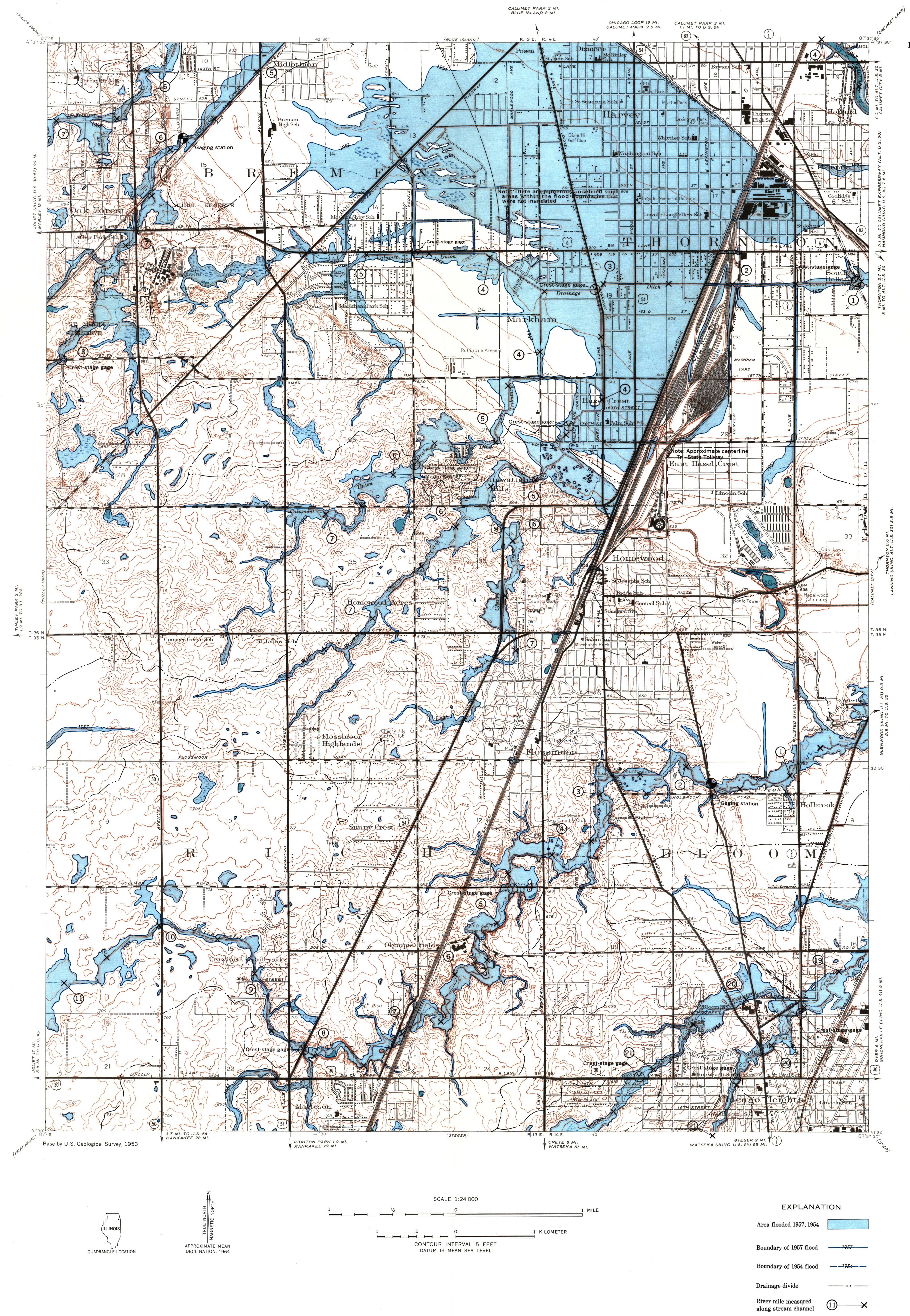
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
ATLAS HA-90



FLOODS IN HARVEY QUADRANGLE, ILLINOIS

This report presents hydrologic data that can be used to evaluate the depth and frequency of flooding that affect the economic development of flood plains. These data also 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 Harvey 7 1/2-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundated areas are shown for the flood of July 1957 along Thorn Creek, Thorn Creek tributary, Butterfield Creek, Cherry Creek, East Branch Cherry Creek, West Branch Cherry Creek, Calumet Union Drainage ditch, Calumet Union Drainage ditch tributary, Little Calumet River, Midlothian Creek, and Midlothian Creek tributary. Limits of the October 1954 flood are shown in the overflow area north of 159th Street and east of Kedzie Avenue. Although the elevation of the 1957 flood along the Calumet Union Drainage ditch upstream from mile 2.5 was higher than in 1954, flooding north of 159th Street was not as extensive because of improvements in the storm-drainage system in Harvey after the 1954 flood.

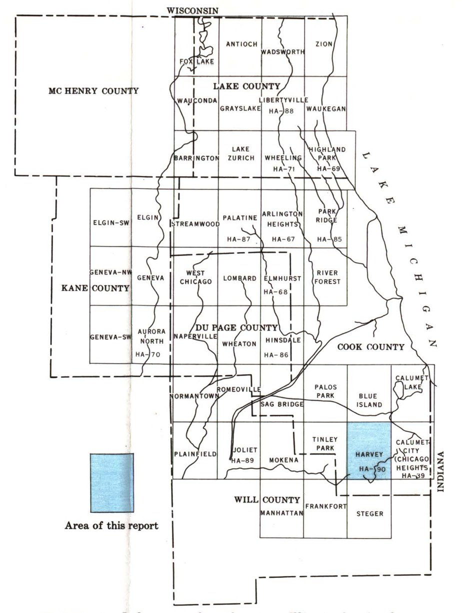


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in the flood-hazard mapping program*

The general procedure followed in defining flood limits was to develop flood profiles from elevations of floodmarks identified in the field. From the profiles the horizontal extent of flooding was delineated on the topographic map by interpolation between contours (lines of equal elevation) and by plotting overflow limits identified during field investigations and surveys. Location of flood limits shown on the map are only approximate because the map scale is small (1 inch equals 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 provide a historic record of facts that reflect channel conditions existing when the floods occurred. No attempt was made to appraise the effect of changes in channel conditions, waterway openings at highways and railroads, or changes in runoff characteristics of the stream caused by increased urbanization that may have taken place after the floods occurred. Protective works built after the floods of 1954 and 1957 may reduce the frequency of flooding in the area but will not necessarily eliminate all future flooding. The inundation pattern of future floods may be affected by new highways and bridges, relocation and improvement of channels, and other cultural changes.

There are numerous depressions or lowland areas in the Harvey quadrangle where surface water accumulates. Flood limits are shown for many such areas but there may be others that were not detected in this investigation.

Flood limits are not defined for areas 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. Under the cooperative agreement, flood maps will be prepared for the 7 1/2-minute quadrangles shown in figure 1. Areal limits of the program include 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 Cook County, the Metropolitan Sanitary District of Greater Chicago, and the Forest Preserve District of Cook County.

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

The flood maps are 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 flood data on which this report is based: Corps of Engineers, U.S. Army; the State of Illinois, Department of Public Works and Buildings, Division of Waterways; and the Department of Highways of Cook County. The Corps of Engineers also furnished a map showing the approximate area inundated during the flood of April 1947 in the vicinity of Harvey, Illinois.

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 gaging stations located in the Harvey 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. Except for the three stations on the Calumet Union Drainage ditch, sizes of drainage areas are listed in the table and the drainage divides are shown on the map. Type of gage at each station also is shown in the following table.

Gaging station	Type of gage[1]	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Thorn Creek:			
At Chicago Heights (U.S. Highway 30)	C	644.11	9.92
Near Chicago Heights (Halsted Street)	C	631.70	17.1
Thorn Creek tributary at Chicago Heights (U.S. Highway 30)	C	661.79	3.85
Butterfield Creek:			
At Olympia Fields (U.S. Highway 54)	C	680.68	9.31
Near Flossmoor (Vollmer Road)	C	649.14	19.2
At Flossmoor (Reigle Road)	R	616.80	23.4
Calumet Union Drainage ditch tributary near Hazel Crest (Kedzie Avenue)	C	632.05	3.18
Cherry Creek at Hazel Crest (170th Street)	C	614.21	5.33
Calumet Union Drainage ditch:			
At Markham (Kedzie Avenue)	C	610.34	(2)
Near Markham (Dixie Highway)	C	603.58	(2)
At South Holland (Vincennes Avenue)	C	593.38	(2)
Midlothian Creek:			
Near Tinley Park (167th Street)	C	656.13	10.6
At Oak Forest (Kilbourn Avenue)	R	620.41	14.0

[1] C, Crest-stage gage; R, water-stage recorder.
[2] Drainage area not determined.

Gage height and year of occurrence of each annual flood (highest peak discharge in each calendar year) above 626.5-foot elevation at the gaging station on Butterfield Creek at Flossmoor during the period 1948-62 are shown in figure 2. The irregular occurrence of floods is evident.

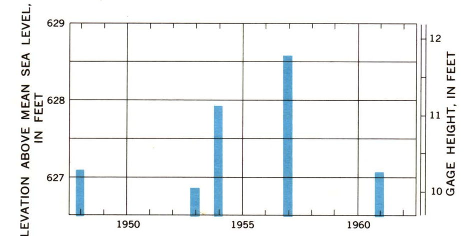


FIGURE 2.—*Annual floods above 626.5-foot elevation, 1948-62, Butterfield Creek at Flossmoor (Reigle Road)*

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. Discharge rates usually are expressed in units of cubic feet per second (cfs). Peak discharge is the maximum discharge attained by a flood. The peak discharge during a flood generally occurs at the time of the maximum height of the flood, but if a stream is affected by variable backwater, the peak discharge may not coincide with the maximum stage.

Flood frequency— Frequency of floods at the Geological Survey gaging stations on Butterfield Creek at Flossmoor and Midlothian Creek at Oak Forest was derived from streamflow records from these stations combined with records from nearby stations and with the regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). The general relation between frequency and discharge is shown in figures 3 and 4, and the general relation between frequency and stage is shown in figures 5 and 6. The relation between stage and frequency is dependent on the relation of stage to discharge which is affected by changes in physical conditions of channels and constrictions. The frequency curves shown in figures 5 and 6 are based on channel conditions existing in 1963. 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 because of the possibility of large errors.

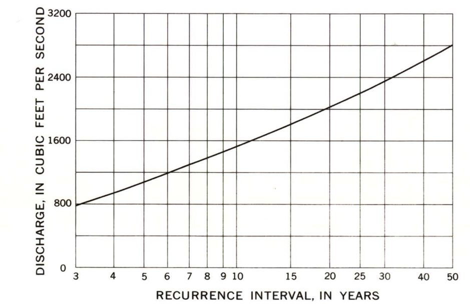


FIGURE 3.—*Frequency of flood discharges on Butterfield Creek at Flossmoor (Reigle Road)*

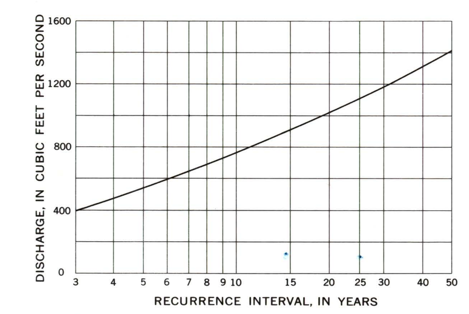


FIGURE 4.—*Frequency of flood discharges on Midlothian Creek at Oak Forest (Kilbourn Avenue)*

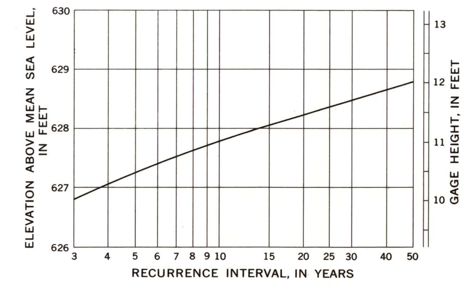


FIGURE 5.—*Frequency of flood stages on Butterfield Creek at Flossmoor (Reigle Road)*

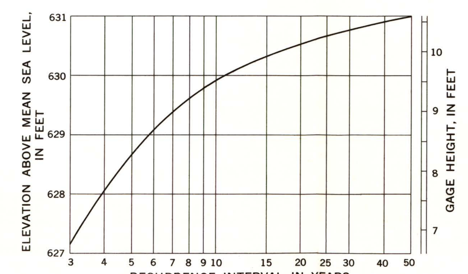


FIGURE 6.—*Frequency of flood stages on Midlothian Creek at Oak Forest (Kilbourn Avenue)*

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 may be stated in terms of their probabilities of occurrence (reciprocals of their recurrence intervals). 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 gaging stations on Butterfield Creek at Flossmoor (fig. 5) and Midlothian Creek at Oak Forest (fig. 6) is tabulated in the following table.

Recurrence interval (years)	Elevation above mean sea level (feet)	
	Butterfield Creek at Flossmoor (Reigle Road)	Midlothian Creek at Oak Forest (Kilbourn Avnue)
50	628.8	631.0
40	628.7	630.9
30	628.5	630.8
20	628.2	630.5
10	627.8	629.9
5	627.2	628.7
3	626.8	627.2

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 the floods of April 1947, October 1954, July 1957, and September 1961, are shown in figures 7-13. Where floodmarks could not be identified, the profiles were constructed on the basis of elevations of lower floods and streambeds, and the extent of overflows was determined from photographs and 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 produced by 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 indicated by the profiles in figures 7-13. The approximate ground elevation can be determined from information indicated by contours on the map, although more accurate elevations may be obtained by leveling to nearby bench marks.

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

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

Ramey, H. P., 1959, Storm water drainage in the Chicago area: Am. Soc. Civil Engineers Proc., v. 85, no. HY 4, p. 11-37.

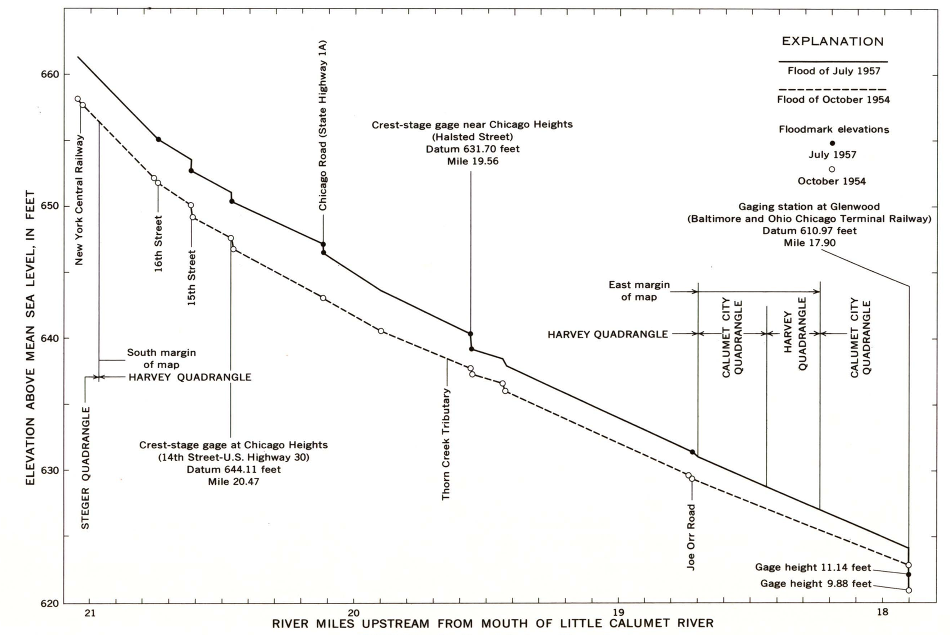


FIGURE 7.—*Profiles of floods on Thorn Creek*

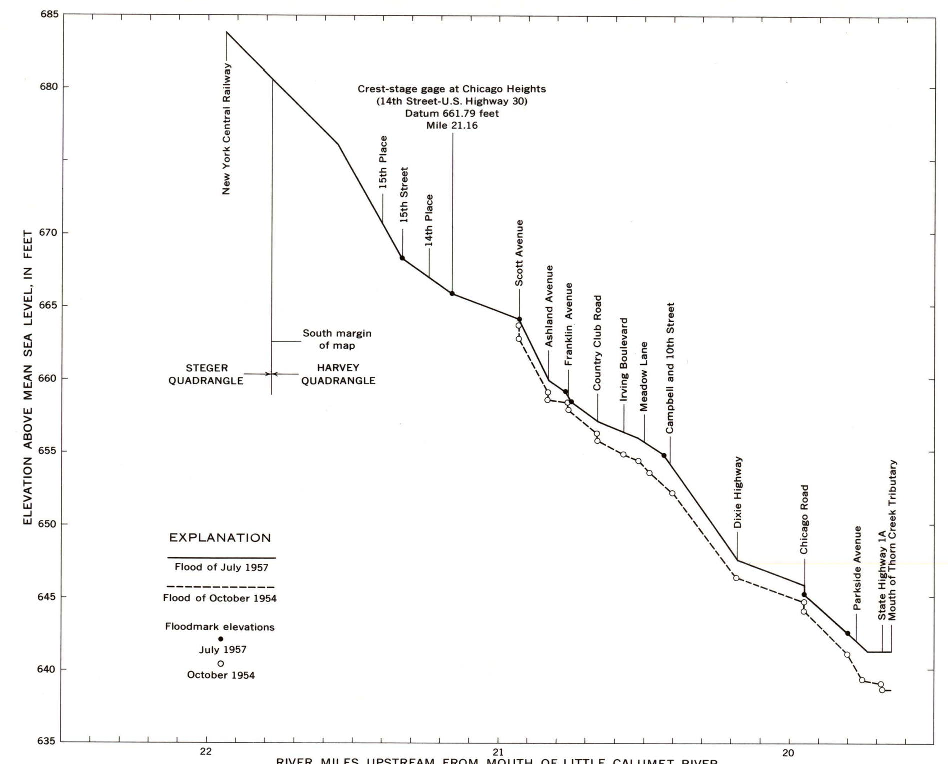


FIGURE 8.—*Profiles of floods on Thorn Creek tributary*

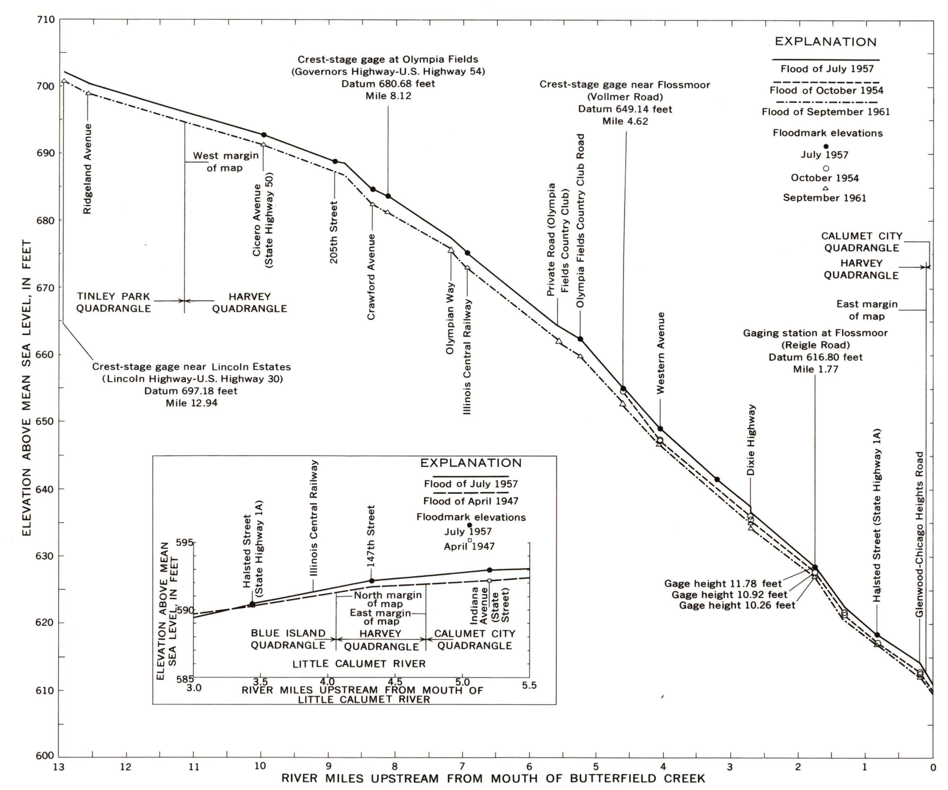


FIGURE 9.—*Profiles of floods on Butterfield Creek and Little Calumet River*

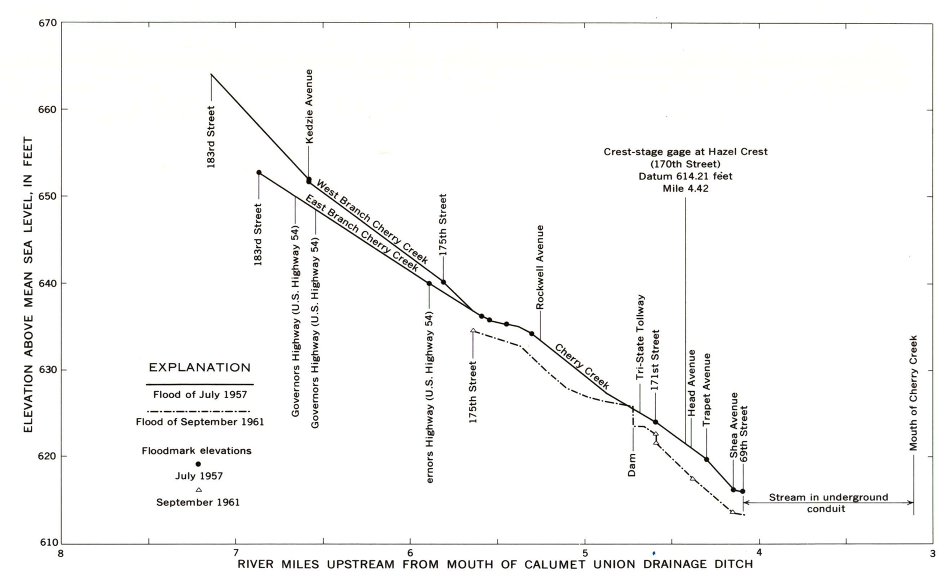


FIGURE 10.—*Profiles of floods on Cherry Creek*

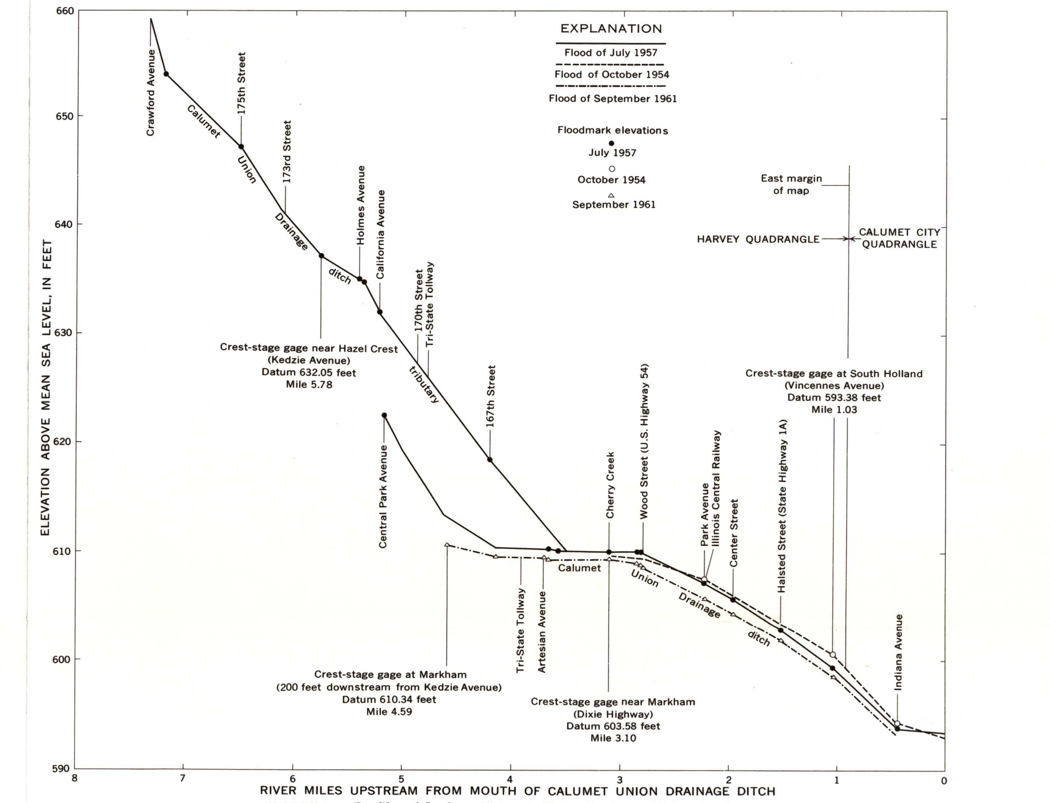


FIGURE 11.—*Profiles of floods on Calumet Union Drainage ditch and tributary*

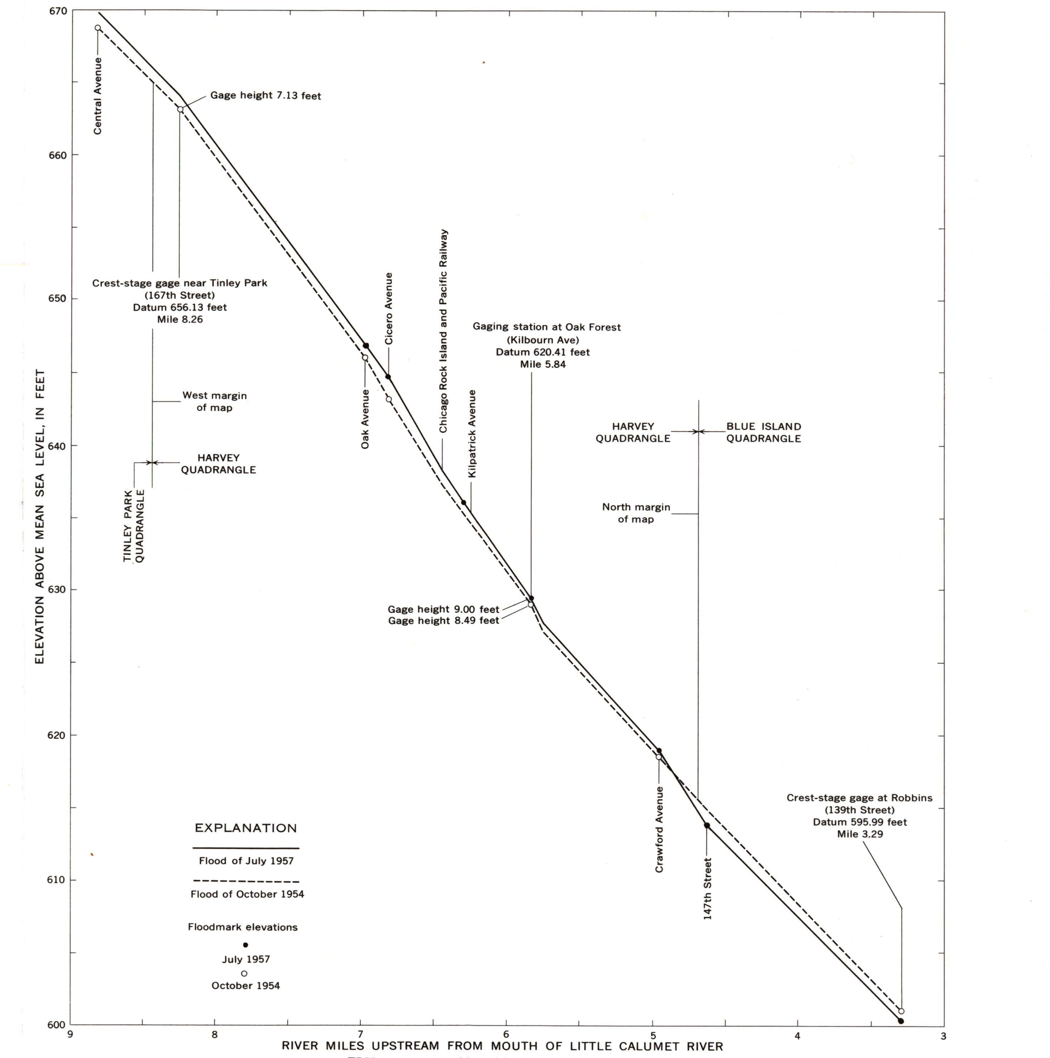


FIGURE 12.—*Profiles of floods on Midlothian Creek*

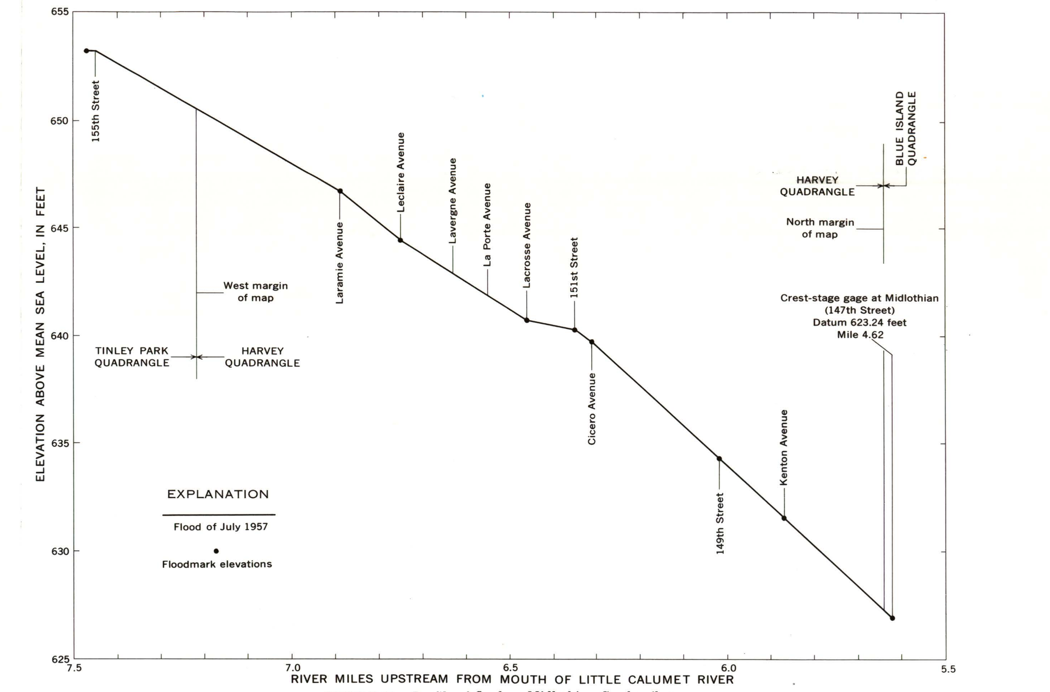


FIGURE 13.—*Profile of flood on Midlothian Creek tributary*

FLOODS IN HARVEY QUADRANGLE, ILLINOIS

By
Howard E. Allen and V. Jeff May
1964

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