FLOODS IN ELWOOD QUADRANGLE NORTHEASTERN ILLINOIS

This report presents hydrologic data that can be used to evaluate the extent, depth, and frequency of flooding that affect the economic development of flood plains in the Elwood quadrangle, northeastern Illinois. It will aid individuals, government agencies, and others responsible for solving existing flood problems and for formulating effective flood-plain regulations that will minimize the creation of new flood problems. The report will also be useful for preparing building and zoning regulations, locating waste disposal facilities, developing recreational areas, and managing surface water in relation to ground-water resources.

The areas inundated by floods along streams in the Elwood 7½-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundated areas for the flood of July 1957 are shown along Prairie Creek, Prairie Creek tributary, Des Plaines River, Sugar Run, Cedar Creek, Jackson Branch, Manhattan Creek, Jackson Creek, and several unnamed streams.

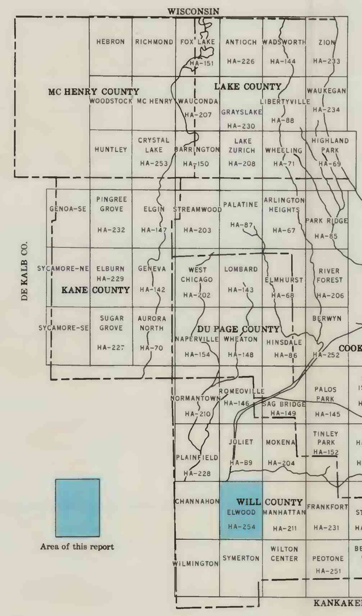

FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

Local residents report that the flood of July 1957 was the highest observed in the past 65 years on streams throughout the Elwood quadrangle. Records at the gaging station on Hickory Creek at Joliet, which is 1¼ miles north of the Elwood quadrangle, are also indicative of the relative magnitude of the July 1957 flood in the area. At Joliet the 1957 flood was 2 feet higher than any other flood recorded since 1945, and it exceeded the estimated 50-year flood stage by 1 foot.

Greater floods than the flood whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflects channel conditions existing when the flood occurred. Changes in channel conditions, in waterway openings at highways and railroads, or changes in runoff characteristics of the streams caused by increased urbanization that may have taken place subsequent to the flood represented on the map could affect the flood height reached by a future flood of comparable discharge. Protective works built after the flood shown 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 stream channels, and other cultural changes.

The general procedure used in defining the flood boundaries was to construct flood profiles from elevations of floodmarks identified in the field and from data available from other agencies. The extent of flooding delineated on the topographic map was derived from the profiles by interpolation between contours (lines of equal ground elevations) and by plotting overflow limits identified during field investigations and surveys. The portrayal of flood boundaries is consistent with the scale of the map (1 inch = 2,000 feet; contour interval, 10 feet).

There are several depressions or lowland areas in the Elwood 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 boundaries are shown for all such areas that were detected in this investigation.

Cooperation and acknowledgment.— The preparation of this report is a part of an extensive flood-mapping program financed through cooperative agreements between the Northeastern Illinois Metropolitan Area Planning Commission and the U.S. Geological Survey. Under previous agreements, flood maps were prepared for forty-three 7½-minute quadrangles. Under the present agreement, the flood-mapping program was expanded to include all the 7½-minute quadrangles shown in figure 1. The program includes parts of Cook and McHenry Counties, nearly all of Kane and Will Counties, and all of Du Page and Lake Counties. The six counties cooperate in the program financially through separate agreements with the Planning Commission. Financial support for the preparation of this report was provided by Will County through the Northeastern Illinois Metropolitan Area Planning Commission.

The cooperative program is administered on behalf of the Planning Commission by Matthew L. Rockwell, Executive Director, and is directly coordinated by Arthur J. Zeizel, Acting Planning Officer.

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

Acknowledgment is made to the Engineering Department of the Joliet Army Ammunition Plant and the Corps of Engineers, U.S. Army, for furnishing some flood data on the flood of July 1957.

Flood heights.— 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 in this report are in feet above mean sea level. Gage heights at crest-stage gages in the Elwood 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. Size of the drainage basin for each station also is shown in the table. The subbasin divides from which the areas were determined are shown on the flood map.

Crest-stage gage	Station number	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Prairie Creek near Elwood (Hoff Road)	5-5273	628.30	26.8
Sugar Run:			
Near Joliet (U.S. Highway 52)	5-5393	617.71	5.21
At Joliet (Rowell Avenue)	5-5393.1	594.20	10.2
Cedar Creek near Elwood (Patterson Road)	5-5394.8	592.13	7.39
Jackson Creek:			
Near Joliet (Spangler Road)	5-5395.6	653.57	15.7
Near Rockdale (U.S. Highway Alternate 66)	5-5396.3	605.45	42.4
At Elwood (Brandon Road)	5-5396.35	586.16	46.6
Jackson Branch near Joliet (U.S. Highway 52)	5-5395.9	646.78	7.54
Manhattan Creek:			
At Manhattan (Gougar Road)	5-5396.1	658.52	5.23
Near Elwood (Rowell Road)	5-5396.2	632.31	12.1

Gage height and year of occurrence of each annual flood (highest peak stage in a calendar year) above 534-foot elevation at the gaging station, Hickory Creek at Joliet, Ill., during the period 1945-65 are shown in figure 2. The gaging station is at Third Avenue in Joliet and is 1¼ miles north of the Elwood quadrangle. The graph shows the history of floods at the gage and illustrates the irregular occurrence of floods on Hickory Creek.

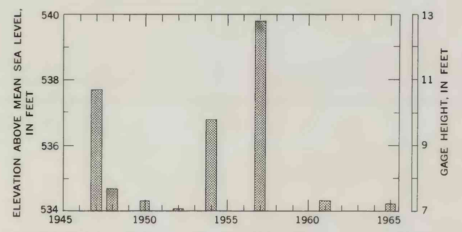

FIGURE 2.—*Annual floods above 534-foot elevation, 1945-65, Hickory Creek at Joliet (Third Avenue).*

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. Discharge rates usually are expressed in units of 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 or debris 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 of this station combined with records of other nearby stations and with the regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). The relation between discharge and frequency is shown in figure 3 and the relation between stage and frequency is shown in figure 4. The relation between stage and frequency is dependent on the relation of stage to discharge which is affected by changes in the physical conditions of stream channels and constrictions. The frequency curve in figure 4 is based on channel conditions existing in 1966. 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.

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.

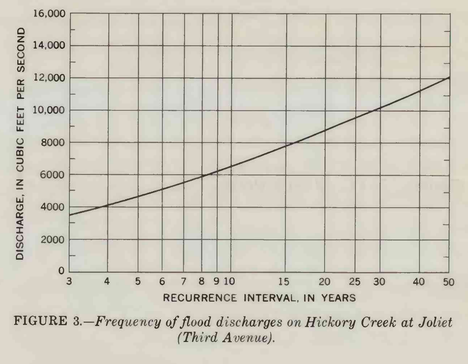

FIGURE 3.—*Frequency of flood discharges on Hickory Creek at Joliet (Third Avenue).*

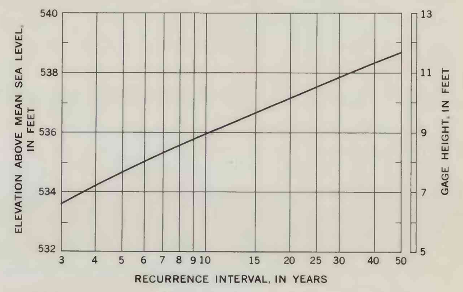

FIGURE 4.—*Frequency of flood stages on Hickory Creek at Joliet (Third Avenue).*

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

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 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 even in the next week.

Flood profiles.— Profiles of the water surface, based primarily on elevations of marks left by floods of July 1957, December 1965, and May 1966, are shown in figures 5-11. Where floodmarks could not be identified, the profiles were constructed on the basis of flood crests determined from reports by local residents and on elevations of streambeds and lower flood stages. River miles used for the profiles correspond to those marked along the streams on the flood map.

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 5-11. The approximate ground elevation can be determined from contours on the map, although more accurate elevations can be obtained by leveling from nearby bench marks.

Additional data.— Other information pertaining to floods in the Elwood quadrangle can 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, 107-200.

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

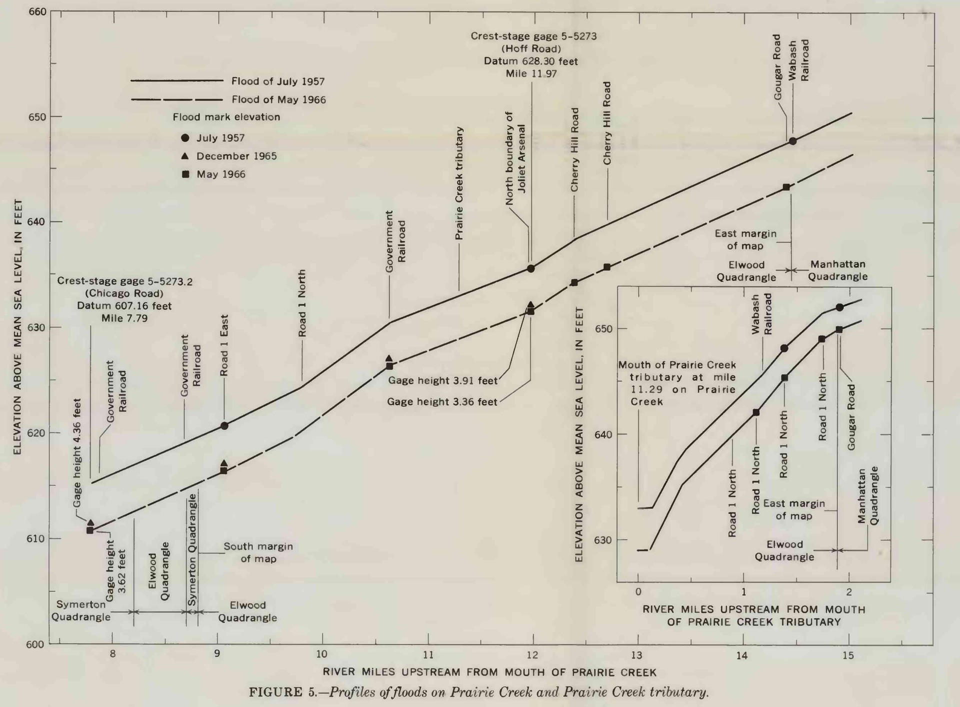

FIGURE 5.—*Profiles of floods on Prairie Creek and Prairie Creek tributary.*

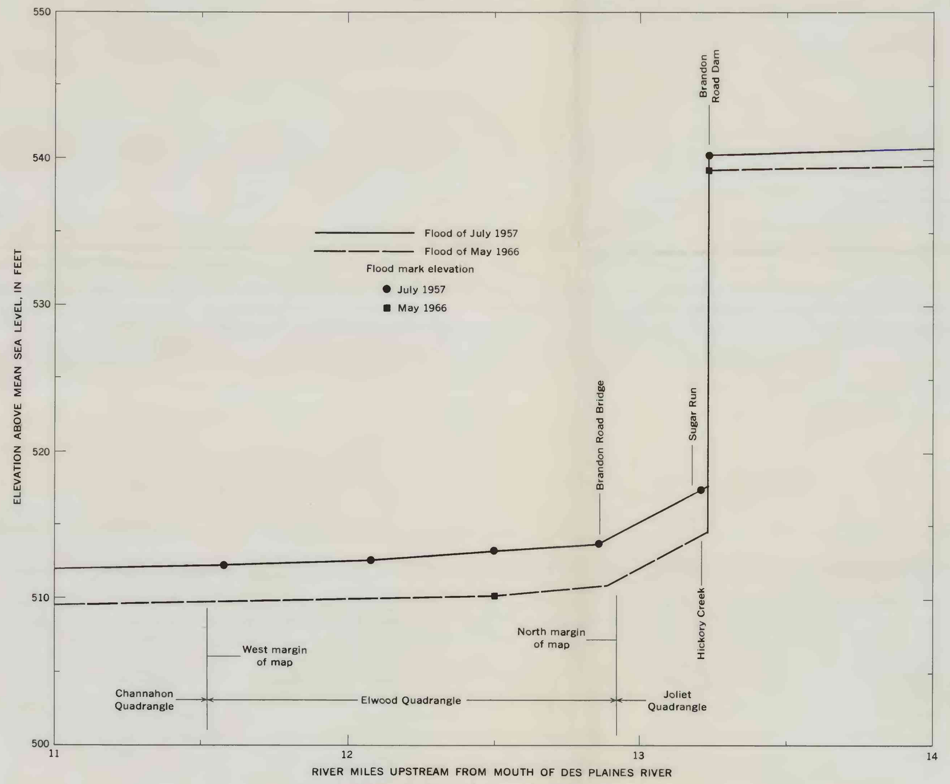

FIGURE 6.—*Profiles of floods on Des Plaines River.*

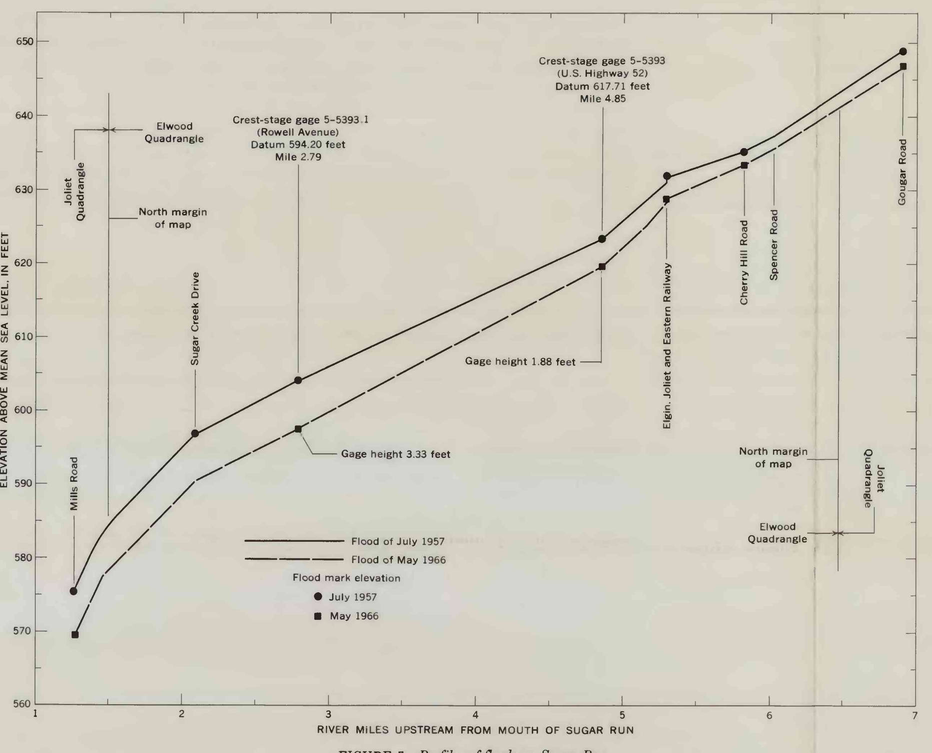

FIGURE 7.—*Profiles of floods on Sugar Run.*

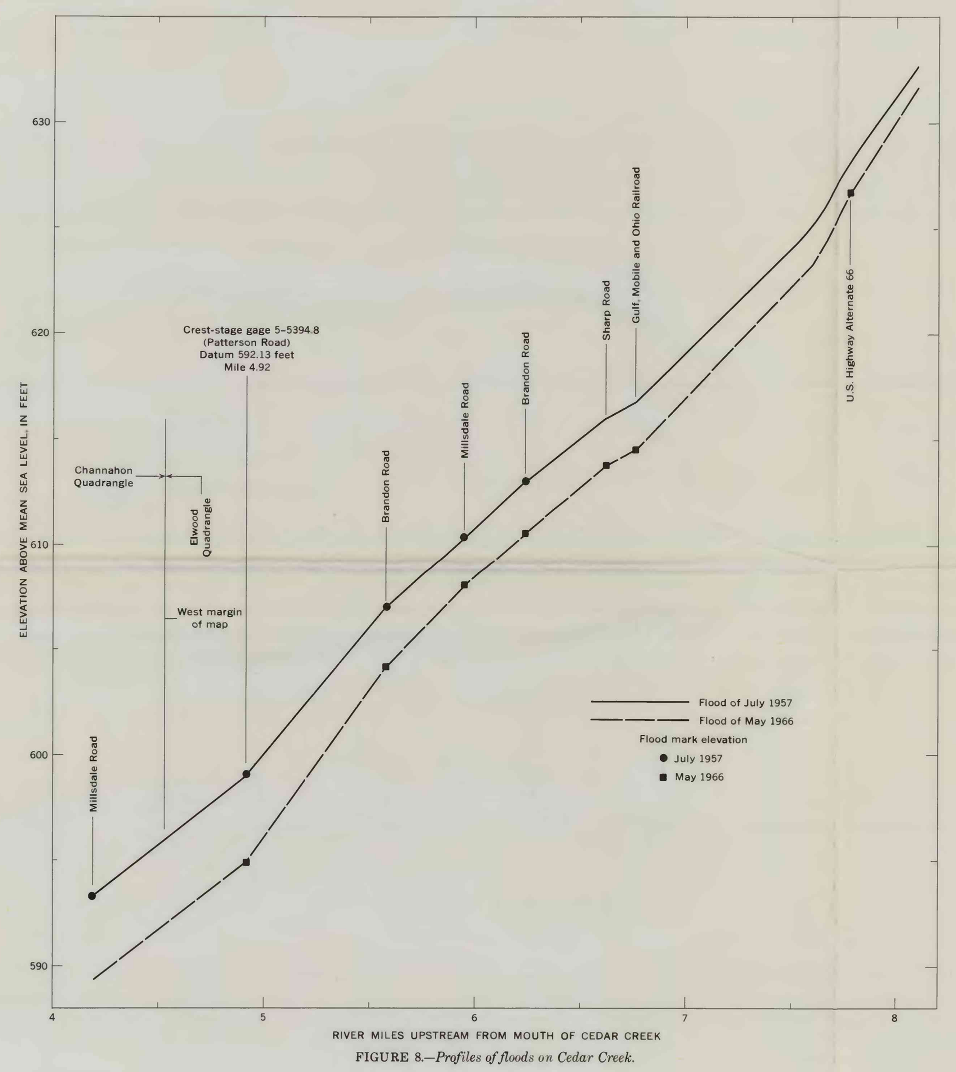

FIGURE 8.—*Profiles of floods on Cedar Creek.*

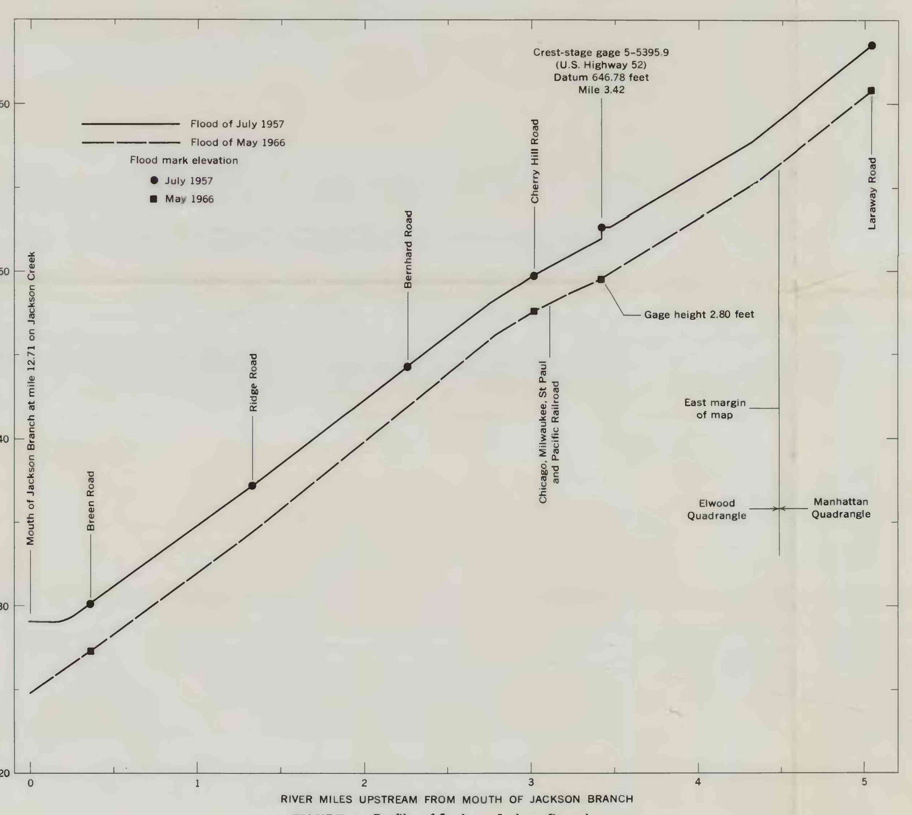

FIGURE 9.—*Profiles of floods on Jackson Branch.*

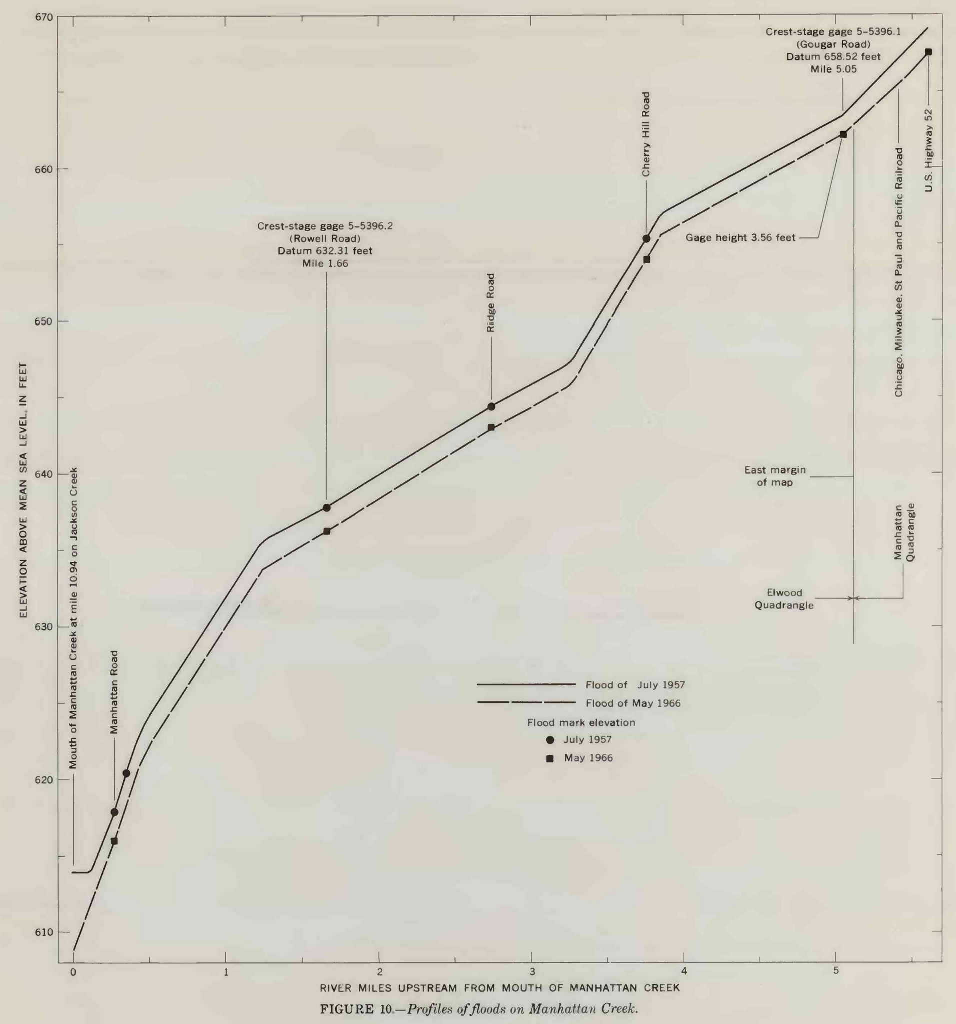

FIGURE 10.—*Profiles of floods on Manhattan Creek.*

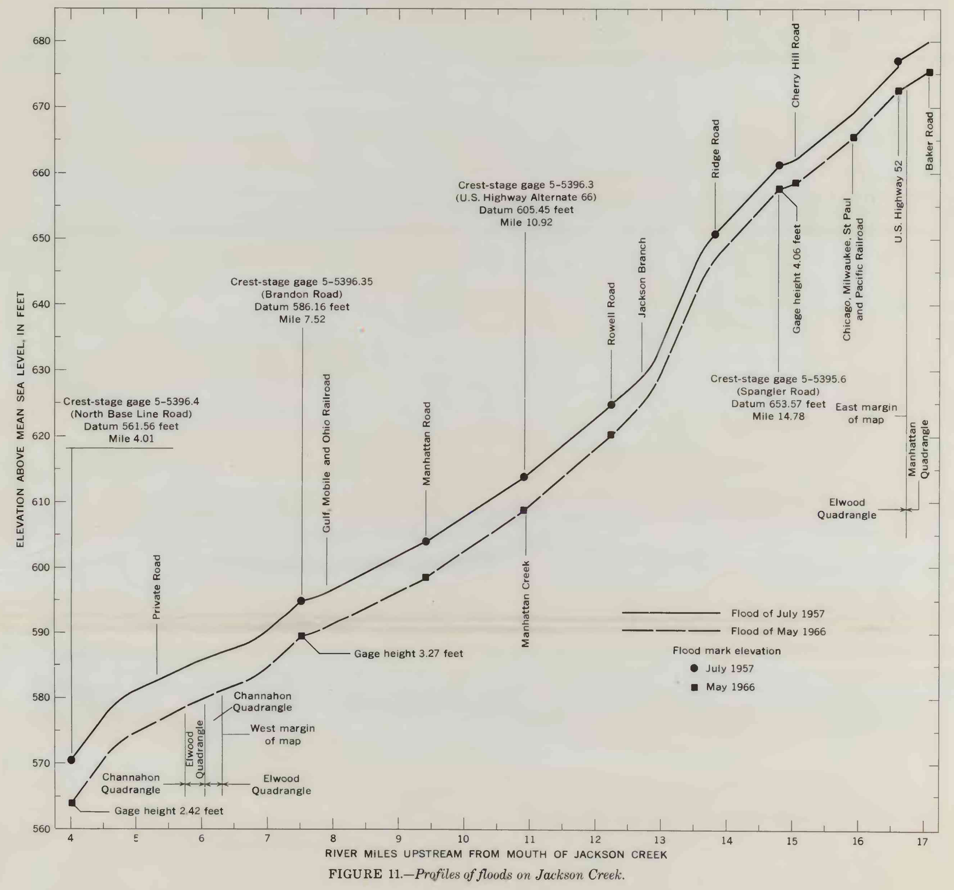

FIGURE 11.—*Profiles of floods on Jackson Creek.*

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