which came from out-of-state because no feldspar was produced in Illinois (U. S. Bur. Mines, 1967, p. 4). At present, feldspar is imported from such distant sources as North Carolina and South Dakota and, therefore, substantial freight charges are involved. For this reason, it has been suggested that certain of the dune, river, and glacial sands in Illinois might be beneficiated to produce a feldspar concentrate of acceptable grade that could supply all or part of the state's needs. Research is currently being carried out in the laboratories of the Illinois Geological Survey to investigate this possibility.

The locations of sand samples tested by Willman (1942) and Hunter (1965) for feldspar content are shown in figure 15. The principal sand deposits in the Northeastern Illinois Region occur in Lake Michigan and its beaches, in sand dunes and beach deposits along the shorelines of glacial Lake Chicago, and in outwash deposits that are widely distributed but especially abundant along the DesPlaines, DuPage, and Fox Valleys. The samples from dunes in southern Cook County had the highest yields of feldspar among those tested from this region.

A key factor in the utilization of feldspar for ceramics and glass-making purposes is its iron oxide content. The maximum allowable for flint (clear) glass is 0.05 percent iron oxide (Fe_2O_3); for amber glass it is 0.50 percent (U. S. Bur. Mines, 1965b, p. 322). Hunter (1965) studied the mode of occurrence and amount of iron oxide in the feldspars of his sand samples. He found that the sands contained potash feldspar, soda-lime feldspar, and feldspathic rock fragments, and that the potash feldspar contained less iron oxide

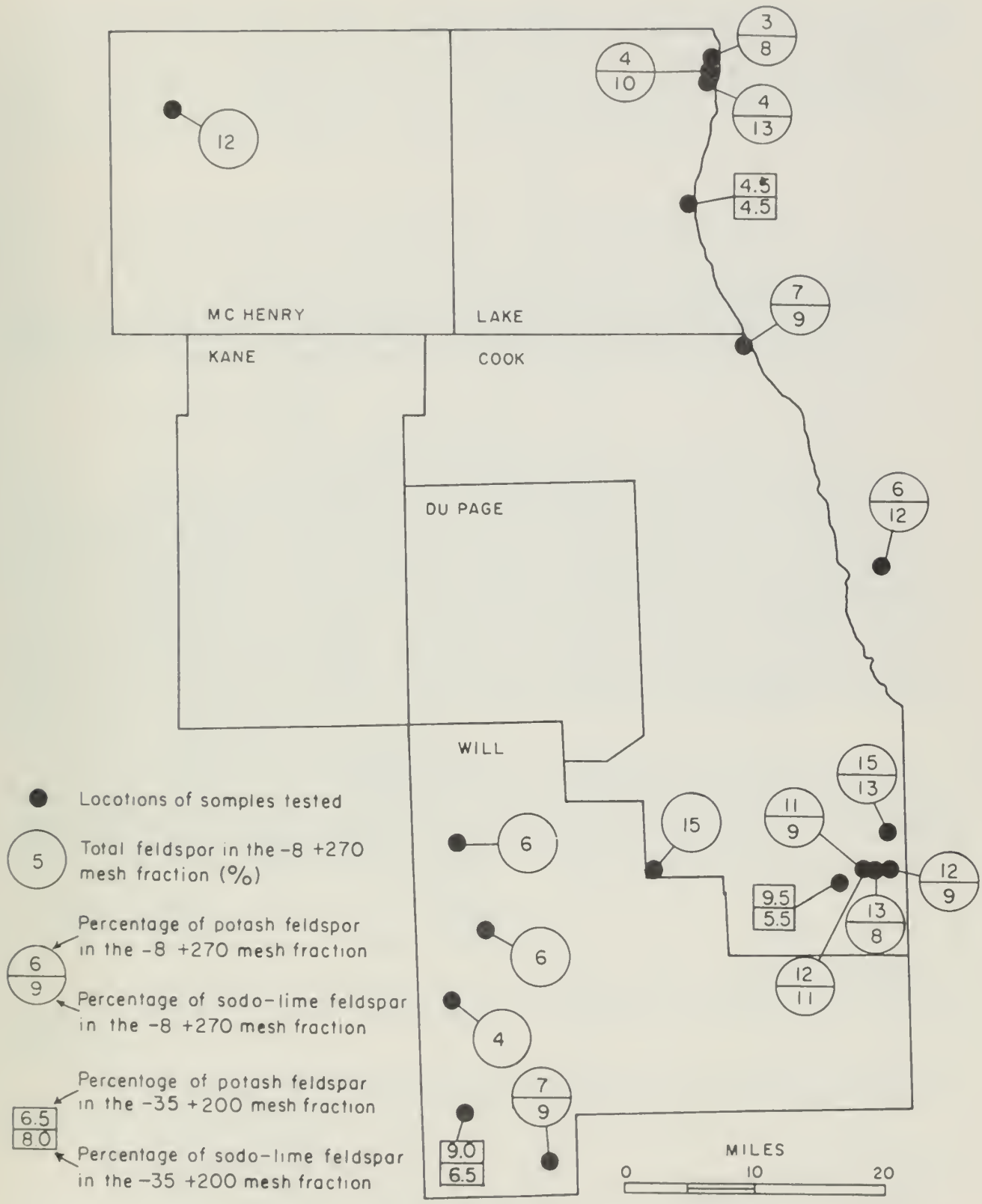


Fig. 15 - Feldspar-bearing sand resources in the Northeastern Illinois Region. Percentages encircled are from Willman (1942); those in squares are from Hunter (1965).

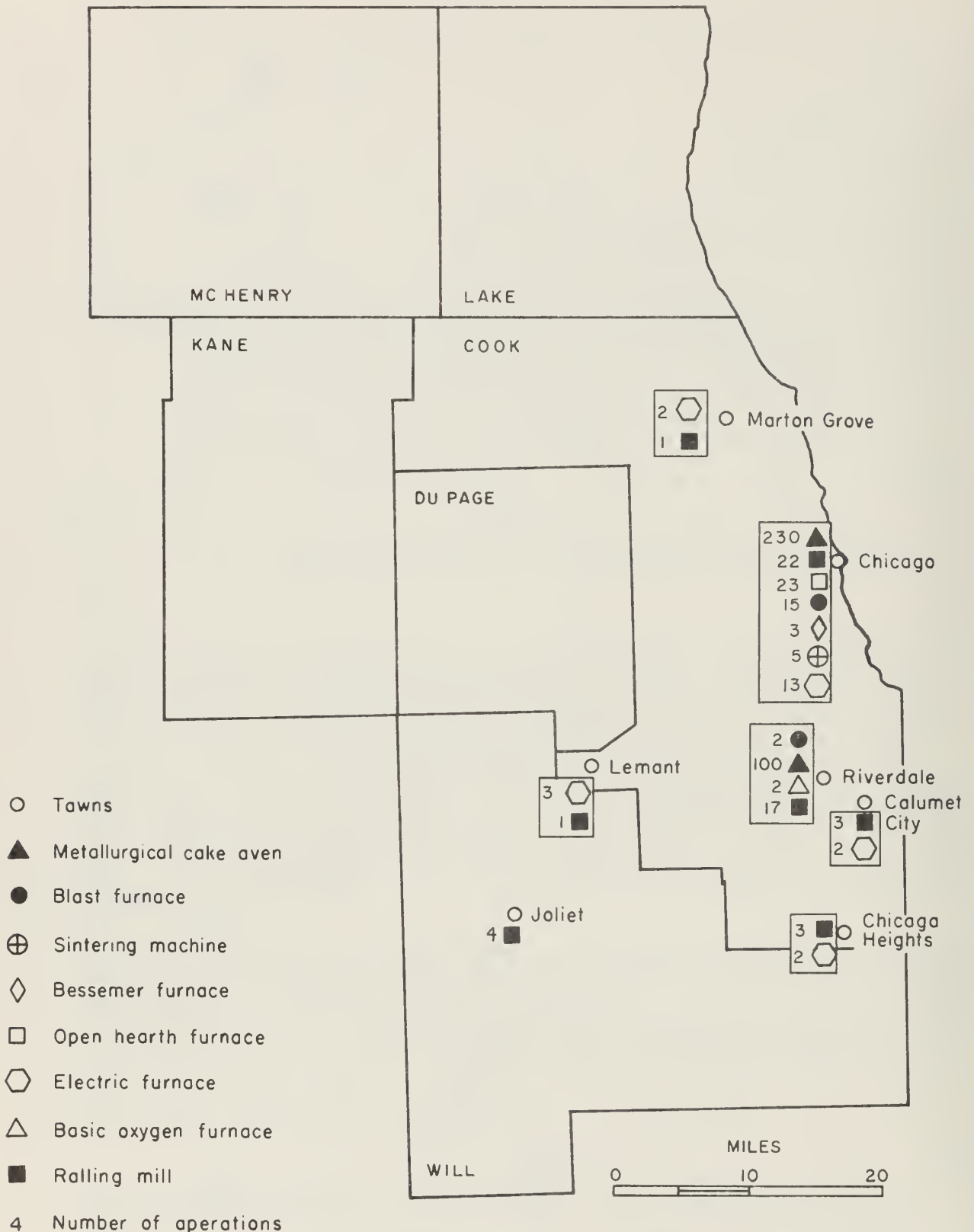


Fig. 16 - Iron and steel facilities in the Northeastern Illinois Region.
 Data from American Iron and Steel Institute Directory (1967).

than either of the other forms. The iron oxide was found to occur in the form of small particles of iron-bearing minerals and as superficial coatings on the grains. When the feldspars were treated with acid in the laboratory, their iron oxide content was reduced to near commercial grade. Treated samples of potash feldspar contained from 0.10 to 0.31 percent iron oxide, whereas treated soda-lime feldspar contained from 0.16 to 0.56 percent.

PROCESSING, TRANSPORTATION, AND DISTRIBUTION FACILITIES

The Northeastern Illinois Region is mainly a mineral-processing and -consuming area rather than a mineral-producing one. The locations of the various processing, transportation, and distribution facilities related to the mineral industries are shown in figures 16, 17, 18, 19, and 20.

Iron and Steel

In 1965 Illinois ranked fourth in steel production in the United States, producing 11.2 million tons, or 8.5 percent, of the total national production (U. S. Bur. Mines, 1966, p. 514; 1967, p. 290). Most of the state's production came from plants in the Northeastern Illinois Region, from Cook County in particular. The locations, types, and numbers of steel-making facilities are shown in figure 16. The following companies operate steel plants in the northeastern region (Am. Iron and Steel Inst., 1967): Borg-Warner Corporation, The Ceco Corporation, Columbia Tool Steel Company, A. Finkl & Sons Company, H. M. Harper Company, Inland Steel Company, Interlake Steel Corporation, International Harvester Company, Republic Steel Corporation, and United States Steel Corporation.

Most of the raw materials used in these plants are imported from other states or other countries. Iron ore comes from Minnesota and Canada; coking coal comes mainly from West Virginia and Kentucky. However, in recent years increasing amounts of relatively low-sulfur Illinois coal have been used in blends for making metallurgical coke in Chicago area plants.

Nonferrous Metals

In addition to the large iron and steel plants in the Northeastern Illinois Region, a number of nonferrous metals plants are operated in the area (fig. 17).

The American Potash and Chemical Corporation processes concentrates bearing thorium, rare earths, and yttrium at its West Chicago plant (U. S. Bur. Mines, 1967, p. 293).

Bismuth, cadmium, and some low-melting alloys are produced in Franklin Park by United Refining & Smelting Co. (U. S. Bur. Mines, 1967, p. 290).

Four secondary lead plants are operated in Chicago by National Lead Company, Goldsmith Brothers, Imperial Type Metals Company, and Inland Metals

Refining Company, and one plant is run by Continental Smelting and Refining Company in McCook (U. S. Bur. Mines, 1964, p. 709).

Apex Smelting Company operates a secondary zinc smelter in Chicago (U. S. Bur. Mines, 1965a, p. 1181).

Nonmetallic Minerals

The Northeastern Illinois Region is the most important area in the state for the processing of industrial minerals, many of which are imported in the crude form from sources outside Illinois.

To serve the very large construction market in and around Chicago, several cement producers have built bulk cement distributing plants in the Northeastern Illinois Region (fig. 18). In 1965, there were 16 plants operated by 9 companies (Pit and Quarry, 1965).

The Chicago area is the major lime producing locality in the state, containing three plants that account for the bulk of the state's production (fig. 33). Marblehead Lime Company (Division of Materials Service—General Dynamics Corporation) produces quicklime and hydrated lime at plants near South Chicago and Thornton. The Chicago plant uses imported stone to produce a high-calcium lime, while the other two plants use local dolomite. Standard Lime and Refractories Company (Division of Martin-Marietta Corporation) produces quicklime at its plant near McCook (U. S. Bur. Mines, 1967, p. 291).

Crude gypsum imported from out-of-state is calcined at the Waukegan plant of National Gypsum Company (fig. 18) (U. S. Bur. Mines, 1967, p. 297).

Crude scrap mica imported from South Dakota is ground and sized by U. S. Mica Company, Inc., at its Forest Park plant (fig. 18). The chief uses are as wallboard joint cement (43 percent), roofing material (23 percent), and in paint (10 percent).

At its Waukegan plant, Johns-Manville Product Corp. converts dolomite to magnesium carbonate for use in insulation.

In Kane County, the George B. Smith Chemical Works, Inc., produces red natural iron oxide pigments at its plant in Maple Park (U. S. Bur. Mines, 1967, p. 296).

In 1966 Illinois was the third largest producer of peat, accounting for 44,374 tons, or 7 percent of the U. S. total for the year. (Sheridan, 1967, p. 2). Four of the six producers are located in the Northeastern Illinois Region. Humus-type peat is produced near Barrington; moss-type at Millburn and Lake Villa, Lake County, and reed-sedge peat at Batavia. The peat is sold in bulk for general soil improvement (U. S. Bur. Mines, 1967, p. 293, 296).

Six of the nine plants in Illinois that process crude perlite are located in the Northeastern Illinois Region (fig. 18). Plants are operated by ITT Bell and Gossett Hydronics, Silbrico Corp., Filter Materials Corp.,

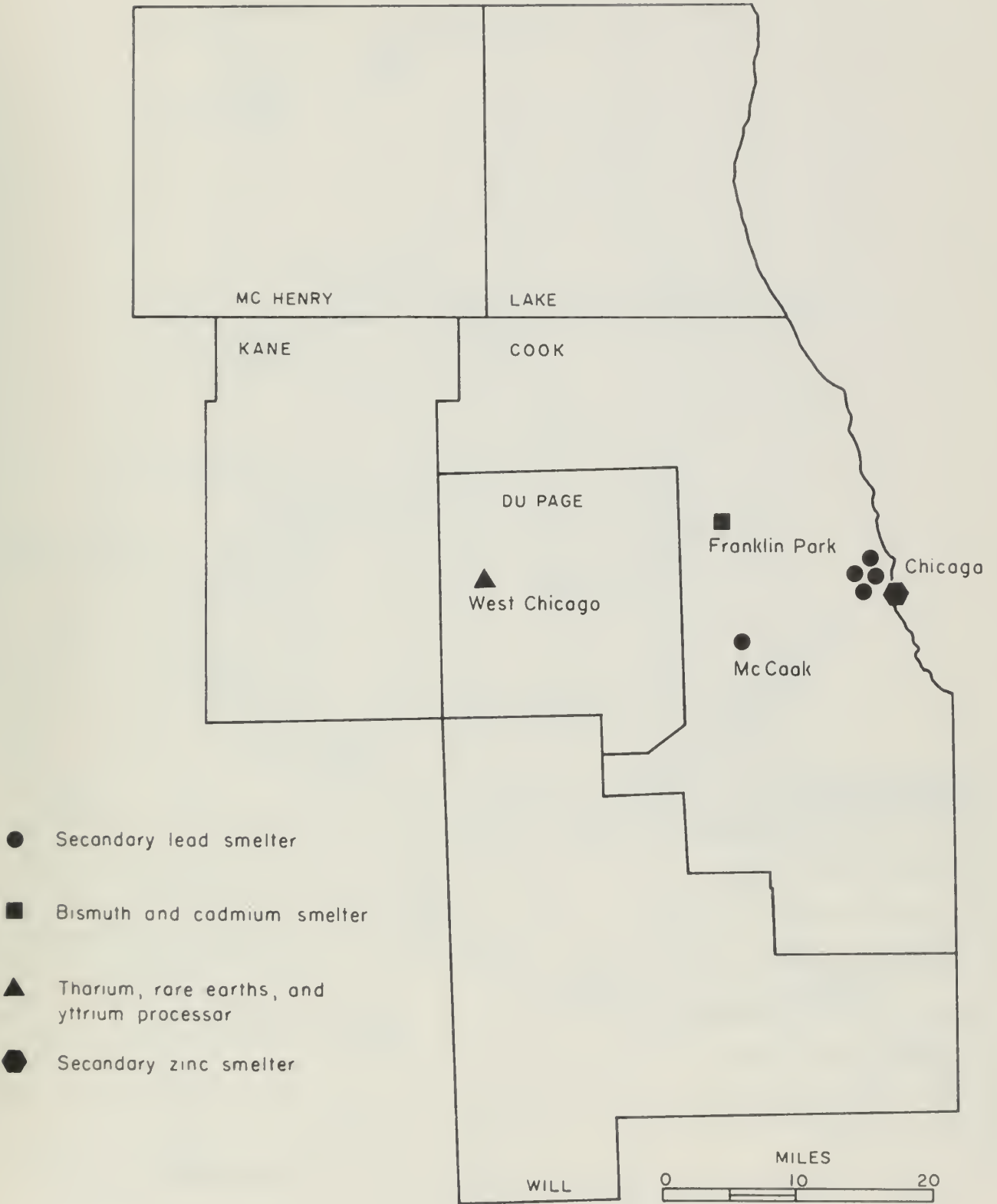


Fig. 17 - Nonferrous metals processing facilities in the Northeastern Illinois Region.

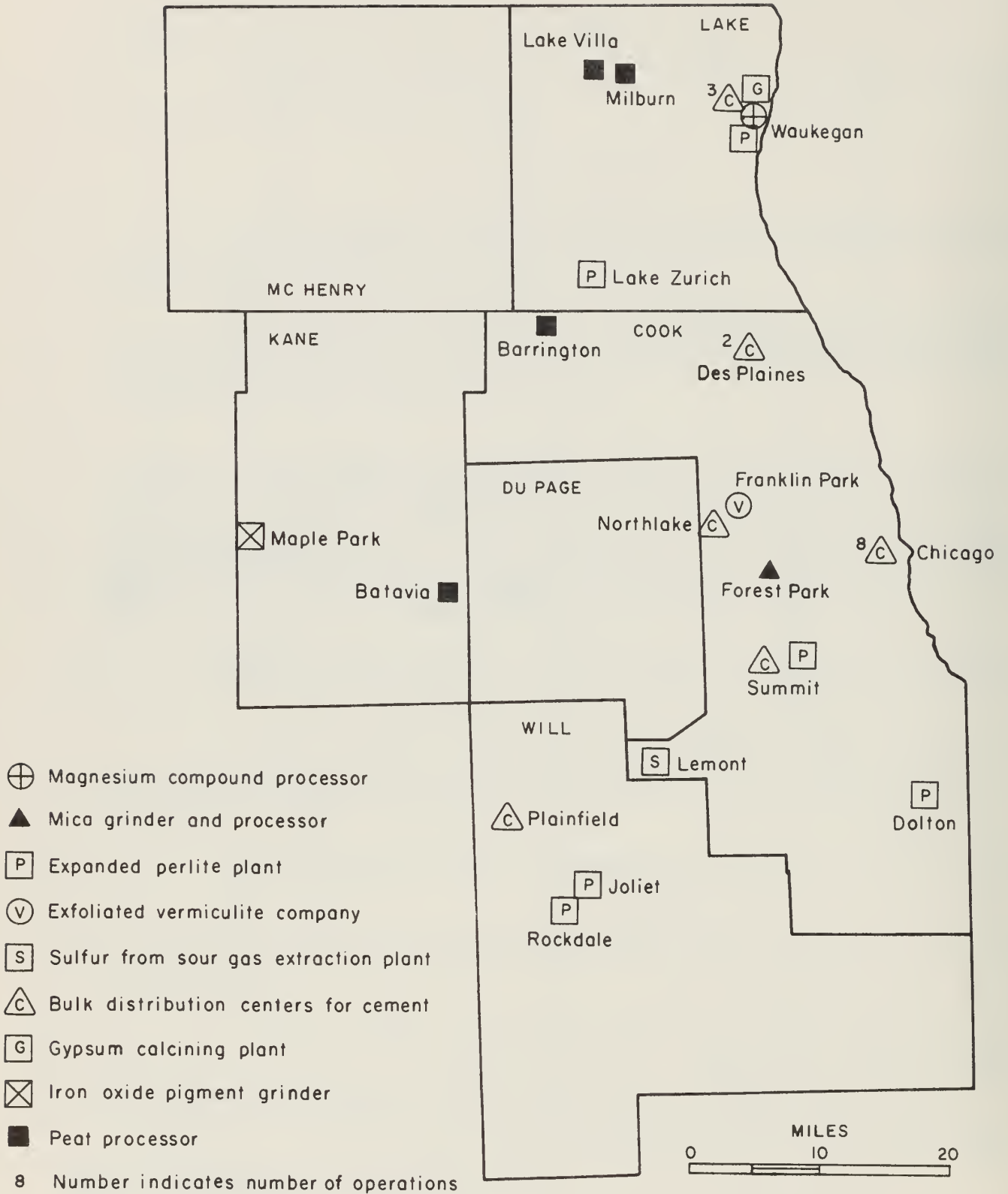


Fig. 18 - Nonmetallic mineral processing facilities in the Northeastern Illinois Region.

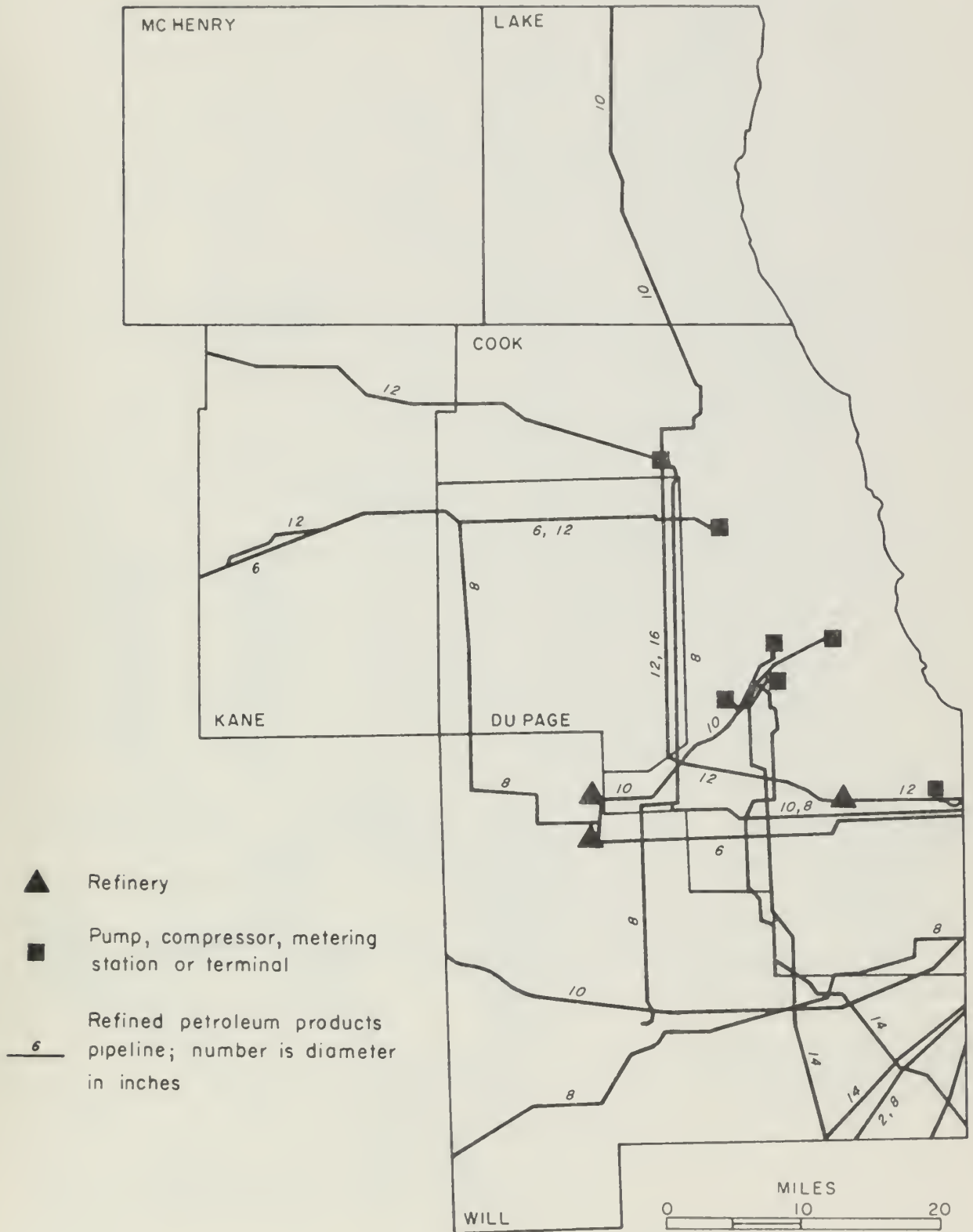


Fig. 19 - Refined products pipelines in the Northeastern Illinois Region (Meents, in preparation, 1968).

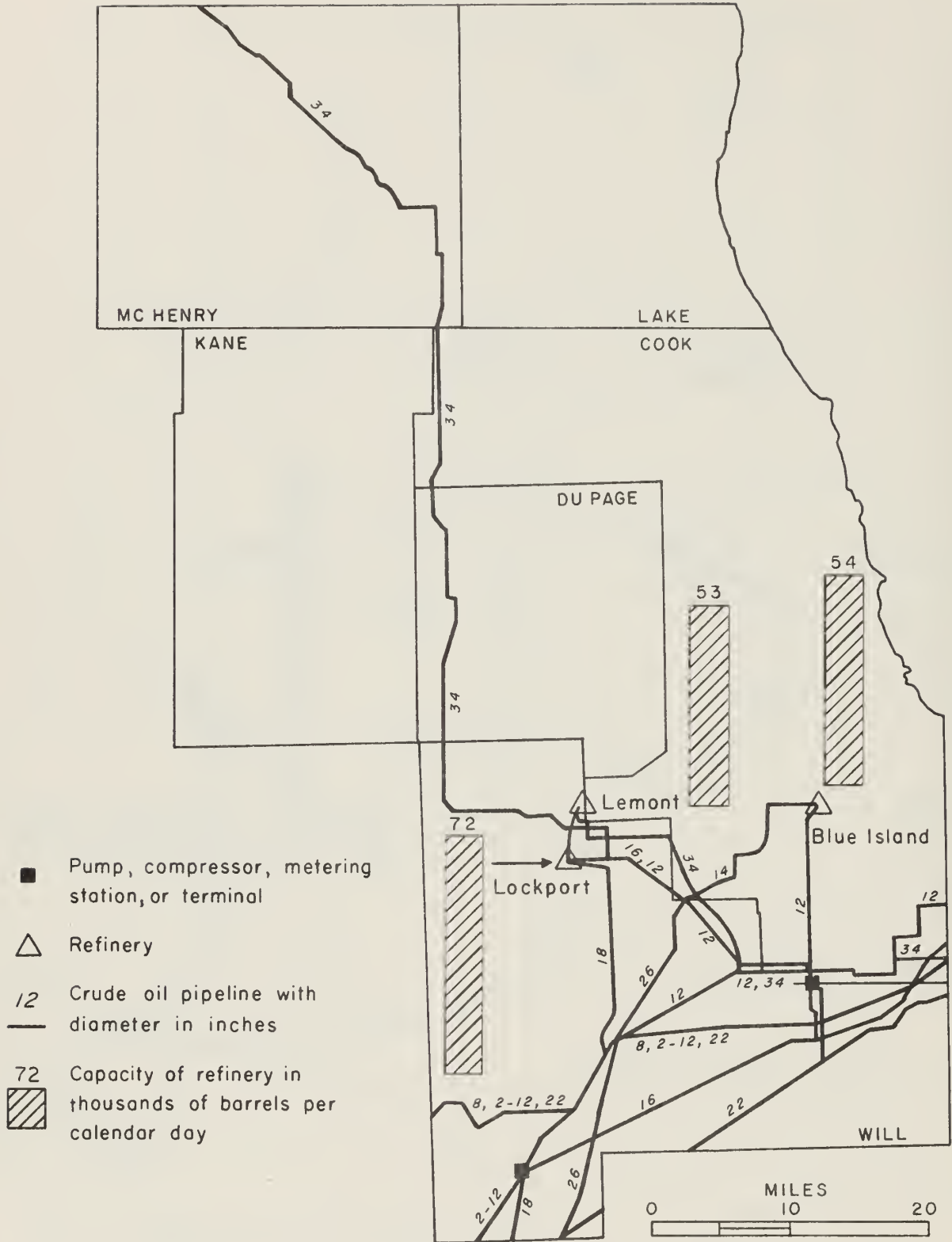


Fig. 20 - Crude oil pipelines, refineries, and refinery capacities in the Northeastern Illinois Region (Meents, in preparation, 1968).

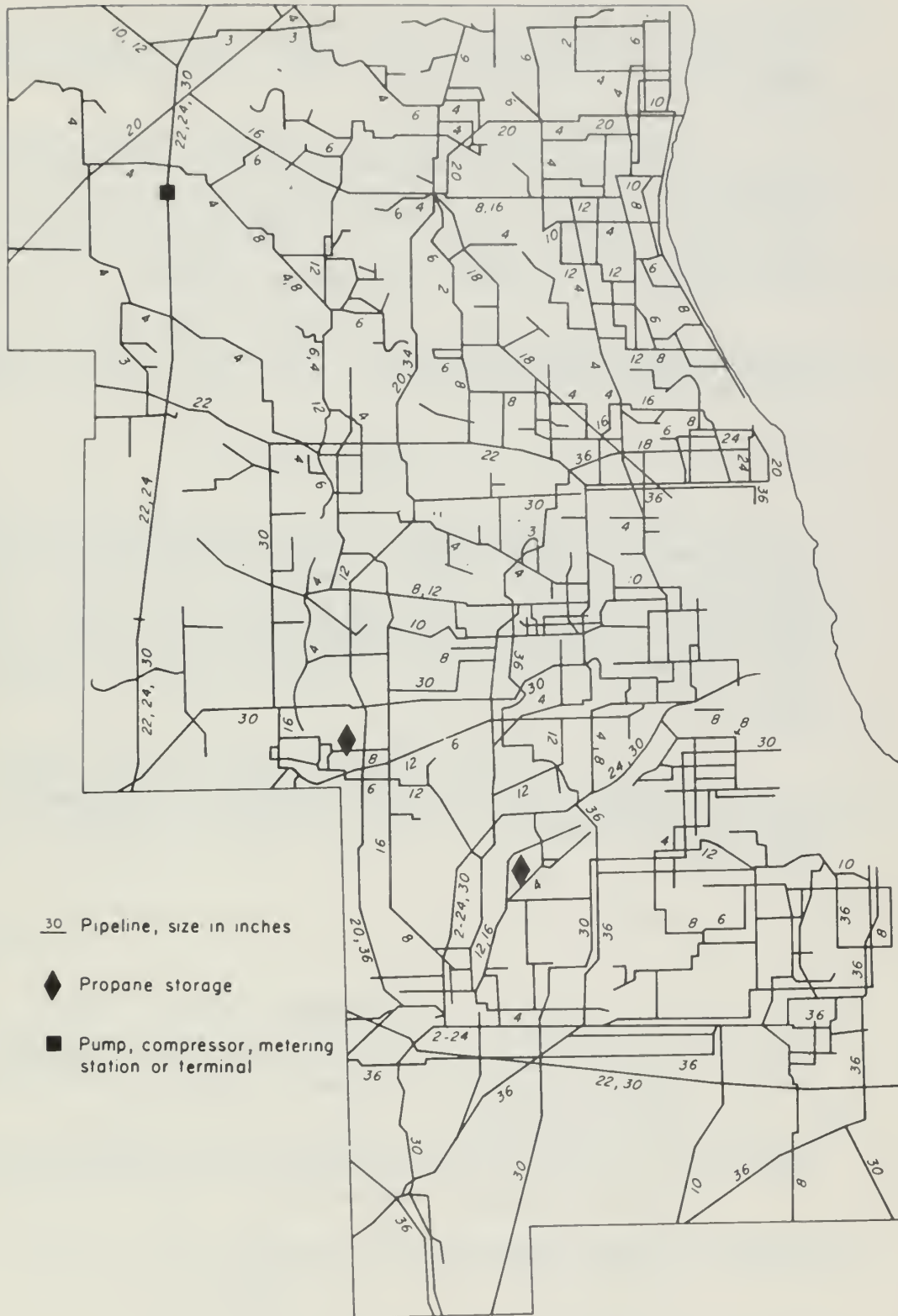


Fig. 21 - Natural gas pipelines in the Northeastern Illinois Region.
(Data from Meents, in preparation, 1968.)

National Gypsum Company, and Johns-Manville Perlite Corp. The expanded perlite is used for building plaster, filter aid, loose-fill insulation, concrete aggregate, soil conditioning, filler, and roof insulation.

The Zonalite Division of W. R. Grace Company, which has vermiculite mines in Montana and South Carolina, operates an exfoliation plant at Franklin Park. Exfoliation is a process whereby the vermiculite splits or swells into a scaly aggregate when heated. The processed vermiculite is sold for use in agriculture (29 percent), loose fill insulation (38 percent), concrete aggregate (13 percent), and plaster aggregate (12 percent).

By-product sulfur is recovered from sour gas at the Lemont refinery of The Pure Oil Company (Division of Union Oil Company of California), which uses the Modified-Claus process (U. S. Bur. Mines, 1967, p. 288).

Oil and Gas

No commercial production of oil or natural gas has been achieved in the Northeastern Illinois Region. However, because of the extremely large metropolitan population, there are extensive transportation, processing, and distribution facilities for oil and gas within the region. Figure 19 shows the locations of the refined petroleum products pipelines. Crude oil pipelines, refinery locations, and refinery capacities are shown in figure 20. Twenty-six percent of the state's refinery capacity is located in the Chicago area.

To serve the large commercial and industrial markets for natural gas in the Chicago area, an extensive network of pipelines and distribution lines have been built. Figure 21 indicates the location and extent of the major ones.

REFERENCES

- American Iron and Steel Institute, 1967, Directory of iron and steel works of the United States and Canada: 31st ed., Am. Iron and Steel Inst., New York, 411 p.
- Anderson, R. C., and D. A. Block, 1962, Sand and gravel resources of McHenry County, Illinois: Illinois Geol. Survey Circ. 336, 15 p.
- Block, D. A., 1960, Sand and gravel resources of Kane County, Illinois: Illinois Geol. Survey Circ. 299, 11 p.
- Busch, W. L., 1968, Mineral production in Illinois in 1966: Illinois Geol. Survey Circ. 418, 24 p.
- Cady, G. H., and others, 1952, Movable coal reserves of Illinois: Illinois Geol. Survey Bull. 78, 138 p.

- Davidson, E. K., 1965, Are the sand and gravel reserves of the United States adequate for future needs?: Natl. Sand and Gravel Assoc. Gen. Public Relations Pub. PR018, March 30, 4 p.
- Ekblaw, G. E., and J. E. Lamar, 1964, Sand and gravel resources of northeastern Illinois: Illinois Geol. Survey Circ. 359, 8 p.
- Hunter, R. E., 1965, Feldspar in Illinois: A further study: Illinois Geol. Survey Circ. 391, 19 p.
- Krey, Frank, and J. E. Lamar, 1925, Limestone resources of Illinois: Illinois Geol. Survey Bull. 46, 392 p.
- Lamar, J. E., and R. S. Schrode, 1950, Preliminary map of limestone outcrops: Illinois Geol. Survey unpub. map on open file.
- Lamar, J. E., and H. B. Willman, 1958, Origin of Illinois sand and gravel deposits: Illinois Geol. Survey Ind. Min. Notes 8, 9 p.
- Meents, W. F., in preparation, Oil and gas industry in Illinois, 1968: Illinois Geol. Survey map.
- Ostrom, M. E., 1956, Capsule report—Subsurface dolomite in Lake, McHenry, and part of northwestern Cook Counties: Illinois Geol. Survey Ind. Min. Notes 4, 7 p.
- Pit and Quarry, 1965, Portland cement plants—U. S., Canada, and Mexico: Pit and Quarry Publications map, Chicago.
- Sheridan, E. T., 1967, Advance data on peat in 1966: Mineral Indus. Surveys, U. S. Bur. Mines, Dept. Interior, Washington, D. C., August 22, 5 p.
- Simon, J. A., 1966, Shipping coal mines in Illinois: Illinois Geol. Survey map.
- Smith, W. H., 1968, Strippable coal reserves of Illinois. Part 6—LaSalle, Livingston, Grundy, Kankakee, Will, Putnam, and parts of Bureau and Marshall Counties: Illinois Geol. Survey Circ. 419, 29 p.
- Suter, Max, R. E. Bergstrom, H. F. Smith, G. H. Emrich, W. C. Walton, and T. E. Larson, 1959, Preliminary report on ground-water resources of the Chicago region, Illinois: Illinois Water Survey and Illinois Geol. Survey Coop. Ground-Water Rept. 1, 89 p.
- U. S. Bureau of the Census, 1961, U. S. census of mineral industries: 1958, v. II, Area statistics: U. S. Govt. Printing Office, Washington, D. C., p. 10-9 to 10-12.
- U. S. Bureau of the Census, 1966, U. S. census of mineral industries: 1963, v. II, Area statistics: U. S. Govt. Printing Office, Washington, D. C., p. 12-7 to 12-10.

- U. S. Bureau of Mines, 1964, 1963 Minerals yearbook: U. S. Bur. Mines, Dept. Interior, Washington, D. C., 1307 p.
- U. S. Bureau of Mines, 1965a, 1964 Minerals yearbook: U. S. Bur. Mines, Dept. Interior, Washington, D. C., 1258 p.
- U. S. Bureau of Mines, 1965b, Mineral facts and problems: U. S. Bureau of Mines Bull. 630, Dept. Interior, Washington, D. C., 1113 p.
- U. S. Bureau of Mines, 1966, 1965 Minerals yearbook: U. S. Bur. Mines, Dept. Interior, v. 1, Washington, D. C., 1095 p.
- U. S. Bureau of Mines, 1967, 1965 Minerals yearbook: U. S. Bur. Mines, Dept. Interior, v. 3, Washington, D. C., 928 p.
- White, W. A., and J. E. Lamar, [compiled by] 1960, Ceramic tests of Illinois clays and shales: Illinois Geol. Survey Circ. 303, 72 p.
- White, W. A., and N. R. O'Brien, 1964, Illinois clay resources for lightweight ceramic block: Illinois Geol. Survey Circ. 371, 15 p.
- Willman, H. B., 1942, Feldspar in Illinois sands—A study of resources: Illinois Geol. Survey Rept. Inv. 79, 87 p.
- Willman, H. B., 1943, High-purity dolomite in Illinois: Illinois Geol. Survey Rept. Inv. 90, 89 p.

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