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UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
NORTHEASTERN ILLINOIS PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
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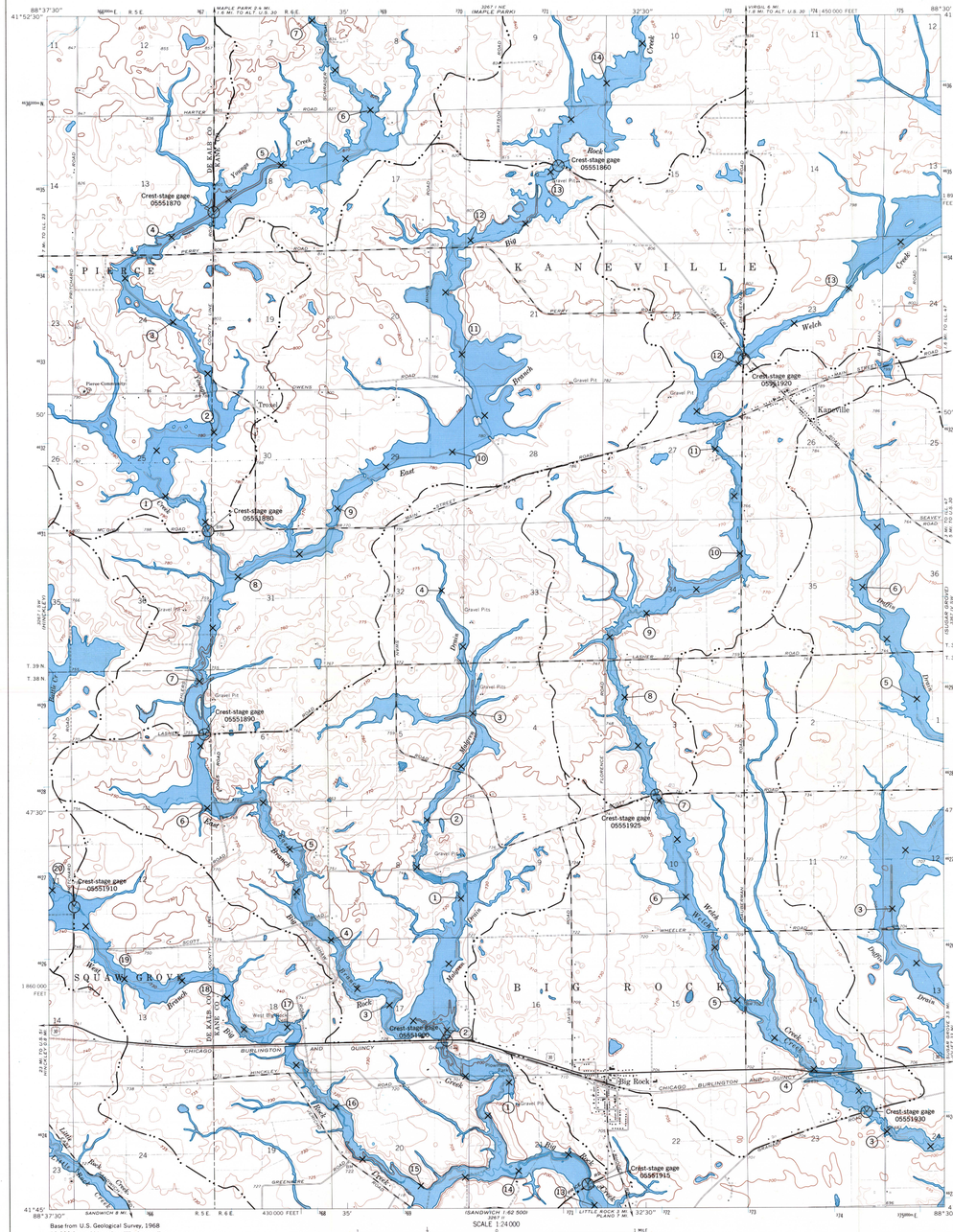

FLOODS IN BIG ROCK QUADRANGLE, NORTHEASTERN ILLINOIS

By
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1973

FLOODS IN BIG ROCK 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 Big Rock 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 approximate areas inundated by floods along streams in the Big Rock quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1.

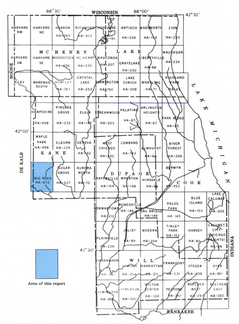

FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

Inundated areas for the flood of October 1954 are shown along Big Rock Creek, West Branch Big Rock Creek, East Branch Big Rock Creek, Malgren Drain, Youngs Creek, Duffin Drain, Welch Creek, and several unnamed streams.

The flood of October 1954 on streams throughout the Big Rock quadrangle was reported by local residents to be the highest observed in the past 71 years.

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 reflect channel conditions existing when the floods occurred. Changes in channel conditions, 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 flood shown on the map could affect the 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 intervals, 10 feet with some supplemental 5-foot intervals).

There are depressions and lowland areas in the Big Rock 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 Planning Commission and the Illinois Department of Public Works and Buildings, Division of Waterways, flood maps have been prepared for the 75-minute quadrangles as shown in figure 1. The total program includes parts of Cook County, nearly all of Kane and Will Counties, and all of Du Page, Lake, and McHenry Counties.

The counties of Cook, Du Page, Kane, Lake, and McHenry cooperate in the program financially through separate agreements with the Planning Commission. Financial support for the preparation of this report was provided by Kane County through the Northeastern Illinois Planning Commission.

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

This 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, hydrologist-in-charge of the project.

Acknowledgment is made to the Kane County Highway Department and the State of Illinois, Department of Public Works and Buildings and Division of Waterways for furnishing 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 Big Rock 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)
Big Rock Creek at Big Rock (Price Road)	05551915	676.65	51.4
East Branch Big Rock Creek:			
Near Kaneville (Harter Road)	05551860	802.58	4.89
Near Hinckley (Lasher Road)	05551890	744.12	13.5
Near Big Rock (U.S. Highway 30)	05551900	700.15	21.0
West Branch Big Rock Creek at Hinckley (Pritchard Road)	05551910	731.64	24.4
Youngs Creek:			
Near Maple Park (County Line Road)	05551870	795.28	4.79
Near Kaneville (McGirr Road)	05551880	761.66	11.4
Welch Creek:			
At Kaneville (Dauberman Road)	05551920	781.90	10.4
Near Kaneville (Scott Road)	05551925	721.52	16.4
Near Big Rock (Granart Road)	05551930	683.53	22.4

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 identified by locating the ridge line or highest ground elevation between adjacent streams. Relief in parts of the quadrangle is slight and at times some of the divides may become submerged during floods. When this occurs water may flow in either direction across the divides depending upon the relative elevation of the streams and conveyance of their channels.

Gage height and year of occurrence of each annual flood (highest peak stage in each calendar year) above 571-foot elevation at the gaging station 05540500 Du Page River at Shorewood, during the period 1941–69 are shown in figure 2. This gaging station is 400 feet upstream from U.S. Highway 52 at Shorewood, and is 24.3 miles southeast of the Big Rock quadrangle.

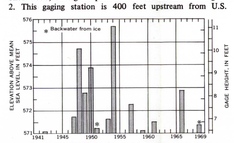

FIGURE 2.—*Annual floods above 571-foot elevation, 1941–69, Du Page River at Shorewood.*

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 debris or an ice jam may cause a high stage during a period of relatively low discharge.

Flood frequency.—Frequency of floods at the Geological Survey gaging station 05551700 Blackberry Creek near Yorkville, was derived from streamflow records at 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 at the gaging station is shown in figure 3, and the relation between frequency and stage is shown in figure 4. The relation between stage and frequency

FIGURE 3.—*Frequency of flood discharges on Blackberry Creek near Yorkville (Boomer Road).*

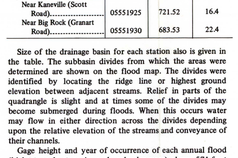

FIGURE 4.—*Frequency of flood stages on Blackberry Creek near Yorkville (Boomer Road).*

is dependent on the relation of stage to discharge which is affected by changes in physical conditions of stream channels and constrictions. The frequency curve shown in figure 4 is based on channel conditions existing in 1970. 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 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 on Blackberry Creek near Yorkville, (fig. 4) is tabulated below:

Recurrence interval (years)	Elevation above mean sea level (feet)
50	622.3
30	622.1
20	621.9
10	621.6
5	621.1
3	620.6

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 during the next year or even during the next week.

Flood profiles.—Profiles of the water surface for the floods of October 1954 and February 1966 are shown in figures 5–8 and 10 but only the October 1954 profile is shown in figure 9.

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.

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 at the same point, indicated by the profiles in figures 5–10. 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 Big Rock quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following 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.

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

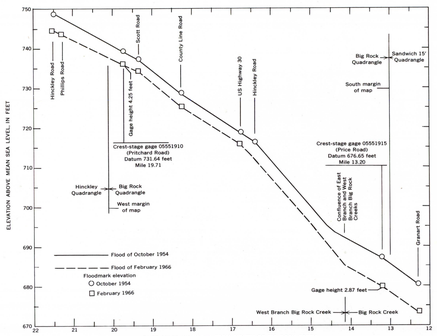

FIGURE 5.—*Profiles of floods on Big Rock Creek and West Branch Big Rock Creek.*

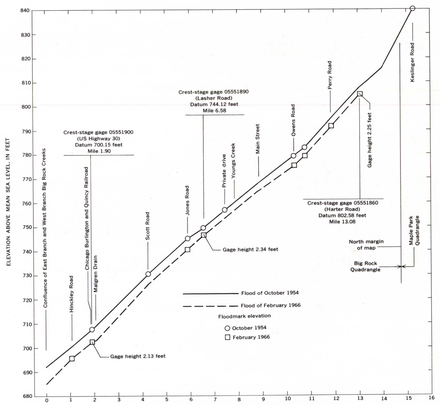

FIGURE 6.—*Profiles of floods on East Branch Big Rock Creek.*

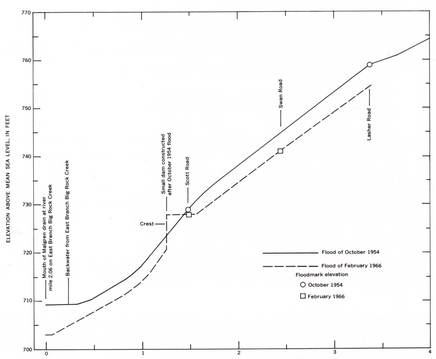

FIGURE 7.—*Profiles of floods on Malgren Drain.*

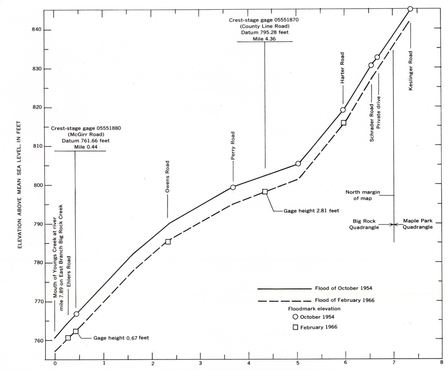

FIGURE 8.—*Profiles of floods on Youngs Creek.*

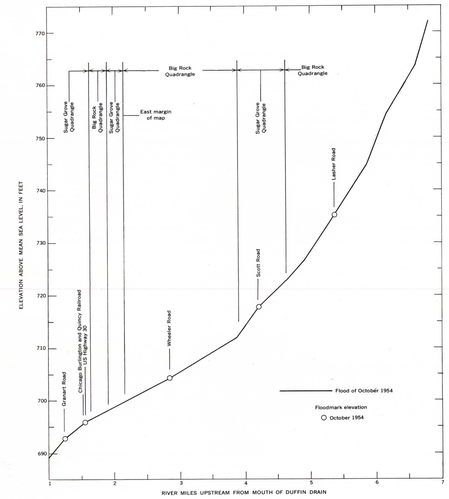

FIGURE 9.—*Profile of flood on Duffin Drain.*

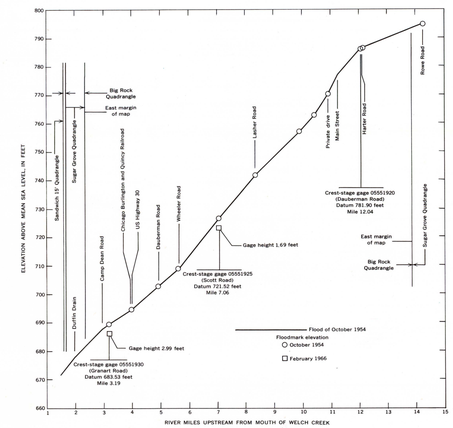

FIGURE 10.—*Profile of flood on Welch Creek.*

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