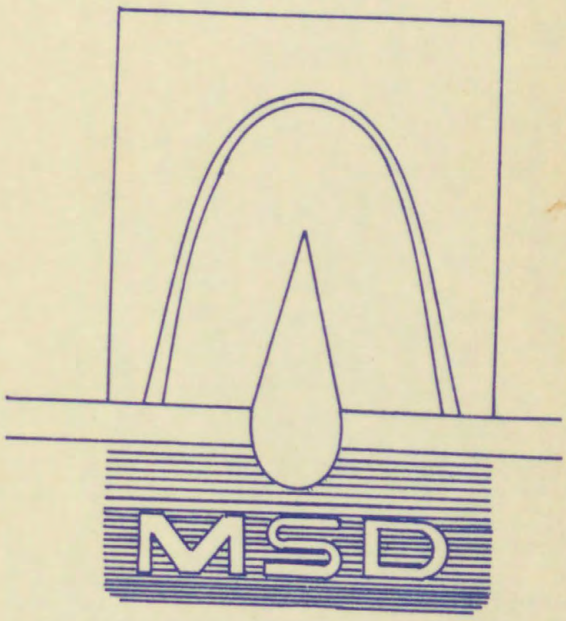
FLOODS IN GRAVOIS CREEK BASIN ST. LOUIS COUNTY, MISSOURI

Open-file report

by

Leland D. Hauth and Donald W. Spencer



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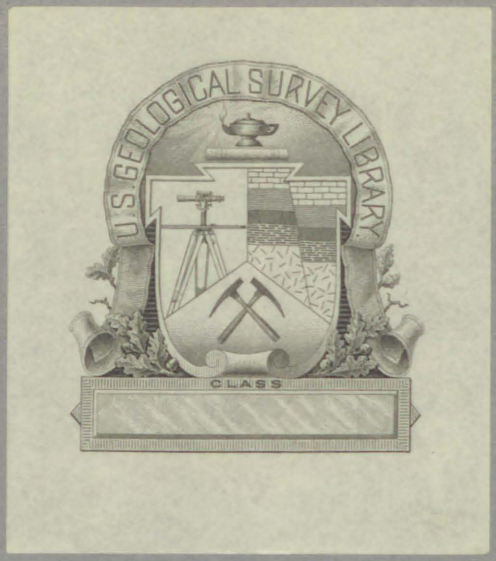
Prepared in cooperation with.

The Metropolitan St. Louis Sewer District

1969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INTRODUCTION

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

This interim report presents stage and inundation data along Gravois Creek and its tributaries for the historic flood of June 1957, and the flood of January 1969. These data can be useful in studies leading to the proper utilization of the basin to minimize future flood problems. Other useful hydrologic data such as flood discharges and frequencies are being gathered, but were not available for this report.

Spencer and Hauth (1969) described the flood situation in Maline Creek basin, St. Louis County, Mo. Areas covered by both reports are shown in figure 1.

COOPERATION AND ACKNOWLEDGMENT

The preparation of this report is a part of the cooperative flood-mapping program of the Metropolitan St. Louis Sewer District, Peter F. Mattei, executive director, and the Missouri district of the Water Resources Division, U.S. Geological Survey, Anthony Homyk, district chief. The Metropolitan St. Louis Sewer District

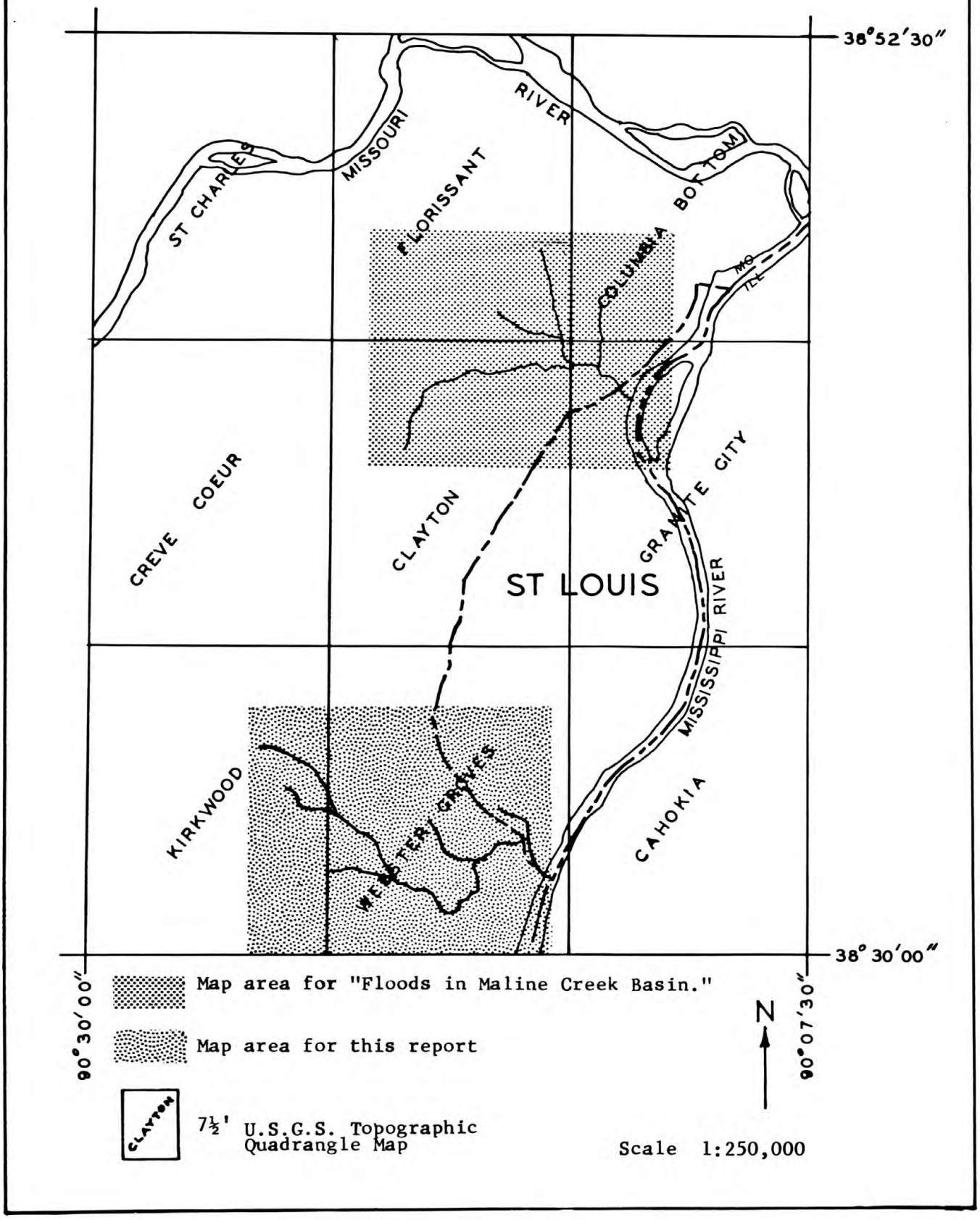

Figure 1.--Index map of the St. Louis area showing location of composite flood inundation map.

provided various maps, bench-mark elevations, printing services, and precipitation records.

FLOOD HISTORY

Many residents in the area were interviewed with regard to the height of the June 1957 flood. The oldest resident interviewed, who had lived in the same location 77 years, indicated that the June 14-15, 1957 flood was the highest known to him. At many sites the residents were able to identify a specific point reached by the flood. Some residents had made marks on the walls of buildings immediately after the flood and had preserved them. At Bayless Road the high-water mark left by the flood could still be seen in one building. To verify flood elevations obtained by interview, more than one person or family was interviewed where possible.

The 1957 flood was caused by a storm which was the most intense in a narrow strip from Pacific, Mo., to Belleville, Ill. The maximum 12-hour rainfall for the storm was 16.54 inches in 9½ hours, 8 miles south of East St. Louis, Ill. The isohyetal map (fig. 2) shows the distribution of total rainfall for the storm period, June 14-15, 1957. Total rainfall in Gravois Creek basin from the storm amounted to about 11 inches, which exceeds the 200-year 24-hour rainfall of 7.7 inches as extrapolated from U.S. Weather Bureau records (1961). Rainfall recorded at the

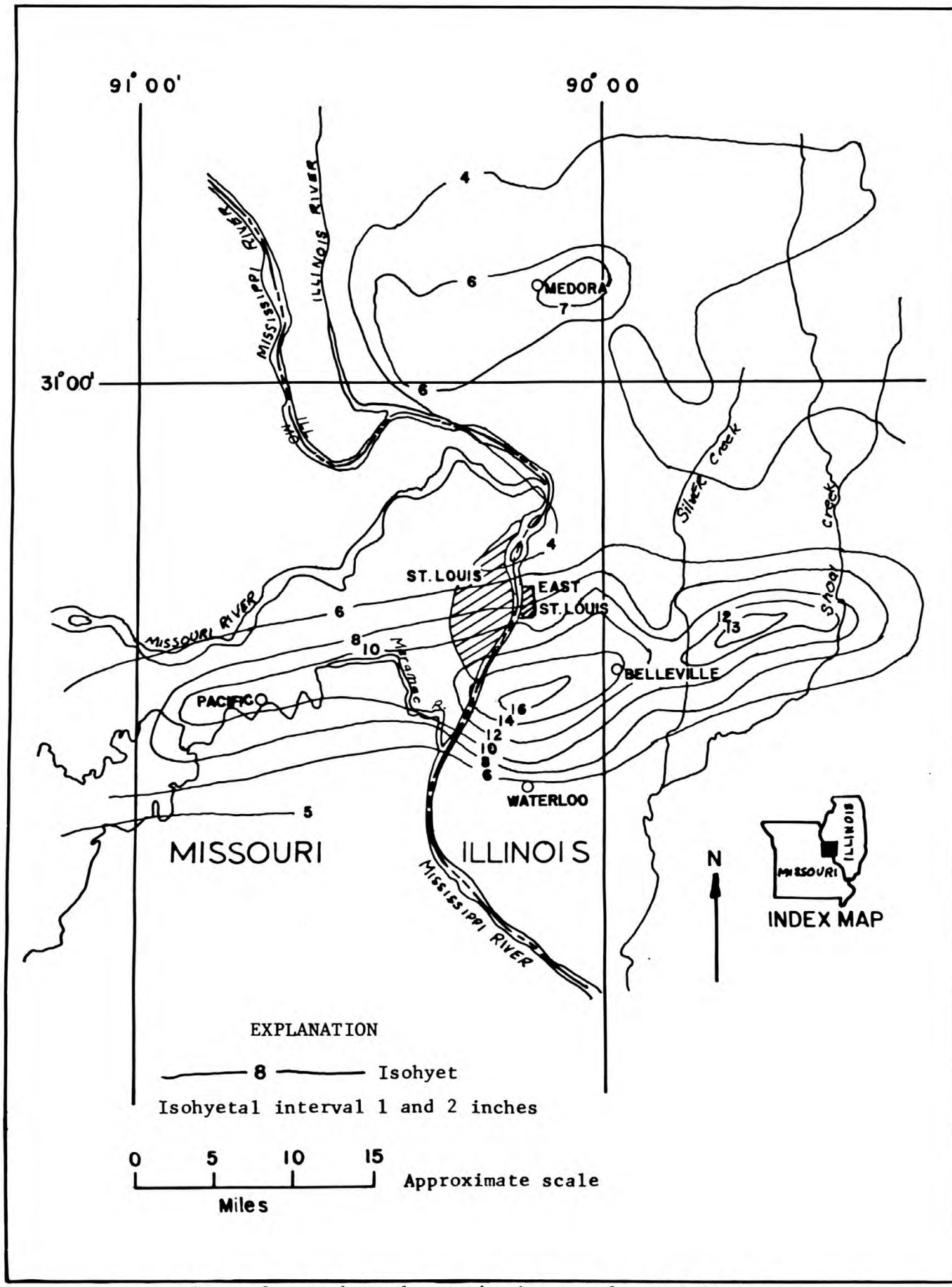

Figure 2.--Isohyetal map showing total rainfall for storm of June 14-15, 1957

U.S. Weather Bureau recording station at Lambert Field in western St. Louis was 8.54 inches and was the maximum of record for a 12-hour period at that station.

Data for the flood of January 29, 1969, were recorded at 14 stage gages in the Gravois Creek basin. This flood was the highest since installation of the gages in July 1967 and resulted from about 2 inches of rain in 19 hours. It varied in magnitude over the basin as a result of variations in the storm and in the timing of the contributions from tributaries.

FLOOD STAGES

The stage gages were established at selected locations within the basin, and flood data collected at these gages are gage heights, or the level of the water surface, measured in feet above some arbitrary datum plane. The gage data, as well as data obtained from interviews, were referenced to mean sea level from bench marks established in basin by the Metropolitan St. Louis Sewer District.

Elevations determined for the January 1969 flood, the 1957 flood, and the channel bed (referenced to mean sea level) were plotted on the profiles at distances measured on U.S. Geological Survey topographic maps. The January 1969 flood elevations are from the stage gages, the 1957 elevations are from interviews and floodmarks, and the channel bed elevations are from surveyed cross sections at the gages. In general, straight lines were drawn between plotted points. At some places, data from all

three profiles and from observations of local conditions were used as guides in drawing lines that were not straight connections between points. These profiles are shown as figures 3-6, and are considered to be quite accurate.

Table 1 presents a list of gaging stations on Gravois Creek and its tributaries. The flood stage measured at the gages for the Jan. 29, 1969 flood and the flood stage obtained by interviews for the June 14-15, 1957 flood are tabulated along with river mileage, and with drainage area for the continuous-recording type gages at which stage-discharge relationships are being developed.

FLOOD PROFILES

The distances used for plotting the flood profiles were measured in miles and tenths of miles upstream from the mouth along the thread of the stream on the map of plate 1. The distances shown for Kirkwood Creek and Musick Creek were measured in the same way with mile zero at the mouth where the creek meets the larger stream.

Water-surface elevations above bridge openings are often raised when the opening constricts the natural channel, or when debris collects on the upstream side of the bridge sub-structure. Vegetal growth along and in the channel, and debris collected along the channel will also tend to increase the flood height. Normal flood-profile slopes are many times changed by the contribution of flow between data points.

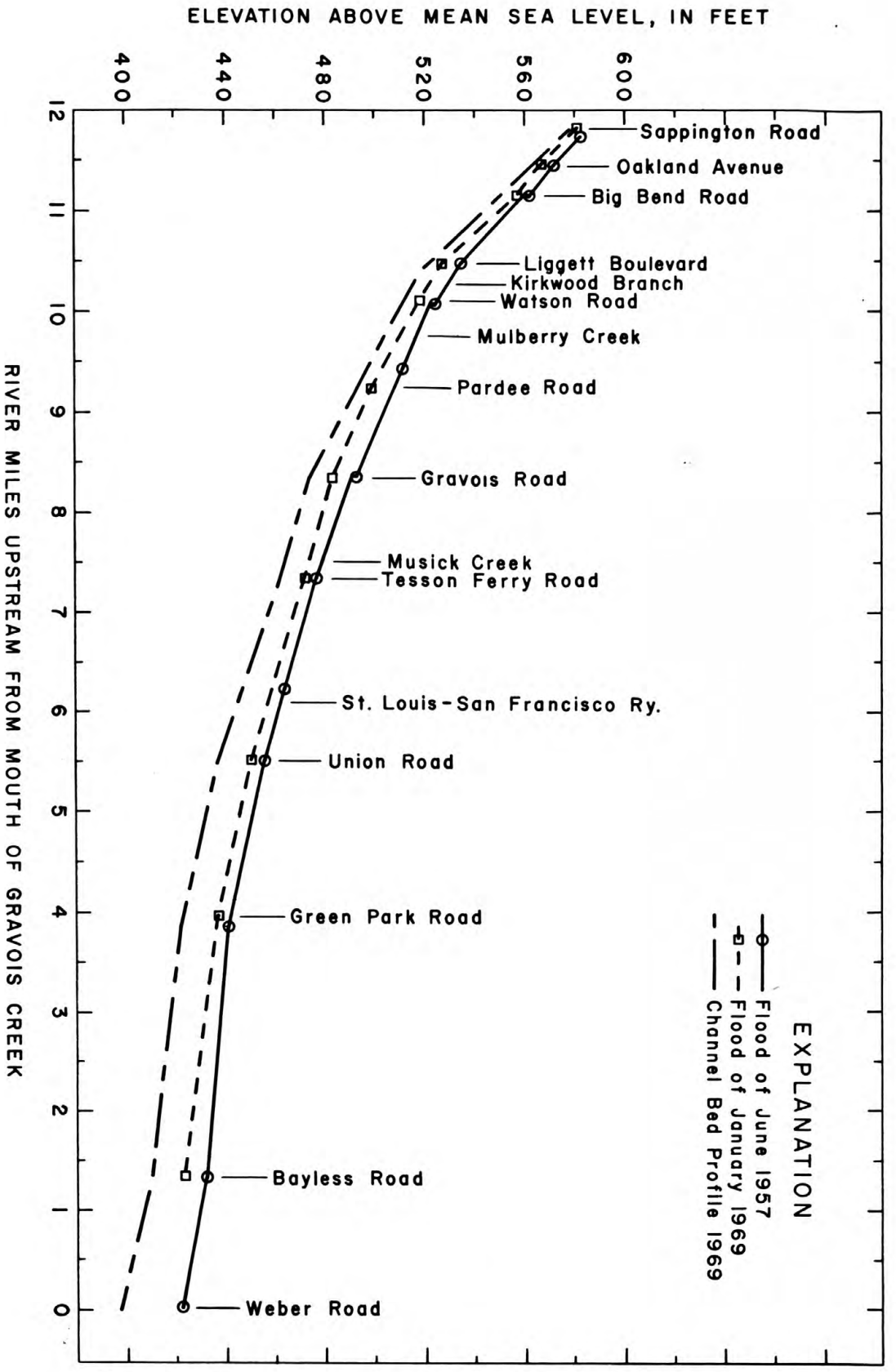

Figure 3.—Profiles of Floods on Gravois Creek, St. Louis County, Mo.

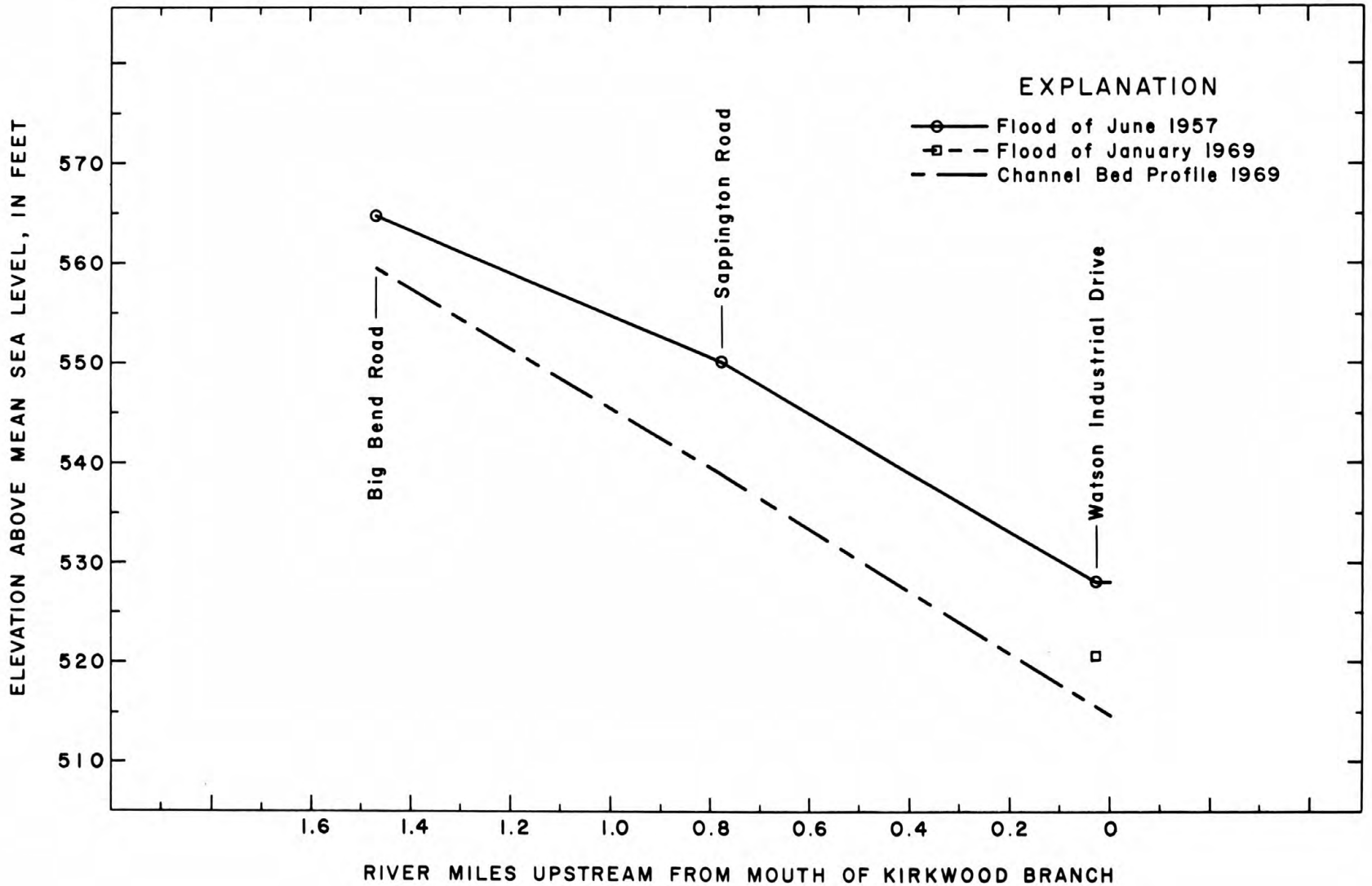

Figure 4.—Profile of Flood of June 14-15, 1957 on Kirkwood Branch, St. Louis County, Mo.

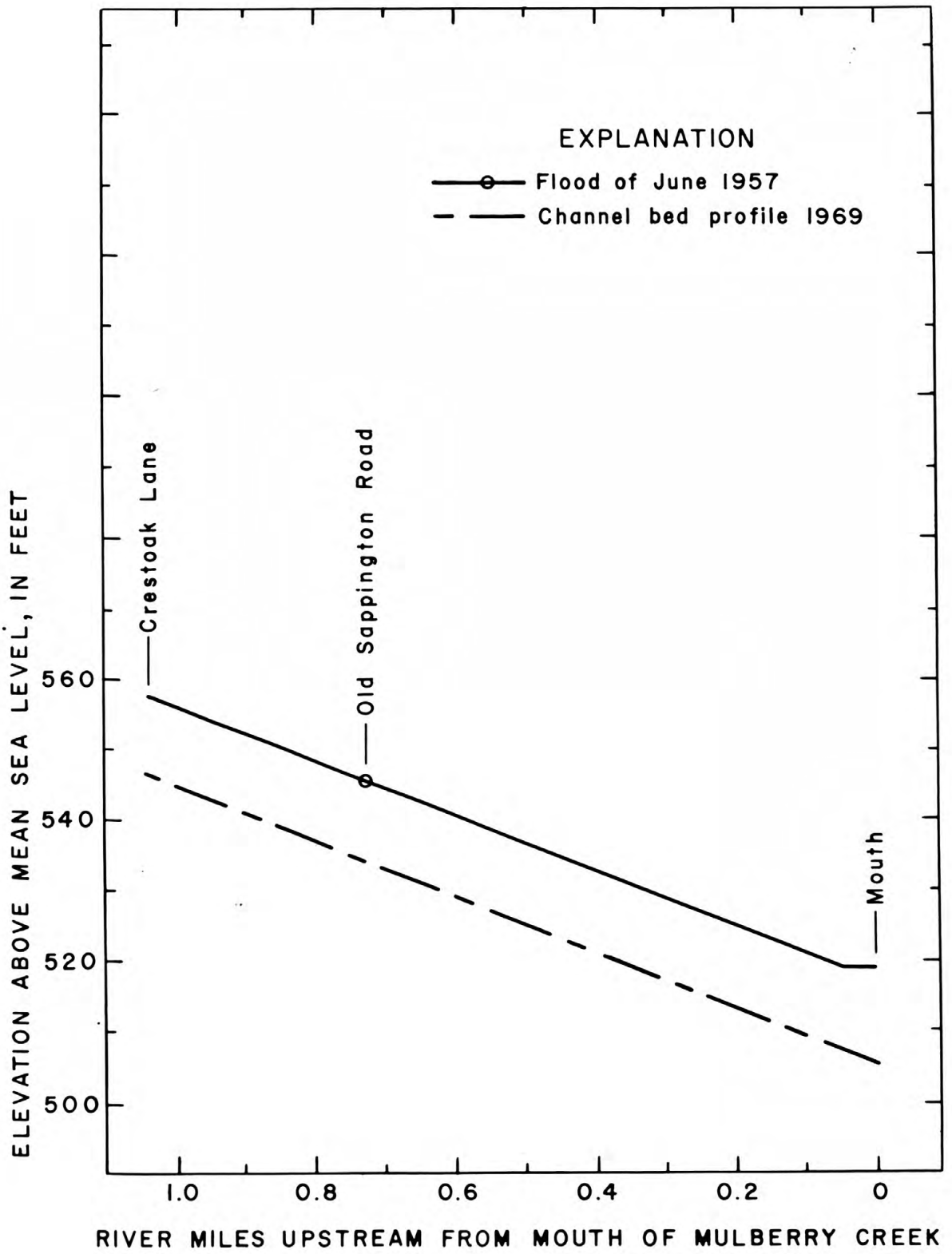

Figure 5.—Profile of Flood of June 14-15 on Mulberry Creek, St. Louis County, Mo.

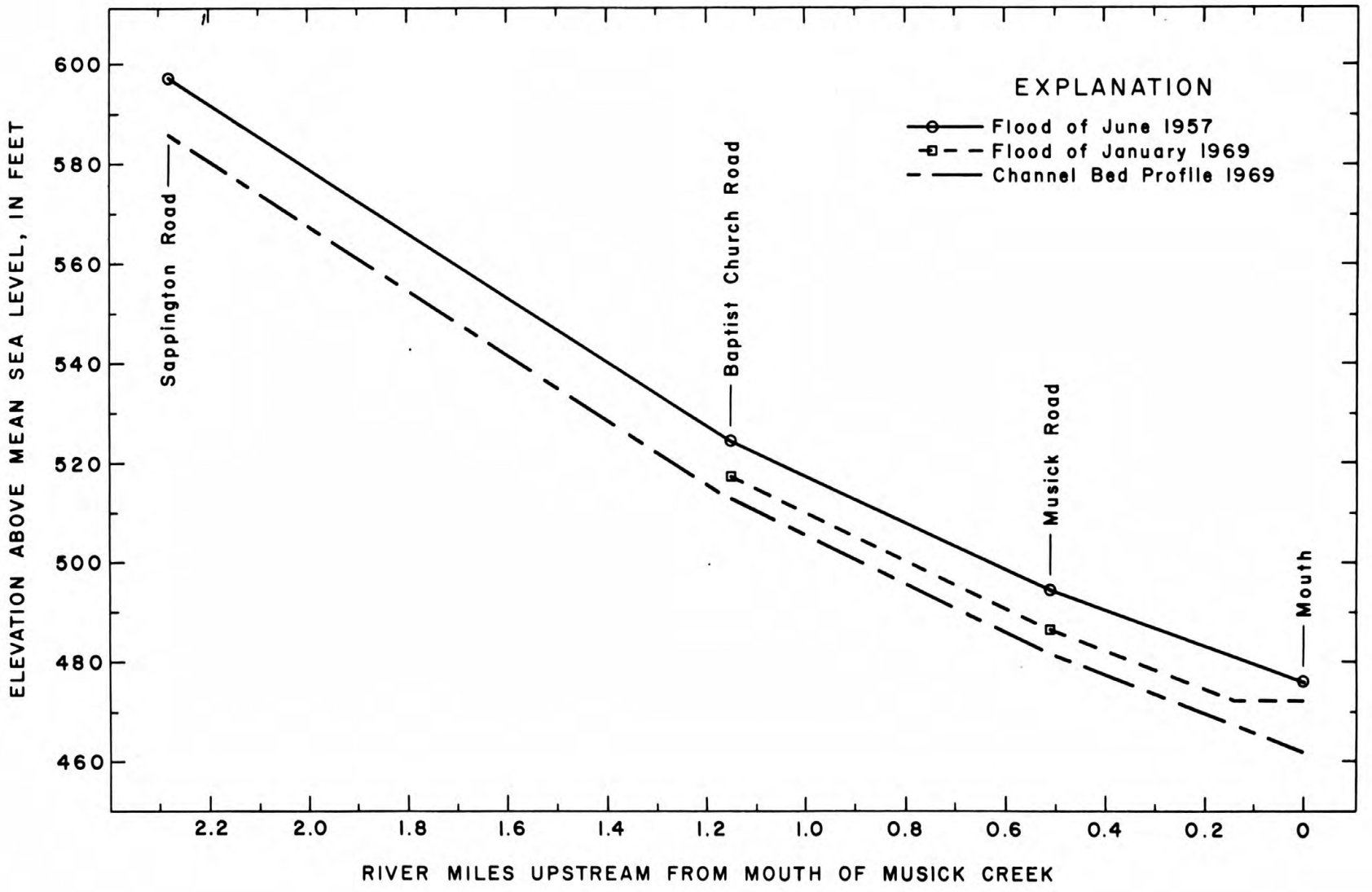

Figure 6.—Profiles of Floods on Musick Creek, St. Louis County, Mo.

Table 1.--Gage locations and flood stage in feet above mean sea level for floods of June 14-15, 1957 and January 29, 1969

Gage location	Station number	Drainage area (sq mi)	River mile	Flood recorded Jan. 29, 1969	Flood of June 1957 based on interview
Gravois Creek at:					
Sappington Road	7-0101.05	-	11.81	581.85	585.5
Oakland Avenue	7-0101.07	-	11.46	567.20	572.0
Big Bend Road	7-0101.10	-	11.15	557.50	562.3
Ligget Blvd.	7-0101.15	2.12	10.47	527.52	534.5
Watson Road	7-0101.30	-	10.11	518.18	525.3
Pardee Road	7-0101.40	-	9.23	499.35	508.0
Gravois Road	7-0101.45	-	8.34	483.60	492.4
Tesson Ferry Rd.	7-0101.55	12.13	7.34	472.11	476.0
Union Road	7-0101.65	-	5.51	450.50	455.3
Green Park Rd.	7-0101.75	-	3.96	437.07	441.4
Bayless Road	7-0101.85	22.28	1.33	422.69	431.8
Weber Road	7-0101.88	-	0.02	*	421.5
Kirkwood Branch at:					
Big Bend Road	7-0101.20	-	1.47	+	<565.3
Sappington Road	7-0101.27	-	0.79	*	550.4
Watson Industrial Drive	7-0101.29	-	0.03	517.86	528.2
Musick Creek at:					
Sappington Road		-	2.28	+	597.2
Baptist Church Rd.	7-0101.50	-	1.15	517.05	524.5
Musick Road	7-0101.54	-	0.51	486.25	494.3
Mulberry Creek at:					
Old Sappington Rd.	-	-	0.73	+	545.4

+ Gaging station not established * Gage did not record

FLOOD INUNDATION

The inundation map (pl. 1) from two topographic maps, shows the area inundated during the 1957 flood. The general procedure used in defining the flood boundaries was to construct the flood profiles described earlier in the text. Then the extent of flooding delineated 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 ft: contour interval, 10 ft).

Conditions presently existing in the channels and along the flood plains conceivably could alter the inundation pattern shown on plate 1. To evaluate the effects of a storm equal in magnitude to that of 1957 under present conditions would involve a more intensive study. Data are now being collected to provide stochastic analyses of the effect of urbanization on the magnitude and frequency of flood discharges.

FLOOD DEPTHS

Approximate depths of flooding can be determined by subtracting ground elevations from the profile elevation at a given point. Caution should be exercised when using this method to determine flood depths, because extensive earthwork in some

areas has significantly altered the contours shown on plate 1, and lines delimiting the inundated areas are accurate only to ± 5 feet. More accurate depths may be obtained by leveling from nearby bench marks to the site in study and subtracting the ground elevation from the elevation from figures 3-6 at the river mileage desired.

SELECTED REFERENCES

Spencer, D. W., and Hauth, L. D., 1968, Floods in Maline Creek basin, St. Louis County, Missouri: U.S. Geol. Survey open-file report, 12 p.

U.S. Geological Survey, 1963, Summary of floods in the United States during 1957: U.S. Geol. Survey Water-Supply Paper 1652-C, p. 55-57.

U.S. Weather Bureau, 1961, Rainfall frequency atlas of the United States: U.S. Weather Bureau Tech. Paper 40, 115 p.

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