DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
ATLAS HA-150

FLOODS IN BARRINGTON QUADRANGLE NORTHEASTERN ILLINOIS

This report summarizes hydrologic data useful for evaluating 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 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 Barrington 7 1/2-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundated areas are shown along Fox River, Flint Creek, and Flint Creek tributary at mile 2.3 for the flood of April 1960; along Spring Creek for the flood of July 1957; and along Flint Creek tributary at mile 9.4 for the flood of March 1962.

The general procedure used in defining flood limits was to define flood profiles from elevations of floodmarks identified in the field. The extent of flooding delineated on the topographic map was derived from the profiles by interpolation between contours (lines of equal 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 (10 feet, supplemented by 5-foot-interval contours in some areas).

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, 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 1957, 1960, and 1962 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.

There are numerous depressions and lowland areas in the Barrington quadrangle where surface water accumulates because of inadequate drainage to the streams. Frequency and depth of flooding in these areas is 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, to some extent, upon the rates of evaporation and seepage into the ground. Flood limits are shown for many of these areas but there may have been other 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. The Barrington quadrangle is in Lake, McHenry, and Cook Counties. Financial support for the preparation of this report was provided by Lake and McHenry Counties.

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 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: the State of Illinois, Department of Public Works and Buildings, Division of Waterways; and the Department of Highways of Cook and Lake Counties.

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 above mean sea level in this report 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. Gage heights for crest-stage gages in the Barrington 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 station also is shown in the table. The subbasin divides from which the areas were determined are shown on the flood map.

Gaging station	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Fox River near Cary (Rawson Bridge)	744.84[1]	1262[2]
Flint Creek:		
At Barrington (Lake-Cook Road)	795.61	5.64[3]
At Cuba (Cuba Road)	763.81	19.7[3]
Near Fox River Grove (Kelsey Road)	741.44	36.4[3]
Flint Creek tributary at North Barrington (State Highway 59)	756.08	8.81
Spring Creek:		
Near Barrington (Lake-Cook Road)	769.15	20.8[3]
At Fox River Grove (Plum Tree Road)	742.85	25.0[3]

[1] Low-flow partial-record station.
[2] Elevation of reference point on top of downstream guardrail.
[3] Revised.

Gage height and year of occurrence of each annual flood (in each calendar year) above 733-foot elevation at the gaging station on Fox River at Algonquin during the period 1916–63 are shown in figure 2. The Algonquin gaging station is at Algonquin, Ill., about 3 miles southwest of the Barrington quadrangle, and at mile 82.6. Stages after 1946 are not comparable with prior stages because of a new dam construction.
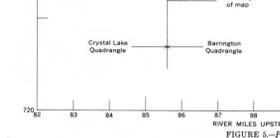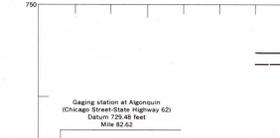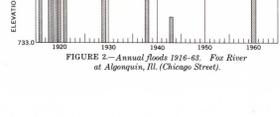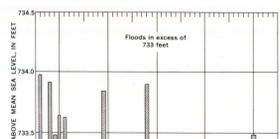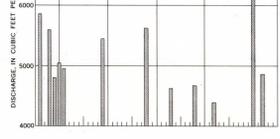
Flood discharge.—The rate of discharge of a stream is the volume of flow that passes a particular station in a given period of time. Usually discharge rates are expressed in cubic feet per second (cfs). Peak discharge is the maximum discharge attained by a flood. The peak discharge during a flood generally occurs at the time of the maximum height (stage) of the flood, but if a stream is affected by variable backwater, the peak discharge may not coincide with the maximum stage. For example, backwater from an ice jam may cause a high stage during a period of relatively low discharge.

Figure 2 includes a graph of the annual maximum discharges in excess of 4,000 cfs for the period of record at the Algonquin gaging station. This graph portrays the relative magnitudes of the flood discharges which are independent of changes resulting from the dam constructed in 1946.

Flood frequency.—Frequency of floods at the Geological Survey gaging station on Fox River at Algonquin was derived from streamflow records of this station combined with records of nearby stations and with regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). The Algonquin gage is at Chicago Street in Algonquin, about 3 miles southwest of the Barrington quadrangle, and at mile 82.6. The general relation between frequency and discharge is shown in figure 3, and the general relation between frequency and stage 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 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.

Recurrence intervals.—As applied to flood events, recurrence interval is the average interval of time within which a given flood will be equalled or exceeded once. Frequencies of floods can be stated in terms of their probabilities of occurrence (virtually reciprocal of their recurrence intervals for floods larger than the 10-year flood). 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 Fox River at Algonquin (fig. 4) is tabulated below.

Recurrence interval (years)	Elevation above mean sea level (feet)
50	733.9
25	733.6
10	733.4
5	733.1
2	732.7
1	732.5

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 experienced in one year does not reduce the probability of that flood being exceeded in the next year or in the next week.

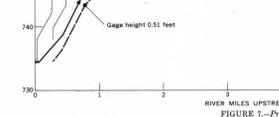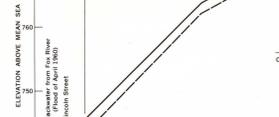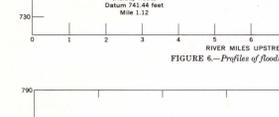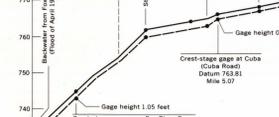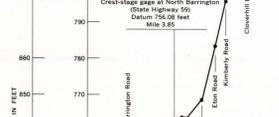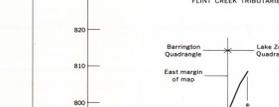*Flood profiles.*—Profiles of the water surface, based primarily on elevations of marks left by floods of July 1957, April 1960, and March 1962, are shown in figures 5–7. Where floodmarks could not be identified, the profiles were constructed on the basis of elevations of lower floods and streambeds, and of flood crests determined from photographs and from 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 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.

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

FIGURE 2.—Annual floods 1916–63. Fox River at Algonquin, Ill. (Chicago Street).

FIGURE 3.—Frequency of flood discharges on Fox River at Algonquin, Ill. (Chicago street).

FIGURE 4.—Frequency of flood stages on Fox River at Algonquin, Ill. (Chicago street).

FIGURE 5.—Profiles of floods on Fox River.

FIGURE 6.—Profiles of floods on Flint Creek and Flint Creek tributaries.

FIGURE 7.—Profiles of floods on Spring Creek.

EXPLANATION

Area flooded 1957, 1960, 1962

Boundary of 1957 flood — 1957
Boundary of 1960 flood — 1960
Boundary of 1962 flood — 1962

Drainage divide

River mile measured along stream channel — 10

Inundated areas defined for different floods, upstream and downstream

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

Base from U.S. Geological Survey, 1960

FLOODS IN BARRINGTON QUADRANGLE, NORTHEASTERN ILLINOIS
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