

UNITED STATES  
DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

FLOOD OF JUNE 18, 1978, ON HONEY CREEK  
TRIBUTARY, THORNVILLE, OHIO

by Earl E. Webber and Ronald I. Mayo

COLUMBUS, OHIO





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## CONVERSION FACTORS

For those readers who may prefer to use metric units rather than U.S. customary units, the conversion factors for the terms used in this report are listed below:

To convert from	To	Multiply by
mile (mi)	kilometer (km)	1.609
mile <sup>2</sup> (mi <sup>2</sup> )	kilometer <sup>2</sup> (km <sup>2</sup> )	2.590
foot (ft)	meter (m)	0.3048
foot <sup>3</sup> per second (ft <sup>3</sup> /s)	meter <sup>3</sup> per second (m <sup>3</sup> /s)	0.02832

# FLOOD OF JUNE 18, 1978, ON HONEY CREEK TRIBUTARY

## AT THORNVILLE, OHIO

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### ABSTRACT

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A high-intensity summer rain estimated at 8 inches in 2 hours caused flooding on a small stream near Thornville, Ohio, destroying a culvert and highway fill on State Route 188. Computation of peak discharges of 3,250 feet<sup>3</sup> per second at a site 4,400 feet above and of 4,050 feet<sup>3</sup> per second at a site 3,250 feet below the culvert indicates a greater than 100-year flood.

### INTRODUCTION

An intense summer storm resulted in rainfall estimated at 8 inches in 2 hours on a small stream basin southwest of Thornville, Ohio, on June 18, 1978. The resulting flood destroyed a large multiplate pipe arch culvert and a part of the road embankment on State Route 188 at the west edge of Thornville. After the flood, a "bucket survey" of rainfall over the area was made, indirect determinations of peak discharge were made above and below damaged State Route 188, and a flood profile was surveyed in the vicinity of State Route 188.

This study is part of a continuing cooperative program between the U.S. Geological Survey and the Ohio Department of Transportation. Objective of the program is to document hydrologic data on high intensity, infrequent events to expand the data base of extreme floods.

## PRECIPITATION

There are no National Weather Service (NWS) rain gages at Thornville. Listed below are the 24-hour rainfalls at nearby NWS gages for the storm of July 18, 1978:

	Inches
Buckeye Lake -----	1.24
New Lexington -----	.72
Roseville -----	1.47
Zanesville -----	1.21
Newark -----	.98

Six unofficial measurements of rainfall were obtained from local people in or immediately adjacent to the Honey Creek tributary basin. These rainfall data are as follows:

<u>Person</u>	<u>Location</u>	<u>Rain in inches</u>
Curtis Hanby	On State Route 204, 1.6 mi west of Thornville	8
David Clum	On State Route 204, 1.2 mi west of Thornville	8
Vernon Haney	On State Route 204, 0.8 mi west of Thornville	7
-----	1.5 mi south of Thornville	8
-----	On County Road 1.5 mi south of of Thornville	7
Lucie Edley	1.2 mi southwest of Thornville	7

These rainfalls and observed times indicate that about 8 inches of rain fell in 2 hours on the Honey Creek tributary basin. National Weather Service intensity-frequency studies of rainfall in the Ohio River valley (U.S. Weather Service, 1957) indicate that a 2-hour, 100-year rain is about 3.0 inches. Obviously, this 8 inches of rain in 2 hours was rare, as it is 2.7 times larger than the computed 100-year frequency rain.

## FLOOD DATA

Subsequent to the storm, high-water marks and associated hydrologic data were recovered and surveyed at three sites: site 1 at a slope-area reach 4,400 ft upstream from State Route 188; site 2 at State Route 188; and site 3 at State Route 204 (fig. 1). Drainage areas were computed for the three sites, and peak discharges were computed by standard U.S. Geological Survey methods at sites 1 and 3. No reliable peak discharge could be computed at site 2, and only maximum high-water elevations above and below State Route 188 were determined. The resulting hydrologic data are listed in table 1. A description of the analysis of each site follows.

The highwater profile near State Route 188 was referred to the National Geodetic Vertical Datum of 1929 (NGVD) and at the two measurement sites to assumed datums.

### Site 1 (4,400 ft upstream from State Route 188)

The natural flow peak discharge was computed as  $3,250 \text{ ft}^3/\text{s}$  on  $1.71 \text{ mi}^2$  by a four-section slope-area measurement rated fair. The flow here was unaffected by storage or by dam-failure type surge (being upstream from the culvert and road fill destruction) and is considered to be the most reliable determination of peak runoff obtained from this study.

### Site 2 (at State Route 188)

No reliable indirect determination of peak discharge was possible here due to the destruction of the 16-foot 7-inch x 10-foot 1-inch corrugated multiplate arch culvert and the partial destruction of the earthfill on State Route 188. Average maximum high water above State Route 188 was 961.1 ft (NGVD of 1929), and average maximum high water below State Route 188 was 951.2 ft. Drainage area at State Route 188 is  $2.32 \text{ mi}^2$ .

### Site 3 (at State Route 204)

A peak discharge determination of  $4,050 \text{ ft}^3/\text{s}$  on  $2.62 \text{ mi}^2$  was obtained at State Route 204 by contracted-opening and flow-over-road methods. This peak discharge was affected by storage above and subsequent failure of State Route 188 highway fill 2,500 ft upstream.



Index map

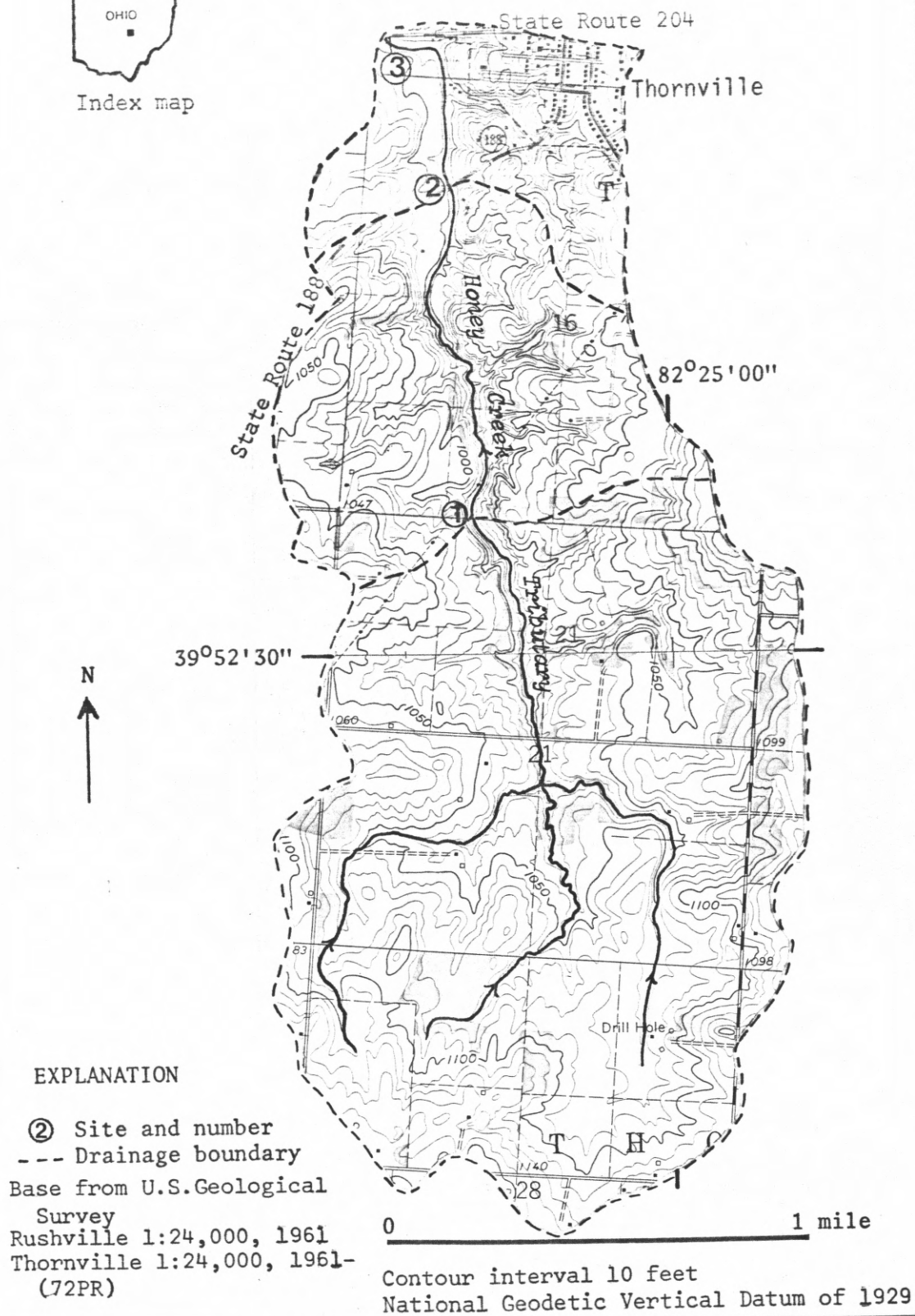


Figure 1.--Study area for flood of June 18, 1978, at Thornville, Ohio

Table 1.--Hydrologic data for flood of June 18, 1978, on Honey Creek tributary at Thornville, Ohio

Number and site location	Drainage area (mi <sup>2</sup> )	Peak discharge (ft <sup>3</sup> /s)	Remarks
1. Lat 39°52'47", long 82°25'32", 4,400 ft upstream from State Route 188 and 1.2 mi south of Thornville.	1.71	3,250	Four-section slope-area measurement. Natural flow conditions.
2. Lat 39°53'28", long 82°25'35" at culvert on State Route 188, 0.45 mi SW of Thornville.	2.32	Not determined	Culvert and road fill washed out. High-water elevation upstream is 961.1 ft (NGVD of 1929). High-water elevation downstream is 951.2 (NGVD of 1929).
3. Lat 39°53'47", long 82°25'46", at bridge on State Route 204, 0.45 mi west of Thornville.	2.62	4,050	Contracted-opening and flow-over-road measurement. Peak discharge affected by upstream storage at State Route 188 and subsequent wash out of road fill and culvert.



## FLOOD FREQUENCY

A flood magnitude and frequency curve was developed at site 1 (1.71 mi<sup>2</sup>) by recently developed methods (Webber and Bartlett, 1976) and is shown in figure 2. The 100-year flood was computed as 1,120 ft<sup>3</sup>/s. Peak discharge on June 18, 1978, was 3,250 ft<sup>3</sup>/s, which is 2.9 times larger than the estimated 100-year flood at this site. The relative magnitude of the computed peak discharge and observed rainfall to their 100-year frequency indicates that both the rainfall and runoff associated with this storm were rare.

## SUMMARY

Eight inches of rain in 2 hours fell on the Honey Creek tributary basin near Thornville, Ohio, on June 18, 1978, and the resulting flood washed out a culvert and road fill on State Route 188. This quantity is 2.7 times larger than the computed 100-year rain of 3 inches in 2 hours. The peak discharge of 3,250 ft<sup>3</sup>/s on 1.71 mi<sup>2</sup> is 2.9 times the 100-year flood of 1,120 ft<sup>3</sup>/s. At the site of the culvert and road fill washout on State Route 188, the average maximum high water above State Route 188 was 961.1 ft (NGVD of 1929) and average maximum high water below was 951.2 ft. Peak discharge at State Route 204, 2,500 ft downstream from the destroyed culvert, was 4,050 ft<sup>3</sup>/s on 2.62 mi<sup>2</sup> and was affected by storage above and subsequent failure of State Route 188 fill.

This flood discharge, 2.9 times larger than the 100-year flood, and the rainfall, 2.7 times larger than the 100-year rainfall, indicate that this storm and subsequent flood were rare.

## SELECTED REFERENCES

- National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Climatological Data, June, 1978, v. 83, no. 6.
- U.S. Department of Commerce, Weather Bureau, 1957, Technical Paper 29, Rainfall Intensity-Frequency Regime, Part 1, the Ohio Valley, 44 p.
- Webber, E. E., and Bartlett, W. P., Jr., 1977, Floods in Ohio--Magnitude and Frequency: Ohio Department Natural Resources, Division of Water Bulletin 45, 74 p.

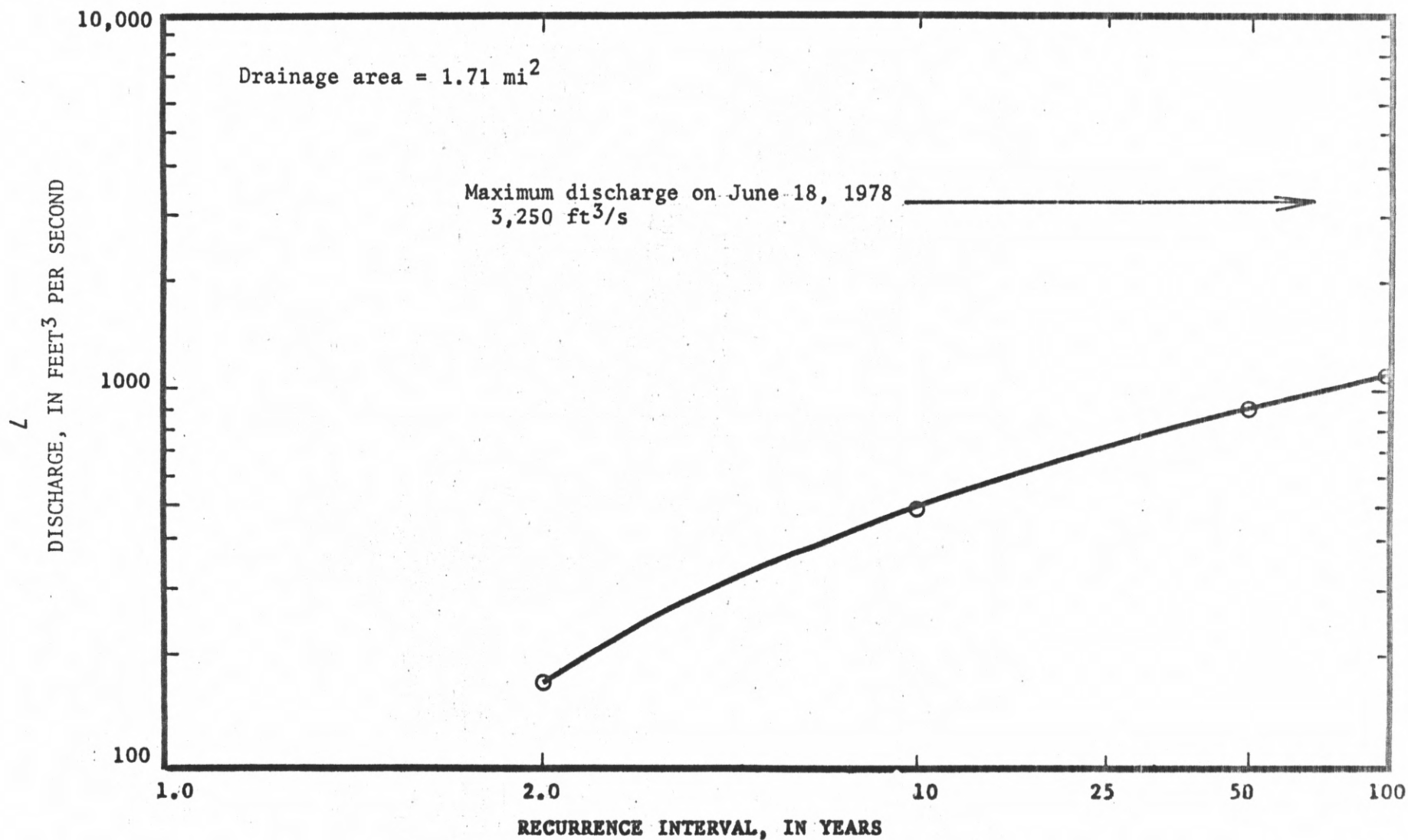


Figure 2.--Magnitude and frequency of floods on Honey Creek tributary at site near Thornville, Ohio



