

FIGURE 1.—Index map



FIGURE 4.—Overflow of the Red Cedar River at Hamilton Street, Okemos.



FIGURE 5.—Overflow of the Red Cedar River at Tacoma Drive, Okemos.

#### FLOOD OF APRIL 1975 AT MERIDIAN TOWNSHIP, MICHIGAN

On April 18 between 5 p.m. and 12 a.m. Meridian Township experienced an intense rain storm that caused the Red Cedar River to overflow its banks resulting in extensive flooding. The Federal Disaster Assistance Administration reported that five homes were destroyed, and 332 homes and 10 businesses damaged. Early estimates indicated that damages may be as high as \$6.25 million.

During the flood the U.S. Geological Survey obtained aerial photography and streamflow data to document the disaster. This report shows, on photomosaic base maps, the extent of flooding along the Red Cedar River and the lower reach of Pine Lake Outlet. Streamflow data obtained at the gaging station on the Red Cedar River at East Lansing, about 3/4 mile (1.2 km) downstream from the western margin of the report area, are given. Information provided within the report is useful in making decisions regarding use of flood plains in the area. It is one of a series of reports on the April 1975 flood in the Lansing metropolitan area.

#### BASIN CHARACTERISTICS

The Red Cedar River begins in southwest Livingston County (fig. 1). Along its course the river has been dredged and aimed in places to accommodate flood runoff. The drainage area of the Red Cedar River at the east boundary of the report area (Meridian Road) is about 315 square miles (815 km<sup>2</sup>). At the west boundary (Hagadorn Road) the drainage area is about 355 square miles (920 km<sup>2</sup>). Glacial materials, primarily of morainal origin, are the principal surface deposits in the basin; outwash occurs along stream channels at some locations. Most of the basin is relatively flat and drainage is not well developed. The highest point in the basin is about 1,050 feet (320 m) above mean sea level. Most of the basin, however, is at an elevation of about 900 ft (270 m). The water surface elevation at the eastern boundary is normally about 340 feet (256 m) above mean sea level. At the western boundary it is normally about 825 feet (251 m). Most of the basin is rural, except in the lower reaches where extensive development has occurred. The Red Cedar River is unregulated although there is a small dam at Williamston about 6 miles (9.7 km) upstream from the western boundary. The impoundment formed by the dam has little storage and consequently has little effect on floodflows.

#### PRECIPITATION

Records of the National Weather Service show that most of the Red Cedar River basin received 4 to 5 inches (102 to 127 mm) of rain during the 7-hour duration of the April 18 storm (fig. 1). Precipitation of that intensity has a frequency of occurrence of about once in 100 years. Areas adjacent to Meridian Township reported precipitation of as much as 5.15 inches (131 mm).

About 2 weeks prior to the storm a heavy snow fell over most of the Red Cedar River basin. As much as 13 inches (330 mm) were recorded at some places. Subsequent melting caused streamflow to be relatively high. In addition, soils became saturated as the snow melted, and their capacity to absorb water was reduced. This condition caused streams to reach higher flood levels than would have normally occurred.

#### FLOOD HISTORY

Streamflow records collected on the Red Cedar River at East Lansing, a short distance downstream, reflect stream conditions in the Township. Streamflow data have been collected at East Lansing since August 1902, except for the period 1905 to 1910.

The National Weather Service has established a flood stage of 7 feet (2.13 m) for East Lansing. At this stage the river is bankfull and flooding begins in low lying areas. Near this stage flooding also begins in low areas in Meridian Township, and thus data obtained at the East Lansing gaging station provide a basis for defining the frequency of flooding in the Township. Flood stages of 7 feet (2.13 m) or more occur almost annually at the East Lansing gage, and may occur several times in one year. Most of these floods cause little damage because the areas inundated are comparatively undeveloped. Table 1 lists floods that have exceeded the 7-foot (2.13 m) flood stage by about 2 feet (0.6 m) or more. The April 1975 flood was the highest since 1904, and was approximately equal to that of April 1947.

Table 1.—Highest known floods on the Red Cedar River at East Lansing.

Date	Stage (ft)	Discharge (ft <sup>3</sup> /s)
March 24, 1904	13.4	8,000
April 3, 1912	9.5	4,100
March 27, 1916	10.2	4,700
March 15, 1918	10.7	5,130
March 13, 1920	9.0	3,680
February 14, 1938	9.2	4,020
April 7, 1947	11.6	5,920
March 20, 1948	10.5	4,960
May 11, 1948	10.0	4,530
March 31, 1960	9.2	3,380
April 20, 1975	12.0	5,940

#### FLOODED AREAS

The extent of flooding along the Red Cedar River and Pine Lake Outlet is shown on the photomosaic base maps. The areas covered by the photomosaic base maps are shown on figure 1. The photomosaic base maps have not been corrected for distortion caused by camera tilt or minor changes of altitude during flight. Although distortion might cause a slight error in the linear scale or in the alignment of the photographs, it has no effect on the boundaries of the flooding. The photographs were taken about 9:45 a.m. on April 20, 1975. Streamflow records obtained at East Lansing indicate that the flood crested about 12 hours after the photographs were taken. The stage of the river had increased only about 3 to 4 inches (76 to 102 mm) during the 12-hour period, and thus photography was taken very near the flood peak in areas near East Lansing. In upstream reaches where the river crested earlier, the photography was taken at about the time of peak stage. Consequently, areas shown as being inundated on the mosaics depict the maximum extent of the flood. Although the flooding was clearly visible in most photographs, flooding may have extended slightly beyond the outlined areas in a few places.

#### STREAM DISCHARGE

Discharge data obtained at East Lansing are equivalent to those at the western boundary of Meridian Township. Discharge is about 10 percent lower at the eastern boundary. The discharge hydrograph for East Lansing is shown in figure 2. The peak discharge of 5,940 ft<sup>3</sup>/s (168 m<sup>3</sup>/s) occurred near midnight on April 20. This discharge is equivalent to a runoff of about 17 in (430 mm) per square mile of drainage area. This runoff is high, but it is low if compared to that of some nearby streams (table 2). Streams having small drainage areas had appreciably higher runoff than did the Red Cedar River.

Table 2.—Peak discharges at selected gaging stations near Meridian Township.

Stream	Drainage Area (mi <sup>2</sup> )	Peak Discharge (ft <sup>3</sup> /s)	Runoff (in/ft <sup>2</sup> /s)
Red Cedar River at H-52	163	2,650	16.3
Deer Creek near Danville	16.3	962	59.0
Sloan Creek near Williamston	9.34	1,290	138
Red Cedar River at East Lansing	355	5,940	16.7
Sycamore Creek near Holt	80.6	2,110	26.2
Nod Lake Drain near Holt	4.28	485	113
Grand River at Lansing	1,230	11,200	9.11
Carrier Creek near Lansing	12.1	532	44.0

#### FLOOD FREQUENCY

The frequency of a flood may be expressed in terms of recurrence interval or of probability of occurrence. Recurrence interval is the average interval of time within which a flood of a given magnitude will be equaled or exceeded once. Probability of occurrence is the inverse of recurrence interval.

The frequency with which a flood of a given magnitude can be expected to occur on the Red Cedar River at East Lansing can be determined from figure 3. The flood of April 1975 had a recurrence interval of about 40 years or about a 2.5 percent chance of occurrence in any year. Floods, however, do not occur at regular intervals nor can the chance of their occurrence be predicted. A flood equal to or greater than that of April 1975 can occur at any time. It is thus important to recognize potential flood problems and to adopt land use practices designed to protect communities against flood losses.

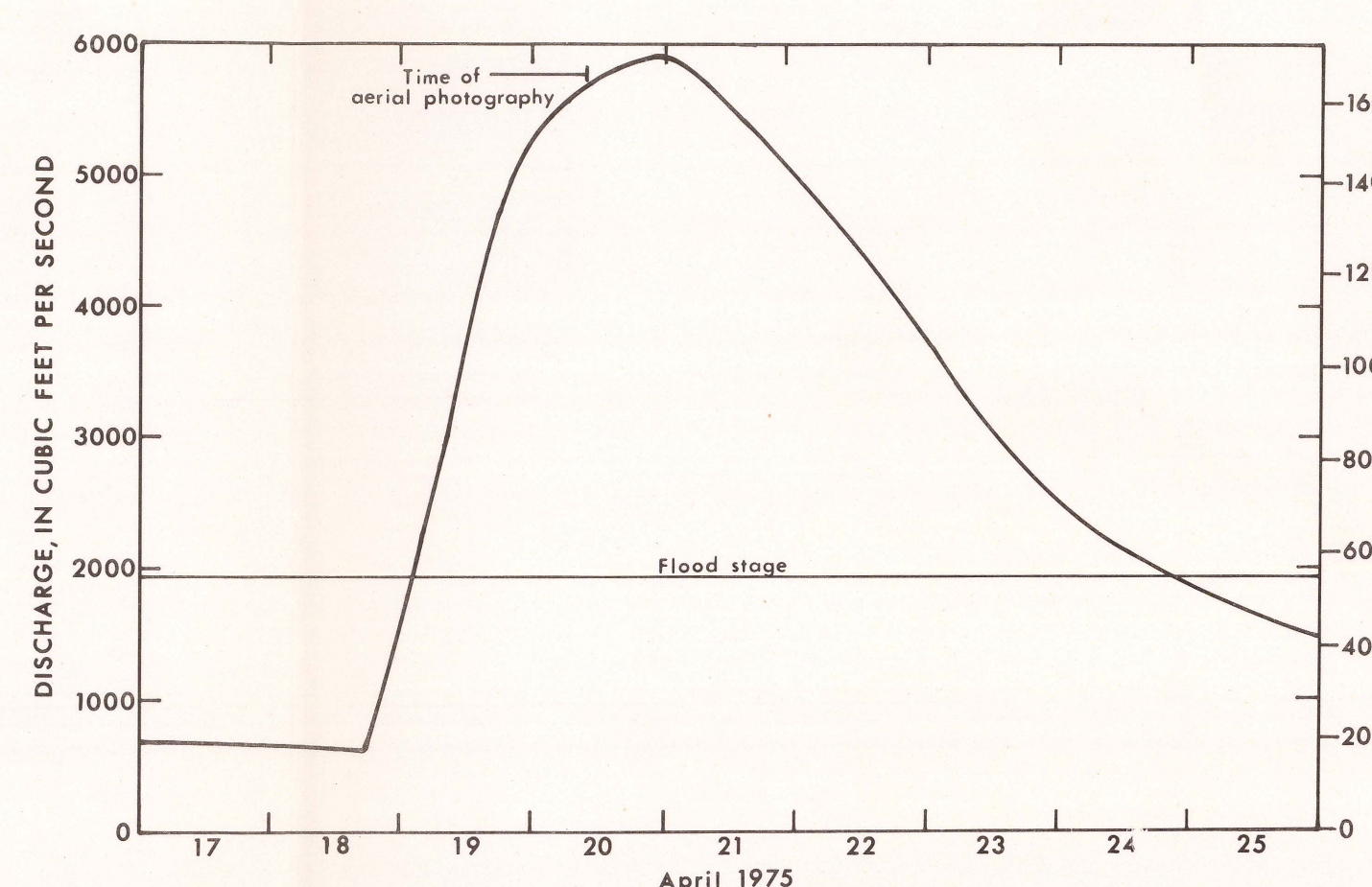


Figure 2.—Discharge hydrograph for the Red Cedar River at East Lansing.

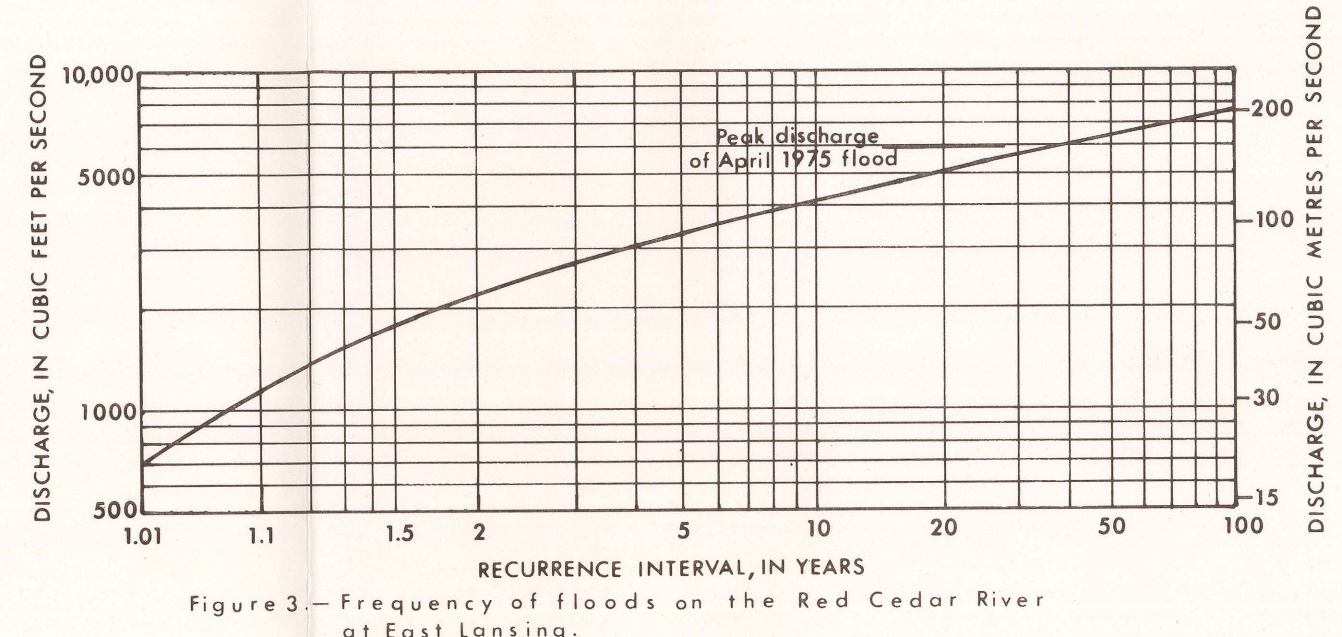


Figure 3.—Frequency of floods on the Red Cedar River at East Lansing.

#### EXPLANATION

Area flooded April 1975  
 Boundary of April 1975 flood (Boundary dashed where estimated)  
 Direction of flow  
 APPROXIMATE SCALE  
 0 200 400 600 800 1000 FEET  
 0 100 200 300 METERS

#### ADDITIONAL INFORMATION

Other information pertaining to floods on the Red Cedar River in Meridian Township may be obtained from the U.S. Geological Survey, Okemos, Michigan, and from the following reports:

U.S. Army, Corps of Engineers, 1968, Flood plain information, Red Cedar River, Ingham County, Michigan; U.S. Army Corps of Engineers, Detroit District, Detroit, Michigan, 28 p.

Wittala, S. W., 1965, Magnitude and frequency of floods in the United States, Part 4, St. Lawrence River basin; U.S. Geol. Survey Water Supply Paper 1677, 267 p.

Table 3.—Factors for converting English units to International System (SI) units.

Multiply English units by	To obtain SI units
inches (in)	25.4 millimetres (mm)
feet (ft)	.3048 metres (m)
miles (mi)	1.609 kilometres (km)
square miles (mi <sup>2</sup> )	2.590 square kilometres (km <sup>2</sup> )
cubic feet (ft <sup>3</sup> )	.02832 cubic metres (m <sup>3</sup> )

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