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UNITED STATES GEOLOGICAL SURVEY

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THE NORTHEASTERN ILLINOIS PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
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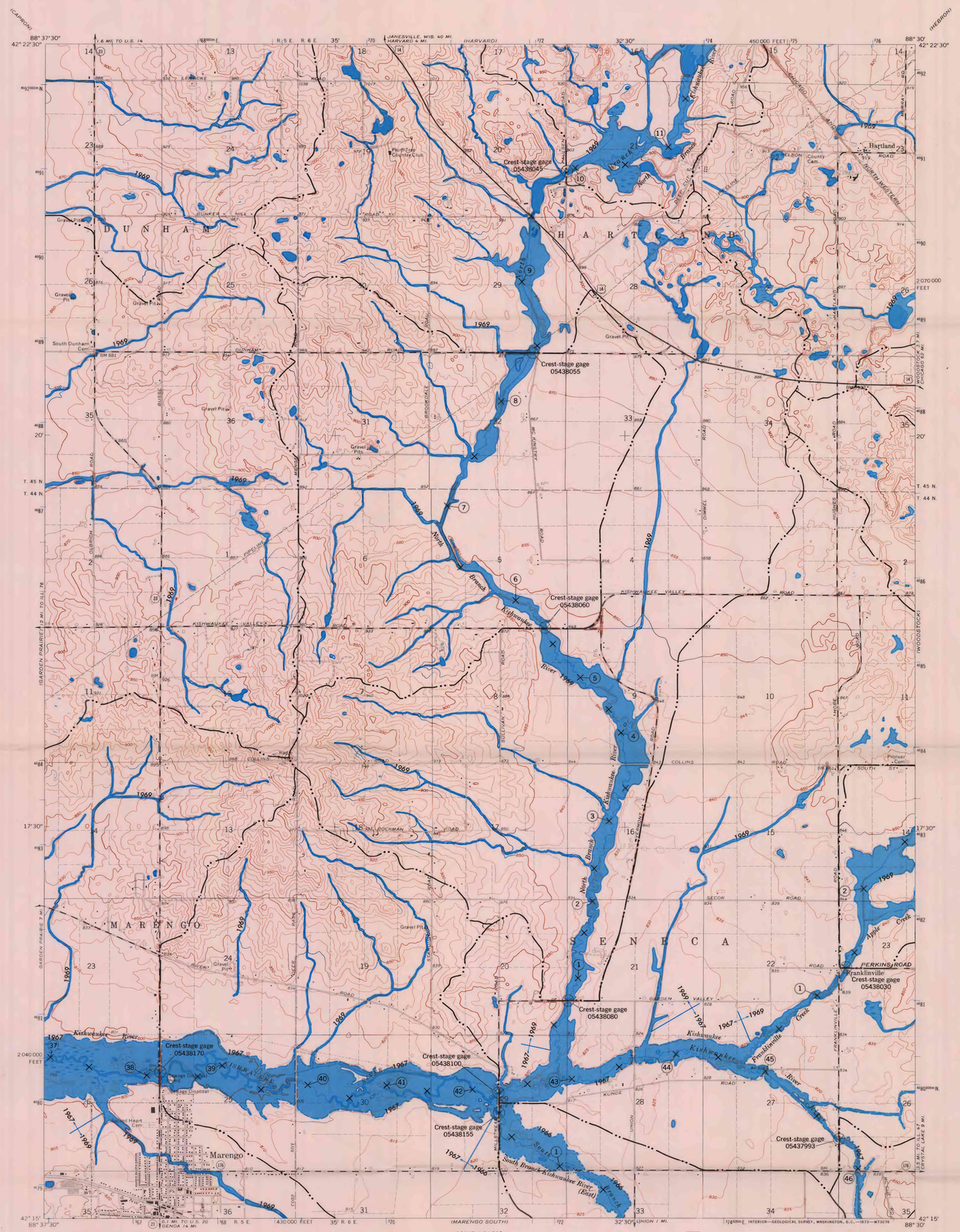

FLOODS IN MARENGO NORTH QUADRANGLE, NORTHEASTERN ILLINOIS

By
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1973

FLOODS IN MARENGO NORTH QUADRANGLE, NORTHEASTERN ILLINOIS

Introduction.—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 Marengo North 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 the ground-water resources.

The areas inundated by floods along streams in the Marengo North quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. The stream names and the dates of the floods as shown on the map are tabulated below:

Date of flood	Area flooded
February 1966.....	South Branch Kishwaukee River (East).
June 1967.....	Kishwaukee River.
June 1969.....	North Branch Kishwaukee River, Franklinville Creek, and several unnamed streams.

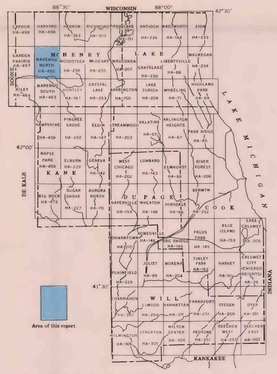

FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

Local residents reported that the flood of June 1969 was the highest observed in the last 15 years on North Branch Kishwaukee River.

Greater floods than those whose boundaries are shown on the map are possible. The flood boundaries shown provide a record of historic fact that reflect channel conditions existing when the floods 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 take place subsequent to the floods represented on the map could affect the 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 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 with some supplemental 5-foot intervals).

There are several depressions and lowland areas in the Marengo North 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 rate 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 Planning Commission and the U.S. Geological Survey. Under previous agreements with the Northeastern Illinois Planning Commission and the Illinois Department of Transportation, Division of Water Resource Management, flood maps have been prepared for the 7½-minute quadrangles as shown in figure 1. The counties of Cook, Du Page, Kane, Lake, and McHenry cooperate by providing financial aid to the mapping program.

The total program includes part of Cook County, nearly all of Kane and Will Counties, and all of Du Page, Lake and McHenry Counties. Financial support for the preparation of this report was provided by McHenry County through the Northeastern Illinois Planning Commission.

The cooperative program for this report is administered on behalf of the Planning Commission by Matthew L. Rockwell, Executive Director.

This report was prepared by the U.S. Geological Survey under the administrative direction of Davis W. Ellis, district chief, and under the immediate supervision of Allen W. Noehre, hydrologist-in-charge of the project.

Acknowledgment is made to the McHenry County Highway Department that supplied some of the data on which this report is based.

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 in this report are in feet above mean sea level. Gage heights for crest-stage gages in the Marengo 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:

Crest-stage gage	Station number	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Kishwaukee River:			
At Franklinville (Franklinville Road).....	05437993	826.54	27.0
Near Marengo (Millstream Road).....	05438100	807.57	85.4
At Marengo (State Highway 23).....	05438170	794.36	166
North Branch Kishwaukee River:			
Near Woodstock (Paulsen Road).....	05438045	886.63	19.6
Near Marengo (Dunham Road).....	05438055	865.01	24.3
Near Franklinville (Kishwaukee Valley Road).....	05438060	839.24	30.0
Near Union (Garden Valley Road).....	05438080	814.13	38.8
South Branch Kishwaukee River (East) near Marengo (Millstream Road).....	05438155	808.42	73.9
Franklinville Creek at Franklinville (Perkins Road).....	05438030	829.83	10.3

Size of the drainage basin for each station also is given in the table. The subbasin divides from which the areas were determined are shown on the flood map. The divides were defined in the usual manner of following the ridge line or highest ground elevation between adjacent streams.

Gage height and year of occurrence of each annual flood (highest peak stage in each calendar year) above 748-foot elevation at the gaging station 05438500 Kishwaukee River at Belvidere, during the period 1938, 1940–71 are shown in figure 2. The gaging station is at the sewage treatment plant in Belvidere, about 1½ miles west of Marengo North quadrangle, and 20.8 miles upstream from mouth of Kishwaukee River. The graph shows the history of floods at the gage and illustrates the irregular occurrence of floods on the Kishwaukee River.

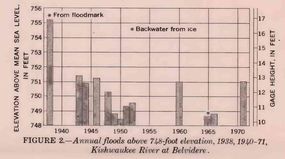

FIGURE 2.—*Annual floods above 748-foot elevation, 1938, 1940–71, Kishwaukee River at Belvidere.*

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 U.S. Geological Survey gaging station 05438500 Kishwaukee River at Belvidere, was derived from streamflow records at this station by using the log-Pearson Type III method.

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 physical conditions of stream channels and constrictions. The frequency curve shown in figure 4 is based on channel conditions existing in 1972. Longer records and future changes in channel conditions may define somewhat different flood-frequency curves at this site. Extrapolation of the curves beyond the limits shown is not recommended.

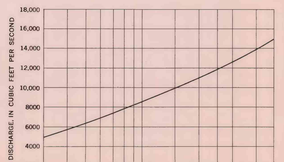

FIGURE 3.—*Frequency of flood discharges on Kishwaukee River at Belvidere.*

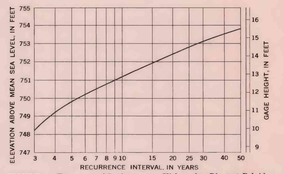

FIGURE 4.—*Frequency of flood stages on Kishwaukee River at Belvidere.*

Recurrence intervals.—As applied to flood events, recurrence interval is the average interval of time within which a given flood will be 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 exceeded in any given year, or a flood with a 50-year recurrence interval would have a 2-percent chance of being exceeded in any given year.

The general relation between recurrence interval and flood height at the gaging station 05438500 on Kishwaukee River at Belvidere (fig. 4) is tabulated in the following table:

Recurrence interval (years)	Elevation above mean sea level (feet)
50.....	753.8
30.....	753.1
20.....	752.4
10.....	751.2
5.....	749.8
3.....	748.2

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 during the next year or even during the next week.

Flood profiles.—Profiles of the water surface, based primarily on elevations of the marks left by floods of February 1966, June 1967, June 1969, June 1970, and September 1970 are shown in figures 5–8.

Where floodmarks could not be identified, the profiles were constructed on the basis of flood crests determined from photographs and 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 5–8. 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 Marengo North quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following report:

Water Resources Council, 1967, A uniform technique for determining flood flow frequencies: Bull. 15, 1025 Vermont Ave., N.W., Wash., D.C. 20005.

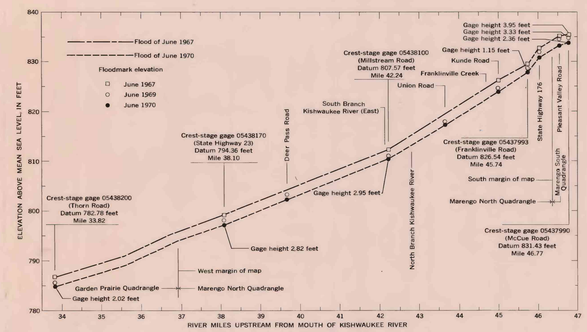

FIGURE 5.—*Profiles of floods on Kishwaukee River.*

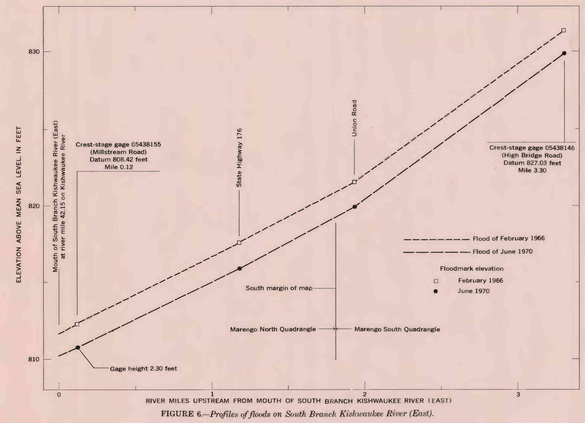

FIGURE 6.—*Profiles of floods on South Branch Kishwaukee River (East).*

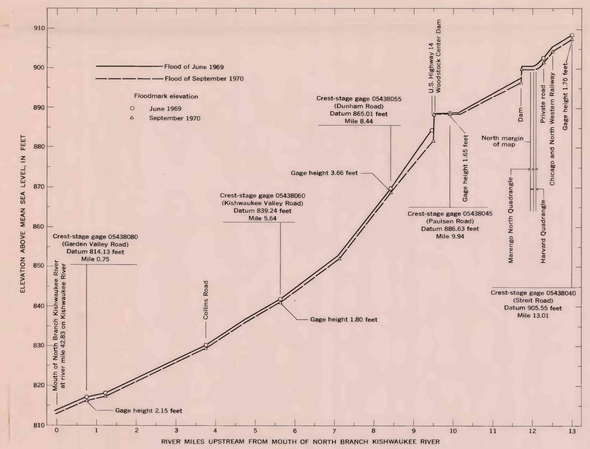

FIGURE 7.—*Profiles of floods on North Branch Kishwaukee River.*

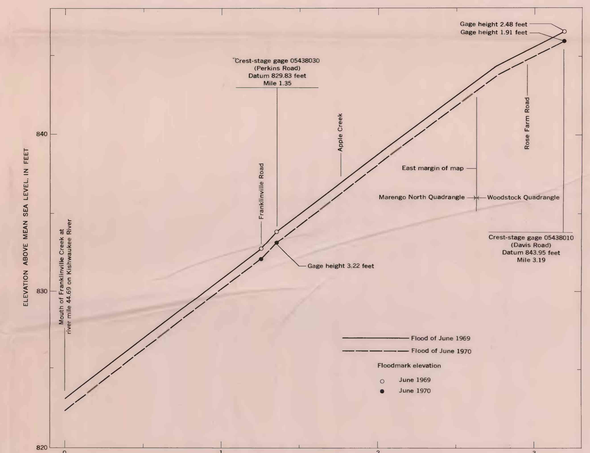

FIGURE 8.—*Profiles of floods on Franklinville Creek.*

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