PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION

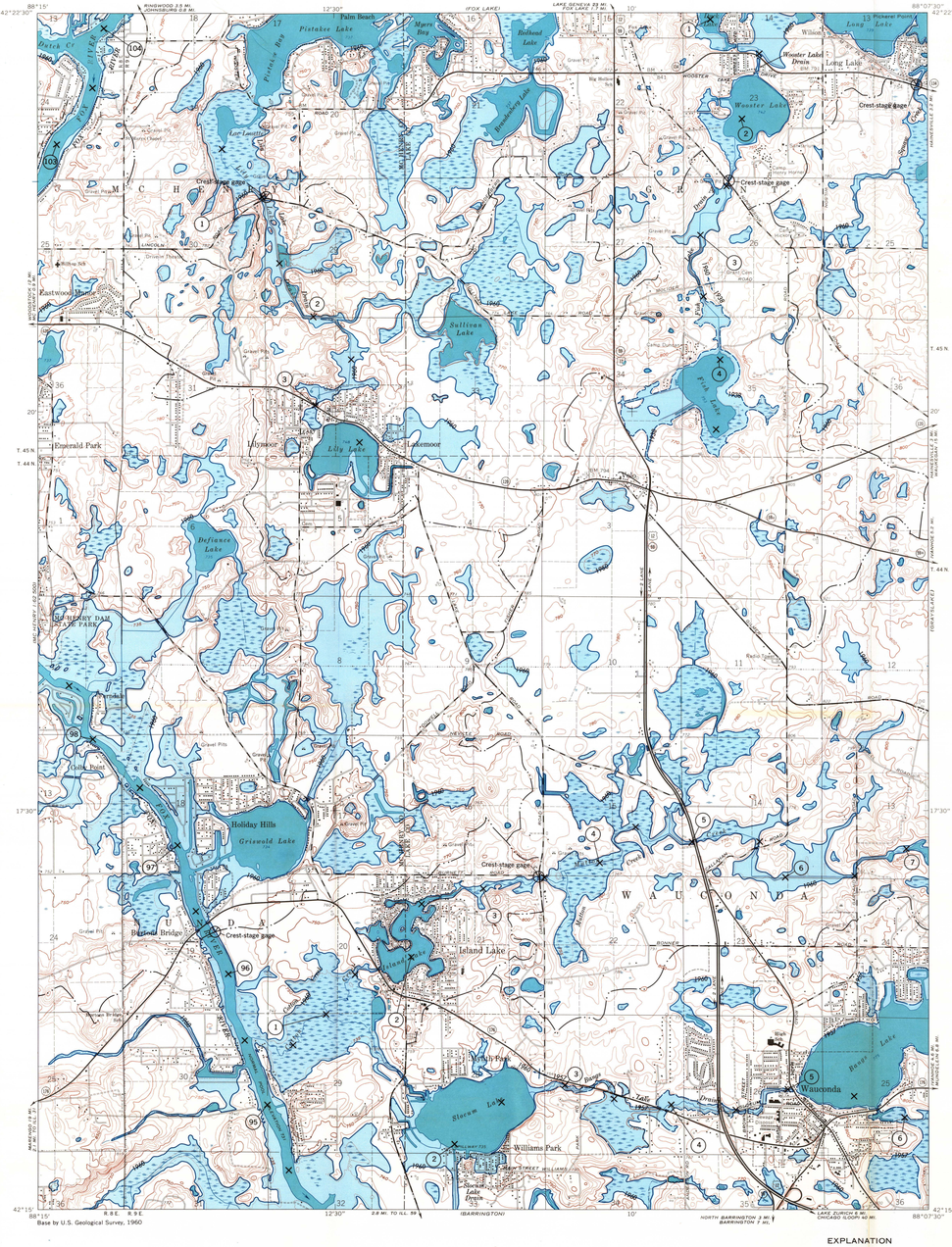

FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

FLOODS IN WAUCONDA QUADRANGLE NORTHEASTERN 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 in the Wauconda quadrangle, Illinois. It will be a valuable tool for the counties and municipalities for solving existing flood problems and for formulating regulations for land use and development that will reduce future flood damage.

The approximate areas inundated by floods along streams and lakes in the Wauconda 7 1/2-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundated areas are shown along Fish Lake and Fish Lake Drain (upstream from Molider Road) for the flood of July 1938; along Bangs Lake and Bangs Lake Drain for the flood of July 1957; along Squaw Creek, Fox River, Fish Lake Drain (downstream for Molider Road), Wooster Lake, Duck Lake, Lily Lake, Lily Lake Drain, Mutton Creek, Island Lake, Cotton Creek, Slocum Lake, Slocum Lake Drain, and several other lakes for the flood of April 1960.

The 1960 flood discharge on the Fox River was the maximum for the period of record, 1916-64, at the Algonquin, Ill., gaging station. The 1960 flood stage, however, has been exceeded six times, by 0.1 to 0.5 foot, in the same period. Upstream from McHenry Dam (at river mile, about 99) the elevation of the 1960 flood was reported to be as much as 1.2 feet lower than that of the 1938 flood. This probably reflects the different discharge capacities of the structures existing at the McHenry Dam site when the floods occurred. The dam was reconstructed in 1939. The floods of July 1938 on Bangs Lake, Fish Lake, and Fish Lake Drain were reported to have been the highest observed in the past 40 years. This flood was probably the highest at other places along the lake drains but data sufficient to define its profile were not available.

Greater floods than those shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflects channel conditions existing when the floods occurred. Changes in channel conditions, waterway openings at highway and railroads, or changes in runoff characteristics of the streams caused by increased urbanization that may have taken place subsequent to the floods shown on the map could affect the flood height reached by a future flood of comparable discharge. Protective works built after the floods 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 flood boundaries was to construct flood profiles from elevations of floodmarks identified in the field and from existing 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 shown are consistent with the scale of the map (1 inch=2,000 feet; contour interval, 5 feet and 10 feet).

There are numerous depressions or lowland areas in the Wauconda 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 a cooperative agreement between The Northeastern Illinois Metropolitan Area Planning Commission and the U. S. Geological Survey. Under the agreement, 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 in the program financially through separate agreements with the Planning Commission. 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 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: the State of Illinois, Department of Public Works and Buildings, Division of Waterways; and the Lake County Regional Planning Commission.

Additional data were obtained from officials of municipalities located 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 of 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 Wauconda 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 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	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Squaw Creek at Long Lake (State Highway 134)	739.78	25.5
Fish Lake Drain near Long Lake (Nippersink Road)	744.37[1]	4.62
Lily Lake Drain near Johnsburg (Lincoln Road)	738.86[1]	6.49
Fox River at Burtons Bridge (450 feet downstream from State Highway 176)	733.22[1]	1,245
Mutton Creek at Island Lake (Darrell Road)	753.52[1]	10.0

[1] Revised

Gage height and year of occurrence of each annual flood (highest peak stage in each calendar year) above 733-foot elevation at the gaging station, Fox River at Algonquin, Ill. (Chicago Street), during the period 1916-64 are shown in figure 2. The gaging station is about 6 1/2 miles southwest of the Wauconda quadrangle, and at mile 82.6. Stages for floods of specific discharges will be lower after 1946 than they were previously because of a dam construction.

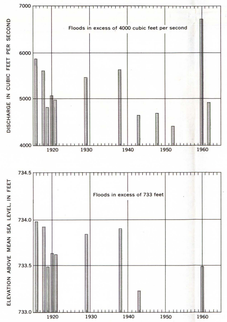

FIGURE 2.—*Annual floods 1916-64, Fox River at Algonquin, Ill. (Chicago Street).*

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 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 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.

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 the regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). 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 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 curve shown in figure 4 is based on channel conditions existing in 1965. 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.

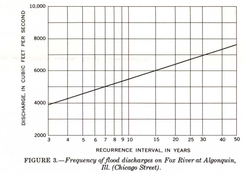

FIGURE 3.—*Frequency of flood discharges on Fox River at Algonquin, Ill. (Chicago Street).*

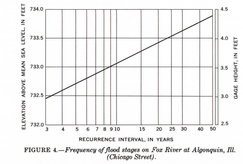

FIGURE 4.—*Frequency of flood stages on Fox River at Algonquin, Ill. (Chicago Street).*

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 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 Fox River at Algonquin (fig. 4) is tabulated below.

Recurrence interval (years)	Elevation above mean sea level (feet)
50	733.9
30	733.6
20	733.4
10	733.1
5	732.7
3	732.5

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 1938, July 1957, April 1960, March 1962, and April 1965, are shown in figures 5-9. Where floodmarks could not be obtained, the profiles were constructed on the basis of flood crests determined from photographs and from reports of local residents, and of 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 5-9. The approximate ground elevation can be determined from contours on the map, although more nearly accurate elevations can be obtained by leveling from nearby bench marks.

Additional data.— Other information pertaining to floods in the Wauconda 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, p. 107-200.

Illinois Department of Public Works and Buildings, Division of Waterways, 1962, Survey report for development of Fox River for recreational navigation, 204 p.

_____ 1962, Report on water levels and McHenry Dam, Fox Chain of Lakes Region, McHenry and Lake Counties, 45 p.

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

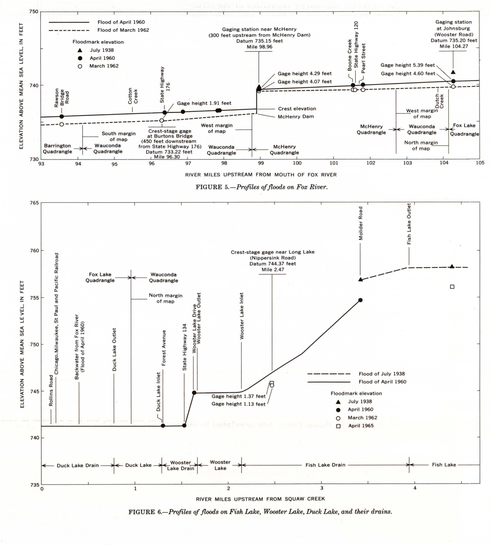

FIGURE 5.—*Profiles of floods on Fox River.*

FIGURE 6.—*Profiles of floods on Fish Lake, Wooster Lake, Duck Lake, and their drains.*

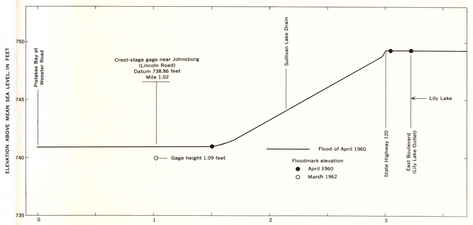

FIGURE 7.—*Profile of flood on Lily Lake Drain.*

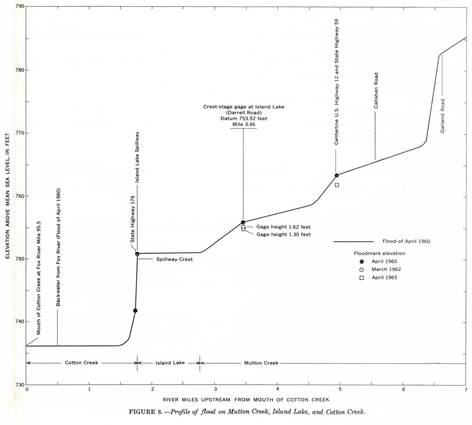

FIGURE 8.—*Profile of flood on Mutton Creek, Island Lake, and Cotton Creek.*

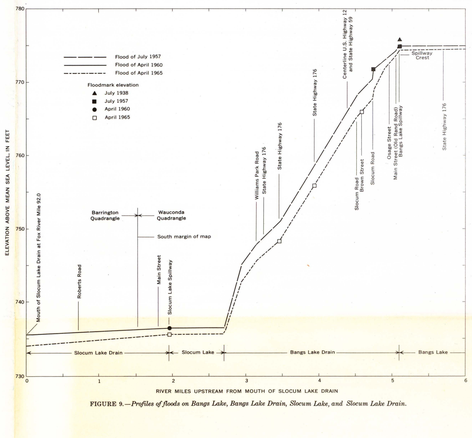

FIGURE 9.—*Profiles of floods on Bangs Lake, Bangs Lake Drain, Slocum Lake, and Slocum Lake Drain.*

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By
Howard E. Allen

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