

FLOODS IN AURORA NORTH QUADRANGLE, ILLINOIS

This report presents hydrologic data that will be useful in the evaluation of flood conditions to minimize the flood hazard in the economic development of flood plains. The data 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. This is the fifth of many such reports planned for northeastern Illinois.

The approximate areas inundated by floods along the Fox River and its tributaries are delineated on the Aurora North 74-minute quadrangle map. The quadrangle location is shown in figure 1. Inundated areas are shown along the Fox River, Mill Creek, and Mahone Creek for the flood of October 1954 and along Indian Creek for the flood of July 1957. These floods are not necessarily the highest expected. Greater floods are possible, but definition of their probable overflow limits is not within the scope of this report. At times limited reaches of the Fox River have been affected by flooding from backwater because of ice jams. Backwater existed at Aurora in 1938 at Fox Street where the stage was about a foot higher than in 1954 although the 1954 flood discharge was greater than in 1938.

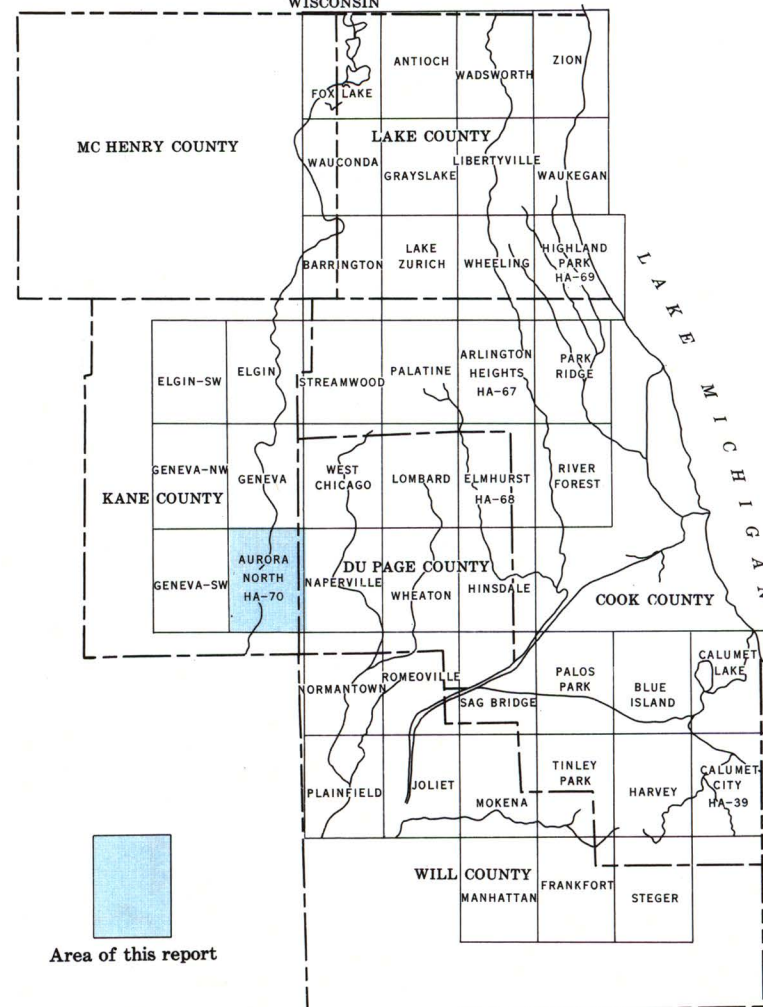


FIGURE 1.—Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.

The flood limits shown on the map reflect channel conditions that existed when the floods occurred and no attempt is made to appraise the effect of channel changes that may have been made later. Protective works built after 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 stream channels, and other cultural changes.

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 whereby flood maps will be prepared for the 74-minute quadrangles shown in figure 1. Areas 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 Kane 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 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. The Aurora North flood map was prepared by Howard E. Allen and Allen W. Noehre.

Acknowledgment is made to the State of Illinois, Department of Public Works and Buildings, Division of Waterways and to the Aurora Sanitary District who supplied some of the flood data on which this report is based. The Division of Waterways also furnished 2-foot-interval contour maps along Fox River and Indian Creek.

Additional data were obtained from personal interviews with local officials and private citizens 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 located in the Aurora North 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 drainage area for each site also is shown in the table. Drainage divides are shown on the map.

Crest-stage gage	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Fox River: at Batavia (Wilson Street)	607.25	1,659
at Aurora (Illinois Avenue)	609.25	1,672
Mill Creek: near La Fox (Kaneville Road)	705.04	18.3
at Moseheart (State Highway 31)	650.39	29.1
Indian Creek: near North Aurora (State Highway 55)	728.68	5.59
at Aurora (State Highway 25)	654.90	17.1

Gage height and year of occurrence of each annual flood (highest peak discharge in each calendar year) above 608.5-foot elevation at the Aurora Sanitary District gage on the Fox River during the period 1930-61 are shown in figure 2. The sanitary district gage is located about 2 1/2 miles south of the Aurora North quadrangle and at mile 43.7. The irregular occurrence of floods is evident from figure 2 which shows that the 608.5-foot elevation was exceeded on the average of once in about every 5 years, but in one 5-year period it was exceeded three times.

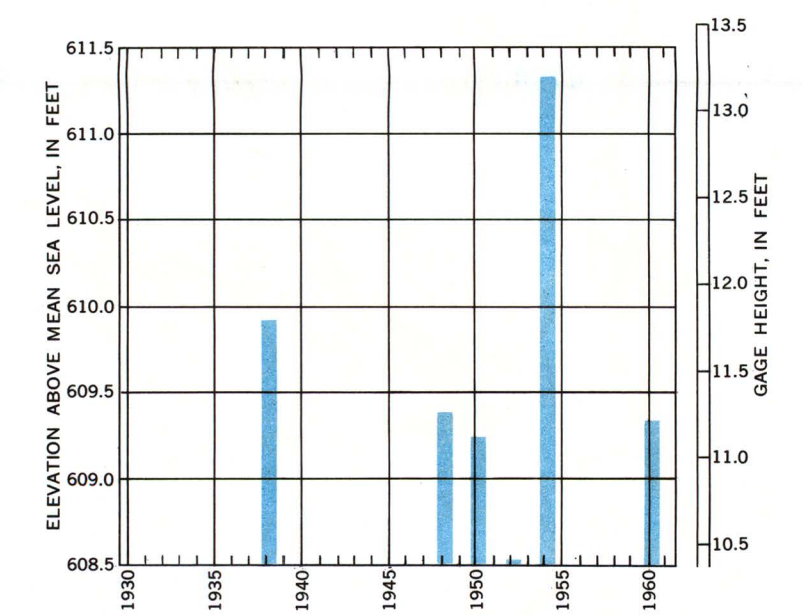


FIGURE 2.—Annual floods above 608.5-foot elevation, 1930-61, Fox River at Aurora (sewage disposal plant).

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 units of cubic feet per second (cfs). Peak discharge is the highest value of the discharge attained by a flood. The maximum discharge during a flood generally occurs at the time of the maximum height of the flood, but if the stream is affected by variable amounts of backwater, the maximum discharge may not coincide with maximum stage.

Flood frequency.—Frequency of flood discharges at the crest-stage gage on Fox River at Aurora (Illinois Avenue at mile 49.85) is derived from the regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). The general relation between frequency and discharge is shown in figure 3. The relation between frequency and stage, shown in figure 4, is derived from the discharge-frequency relation and the stage-discharge relation, or rating curve, at the gage. The interrelation between discharge, frequency, and stage at the Illinois Avenue gage is based on existing channel conditions. Longer records and future changes in channel conditions may define somewhat different flood-frequency relations. The stage-discharge relation at the gage is directly influenced by the overflow dam located 0.9 mile downstream and to a lesser degree by the

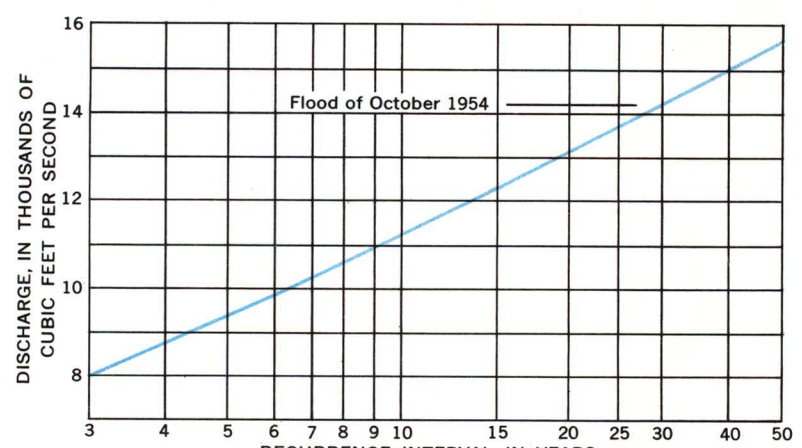


FIGURE 3.—Frequency of flood discharges on Fox River at Aurora (Illinois Avenue).

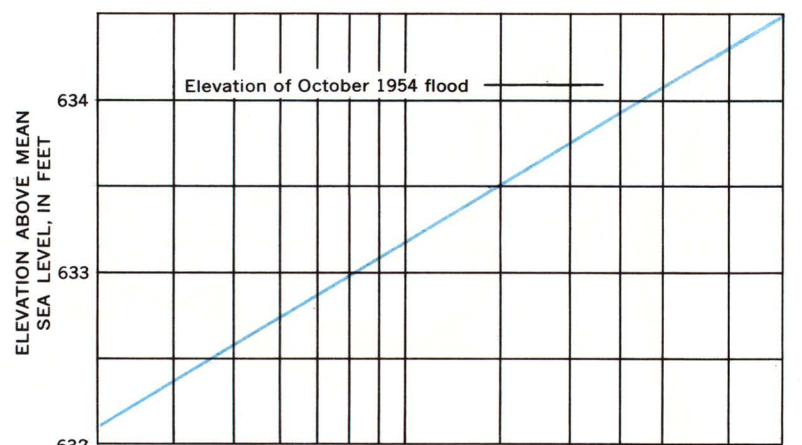


FIGURE 4.—Frequency of flood stages on Fox River at Aurora (Illinois Avenue).

condition of the intervening channel. Changes in the dam, either natural or man-made, may alter the stage-frequency relation. For example, if debris or an ice jam at the dam should cause temporary backwater at the gage, a flood with a relatively low discharge might produce a much higher stage at the gage than expected from the frequency curves shown. Extrapolation of the curves beyond the limits shown is not recommended because of the possibility of large errors.

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 the crest-stage gage on Fox River at Aurora (fig. 4) is tabulated below:

Recurrence interval (years)	Elevation above mean sea level (feet)
50	634.5
40	634.3
30	634.1
20	633.8
10	633.2
5	632.6
2	632.1

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 March 1948, October 1954, July 1957 and September 1961, are shown in figures 5-7. Where definite floodmarks could not be identified, the profiles were constructed on basis of elevations of lower floods and stream beds, and the extent of overflows determined from reports of local residents. River miles used for the profiles correspond to those marked along the streams on the flood map.

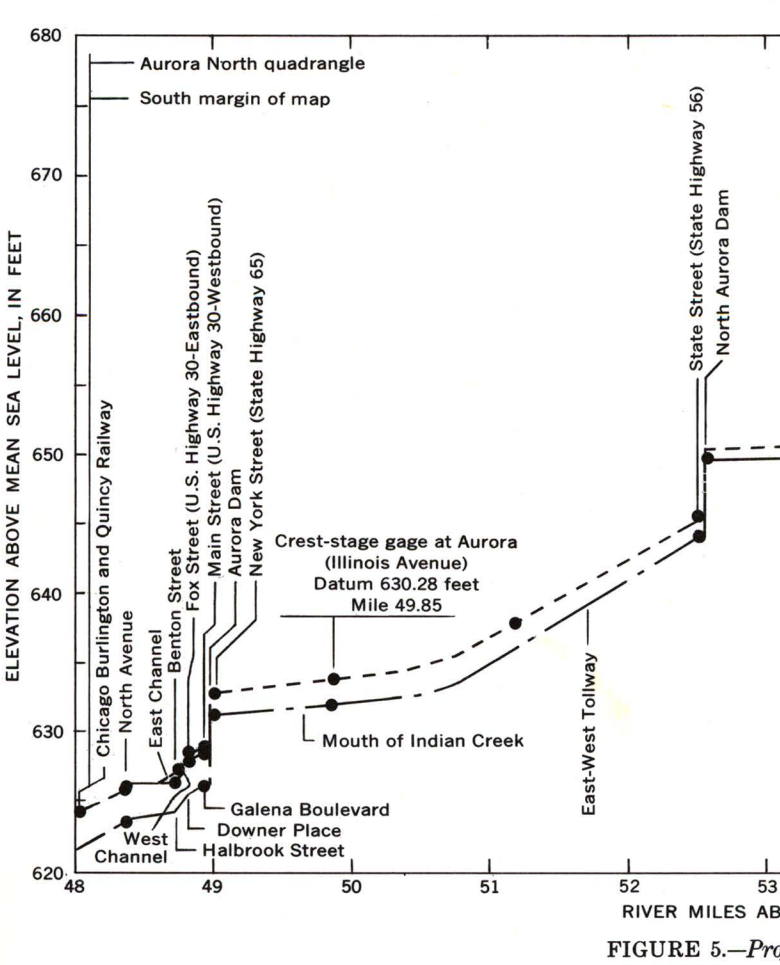


FIGURE 5.—Profiles of floods on Fox River.

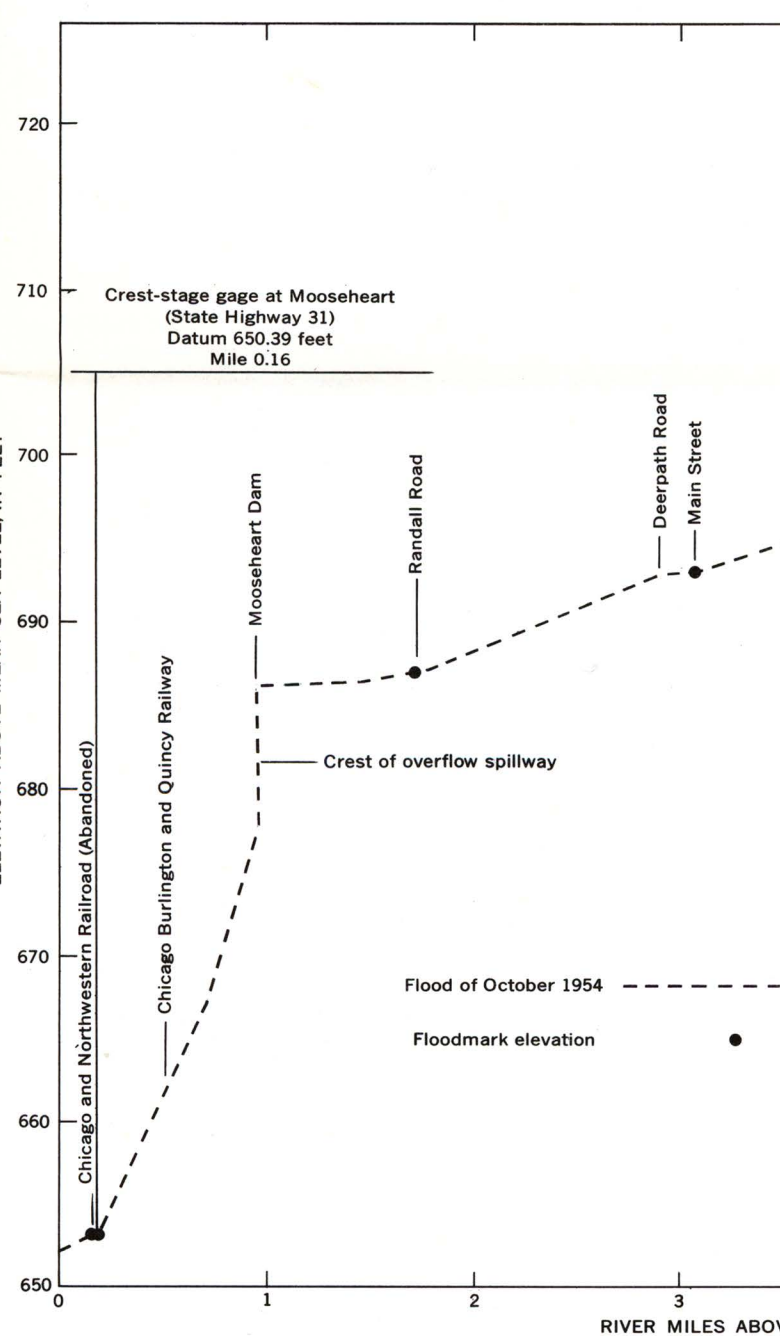


FIGURE 6.—Profiles of floods on Mill Creek and Mahone Creek.

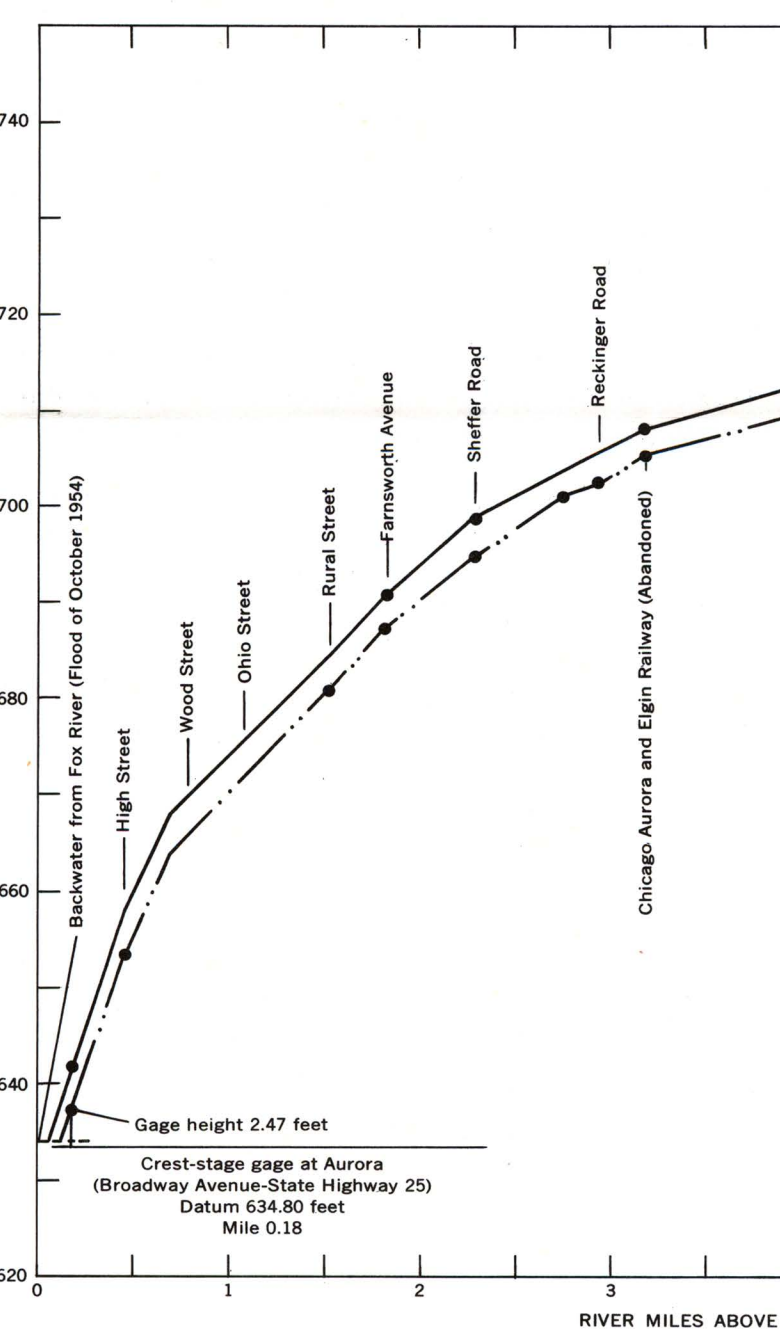


FIGURE 7.—Profiles of floods on Indian Creek.

The abrupt changes in the Fox River profiles (fig. 5) indicate the difference in the water-surface elevations upstream and downstream from the overflow dams.

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 5-7. The approximate ground elevation can be determined from information indicated by contours on the map, although more accurate elevations can be obtained by leveling to nearby bench marks.

Additional data.—Other information pertaining to floods in the Aurora North 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.
Illinois Division of Waterways, Department of Public Works and Buildings, 1960, Survey report for flood control, Indian Creek and tributaries.
Mitchell, W. D., 1954, Floods in Illinois, magnitude and frequency; Illinois Div. Waterways, Department of Public Works and Buildings.

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1963