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DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
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FLOODS IN MALINE CREEK BASIN

ST. LOUIS COUNTY

MISSOURI

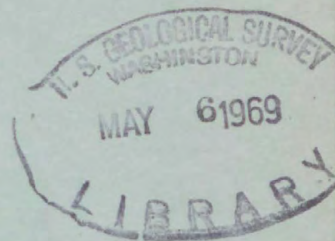
By

Donald W. Spencer and Leland D. Hauth

Prepared in Cooperation with
The Metropolitan St. Louis Sewer District

Open-file report
St. Louis, Missouri

1968



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FLOODS IN MALINE CREEK BASIN, ST. LOUIS COUNTY, MISSOURI

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INTRODUCTION

The rapid growth of suburban St. Louis presents problems in the economic development of flood plains within the area. The U.S. Geological Survey in cooperation with the Metropolitan St. Louis Sewer District has a project to study the hydrology of five major drainage basins within the area of responsibility of the Sewer District.

This report presents hydrologic data on two flood events that can be used in evaluating the extent and depth of flooding with respect to a given stage in the Maline Creek basin. The report will aid decision making in the utilization of flood plains by providing data necessary to solve existing flood problems, and for regulating usage of flood plains to minimize the creation of new flood problems. Data are presented which will be useful in flood-plain zoning and building regulations, locating disposal facilities, locating recreational areas, designing storm and sanitary sewers, and for future bridge and culvert design.

COOPERATION AND ACKNOWLEDGMENT

The preparation of this report is a part of flood mapping program between the Metropolitan St. Louis Sewer District, Peter F. Mattai, Executive Director, and the U.S. Geological Survey. The Sewer District provided various maps, bench-mark elevations,

printing services, and precipitation records. Sewer District representatives were most helpful in obtaining permission from suburban governments and private concerns to install rain gages and stage gages on public and private properties.

This report was prepared by the U.S. Geological Survey under the direction of Anthony Homyk, district chief, Missouri District, Water Resources Division.

Acknowledgment is given to the St. Louis District of the Corps of Engineers for rainfall data and other pertinent information used in this report.

Additional data pertaining to past flooding were obtained from the residents and public officials of the area.

FLOOD HISTORY

The approximate area inundated by the flood of June 14-15, 1957 in the Maline Creek basin is delineated on a composite topographic map (plate 1). The composite was made from four quadrangles to place all of the Maline Creek basin on one map. The area location map is shown as figure 1.

Information about the flood of June 14-15, 1957 was obtained from personal interviews with residents of the immediate area. This flood was the highest observed in the past 25 years, and was caused by a storm which was most intensive in a narrow strip from Pacific, Mo. through Belleville, Ill., and caused extensive flooding and damage in both states.

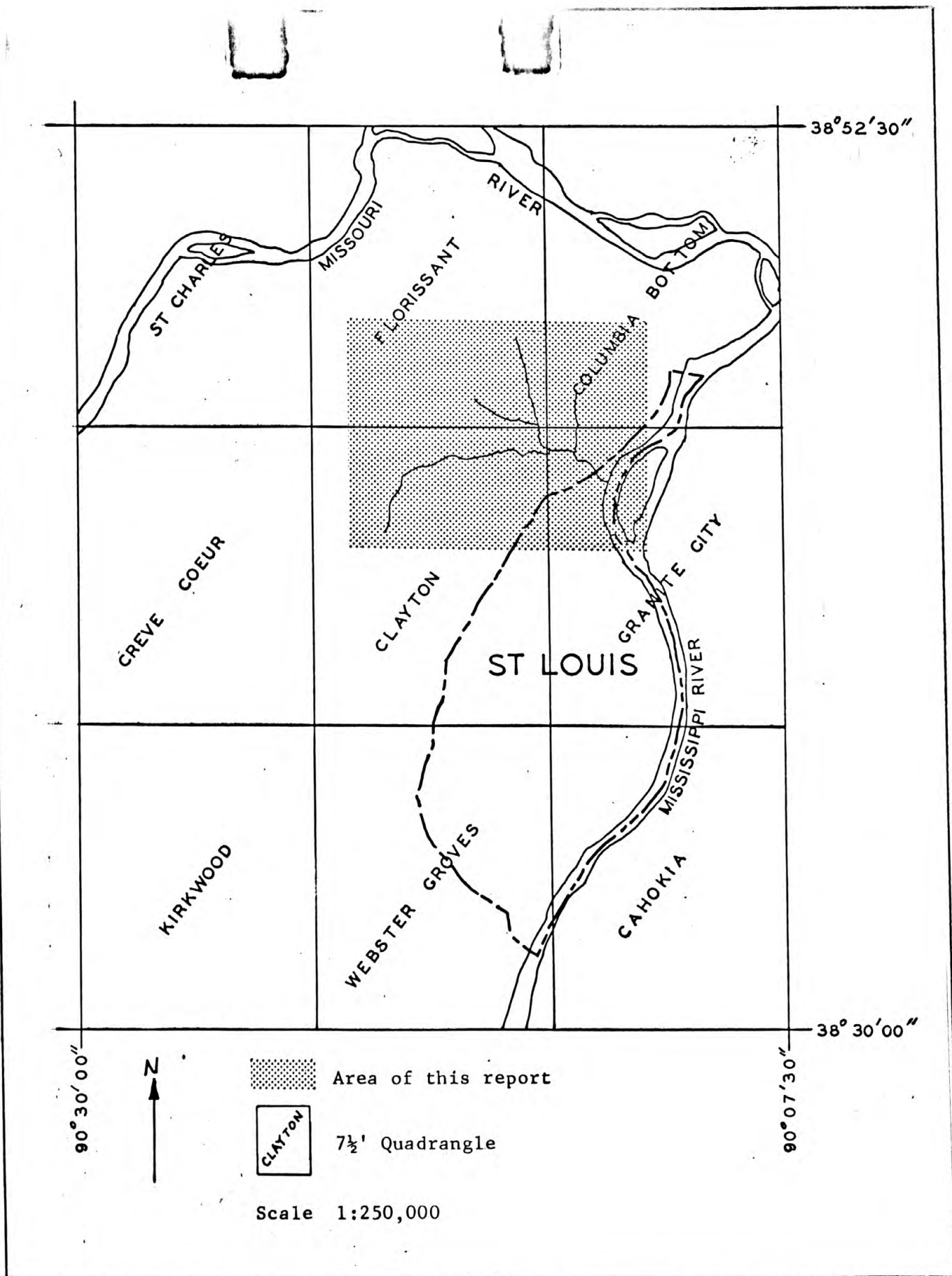


Figure 1.--Index map of the St. Louis area showing location of composite flood inundation map.

Figure 2 shows the distribution of total rainfall for the storm period, June 14-15, 1957. The maximum total rainfall for the storm was 16.54 inches in 9½ hours 8 miles south of East St. Louis, Ill. The rainfall for St. Louis, 8.54 inches, is the maximum recorded 12-hour rainfall for the city. The 12-hour rainfall in Maline Creek basin was about 6 inches, representing an event with a recurrence interval of 100 years.^{1/}

The highest flood recorded by the stage gages since the beginning of installation in November 1967 was approximately bankfull stage throughout the basin. The flood occurred on September 17, 1968, as the result of a high-intensity short-duration storm that produced up to about 2 inches of rainfall in 3-4 hours.

FLOOD DATA

To define the flood profiles of Maline Creek from Natural Bridge Road to Riverview Drive, distances were measured in miles upstream from the mouth along the thread of the stream on U.S. Geological Survey topographic maps. Mileages for Black Jack Creek and Dellwood Creek were obtained in the same manner as for Maline Creek except the zero mile was taken at the creeks' confluences with the larger stream.

Flood profiles.--The height of a flood at a gaging station is usually referred to as gage height, or stage, which is the elevation at the

^{1/} Hershfield, D. M., 1961, Rainfall Frequency Atlas of the United States for Durations from 30 minutes to 24 hours and Return Periods from 1 to 100 Years: U.S. Weather Bureau Tech. Paper No. 40, 61 p., 15 figs., 54 charts.

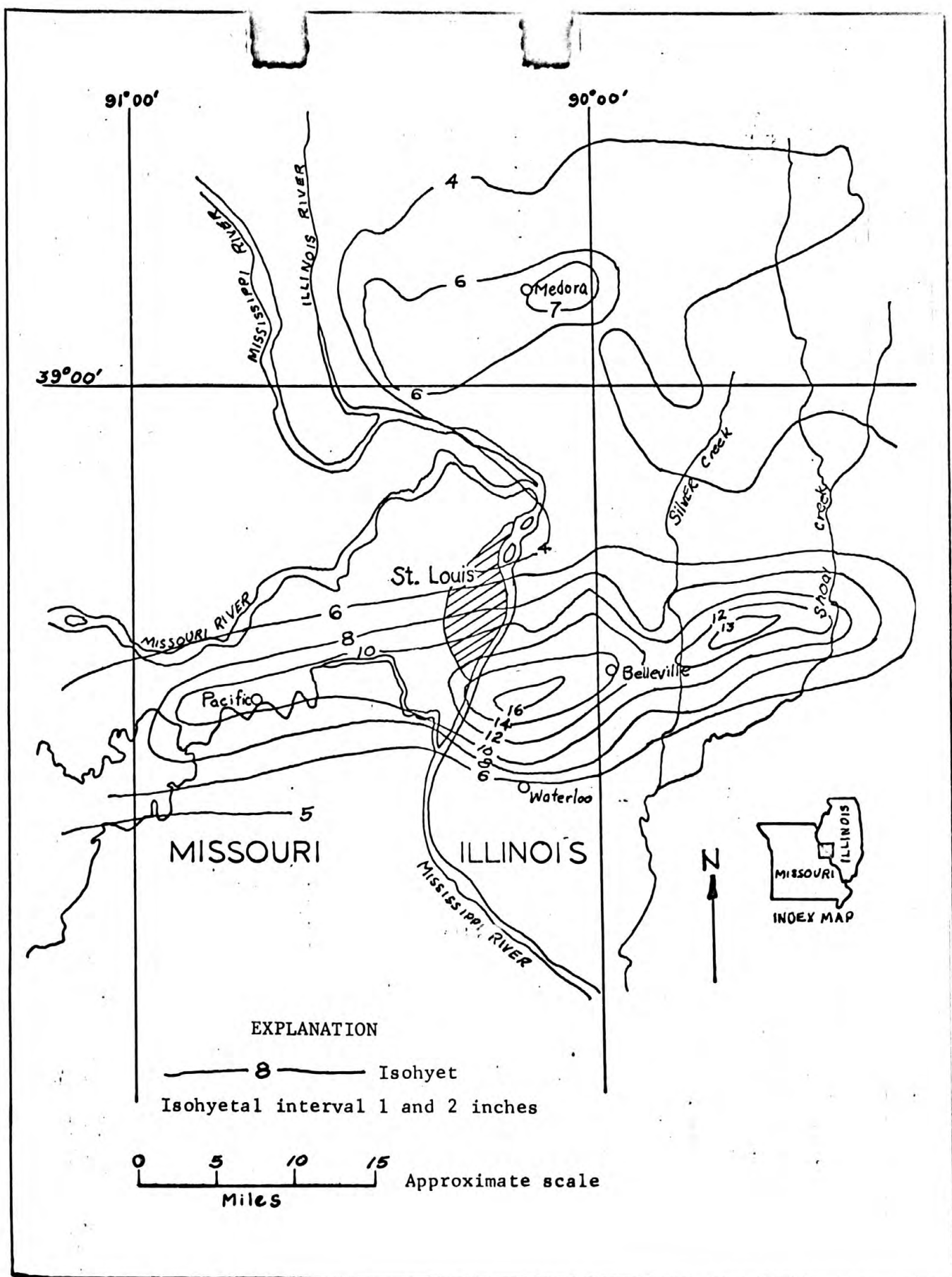


Figure 2.--Isohyetal map showing total rainfall for storm of June 14-15, 1957.

water surface above a given datum plane. Elevations shown in this report are in feet above mean sea level.

The stage information obtained from interviewing local residents about the June 14-15, 1957 flood and the datum of the stage gages were referenced to mean sea level from bench marks established by the Sewer District. Elevations for the September 17, 1968 flood were obtained from the stage gages. The flood elevation data for the two floods were then plotted on the profile sheets (figs. 3-5) and the flood profiles were drawn through the data points.

The flood profiles for the June 1957 flood are considered to be quite accurate. At many sites the residents were able to identify a specific point and indicate the distance from the point to the water surface of the 1957 flood. To verify flood elevations, more than one person or family was interviewed to obtain comparative information. The 1957 flood profile was compared to the profile of the September 1968 flood to provide an additional basis for determining the validity of the information.

The abrupt change on Maline Creek at Bellefontaine Road indicates the difference in elevations of the water surface at the upstream and downstream sides of the road crossing that produces channel constriction. The difference in elevations at these points may vary with future floods. An improved channel or bridge opening would tend to lower the flood height on the upstream side. Likewise vegetation growth along and in the channel and debris caught on the upstream side of crossings will tend to increase flood height.

Figure 3.--Profiles of floods on Maline Creek, St. Louis County, Mo.

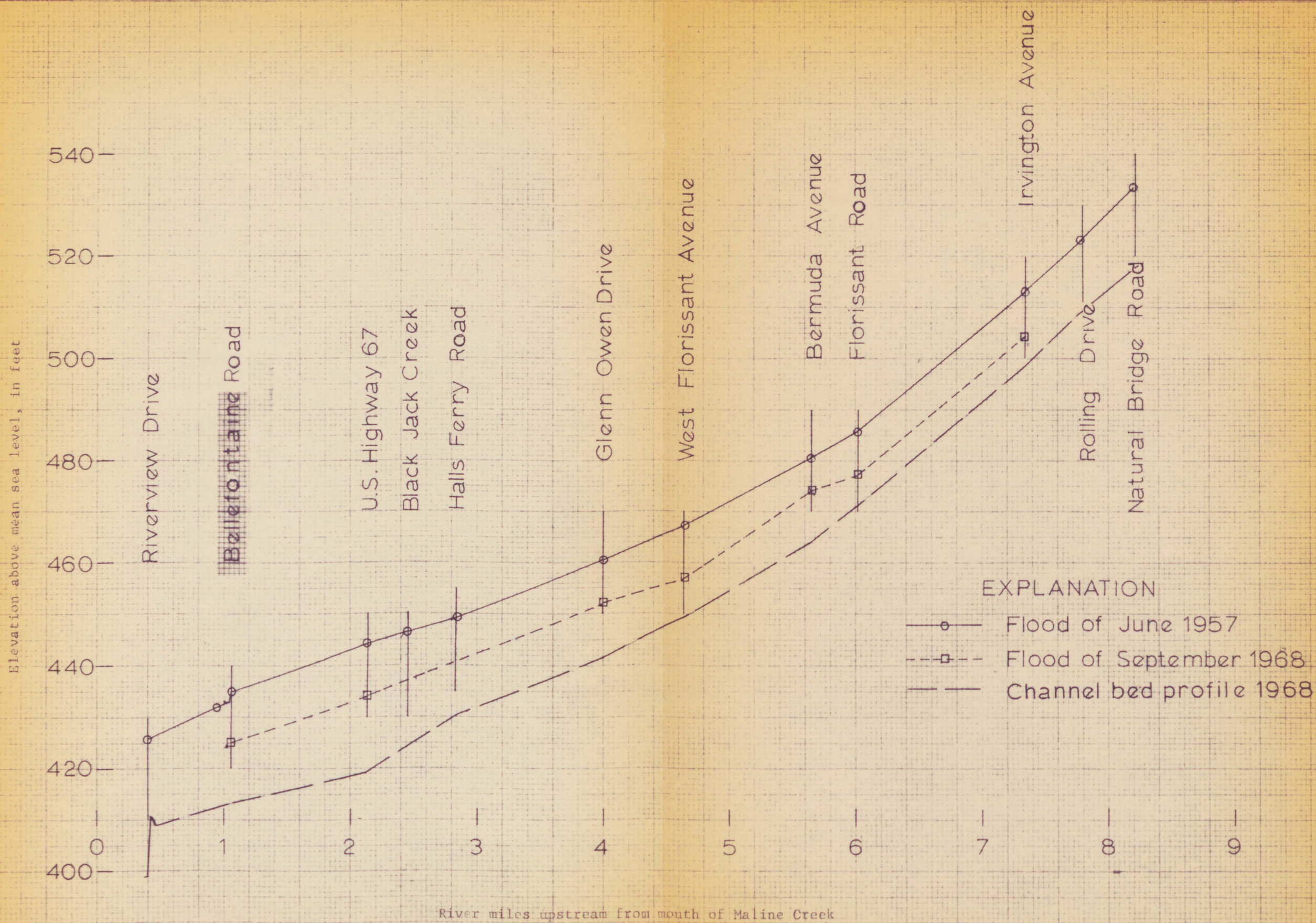


Figure 4.--Profiles of floods on Black Jack Creek, St. Louis County, Mo.

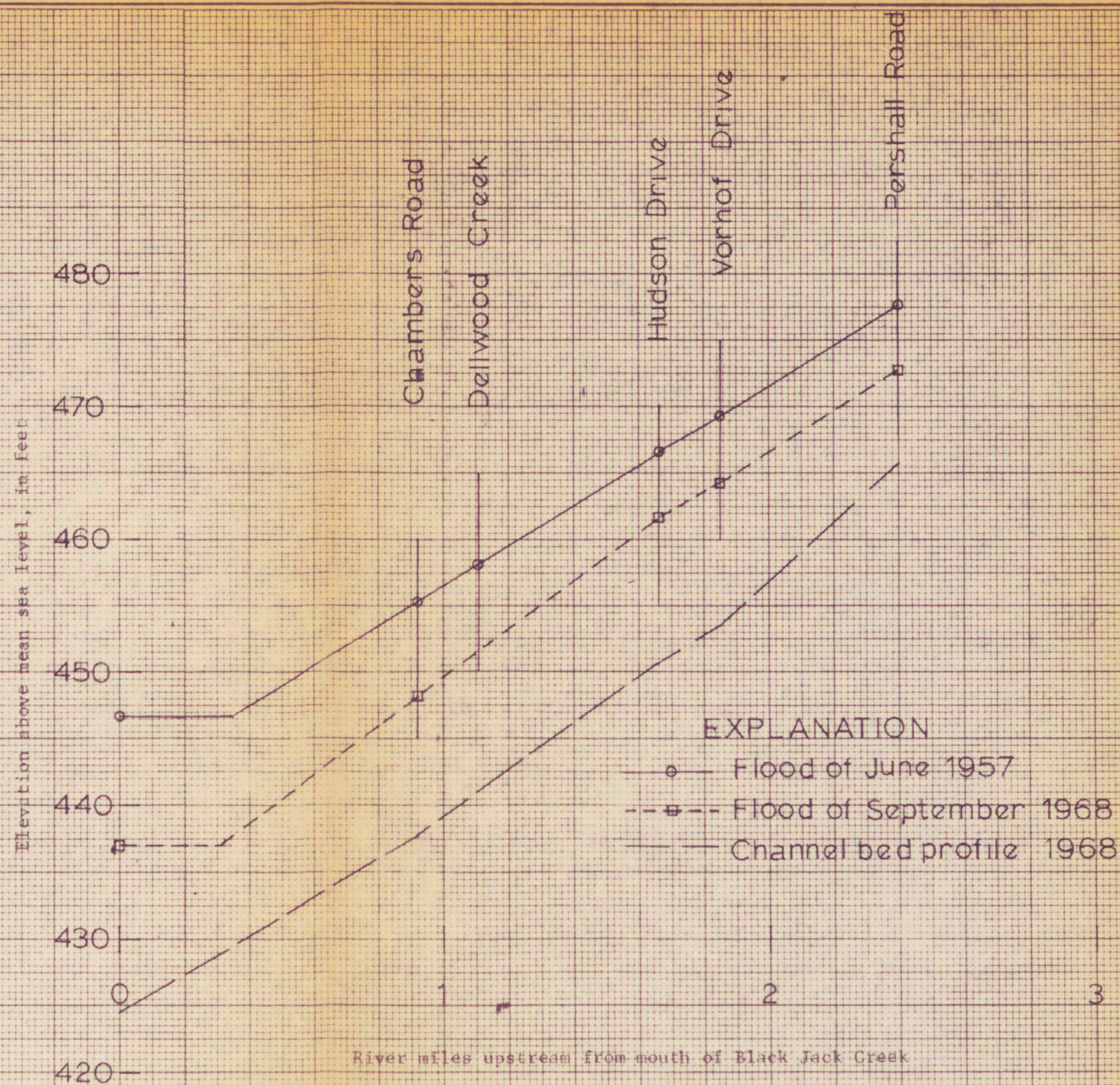
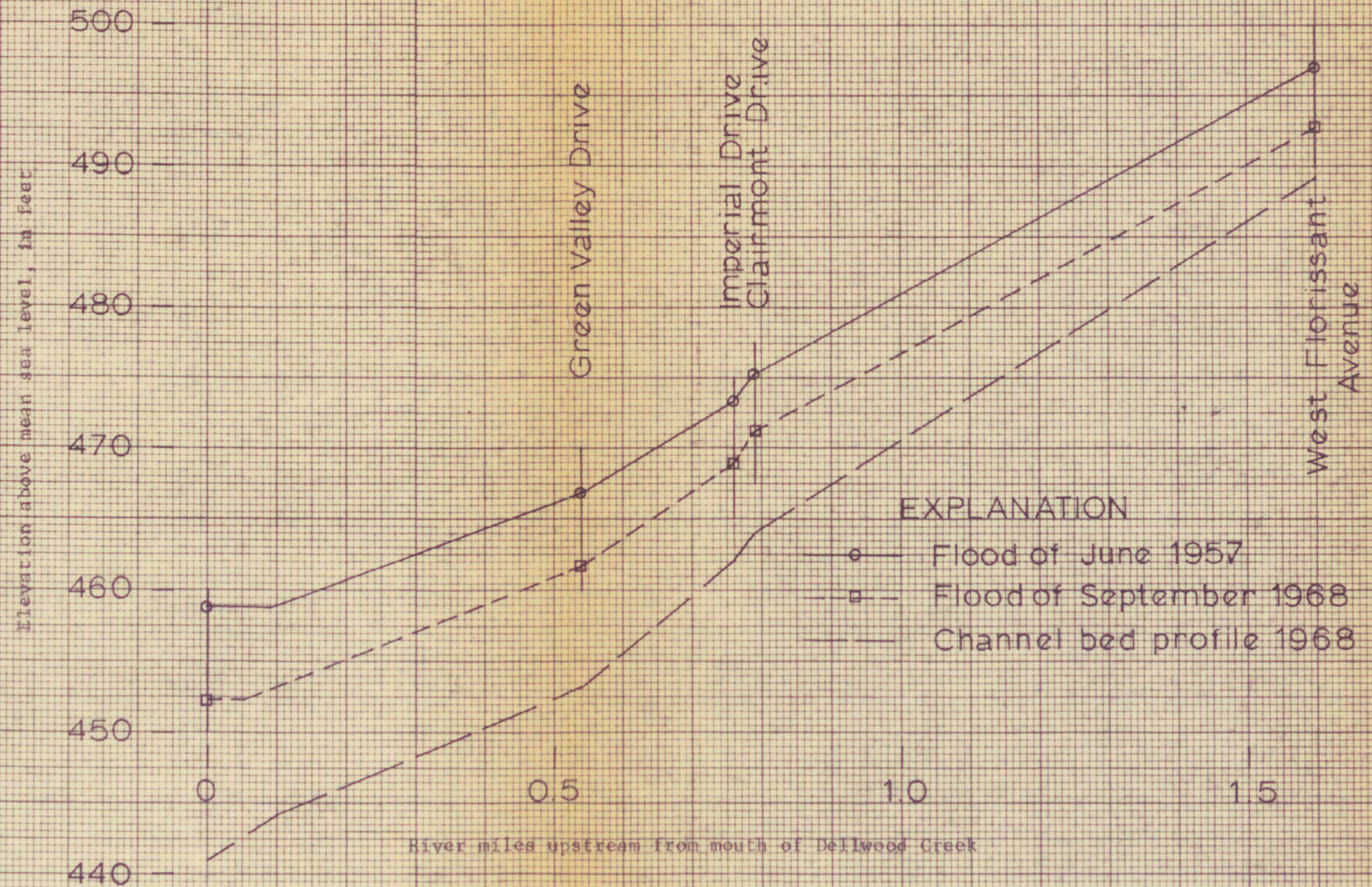


Figure 5.--Profiles of Floods on Dellwood Creek, St. Louis County, Mo.



The inundation map (plate 1) reflects conditions which existed during the 1957 flood. The maps from which the composite was made were published in 1951 (Columbia Bottom) and 1954 (Florissant, Clayton, and Granite City). The general procedure used in defining flood boundaries was to construct the flood profiles described earlier in the text. 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 intervals, 10 feet).

Conditions presently existing in the channels and along the flood plains conceivably would alter the inundation pattern for a storm similar to that of June 1957. To evaluate what would happen if the 1957 storm were to occur under today's conditions would involve a more intensive and detailed study. The data for the 1957 flood would have to be adjusted on the basis of an analysis of current data that would provide runoff factors and basin-lag time factors. More data than are presently available must be collected to provide an analysis that would be statistically accurate in evaluating the 1957 flood under present conditions. These data are currently being collected.

Table 1 presents a list of gaging stations on Maline Creek and its tributaries. The flood stages obtained by the gages for the September 17, 1968 flood and the flood stages obtained by interview for the June 14-15, 1957 flood are tabulated here along with river

Table 1.--Gage location and flood stage in feet above mean sea level
for floods of June 14-15, 1957 and September 17, 1968

| Gage location | Station number | (1) Drainage area | River mile | (2) Flood Recorded Sept.17, 1968 | (2) Flood of June 1957 from interview |
|---|-------------------|-------------------------|---------------|--|---|
| Maline Creek at Irvington | 7-0040.40 | - | 7.35 | 504.88 | 512.9 |
| at Suburban and Mueller | 7-0040.60 | - | 6.90 | 494.01 | + |
| at Florissant Rd | 7-0040.80 | - | 6.02 | 477.71 | 485.8 |
| at Bermuda Dr | 7-0041.00 | 9.16 | 5.60 | 474.21 | 480.5 |
| at West Florissant Rd | 7-0041.20 | - | 4.65 | 457.09 | 467.2 |
| at Glenn Owen Dr | 7-0041.50 | 12.6 | 4.00 | 452.33 | 460.8 |
| at Halls Ferry Rd | 7-0042.00 | - | 2.83 | * | 449.4 |
| at U. S. Highway 67 | 7-0049.00 | - | 2.13 | 434.14 | 444.2 |
| at Bellefontaine Rd | 7-0050.00 | 24.1 | 1.06 | 425.11 | 433.3 |
| Black Jack Creek at I-270 | 7-0043.00 | - | 2.40 | 472.90 | 477.6 |
| at Vorhof Dr | 7-0043.80 | - | 1.85 | 464.29 | 469.3 |
| at Hudson Dr | 7-0044.00 | - | 1.66 | 461.59 | 466.6 |
| at Chambers Rd | 7-0046.50 | 6.95 | .92 | 448.08 | 455.4 |
| Dellwood Creek at West Florissant Rd | 7-0044.50 | - | 1.60 | 492.74 | |
| at Clairmont Dr | 7-0045.70 | - | .85 | 471.08 | 475.2 |
| at Imperial Dr | 7-0045.71 | - | .76 | 468.99 | 473.4 |
| at Green Valley Dr | 7-0045.80 | 1.93 | .54 | 461.66 | 466.9 |
| at Halls Ferry Rd | 7-0046.00 | - | .10 | * | + |

* Gage did not record

(1) Square miles

+ No information obtained

(2) Elevation in feet above
mean sea level

mileages and with drainage areas for stations having continuous recording type gages. The recording gages are the points at which stage-discharge relationships will be developed.

Flood depths.--The accuracy of the area inundated as shown on plate 1 is of necessity related to the accuracy of the base map. Approximate depths of flooding can be obtained by subtracting ground elevations from the profile elevation at a given point. Instances were noted in the field where the contour elevations had been altered from those on the map by extensive earth work in some areas. Caution should be exercised when using this method to determine flood depths. More accurate depths may be obtained by leveling from nearby bench marks to the site under study and subtracting this ground elevation from the elevation on the profiles at the river mileage desired. Straight line interpolation between the known points on the profile is the generally accepted method of arriving at an elevation between the two points.



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