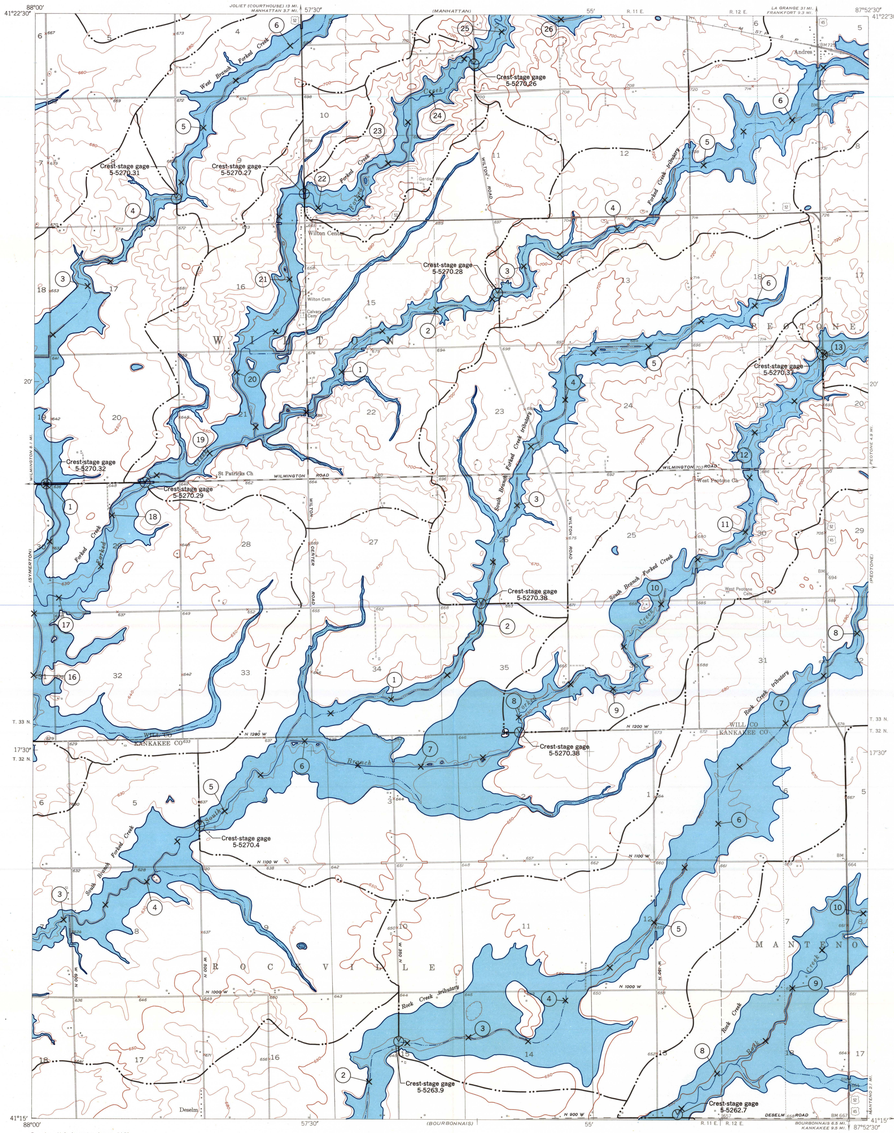
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH THE
STATE OF ILLINOIS
DEPARTMENT OF PUBLIC WORKS AND BUILDINGS
DIVISION OF WATERWAYS

HYDROLOGIC INVESTIGATIONS
ATLAS HA-304



FLOODS IN WILTON CENTER 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 Wilton Center 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 ground-water resources.

The areas inundated by floods along streams in the Wilton Center 7 1/2-minute quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1. Inundated

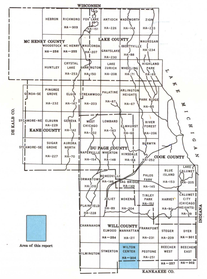


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

areas for the flood of July 1957 are shown along Rock Creek, Rock Creek tributary, Forked Creek, Forked Creek tributary, West Branch Forked Creek, South Branch Forked Creek tributary, and several unnamed streams.

Local residents report that the flood of July 1957 was the highest observed in the past 70 years in streams throughout the Wilton Center quadrangle. Records at the gaging station on Hickory Creek at Joliet, which is 10 1/2 miles northwest of the Wilton Center quadrangle, are also indicative of the relative magnitude of the July 1957 flood in the area. At the Hickory Creek gage, the July 1957 flood was 2 feet higher than any other flood recorded since 1945, and it exceeded the estimated 50-year flood stage by 1 foot.

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, in waterway openings at highways and railroads, or changes in runoff characteristics of the streams caused by increased urbanization that may have taken place subsequent to the flood represented on the map could affect the flood 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 interval, 10 feet).

There are several depressions or lowland areas in the Wilton Center 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 a flood-mapping program financed through a cooperative agreement between the State of Illinois, Department of Public Works and Buildings, Division of Waterways and the U.S. Geological Survey. The agreement with the Division of Waterways includes the flood mapping of the following 7 1/2-minute quadrangles: Beecher East, Wilton Center, Channahon, Wilmington, and Symerton. Under separate agreements with the Northeastern Illinois Planning Commission, the flood-mapping program in Northeastern Illinois includes the remainder of the 7 1/2-minute quadrangles shown in figure 1. The total program includes parts of Cook and McHenry Counties, nearly all of Kane and Will Counties, and all of Du Page and Lake Counties.

The cooperative program for this report is administered on behalf of the Division of Waterways by John C. Guillou, Chief Waterway Engineer.

The 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.

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 at crest-stage gages in the Wilton Center 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)
Rock Creek near Dwight (Dwight Road–N 900 W)	5-5262.7	643.72	35.0
Rock Creek tributary near Dwight (Road W 350 N)	5-5263.9	635.89	9.59
Forked Creek: Near Manhattan (Wilton Road)	5-5270.26	666.55	25.3
At Wilton Center (U.S. Highway 52)	5-5270.27	654.72	26.5
At Wilton Center (Wilmington Road)	5-5270.29	631.63	37.4
Forked Creek tributary near Andres (Wilton Road)	5-5270.28	677.02	4.43
West Branch Forked Creek: At Wilton Center (County Road)	5-5270.31	658.93	4.96
Near Symerton (Wilmington Road)	5-5270.32	630.03	9.64
South Branch Forked Creek: Near Andres (U.S. Highways 45 and 52)	5-5270.37	680.95	13.1
Near Wilton Center (Will-Kankakee County Line-Road N 1200 W)	5-5270.38	644.40	17.1
Near Dwight (Road W 500 N)	5-5270.40	623.38	29.2
South Branch Forked Creek tributary near Wilton Center (County Road)	5-5270.39	648.68	5.15

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. Relief in parts of the quadrangles 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 divide depending upon the relative elevation of the streams and the conveyance of their channels.

Gage height and year of occurrence of each annual flood (highest peak stage in a calendar year) above 534-foot elevation at the gaging station, Hickory Creek at Joliet, during the period 1945–67 are shown in figure 2. The gaging station is at Third

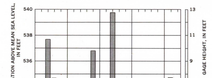


FIGURE 2.—*Annual floods above 534-foot elevation, 1945–67, Hickory Creek at Joliet (Third Avenue).*

Avenue in Joliet and is 10 1/2 miles northwest of the Wilton Center quadrangle. The graph shows the history of floods at the gage and illustrates the irregular occurrence of floods on Hickory Creek.

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 Geological Survey gaging station on Hickory Creek at Joliet was derived from streamflow records of this station combined with records of other nearby stations and with the regional flood-frequency relation for streams in northeastern Illinois (Mitchell, 1954). 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

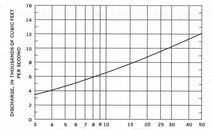


FIGURE 3.—*Frequency of flood discharge on Hickory Creek at Joliet (Third Avenue).*

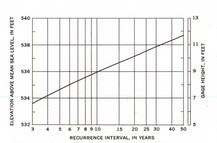


FIGURE 4.—*Frequency of flood stage on Hickory Creek at Joliet (Third Avenue).*

on the relation of stage to discharge which is affected by changes in the physical conditions of stream channels and constrictions. The frequency curve shown in figure 4 is based on channel conditions existing in 1968. 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 equaled or 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 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 Hickory Creek at Joliet (fig. 4) is tabulated below:

Recurrence interval (years)	Elevation above mean sea level (feet)
50	558.3
25	551.2
10	537.3
5	535.9
3	534.6
3	533.6

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, based primarily on elevations of marks left by floods of July 1957, December 1965, and February 1968 are shown in figures 5–11. Where floodmarks could not be obtained, the profiles were constructed on the basis of flood crests determined from reports by local residents, and on the basis 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 5–11. 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 Wilton Center quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following reports:

Barker, Bruce; Carlisle, J. B.; and Nyberg, Raymond, 1967, Kankakee River basin study, a comprehensive plan for water resources development: Illinois Dept. Public Works and Bldgs., Div. of Waterways, 77 p.

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, 107–200.

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

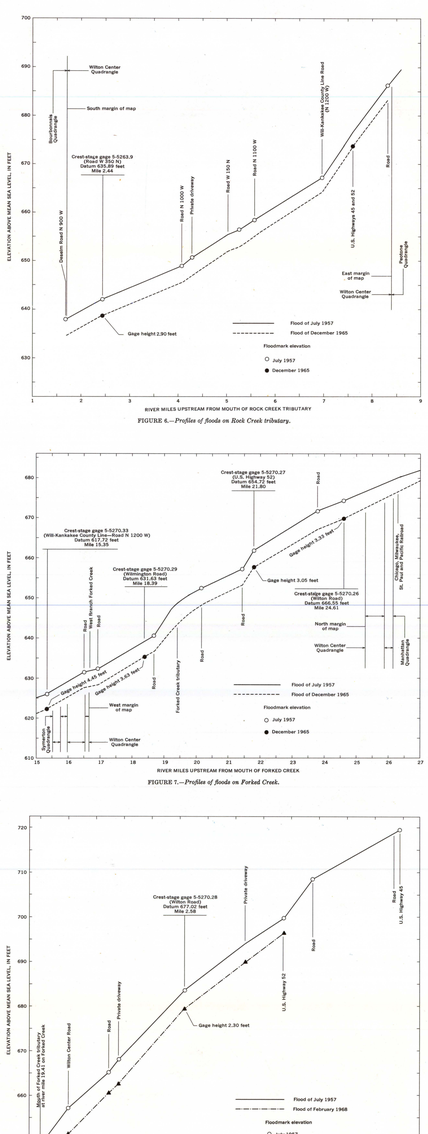


FIGURE 6.—*Profiles of floods on Rock Creek tributary.*

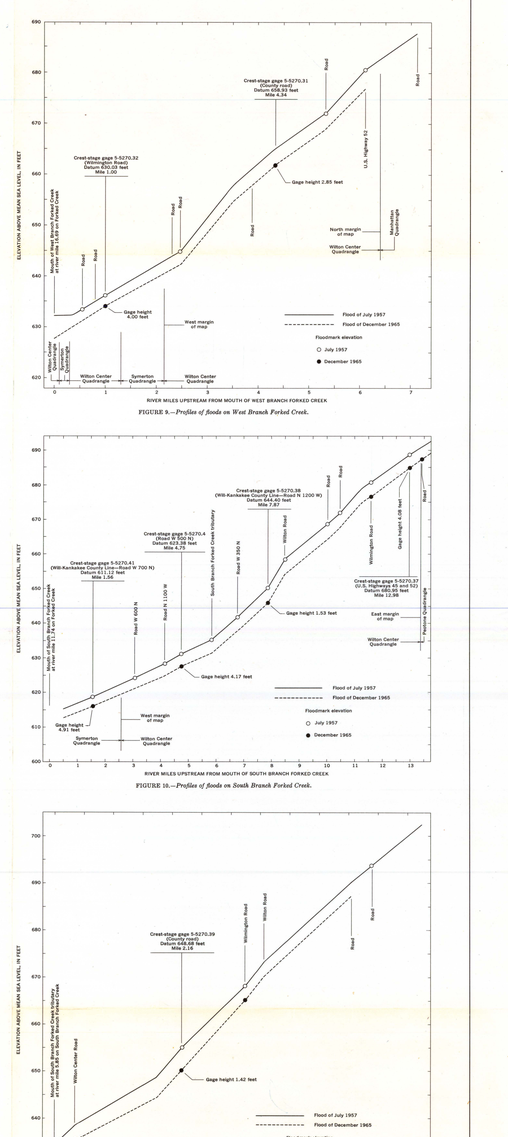


FIGURE 9.—*Profiles of floods on West Branch Forked Creek.*

FIGURE 7.—*Profiles of floods on Forked Creek.*

FIGURE 10.—*Profiles of floods on South Branch Forked Creek.*

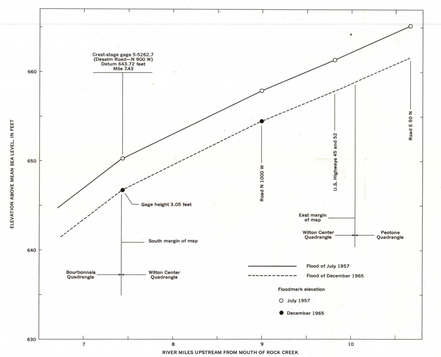


FIGURE 8.—*Profiles of floods on Rock Creek.*

FIGURE 5.—*Profiles of floods on Forked Creek tributary.*

FIGURE 11.—*Profiles of floods on South Branch Forked Creek tributary.*

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1969—W68443

FLOODS IN WILTON CENTER QUADRANGLE, NORTHEASTERN ILLINOIS

By
Howard E. Allen and Allen W. Noehre

1969

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