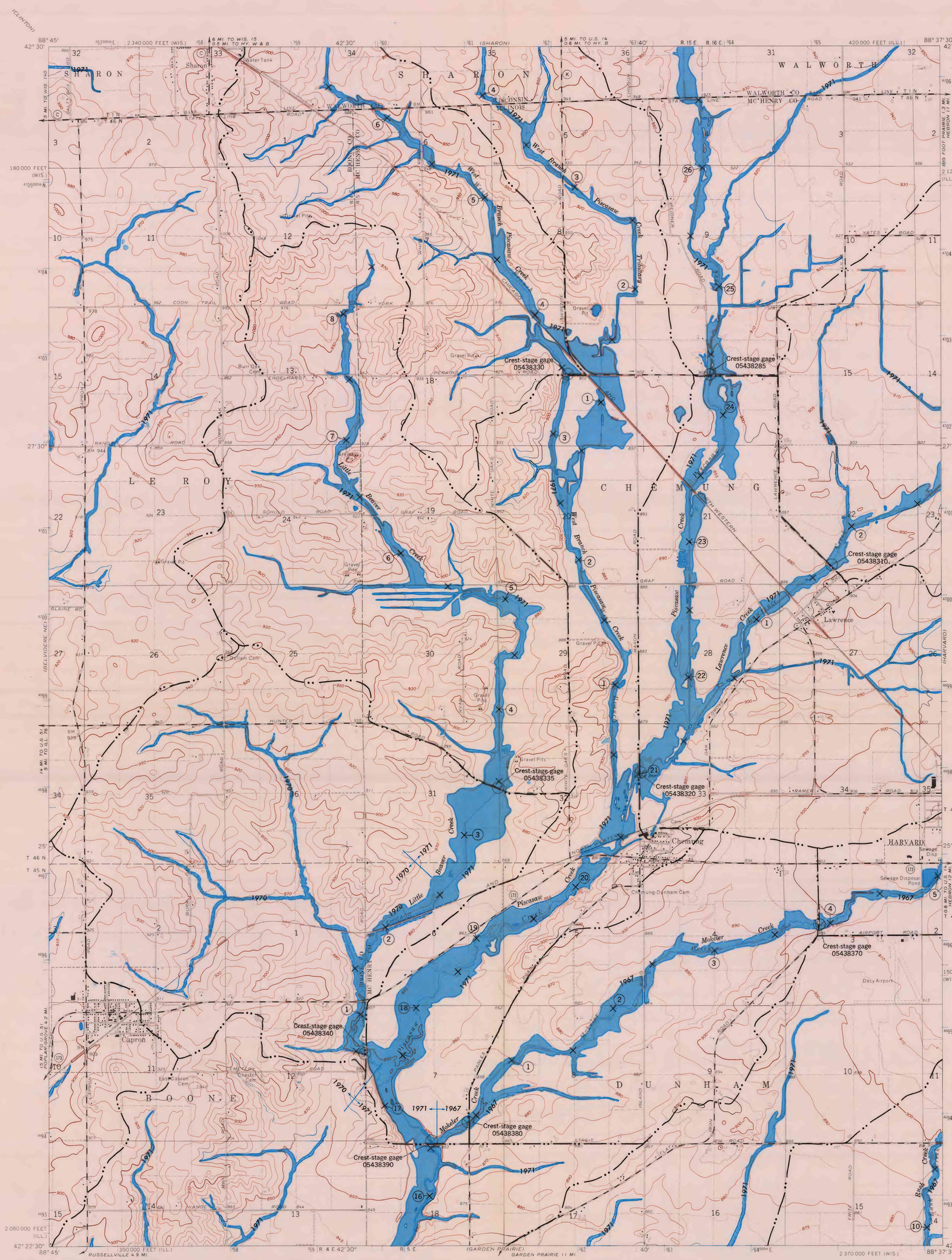

(Total 49 quads)

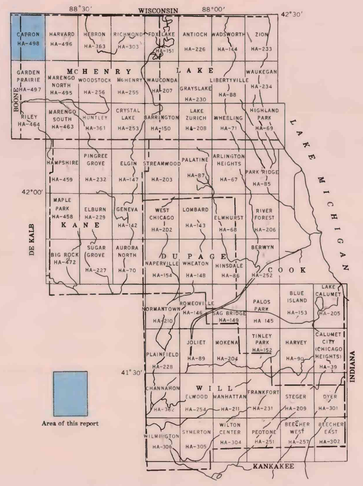

FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

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 the Capron quadrangle, northeastern Illinois. It can 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 can 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 Capron quadrangle are shown on a topographic map. The quadrangle location is shown in figure 1. The stream names and the dates of the floods shown on the map are listed in the following table:

Date of flood	Area flooded
June 1967	Mokeler Creek and Rush Creek.
September 1970	Little Beaver Creek and an unnamed tributary.
February 1971	Lawrence Creek, Piscasaw Creek, W. Br. Piscasaw Creek, W. Br. Piscasaw Creek tributary, Little Beaver Creek, and several unnamed streams.

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 future floods of comparable discharges. 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.

There are several depressions and lowland areas in the Capron 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, seepage into the ground, and water table elevation. Flood boundaries are not shown for such areas in this report.

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.

History of flooding.—A long-time resident at Weidner Road near Piscasaw Creek reported that the flood of February 1971 was the highest he remembered during his 61-year residency. Another long-time resident at Streit Road said that the flood of 1880 on Piscasaw Creek was higher than any subsequent floods he had heard of or seen. The same men said that the February 1971 flood was the highest at Streit Road since 1957. A new bridge was built at Streit Road about 1959.

Piscasaw Creek enters the Kishwaukee River on the east side of Belvidere. The flood of February 1971 at the gaging station Kishwaukee River at Belvidere (05438500) was the highest since 1946, suggestive that the 1971 flood on Piscasaw Creek, a large tributary, was of relatively high magnitude.

Some dredging and realinement of Little Beaver Creek was reportedly done in 1969. Previously there had been frequent flooding, reports indicate. A resident at Hunter Road said that the flood of February 1971 was the highest he had seen since the dredging operation.

The flood of September 1970 on some tributaries to Piscasaw Creek was nearly equal in magnitude to that of February 1971. Near the mouth of Little Beaver Creek the September flood was apparently even a little higher.

A thunderstorm in June 1967 resulted in floods on Mokeler and Rush Creeks which were higher than those in February 1971.

Flood height.—The height of a flood is usually expressed in terms of gage height or stage. Gage height is the water surface elevation recorded above the datum plane at a gaging station. The elevation of the datum plane is measured in feet above mean sea level. Gage heights for crest-stage gages, which were installed during October 1969 in the Capron quadrangle, can be converted to elevation above mean sea level by adding the gage height to the appropriate gage datum listed in the following table:

Crest-stage gage	Station number	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Piscasaw Creek:			
Near Lawrence (Lawrence Road).	05438285	898.04	28.9
At Chemung (Maxon Road)	05438320	869.47	52.7
Near Capron (Streit Road)	05438390	844.86	88.1
Mokeler Creek:			
Near Chemung (Flat Iron Road).	05438370	893.82	5.62
Near Capron (Pagles Road)	05438380	849.02	9.23
Little Beaver Creek:			
Near Chemung (Hunter Road)	05438335	867.46	6.38
Near Capron (County Line Road)	05438340	849.23	12.9
West Branch Piscasaw Creek near Lawrence (Perkins Road)	05438330	895.72	4.79
Lawrence Creek at Lawrence (Lawrence Road)	05438310	885.78	16.1

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 by 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 936.6-foot elevation at the gaging station Lawrence Creek tributary near Harvard (05438300) during the period 1961–71 are shown in figure 2. The graph shows the history of floods at the gage and illustrates the irregular occurrence of floods.

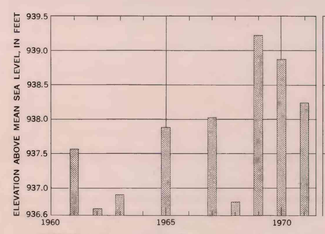

FIGURE 2.—*Annual floods above 936.6-foot elevation, 1961–71, Lawrence Creek tributary near Harvard, Ill. (U.S. Highway 14).*

Flood discharge.—The discharge of a stream is the volume of water and its constituents that passes a particular location in a given period of time. Discharge usually is expressed in units of cubic feet per second (cfs). The peak discharge (maximum discharge) attained by a flood generally occurs at the time of the maximum height (stage) of the flood. However, 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.—Frequencies of floods at the U.S. Geological Survey gaging stations on Coon Creek at Riley (05438250) and on Lawrence Creek tributary near Harvard (05438300) were computed by fitting the logarithms of the annual floods to a Pearson Type III distribution. The Coon Creek gage is located 0.7 mile southwest of Riley and about 14 miles south of the Capron quadrangle. The Lawrence Creek tributary gage is located 2.5 miles north of Harvard, on U.S. Highway 14, and 1.2 miles east of the Capron quadrangle.

Recurrence interval is the average interval of time within which a given flood discharge will be exceeded once. Frequencies of floods can also be stated in terms of their probabilities of occurrence. Probabilities of occurrence are very nearly equal to reciprocals of recurrence intervals greater than 10 years. For example, there is a 4-percent chance that the 25-year flood will be exceeded in any year, or a 2-percent chance for the 50-year flood.

Recurrence intervals are average figures—the average number of years between floods that exceed given magnitudes. The occurrence of a major flood in one year does not reduce the probability of that flood being exceeded during the next year, or eliminate the possibility of a bigger flood even the next week.

The current relations between discharge and recurrence interval for the gaging stations Coon Creek at Riley and Lawrence Creek tributary near Harvard are shown graphically in figures 3 and 4. The relation between stage and recurrence interval is usually dependent on the stage-discharge relation which is affected by channel morphology and bridge, culvert, and road geometry. The stage-frequency curves shown in figures 5 and 6 are based on the conditions effective in 1972. In the future longer records and changes in channel conditions and bridge, culvert, or road dimensions may alter these flood-frequency relationships. Extrapolation of the curves beyond the limits shown is not recommended.

The current relation between stage and recurrence interval is presented in tabular form as follows:

Recurrence interval (years)	Elevation above mean sea level (feet)	
	Coon Creek at Riley	Lawrence Creek tributary near Harvard
50	801.4	940.3
30	801.3	939.8
20	801.2	939.5
10	801.0	938.9
5	800.7	938.3
3	800.4	937.9

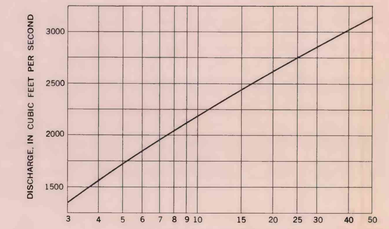

FIGURE 3.—*Frequency of flood discharges on Coon Creek at Riley.*

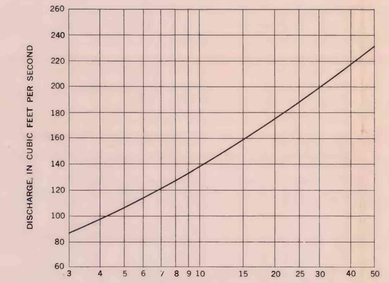

FIGURE 4.—*Frequency of flood discharges on Lawrence Creek tributary near Harvard. (U.S. Highway 14).*

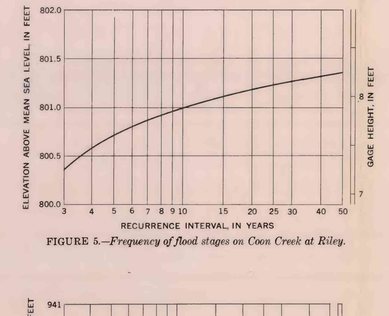

FIGURE 5.—*Frequency of flood stages on Coon Creek at Riley.*

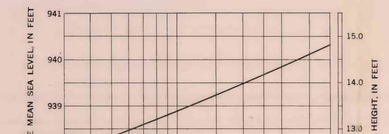

FIGURE 6.—*Frequency of flood stages on Lawrence Creek tributary near Harvard (U.S. Highway 14).*

Flood profiles.—The general procedure used to construct flood profiles on the Capron quadrangle was as follows: (1) determined high-water elevations for specific floods on the larger streams in the quadrangle; (2) plotted graph of flood-mark elevations versus river-mile stationing; (3) developed water-surface profiles between high-water marks on basis of profiles and high-water marks from lower floods, thalweg profiles determined from contour map and field surveys, depths of flow in channels, and engineering judgment.

River miles used for the profiles correspond to those marked along the low-water channels of the streams on the flood map. During periods of overbank flow actual distances traveled by floodflows may be somewhat less than the distances measured along the thalweg, due to submergence of the low-water channel.

Water-surface profiles were developed primarily from the high-water marks left by the floods of June 1967, September 1970, and February 1971. Profiles for these floods are shown in figures 7–13.

Flood depths.—Depth of flooding at any point can be estimated by subtracting the ground elevation from the flood-profile elevation at that point. 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.

Flood boundaries.—The general procedure used to locate flood boundaries on the Capron quadrangle was as follows: (1) transferred flood profile data—points where flood profiles crossed contour elevations—to corresponding points on the topographic map; (2) drew flood boundaries through these points interpolating between contours.

In a few short reaches of some streams, some possibly unidentified, the above procedures was inadequate. In the identified reaches flood limits were based on field observations and surveys, and reports of local residents.

Additional data.—Other information pertaining to floods in the Capron quadrangle can be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following reports:

Ellis, D. W., 1968, Floodflows from small drainage areas in Illinois—Preliminary flood-frequency relations: U.S. Geol. Survey open-file report, 10 p.

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

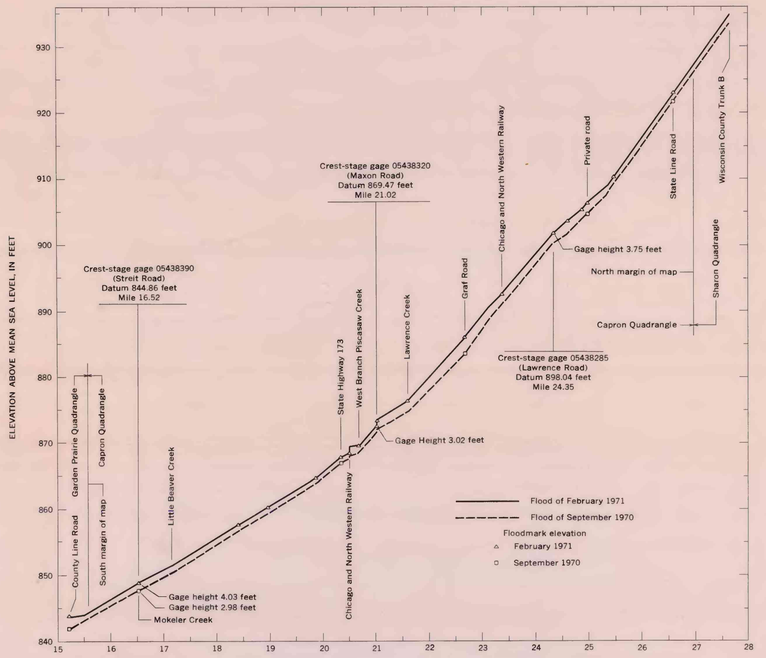

FIGURE 7.—*Profiles of floods on Piscasaw Creek.*

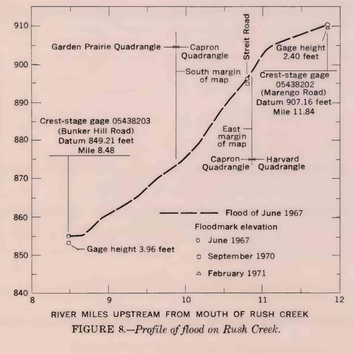

FIGURE 8.—*Profile of flood on Rush Creek.*

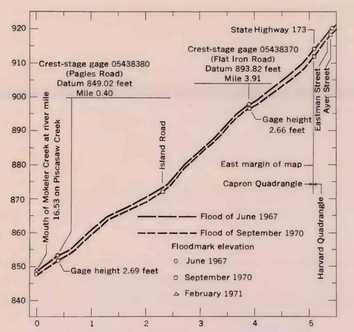

FIGURE 9.—*Profiles of floods on Mokeler Creek.*

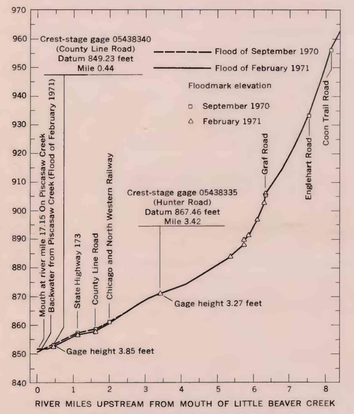

FIGURE 10.—*Profiles of floods on Little Beaver Creek.*

FIGURE 11.—*Profiles of floods on West Branch Piscasaw Creek Tributary.*

FIGURE 12.—*Profile of flood on Lawrence Creek.*

FIGURE 10.—*Profiles of floods on Little Beaver Creek.*

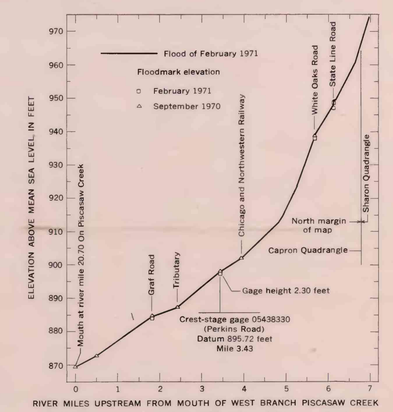

FIGURE 13.—*Profile of flood on West Branch Piscasaw Creek.*

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FLOODS IN CAPRON QUADRANGLE, NORTHEASTERN ILLINOIS

By
R. Stephen Grant and Marvin D. Duerk

1973

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