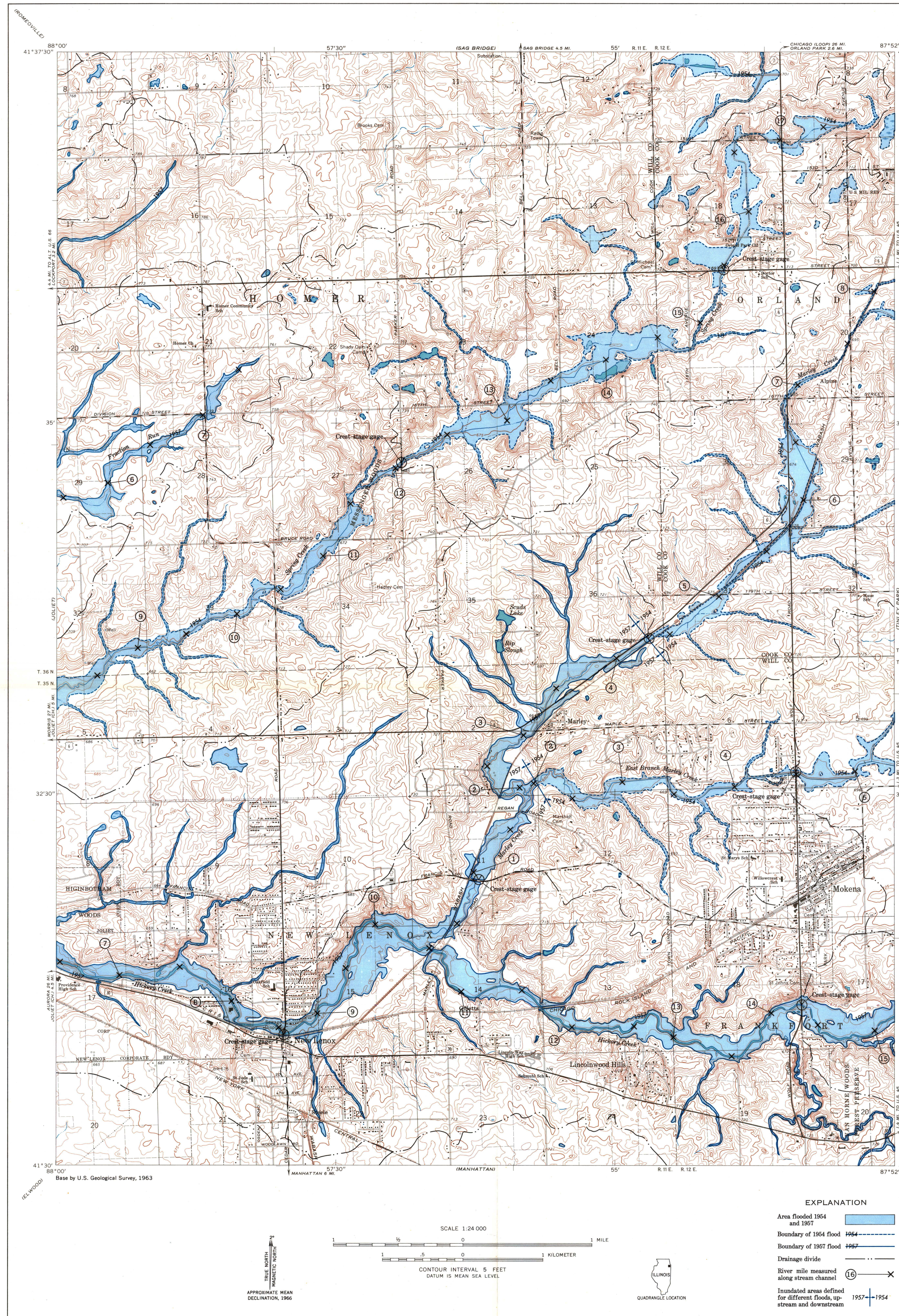
PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION



FLOODS IN MOKENA QUADRANGLE NORTHEASTERN ILLINOIS

This report presents hydrologic data which can be used to evaluate the depth and frequency of flooding that affect the economic development of flood plains. The report is intended to be used as a planning tool, and the data contained herein will provide a technical basis for making sound decisions concerning the use of flood-plain lands. No recommendations or suggestions for land-use regulations are made and no solutions of existing flood problems are proposed.

The approximate areas inundated by floods along streams in the Mokena 7 1/2-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundation shown on the map occurred during the flood of October 1954 along Spring Creek, East Branch Marley Creek, and Marley Creek upstream from mile 4.33; and during the flood of July 1957 along Hickory Creek, Fraction Run, and Marley Creek downstream from mile 4.33.

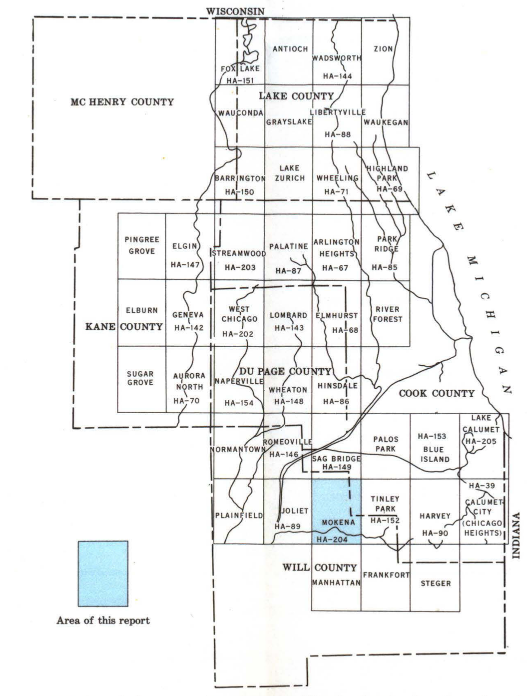


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in the flood-hazard mapping program.*

The general procedure used in defining flood limits was first to construct flood profiles by use of available data. Second, the extent of flooding was delineated on the topographic map on basis of the profiles by interpolation between contours (lines of equal ground elevation) and by plotting overflow limits established by field investigations and surveys. The flood limits shown on the map are approximate because the map scale is small (1 inch = 2,000 feet) and the contour interval is relatively large (5 feet).

The flood limits shown on the map are not necessarily those for the highest floods expected. Greater floods are possible, but definition of their probable overflow limits is not within the scope of this report. The flood limits reflect channel conditions existing when the floods occurred. No appraisals are made of the effect of changes in channel conditions or waterway openings at highways and railroads, or possible changes in runoff characteristics of the streams caused by increased urbanization after the floods occurred. Protective works built after the floods of October 1954 and July 1957 may reduce the frequency and magnitude of flooding in the area but will not necessarily eliminate future flooding. The inundation pattern of future floods may be affected by new highways and bridges, relocation and improvement of stream channels, and other cultural changes.

There are numerous depressions or lowland areas in the Mokena quadrangle where surface water accumulates because of inadequate drainage into the streams. Frequency and depth of flooding in these areas are unrelated to the water-surface elevation along the streams. Some areas are flooded only briefly after periods of heavy rainfall or snowmelt, whereas others remain inundated continuously, depending, largely, upon the rates of evaporation and seepage into the ground. Flood limits are shown for many such areas but there may have been other flooded areas that were not detected during this investigation.

Flood limits are not defined for areas that were inundated as a result of backup in storm drains.

Cooperation and acknowledgment — The preparation of this report is a part of an extensive flood-mapping program financed through a cooperative agreement between the Northeastern Illinois Metropolitan Area Planning Commission and the U.S. Geological Survey whereby flood maps will be prepared for the 7 1/2-minute quadrangles shown in figure 1. The program includes parts of Cook, Kane, McHenry, and Will Counties, and all of Du Page and Lake Counties. The six counties cooperate financially in the program through separate agreements with the Planning Commission. Financial support for the preparation of this report was provided by Will County.

The cooperative program is administered on behalf of the Planning Commission by Matthew L. Rockwell, Executive Director, and is directly coordinated by John R. Sheaffer, Chief Planner.

The report was prepared by the U.S. Geological Survey under the administrative direction of William D. Mitchell, district engineer, and under the immediate supervision of Davis W. Ellis, engineer-in-charge of the project.

Acknowledgment is made to the following agencies that supplied some of the data on which this report is based: Corps of Engineers, U.S. Army; Will County Highway Department; and the Department of Highways, Cook County.

Additional data were obtained from officials of municipalities in the area and from field investigations.

Flood height — The height of a flood at a gaging station usually is stated in terms of gage height or stage, which is the elevation of the water surface above a selected datum plane. Elevations shown on the map are in feet above mean sea level. Gage heights for crest-stage gages in the Mokena quadrangle can be converted to elevations above mean sea level by adding the gage height to the appropriate datum of gage listed in the following table. The drainage area for each station is shown in the table, and the subbasin drainage divides from which the areas were determined are shown on the flood map.

Crest-stage gage	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Hickory Creek:		
At Mokena (Wolf Road)	655.99	42.8
At New Lenox (Cedar Road)	619.08	75.3
Spring Creek:		
Near Orland Park (159th Street)	688.05	1.57
Near Marley (Parker Road)	672.94	7.34
Marley Creek:		
Near Mokena	660.03	9.63
At Marley (Francis Road)	638.13	21.9
East Branch Marley Creek at Mokena (Wolf Road)	674.02	4.85

Gage height and year of occurrence of each annual flood (highest peak stage in each calendar year) at the gaging station, Hickory Creek at Joliet, during the period 1945-64 are shown in figure 2. The Joliet gaging station is at Third Avenue in Joliet, Ill., about 3 1/2 miles west of the Mokena quadrangle, and at mile 2.0. The irregular occurrence of floods is evident.

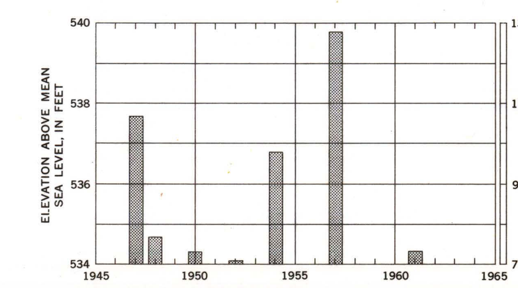


FIGURE 2.— *Annual floods above 534-foot elevation, 1945- 64, Hickory Creek at Joliet, Illinois (Third Avenue).*

Flood discharge — The rate of discharge of a stream is the volume of flow that passes a particular location in a given period of time. Usually discharge rates are expressed in cubic feet per second (cfs). Peak discharge, the maximum discharge attained by a flood, generally occurs at the time of the maximum height (stage) of the flood, but if a stream is affected by variable backwater, the time of the peak discharge may not coincide with that of the maximum stage. For example, backwater from an ice jam may cause a high stage during a period of relatively low discharge.

Flood frequency — Frequency of floods at the Geological Survey gaging station on Hickory Creek at Joliet was derived from streamflow records at this station combined with records at other nearby stations and the regional flood-frequency relation for streams in Northern Illinois (Mitchell, 1954). The Joliet gage is at Third Avenue in Joliet, about 3 1/2 miles west of the Mokena quadrangle, and at mile 2.0.

The general relation between discharge and frequency is shown in figure 3, and the general relation between stage and frequency is shown in figure 4. The relation between flood stage and frequency is dependent on the relation of flood stage to discharge which is affected by changes in physical conditions of channels and constrictions. The frequency curve shown in figure 4 is based on channel conditions existing in 1964. Longer records and future changes in channel conditions may define somewhat different flood-frequency curves. Extrapolation of the curves beyond the limits shown is not recommended.

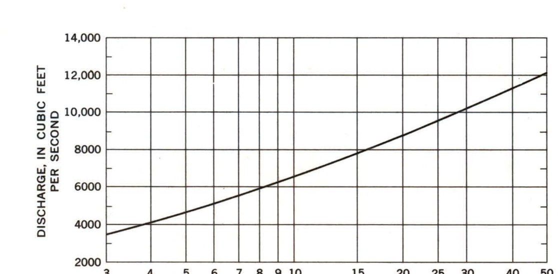


FIGURE 3.—*Frequency of flood discharges on Hickory Creek at Joliet, Illinois (Third Avenue).*

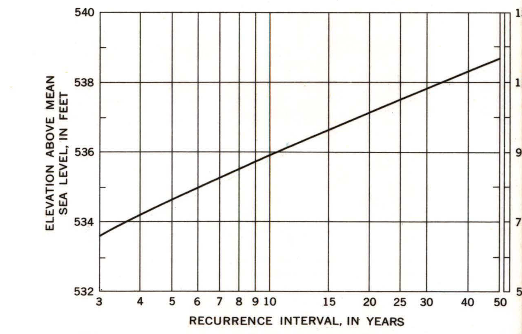


FIGURE 4.— *Frequency of flood stages on Hickory Creek at Joliet, Illinois (Third Avenue).*

Recurrence intervals — As applied to flood events, recurrence interval is the average interval of time within which a given flood will be equaled or exceeded once. Frequencies of floods can be stated in terms of their probabilities of occurrence (virtually, reciprocals of their recurrence intervals for floods with recurrence intervals greater than 10 years). For example, a flood with a 25-year recurrence interval would have a 4-percent chance of being equaled or exceeded in any given year; or a flood with a 50-year recurrence interval would have a 2-percent chance of being equaled or exceeded in any given year.

The general relation between recurrence interval and flood height at the gaging station on Hickory Creek at Joliet (fig. 4) is tabulated below:

Recurrence interval (years)	Elevation above mean sea level (feet)
50	538.7
30	537.8
20	537.2
10	535.9
5	534.6
3	533.6

It is emphasized that recurrence intervals are average figures--the average number of years that will elapse between occurrences of floods that equal or exceed a given magnitude. The fact that a major flood is experienced in one year does not reduce the probability of that flood being exceeded in the next year or in the next week.

Flood profiles — Profiles of the water surface, based primarily on elevations of marks left by floods of October 1954, July 1957, and June 1964 are shown in figures 5-7. Where floodmarks could not be identified, the profiles were constructed on the basis of elevations of lower floods and streambeds and of reports of local residents. River miles used for the profiles correspond to those marked along the streams on the flood map.

The abrupt changes in the profiles, shown at some road crossings, indicate the difference in water-surface elevations at the upstream and downstream sides of bridges that produce channel constrictions. The drop in water surface through bridge openings during future floods may be different from that shown on the profiles. An increase in channel capacity through a bridge opening would reduce the flood height on the upstream side. An accumulation of debris at a bridge would reduce the channel capacity and tend to increase the upstream flood height. Channel changes through bridge openings may also change the overflow pattern of future floods.

Flood depths — Depth of flooding at any point can be estimated by subtracting the ground elevation from the water-surface elevation at the same point indicated by the profiles in figures 5-7. The approximate ground elevation can be determined from contours on the map, although more nearly accurate elevations can be obtained by leveling to nearby bench marks.

Additional data — Other information pertaining to floods in the Mokena quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following reports:

Daniels, W. S., and Hale, M. D., 1958, Floods of October 1954 in the Chicago area, Illinois and Indiana: U.S. Geol. Survey Water-Supply Paper 1370-B, p. 107-200.

Illinois Department of Public Works and Buildings, Division of Waterways, 1950, Survey report for flood control, Hickory Creek at Joliet, 70 p.

Mitchell, W. D., 1954, Floods in Illinois, magnitude and frequency: Illinois Dept. Public Works and Bldgs., Div. of Waterways, 386 p.

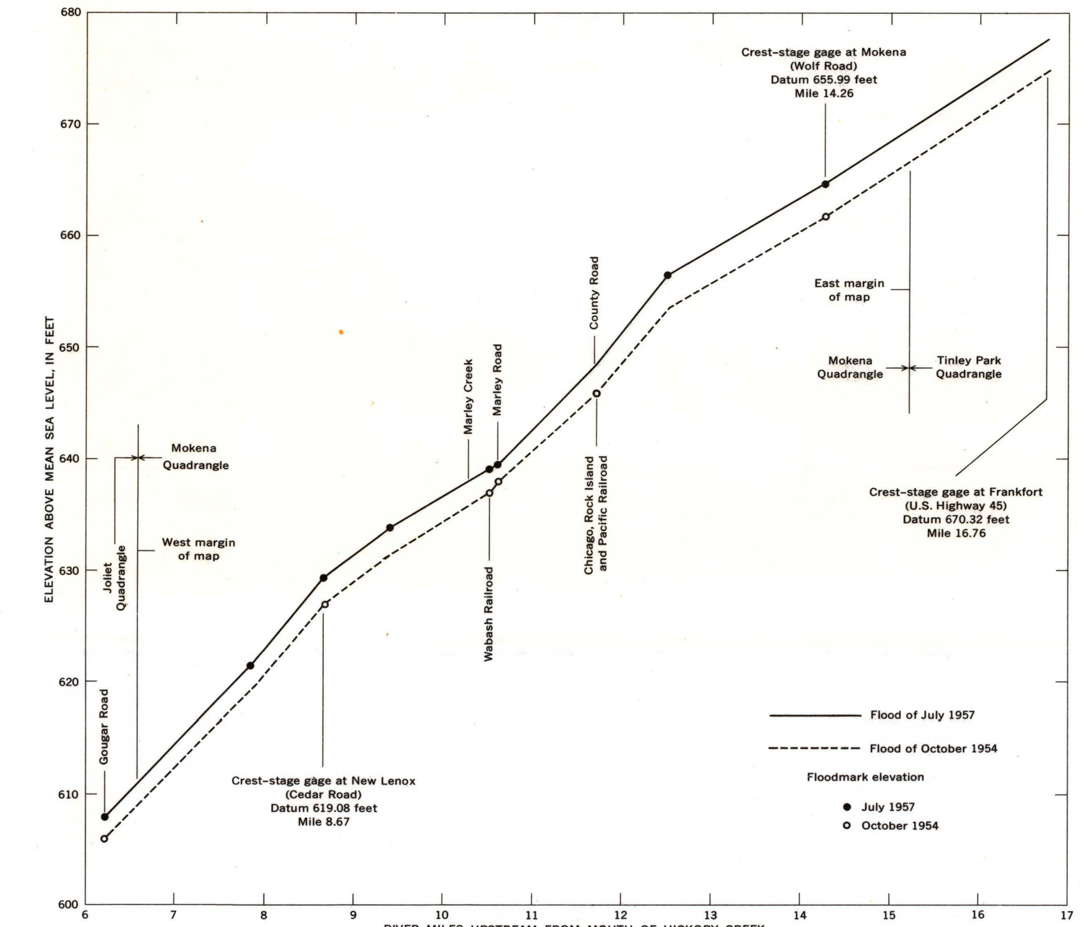


FIGURE 5.—*Profiles of floods on Hickory Creek.*

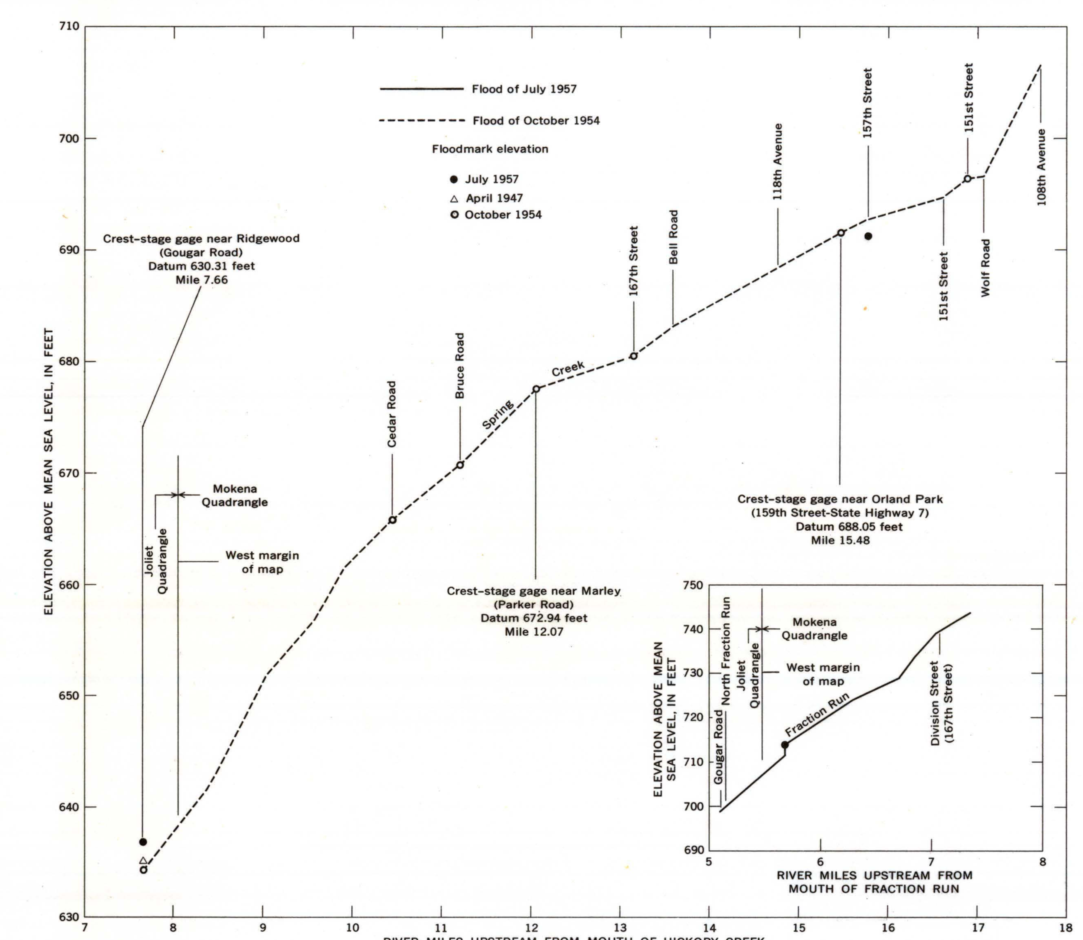


FIGURE 6.—*Profiles of floods on Spring Creek and Fraction Run.*

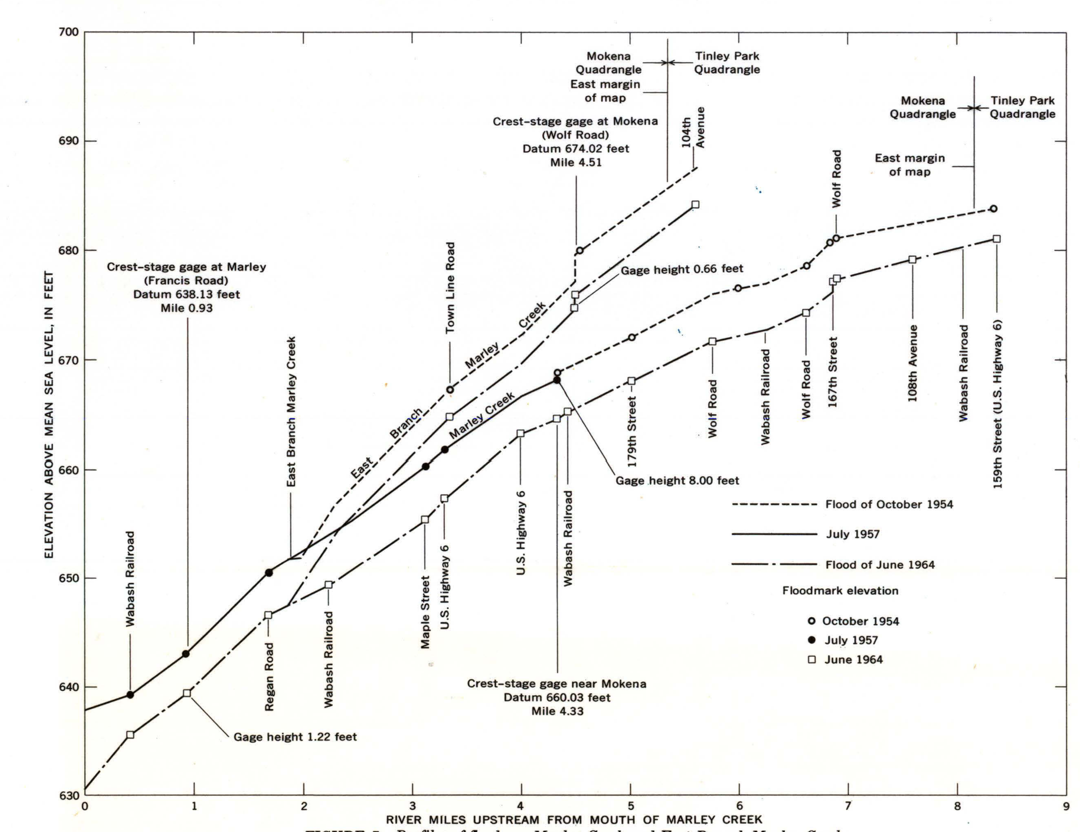


FIGURE 7.—*Profiles of floods on Marley Creek and East Branch Marley Creek.*

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1966

FLOODS IN MOKENA QUADRANGLE, NORTHEASTERN ILLINOIS

By
Allen W. Noehre
1966

For sale by the U.S. Geological Survey, price 75 cents