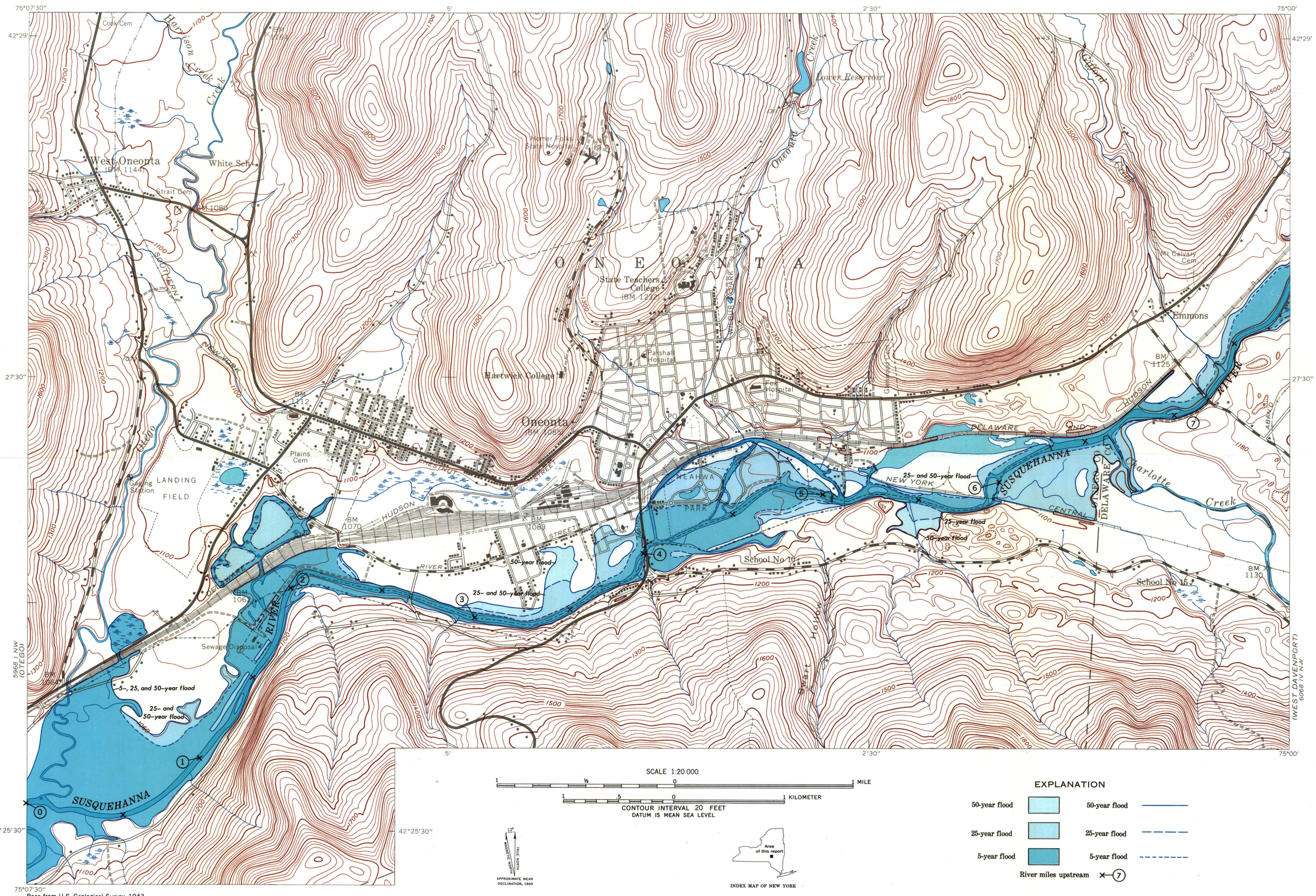
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

HYDROLOGIC INVESTIGATIONS
ATLAS HA–350



Base from U.S. Geological Survey, 1943

FLOODS ON SUSQUEHANNA RIVER AT ONEONTA, NEW YORK

This report was prepared by the U.S. Geological Survey to further the objectives of the Appalachian Regional Commission. The frequency, depth, and extent of flooding that may be expected along the Susquehanna River in the vicinity of Oneonta, Otsego County, are evaluated in this report. The map illustrates the approximate flood inundation areas for floods having recurrence intervals of 5, 25, and 50 years. Greater floods than those indicated on the map will occur in the future as they have in the past, but there is less than a 2-percent chance that they will occur in any one year. Future cultural changes may alter the extent of flooding, and protective features may lessen the depth and frequency of flooding, but none of these changes will entirely eliminate flooding. The technical information provided herein will be useful in planning for the development and regulation of flood-plain lands for varying degrees of inundation.

During the field reconnaissance and surveys, selected sites were investigated along 8 miles of the Susquehanna River upstream from the mouth of Otego Creek. The general procedure used to delineate the limits of overflow was to determine the peak stage for floods of each of the three selected frequencies. The profiles between each of the sites were defined and the flood boundaries determined by field investigations or by interpolating between the contours.

The computed profiles represent the water-surface elevation that would result from unimpeded open-water flow. The backwater effect of floods on the main stem upon the tributaries at their confluence within the study area are not shown on the map.

Flood history.—The primary source of flood data for the Susquehanna River in the vicinity of Oneonta was streamflow records for Charlotte Creek at West Davenport and main-stem stations at Colliersville and Unadilla. These records are published in water-supply papers of the U.S. Geological Survey. Supplemental data for the 1935 and the 1936 floods are published in two special water-supply reports (Johnson, 1936; Grover, 1937).

Published reports of various government agencies, newspaper accounts, interviews with local residents, and other sources provided information about floods that had occurred before the gaging stations were established. The U.S. Weather Bureau operated a nonrecording gage at the Main Street bridge at Oneonta from 1901 to 1953 for the collection of river-stage data.

An analysis of the data indicates that the floods of March 1865 and April 1960 may have been the greatest floods known on the upper Susquehanna River. The March 1936 flood was also of major significance and only slightly lower in stage than the March 1865 and April 1960 floods.

Flood occurrence.—The height of a flood at a gaging station is expressed in terms of the gage height, or stage, which is the elevation of the water surface above an arbitrarily selected datum plane. Gage heights for the gaging station on the Susquehanna River at Unadilla can be converted to elevations above mean sea level by adding 996.08 feet.

Annual floods above 1,007.9-foot elevation, approximately bankfull stage, for the period of record at the Unadilla site are shown in figure 1. The irregular distribution of floods is evident. Floods above the 1,007.9-foot mark occurred four times in the first 5 years of station operation, twice in the next 16 years, five times in the following 6 years, and not at all between 1964 and 1967.

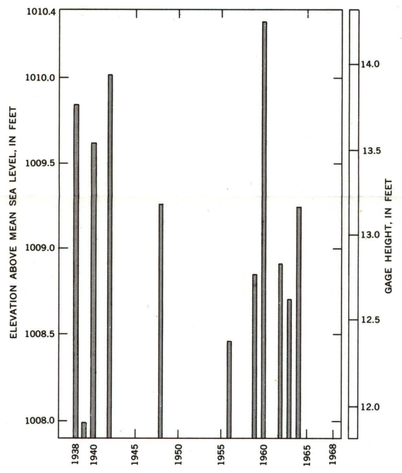


FIGURE 1—*Annual floods above 1007.9 foot-elevation, Susquehanna River at Unadilla, New York, 1938–1968.*

Flood discharge.—The rate of discharge of a stream is the volume of water that passes a particular location in a given period of time. Normally, the discharge rates are expressed in units of cubic feet per second (cfs). Peak discharge is the maximum discharge that occurs during a flood. Occasionally the peak discharge does not occur at the time of maximum elevation because of variable backwater conditions.

Flood frequency.—Frequency of flooding on the Susquehanna River was determined from long-term continuous records of annual floods for the gaging station at Unadilla, the regional flood-frequency relations developed for streams in south-central New York (Robison, 1961; Tice, 1967), and analysis by the log-Pearson Type III method (Water Resources Council, 1967). The general relations between discharge and frequency, converted to the partial-duration series, are shown in figure 2 for three sites. Extrapolation of the flood-frequency curves beyond the limits shown is not recommended because of questionable reliability of the estimated relations.

FIGURE 2—*Frequency of flood discharges on Susquehanna River.*

Recurrence intervals.—As applied to flood events, recurrence interval is the average interval of time within which a flood of a given magnitude will be equaled or exceeded once. For floods greater than the 10-year flood, it is virtually inversely related to the chance of a specific flood being equaled or exceeded once in any one year. Thus, a 25-year flood would have 1 chance in 25, or a 4-percent chance of being equaled or exceeded in any one year.

The general relation between recurrence interval and flood height for floods at the Unadilla gaging station and 2.60-mileage point (270 feet below Bridge Street bridge) at Oneonta is shown in the following tabulation:

Recurrence interval (years)	Elevation above mean sea level (feet)	
	Susquehanna River at Unadilla	Susquehanna River at Oneonta
50	1,010.9	1,066.3
30	1,010.7	1,066.0
20	1,010.1	1,065.6
10	1,009.6	1,065.1
5	1,008.9	1,064.4
3	1,008.4	1,063.9

These stage-frequency relations were based on a composite rating curve for Unadilla for the entire period of record and a step-backwater method computation of water-surface profiles for Oneonta. Different stage-frequency relations would result from major stream-channel changes and could be modified by retention storage.

Flood profiles.—A profile of the water surface of Susquehanna River is shown in figure 3 for hypothetical floods of 5- , 25- , and 50-year recurrence intervals. Figure 2 shows an evaluation of the flood frequency at these selected points while figure 3 extends this information to any site in the study area. The water-surface elevation of a flood of specified frequency at any desired site can be determined by plotting on the appropriate figure the stage for the selected frequency listed in the stage-frequency tabulation, and drawing the profile through this point, approximately parallel to the profiles shown. Note that there is little difference in the profile of the 25- and 50-year recurrence interval floods.

Generally, abrupt changes in the profile are due to differences in water-surface elevation between the upstream and downstream sides of bridges and are caused by constriction of the channel at the bridge structure. The base line for the profile is located along the centerline of the stream. River mileage for Susquehanna River was established by using longitude 75°07'30" (west edge of the 7.5-minute Oneonta, N.Y., quadrangle) as the zero point.

Flood depth.—The profiles shown in figure 3 can be used to determine the depth of flooding at any point by subtracting the ground-surface elevation from the indicated water-surface elevation. Leveling from nearby bench marks will give a more accurate determination of the ground-surface elevation, but a satisfactory approximation can be obtained for most points by interpolation between the map contours.

Future conditions.—The hydrologic data presented in this report represent stream-channel conditions existing prior to 1968. Planned major highway construction and river-channel alinement changes, to be undertaken shortly, may alter the flood profiles and inundation patterns shown. In addition, the construction of contemplated flood-control measures may affect the frequency and depth of flooding but will not necessarily eliminate all future flooding.

Acknowledgments.—The selection of the site for this project was made in collaboration with the Appalachian Regional Commission and the State of New York. Coordination of planning with the district office of the Corps of Engineers was accomplished through the office of Appalachian Studies, Corps of Engineers. This report was prepared by the U.S. Geological Survey under the administrative direction of Garald G. Parker, district chief. Flood information and additional data were obtained from other government agencies, newspapers, and from individuals.

Additional information.—Other information pertaining to floods at Oneonta, New York, can be obtained from the U.S. Geological Survey, P.O. Box 948, Albany, New York, 12201, and from the following published reports:

Grover, N. C., 1937, The floods of March 1936: U.S. Geol. Survey Water-Supply Paper 799, 667 p.

Johnson, Hollister, 1936, The New York State flood of July 1935: U.S. Geol. Survey Water-Supply Paper 773–E, p. 233–268.

Robison, F. L., 1961, Floods in New York, magnitude and frequency: U.S. Geol. Survey Circ. 454, 10 p.

Tice, R. H., 1967, Magnitude and frequency of floods in the United States, part 1–B: U.S. Geol. Survey Water-Supply Paper 1672, 585 p.

U.S. Weather Bureau, 1901–53, Daily river stages at river gage stations on the principal rivers of the United States: Washington, D.C., U.S. Govt. Printing Office.

Water Resources Council, Hydrology Committee, 1967, A uniform technique for determining flood-flow frequencies: Water Resources Council Bull. 15, 15 p.

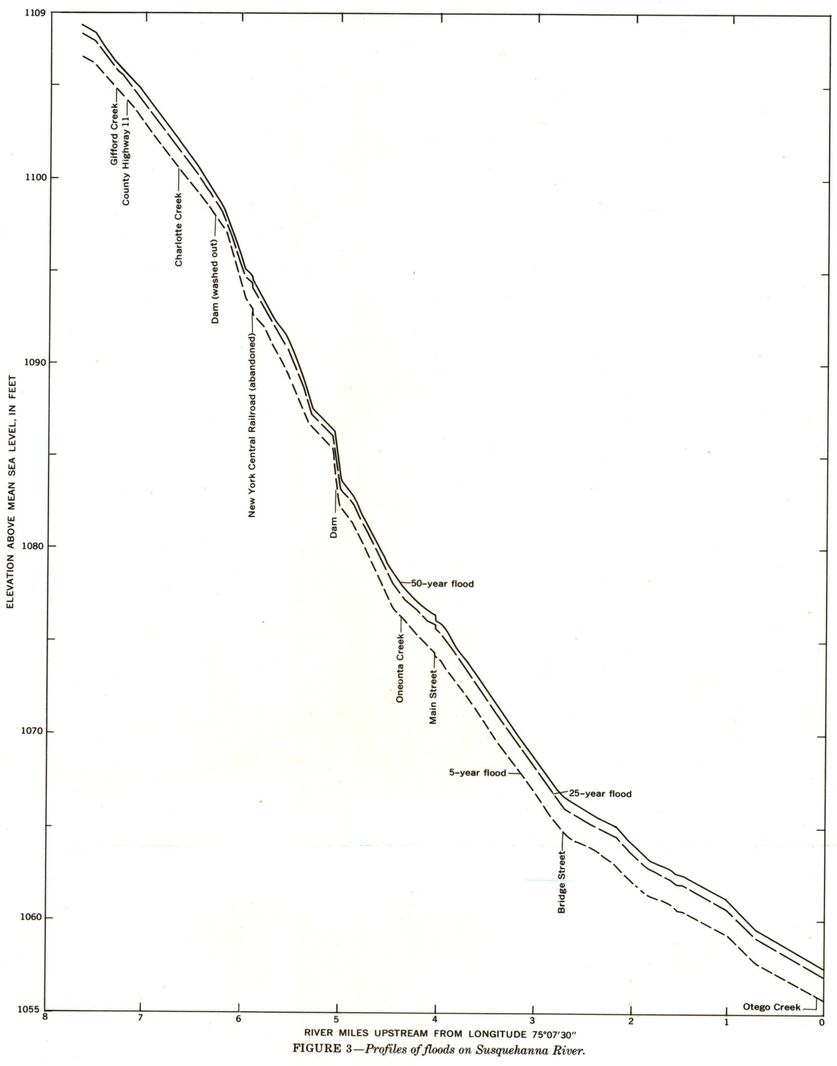


FIGURE 3—*Profiles of floods on Susquehanna River.*

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1969

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