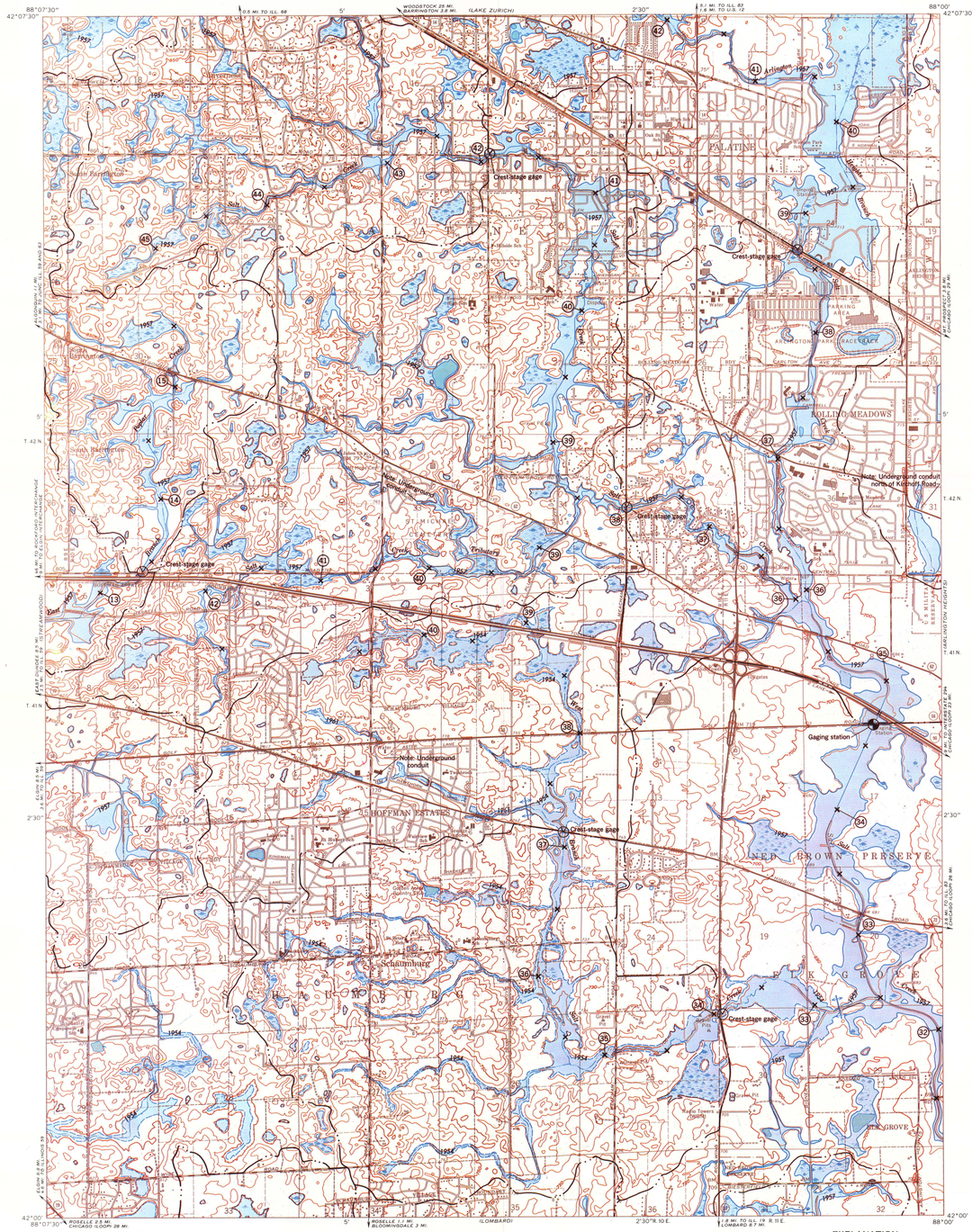
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED IN COOPERATION WITH
THE NORTHEASTERN ILLINOIS METROPOLITAN
AREA PLANNING COMMISSION

HYDROLOGIC INVESTIGATIONS
ATLAS HA-87



FLOODS IN PALATINE QUADRANGLE, ILLINOIS

Hydrologic data for evaluating the depth and frequency of flooding that affect the economic development of flood plains are presented in this report. The report is intended to be used as a planning tool and the data contained herein provide a technical basis for making sound decisions concerning the use of flood-plain lands. No recommendations or suggestions for land-use regulations are made and no solutions of existing flood problems are proposed. This is the ninth of many such reports planned for northeastern Illinois.

The approximate areas inundated by floods along streams in the Palatine 7 1/2-minute quadrangle are delineated on the map. The quadrangle location is shown in figure 1. Inundated areas are shown along Salt Creek and its unnamed tributaries, Arlington Heights Branch Salt Creek, and East Branch Poplar Creek for the floods of July 1957; along West Branch Salt Creek for the flood of October 1954; and along an unnamed tributary of West Branch Salt Creek for the flood of September 1961.

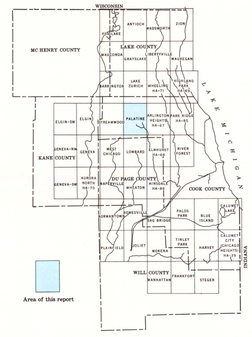


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program*

The general procedure followed in defining flood limits was first to develop flood profiles from elevations of floodmarks identified in the field. The horizontal extent of flooding delineated on the topographic map was derived from the profile by interpolating between contours (lines of equal elevation) and by plotting overflow limits described by local residents and established by field surveys. The locations of flood limits shown on the map are only approximate because the map scale is small (1 inch = 2,000 feet) and the contour interval (10 feet) is relatively large. A more accurate representation of flood boundaries can be made on a topographic map with a larger scale and a smaller contour interval.

The flood limits shown on the map are not necessarily those for the highest floods expected. Greater floods are possible, but definition of their probable overflow limits is not within the scope of this report. The flood limits provide a record of historic facts that reflect channel conditions existing when the floods occurred. No attempt was made to appraise the effect of changes in channel conditions, waterway openings at highways and railroads, or changes in runoff characteristics of the streams caused by increased urbanization that may have taken place after the floods occurred. However, these effects and other changes that influence flooding should be evaluated to properly plan flood plain development. Protective works built after the floods of 1954, 1957, and 1961 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 numerous depressions or lowland areas in the Palatine quadrangle where surface water accumulates. Flood limits are shown for many such areas but there may be others that were not detected in this investigation.

Flood limits are not defined for areas inundated as a result of backup in storm drains.

Cooperation and acknowledgment --The preparation of this report is part of an extensive flood-mapping program financed through a cooperative agreement between The Northeastern Illinois Metropolitan Area Planning Commission and the U.S. Geological Survey whereby flood maps will be prepared for the 7 1/2-minute quadrangles shown in figure 1. Areal limits of the program include parts of Cook, Kane, McHenry, and Will Counties, and all of Du Page and Lake Counties. The six counties cooperate financially in the program through separate agreements with the Planning Commission. The Palatine quadrangle is in Cook County. Financial support for the preparation of this report was provided by the County of Cook, the Metropolitan Sanitary District of Greater Chicago, and the Forest Preserve District of Cook County.

The cooperative program is administered on behalf of the Planning Commission by Paul Oppermann, Executive Director; and is directly coordinated by John R. Sheaffer, Chief Planner.

The flood maps are prepared by the Geological Survey under the administrative direction of William D. Mitchell, district engineer, and under the immediate supervision of Davis W. Ellis, engineer-in-charge of the project. The Palatine flood map was prepared by Howard E. Allen and Dean E. Long with assistance from other staff members of the Oak Park subdistrict office.

Acknowledgment is made to the following agencies that supplied some of the flood data on which this report is based: the State of Illinois, Department of Public Works and Buildings, Division of Waterways, and the Department of Highways of Cook County. The Division of Waterways also furnished 2-foot-interval contour maps along Salt Creek.

Additional data were obtained from officials of municipalities in the area, particularly Palatine; from Consoer, Townsend and Associates, consulting engineers, Chicago, Ill.; from personal interviews with private citizens; and from field investigations.

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 on the map are in feet above mean sea level. Gage heights for gaging stations located in the Palatine 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. Size of drainage area and type of gage at each station also are shown in the table. Drainage divides are shown on the map.

Gaging station	Type of gage	Datum of gage above mean sea level (feet)	Drainage area (square miles)
Salt Creek:			
At Palatine (Chicago Avenue)	C	746.26	6.23
Near Palatine (Meacham Road)	C	711.61	16.0
Near Arlington Heights (Golf Road)	R	681.32	32.5
Arlington Heights Branch Salt Creek at Palatine (Northwest Highway)	C	709.80	9.84
West Branch Salt Creek:			
At Schaumberg (Higgins Road)	C	719.48	4.98
Near Roselle (Rohlwing Road)	C	691.22	12.0
East Branch Poplar Creek near Palatine (Central Road)	C	792.00	2.67

C/, Crest-stage gage; R, Water-stage recorder.

Gage height and year of occurrence of each annual flood (highest peak discharge in each calendar year) above 632-foot elevation at the gaging station on Salt Creek at Western Springs during the period 1946–62 are shown in figure 2. The Western Springs gaging station is located at Wolf Road, about 12 miles south of the Palatine quadrangle, and at mile 8.8. The irregular occurrence of floods is evident (fig. 2).

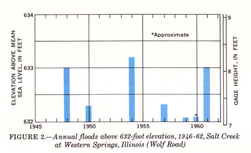


FIGURE 2.—*Annual floods above 632-foot elevation, 1946–62, Salt Creek at Western Springs, Illinois (Wolf Road)*

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. Usually discharge rates are expressed in units of cubic feet per second (cfs). Peak discharge is the maximum value of the discharge attained by a flood. The peak discharge during a flood generally occurs at the time of the maximum height of the flood, but if a stream is affected by variable backwater, the peak discharge may not coincide with maximum stage.

Flood frequency --Frequency of floods at the Geological Survey gaging station on Salt Creek near Arlington Heights was derived from streamflow records for this station combined with records for other nearby stations and with the regional flood-frequency relation for streams in northern Illinois (Mitchell, 1954). The general relation between frequency and discharge is shown in figure 3, and the general relation between frequency and stage is shown in figure 4. The relation between flood stage and frequency is dependent on the relation of flood stage to discharge which is affected by changes in physical conditions of channels and constrictions. The frequency curve shown in figure 4 is based on channel conditions existing in 1962. 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 because of the possibility of large errors.

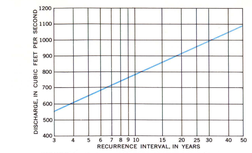


FIGURE 3.—*Frequency of flood discharges on Salt Creek near Arlington Heights (Golf Road)*

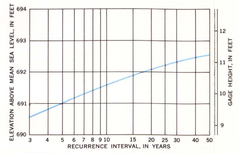


FIGURE 4.—*Frequency of flood stages on Salt Creek near Arlington Heights (Golf Road)*

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 may be stated in terms of their probabilities of occurrence (reciprocals of their recurrence intervals). 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 Salt Creek near Arlington Heights (fig. 4) is tabulated below:

Recurrence interval (years)	Elevation above mean sea level (feet)
50	692.6
40	692.5
30	692.3
25	692.1
10	691.6
5	691.0
3	690.6

It is emphasized that recurrence intervals are average figures--the average number of years that will elapse 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 in the next year or in the next week.

Flood profiles --Profiles of the water surface, based primarily on elevations of marks left by floods of October 1954, July 1957, March 1960, September 1961, and March 1962, are shown in figures 5–8. Where floodmarks could not be identified, the profiles were constructed on the basis of elevations of lower floods and streambeds, and the extent of overflows determined from photographs and reports of local residents. 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 produced by 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 indicated by the profiles in figures 5–8. The approximate ground elevation can be determined from information indicated by contours on the map, although more accurate elevations can be obtained by leveling to nearby bench marks.

Additional data --Other information pertaining to floods in the Palatine quadrangle may be obtained at the office of the U.S. Geological Survey, Oak Park, Ill., and from the following published 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.

Illinois Department of Public Works and Buildings, Division of Waterways, 1958, Report on plan for flood control and drainage development, Salt Creek, 60 p.

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

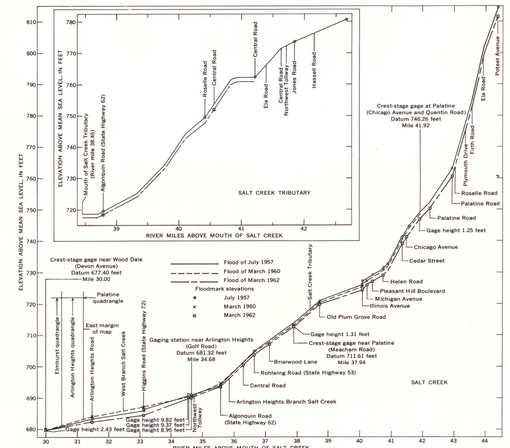


FIGURE 5.—*Profiles of floods on Salt Creek and Salt Creek Tributary*

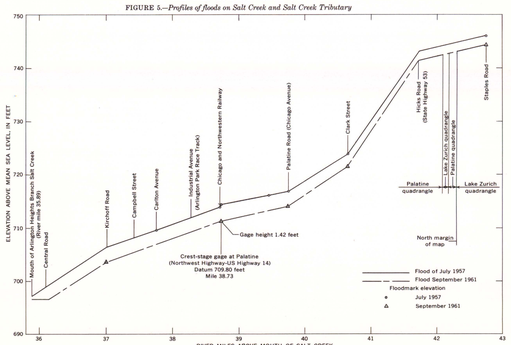


FIGURE 6.—*Profiles of floods on Arlington Heights Branch Salt Creek*

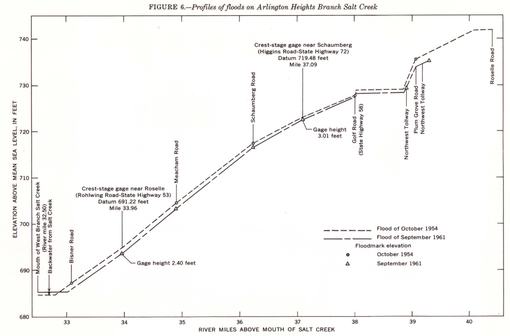


FIGURE 7.—*Profiles of floods on West Branch Salt Creek*

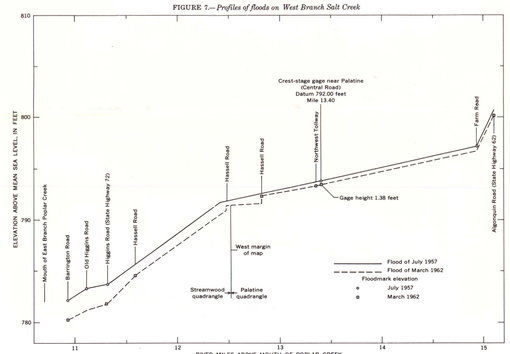


FIGURE 8.—*Profiles of floods on East Branch Poplar Creek*

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA— w 63336

FLOODS IN PALATINE QUADRANGLE, ILLINOIS

By
Howard E. Allen, Davis W. Ellis, and Dean E. Long

1964

HYDROLOGIC INVESTIGATIONS
ATLAS HA-87