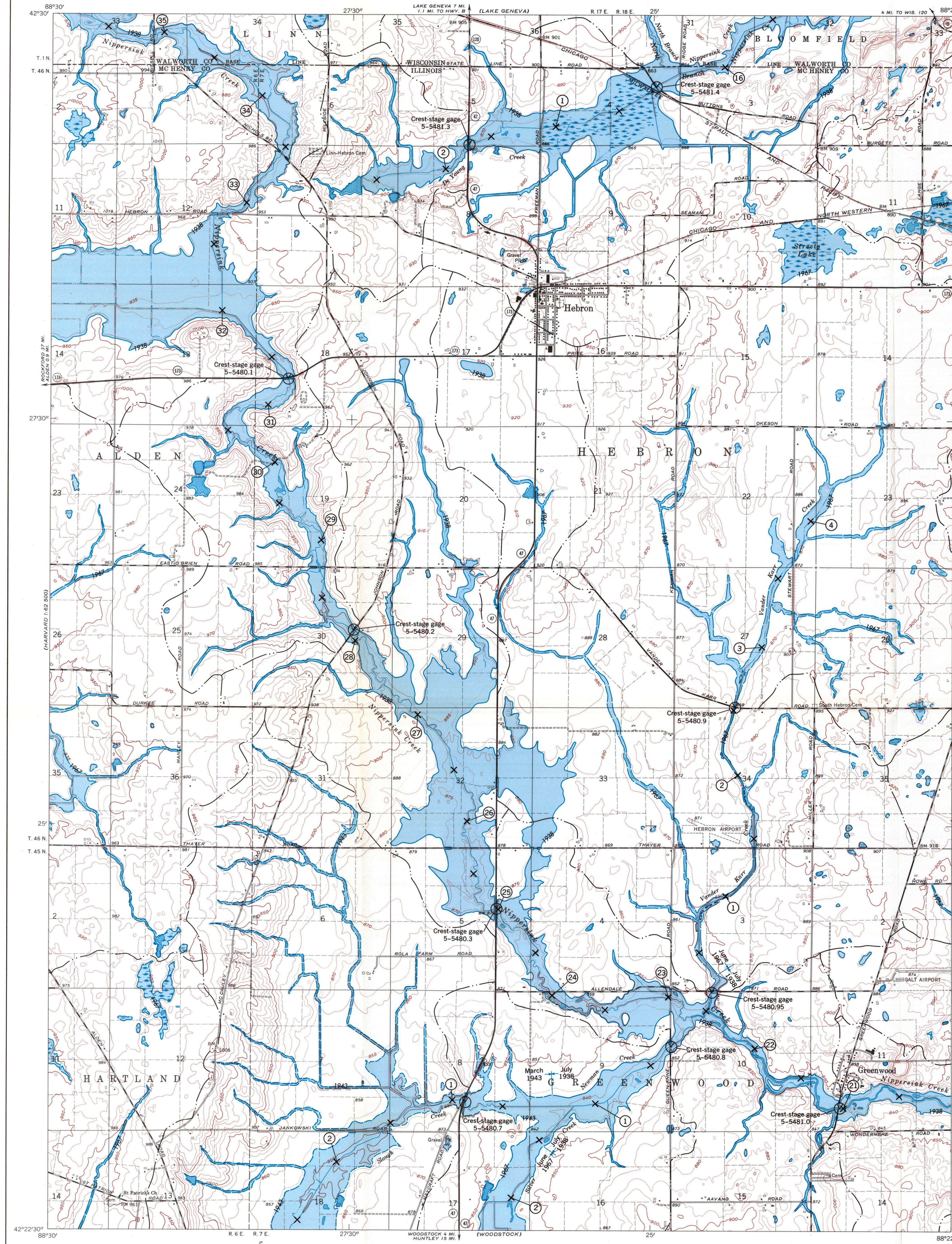
PREPARED IN COOPERATION WITH THE
NORTHEASTERN ILLINOIS PLANNING COMMISSION



Base from U.S. Geological Survey, 1963

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DOTTED CONTOUR INTERVAL 5 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

EXPLANATION

Area flooded
Boundary of 1938 flood
Boundary of 1943 flood
Boundary of 1967 flood
Drainage divide
River mile measured along stream channel
Inundated areas defined from different floods, upstream and downstream

FLOODS IN HEBRON 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 Hebron 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 Hebron quadrangle are delineated on a topographic map. The quadrangle location is shown in figure 1.

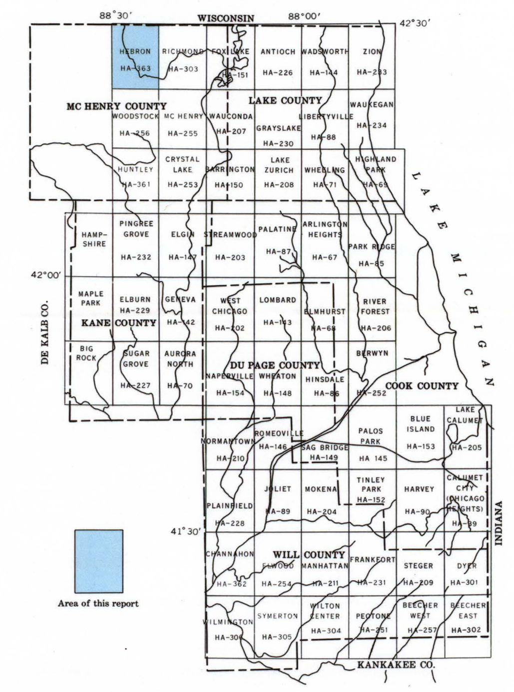


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

Inundated areas are shown along Nippersink Creek, De Young Creek, Newman Creek, North Branch Nippersink Creek, and several unnamed streams for the flood of July 1938, along Slough Creek for the flood of March 1943, and along Silver Creek and Vander Karr Creek for the flood of June 1967.

Local residents reported that the flood of July 1938 was the highest observed in the past 70 years on Nippersink Creek.

Greater floods than those whose boundaries are 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, 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 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 Hebron 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, flood maps were prepared for forty-three 7½-minute quadrangles. Under present agreements with the Planning Commission and the Illinois Department of Public Works and Buildings, Division of Waterways, the flood-mapping program was expanded to include all the 7½-minute quadrangles shown in figure 1 and this report completes these agreements. The counties of Cook, Du Page, Kane, Lake, and McHenry cooperate in the program financially through separate agreements with the Planning Commission. The Illinois Department of Public Works and Buildings, Division of Waterways cooperated in financing the flood-mapping of the following 7½-minute quadrangles: Beecher East, Wilton Center, Symerton, Wilmington, and Channahon. 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. 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 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 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 Hebron 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)
Nippersink Creek:			
Near Alden (State Highway 173)	5-5480.1	926.29	19.9
Near Hebron (Johnson Road)	5-5480.2	895.24	22.3
Near Greenwood (State Highway 47)	5-5480.3	862.55	26.6
At Greenwood (Greenwood Road)	5-5481.0	819.78	84.9
Slough Creek near Greenwood (State Highway 47)	5-5480.7	848.90	17.0
Newman Creek near Greenwood (Queen Anne Road)	5-5480.8	836.50	37.4
Vander Karr Creek:			
Near Hebron (Vander Karr Road)	5-5480.9	857.16	8.43
Near Greenwood (Allendale Road)	5-5480.95	837.33	12.4
De Young Creek:			
At Hebron (State Highway 47)	5-5481.3	871.86	1.43
Near Hebron (Buttons Road)	5-5481.4	859.80	5.64

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 Kishwaukee River at Belvidere, during the period 1938, 1940-68 are shown in figure 2. The

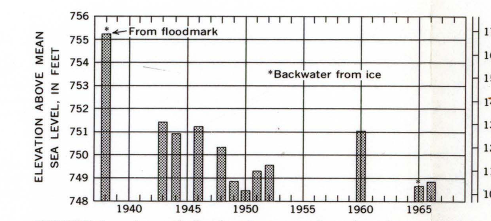


FIGURE 2.—*Annual floods above 748-foot elevation, 1938, 1940-68, Kishwaukee River at Belvidere, Ill.*

gaging station is at the sewage treatment plant in Belvidere, about 21 miles southwest of the Hebron quadrangle, and 20.8 miles upstream from the 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.

Flood dishcarge.—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 on Nippersink Creek near Spring Grove, Ill., was derived from streamflow records of this station combined with those of nearby stations and with the regional flood-frequency relation for streams in Northeastern Illinois (Mitchell, 1954).

The Nippersink Creek gaging station is at Winn Road, 8.0 miles east of the Hebron quadrangle and at river mile 7.34 on Nippersink Creek. 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

FIGURE 3.—*Frequency of flood discharges on Nippersink Creek near Spring Grove, Ill. (Winn Road)*

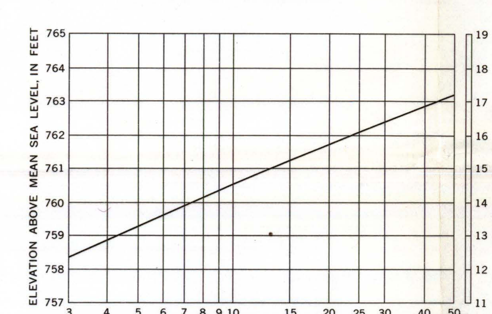


FIGURE 4.—*Frequency of flood stages on Nippersink Creek near Spring Grove, Ill. (Winn Road)*

stage and frequency 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 1969. 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 Nippersink Creek near Spring Grove (fig. 4) is tabulated below.

Recurrence interval (years)	Elevation above mean sea level (feet)
50	763.2
30	762.4
20	761.7
10	760.5
5	759.3
3	758.4

It is emphasized that recurrence intervals are average figures—the average number of years between occurrence 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 July 1938, March 1943, February 1966, and June 1967 are shown in figures 5-10.

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 5-10. 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 Hebron quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following report:

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

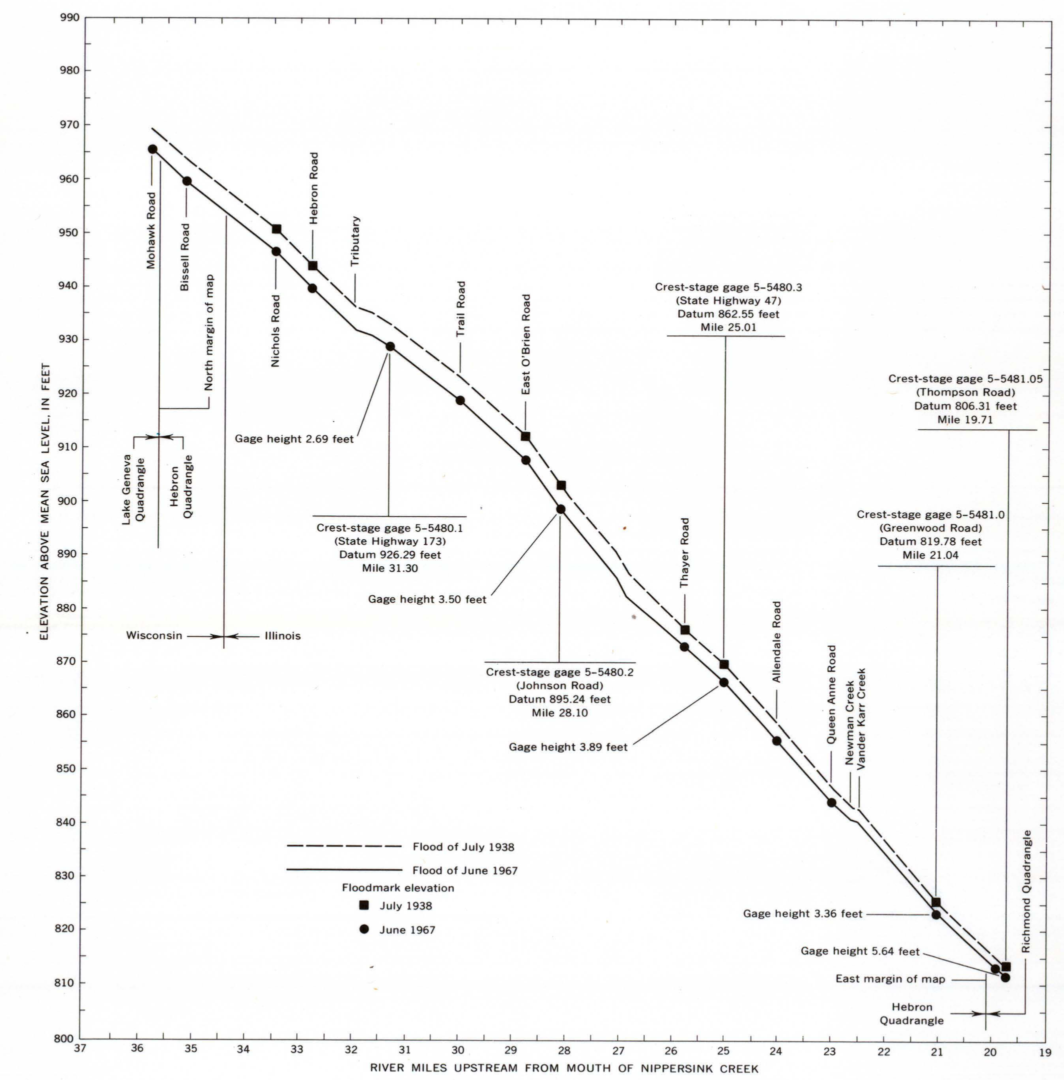


FIGURE 5.—*Profiles of floods on Nippersink Creek.*

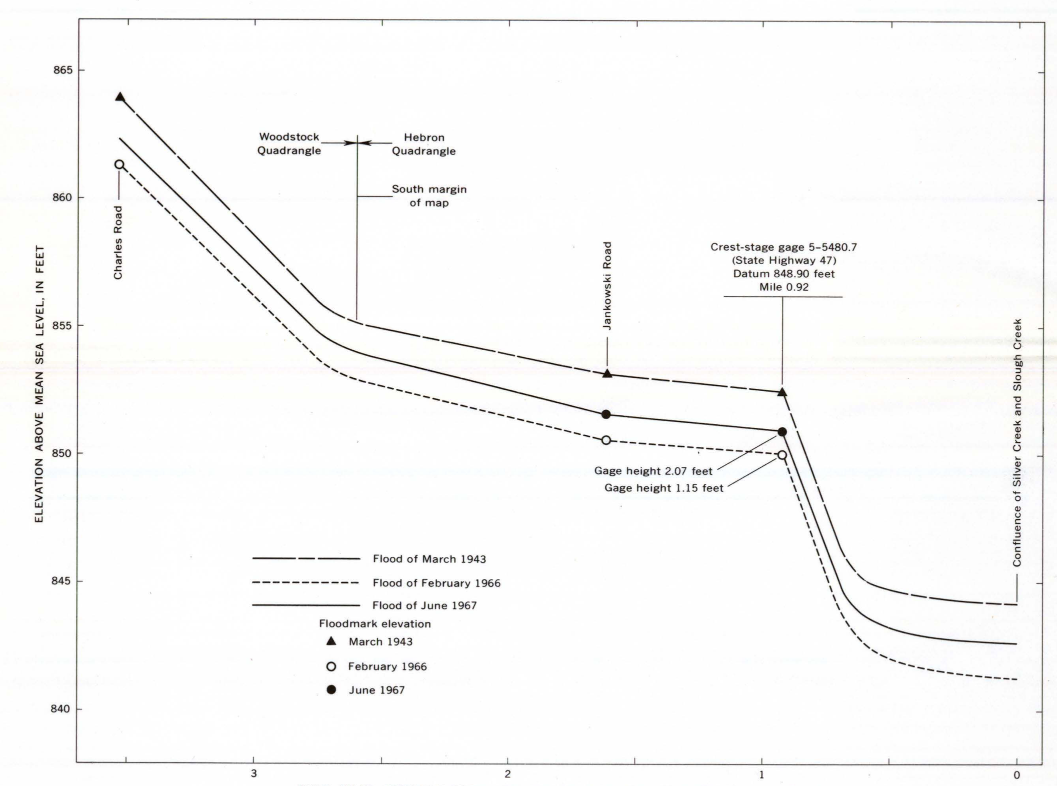


FIGURE 6.—*Profiles of floods on Slough Creek.*

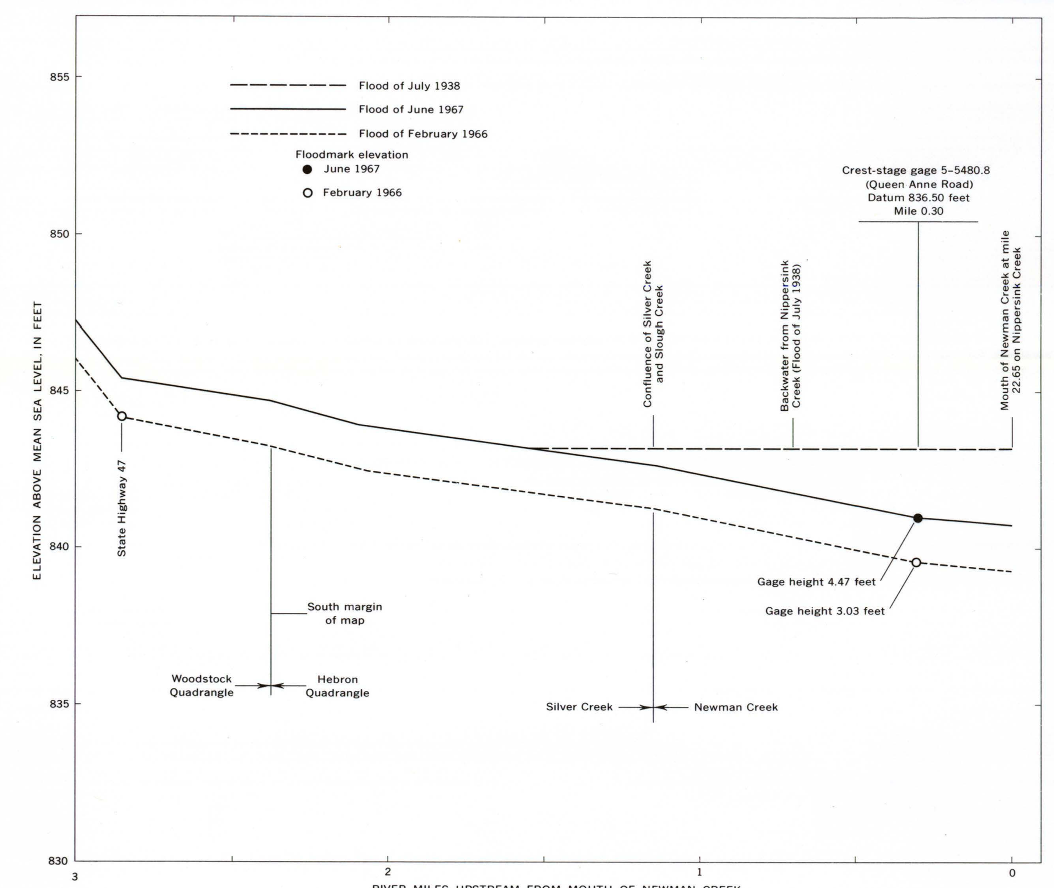


FIGURE 7.—*Profiles of floods on Newman Creek and Silver Creek.*

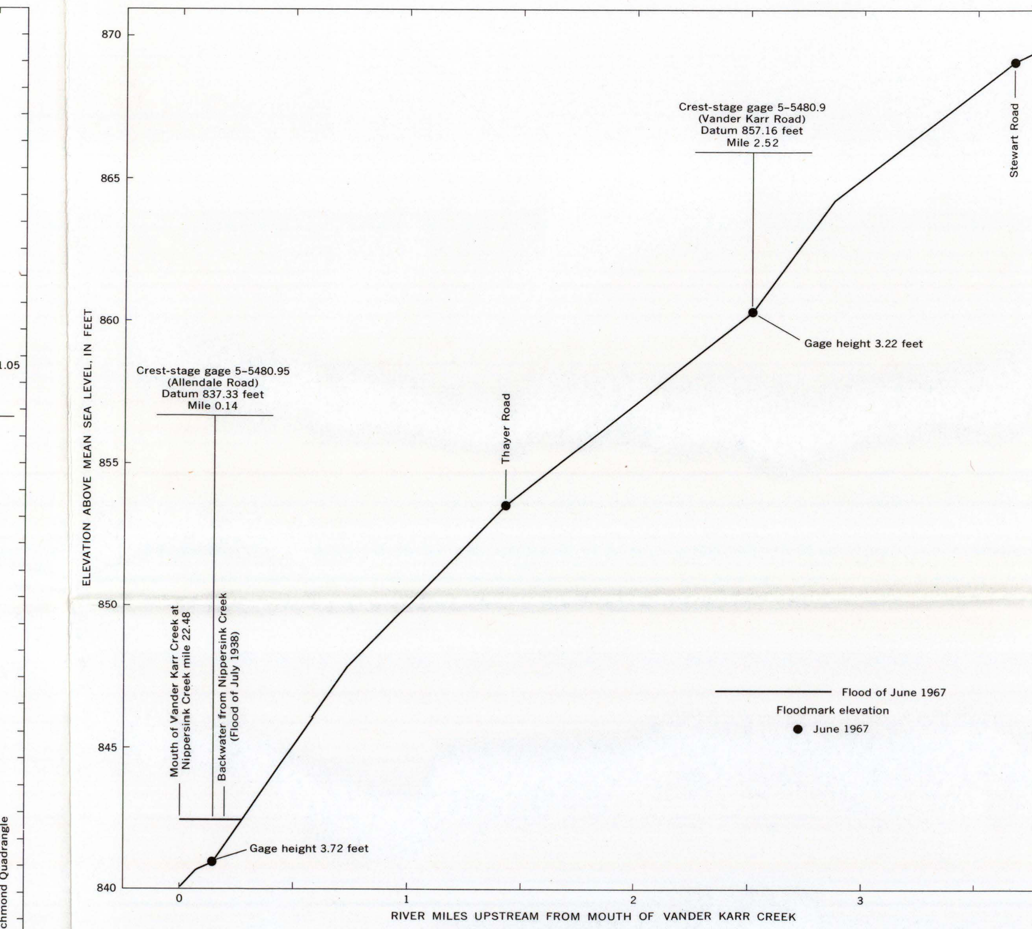


FIGURE 8.—*Profile of flood on Vander Karr Creek.*

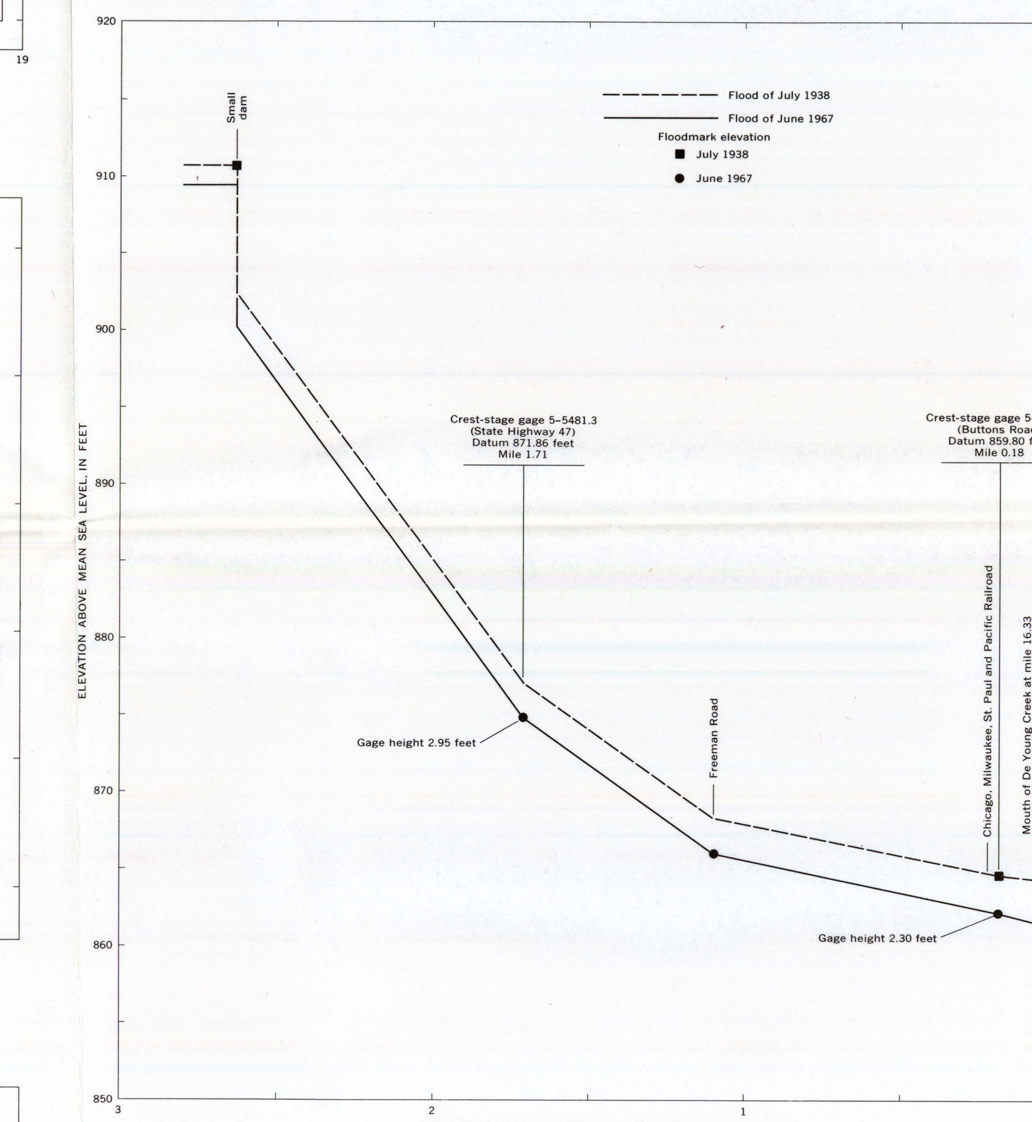


FIGURE 9.—*Profiles of floods on De Young Creek.*

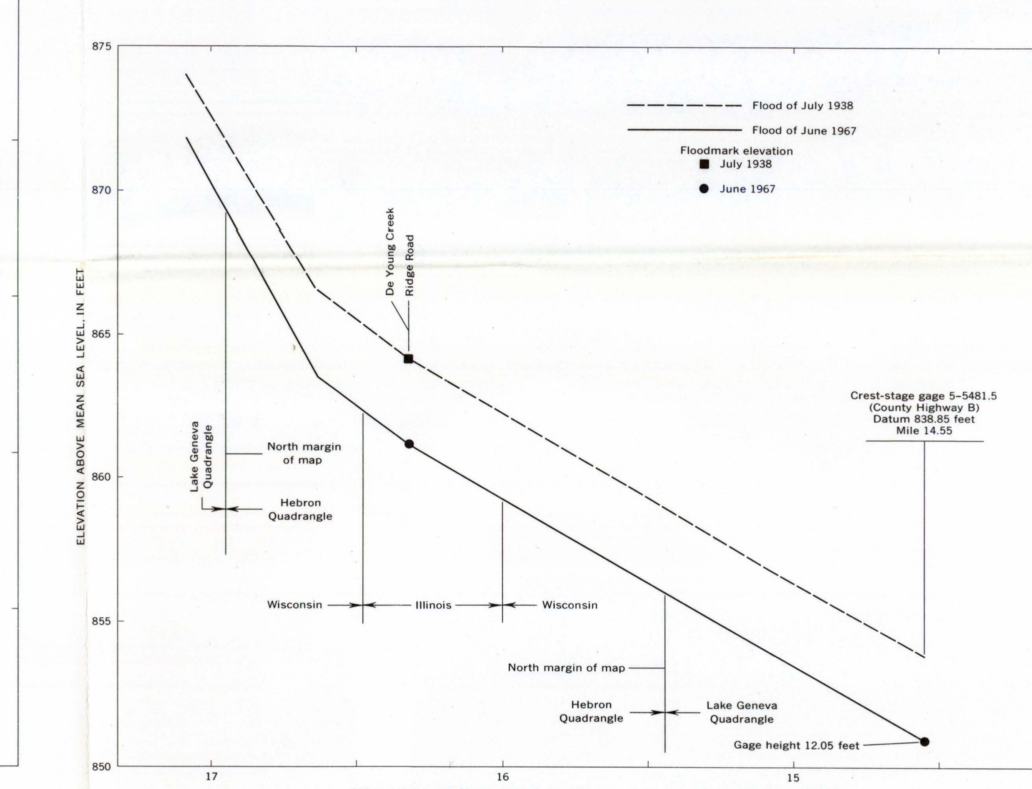


FIGURE 10.—*Profiles of floods on North Branch Nippersink Creek.*

FLOODS IN HEBRON QUADRANGLE, NORTHEASTERN ILLINOIS

By

Howard E. Allen and R. Stephen Grant

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