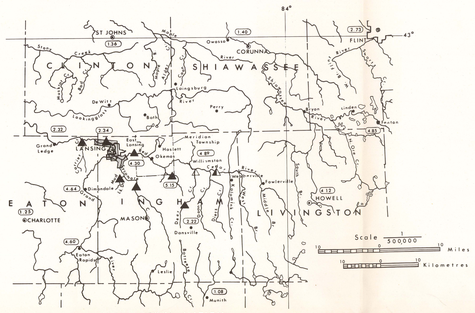
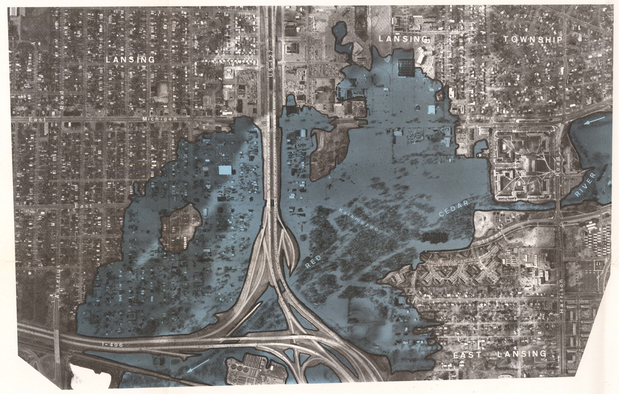



FIGURE 1. — Index map

Photograph by Norris Ingalls, The State Journal

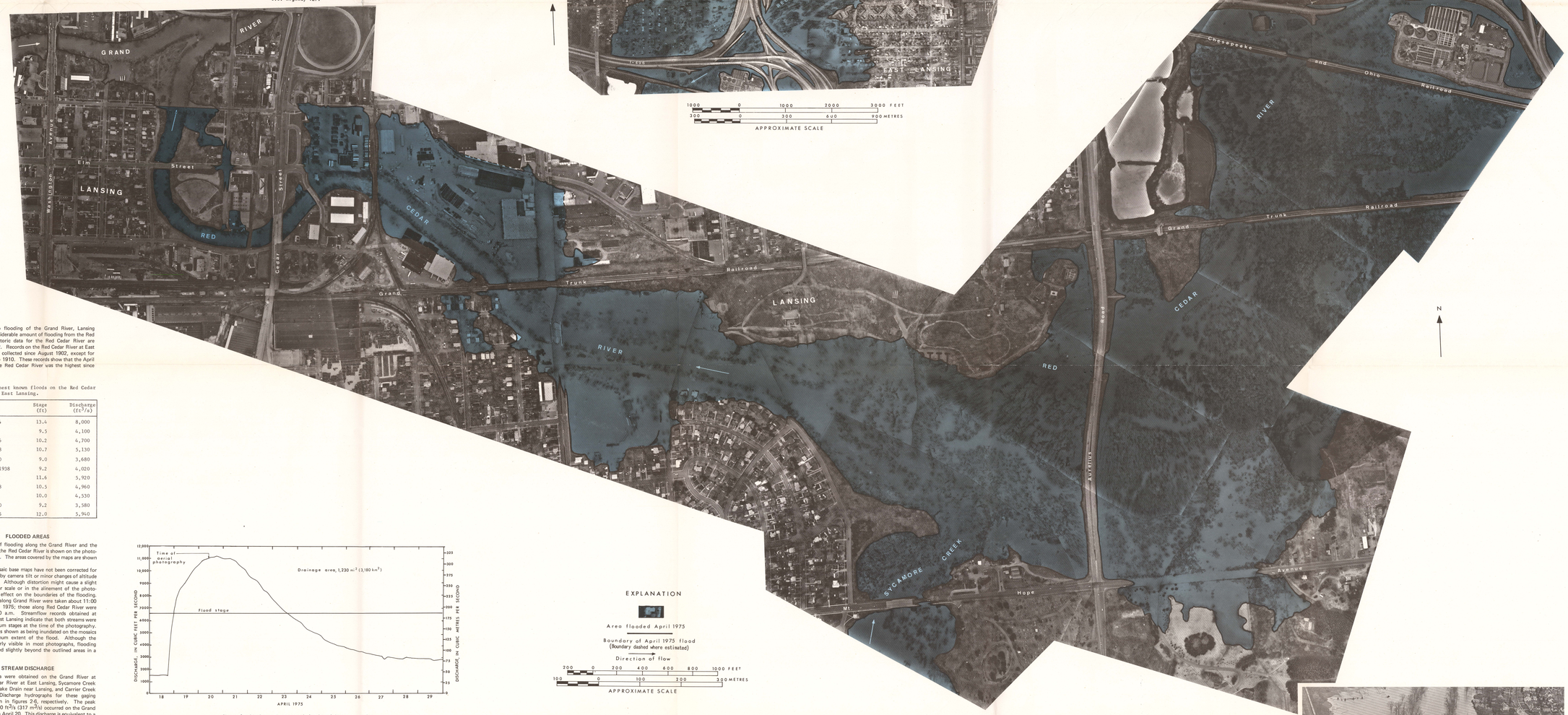
FIGURE 7.--Overflow of the Red Cedar River at Michigan Avenue and U.S. Highway 127.





Photograph by Norris Ingalls, The State Journal

FIGURE 8.--Overflow of the Red Cedar River at Kalamazoo Street.




## FLOOD OF APRIL 1975 AT LANSING, MICHIGAN

On April 18 between 5 p.m. and 12 p.m. an intense rainstorm fell in the Lansing area resulting in extensive flooding. The Federal Disaster Assistance Administration estimated that 175 homes were damaged to at least half their value, 4,500 homes received some damage, with additional losses to schools, utilities, hospitals, and transportation systems. Early estimates indicated that damages may be as high as $20 million.

During the time of flooding 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 in the Lansing area. Areas included are the lower reaches of the Red Cedar River and Sycamore Creek and the Grand River downstream from the confluence of the Red Cedar River. Little flooding occurred on the Grand River upstream from the Red Cedar so, although aerial photography was obtained for that reach, photomosaics were not prepared. Streamflow data collected at five gaging stations near Lansing are given. Information on the magnitude of the flood should be 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

From its headwaters in the northeastern part of Hillsdale County, about 60 miles south of Lansing, the Grand River flows in a northerly direction to Lansing then in a westerly direction to Lake Michigan. The drainage area of the Grand River above the gaging station at North Grand River Avenue in Lansing is about 1,230 square miles (3,190 km$^2$). Of this total, about 474 square miles (1,230 km$^2$) are drained by the Red Cedar River which joins the Grand River at Lansing.

Glacial materials, primarily of morainal origin, are the principal deposits in the basin; outwash occurs along stream channels in some places. The topography ranges in elevation from about 1,100 feet (335 m) in the headwaters to about 820 feet (250 m) at Lansing. Most of the basin is rural except for the Lansing area which is extensively developed.

### PRECIPITATION

Records of the National Weather Service show that the Grand 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 on the average. In nearby areas, precipitation of as much as 5.15 inches (131 mm) was reported.

About 2 weeks prior to the storm, a heavy snow fell in the Lansing area. 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 probably caused streams to reach higher flood levels than they would have otherwise.

### FLOOD HISTORY

Streamflow records have been collected on the Grand River at Lansing since 1901. During this time, floods on the Grand River equal to or greater in discharge than the 1975 flood have occurred six times (table 1). The National Weather Service has established a flood stage of 11 feet (3.35 m) for Lansing. At this stage the river is bankfull and flooding begins in low lying areas. Table 1 lists floods that have exceeded the 11 foot (3.35 m) flood stage by about 2 feet (0.6 m) or more.

Table 1.--Highest known floods on the Grand River at Lansing.

| Date | Stage (ft) | Elevation (ft) | Peak Discharge (ft$^3$/s) |
|---|---|---|---|
| March 10, 1904 | 13.8 | 819.3 | 10,500 |
| March 26, 1904 | 20.2 | 825.7 | 24,500 |
| June 7, 1905 | 15.2 | 820.7 | 12,800 |
| March 14, 1908 | 14.8 | 820.3 | 12,200 |
| April 5, 1912 | 13.0 | 818.5 | 9,290 |
| March 29, 1916 | 14.2 | 819.7 | 11,100 |
| March 15, 1918 | 16.7 | 822.2 | 15,800 |
| April 7, 1947 | 16.9 | 822.4 | 16,400 |
| March 21, 1948 | 14.7 | 820.2 | 12,000 |
| April 20, 1975 | 15.6 | 821.0 | 11,200 |

In addition to flooding of the Grand River, Lansing experienced a considerable amount of flooding from the Red Cedar River. Historic data for the Red Cedar River are provided in table 2. Records on the Red Cedar River at East Lansing have been collected since August 1902, except for the period 1905 to 1910. These records show that the April 1975 flood on the Red Cedar River was the highest since 1904.

Table 2.--Highest known floods on the Red Cedar River at East Lansing.

| Date | Stage (ft) | Discharge (ft$^3$/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 | 3,580 |
| April 20, 1975 | 12.0 | 5,940 |

### FLOODED AREAS

The extent of flooding along the Grand River and the lower reaches of the Red Cedar River is shown on the photomosaic base maps. The areas covered by the 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 the flight. Although distortion might cause a slight error in the linear scale or in the alinement of the photographs, it has no effect on the boundaries of the flooding. The photographs along Grand River were taken about 11:00 a.m. on April 20, 1975; those along Red Cedar River were taken about 9:30 a.m. Streamflow records obtained at Lansing and at East Lansing indicate that both streams were near their maximum stages at the time of the photography. 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 were obtained on the Grand River at Lansing, Red Cedar River at East Lansing, Sycamore Creek near Holt, Mud Lake Drain near Lansing, and Carrier Creek near Lansing. Discharge hydrographs for these gaging stations are shown in figures 2-6, respectively. The peak discharge of 11,200 ft$^3$/s (317 m$^3$/s) occurred on the Grand River at 6 p.m. on April 20. This discharge is equivalent to a runoff of 9.11 ft$^3$/s (0.26 m$^3$/s) per square mile of drainage area. This runoff is relatively low when compared to that of some nearby streams (table 3). Streams with small drainage areas had appreciably higher runoff than did the Grand River.

Table 3.--Peak discharges at selected gaging stations in the Lansing metropolitan area.

| Stream | Drainage Area (mi$^2$) | Peak Discharge (ft$^3$/s) | Runoff $\left[(ft^3/s)/mi^2\right]$ |
|---|---|---|---|
| Red Cedar River at M-52 | 163 | 2,650 | 16.3 |
| Deer Creek near Dansville | 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 |
| Mud 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 |




Figure 2.—Discharge hydrograph for Grand River at Lansing

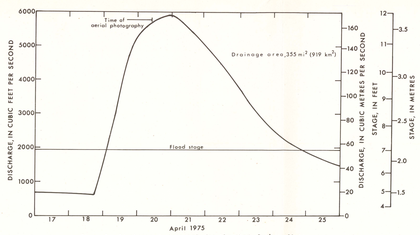



Figure 3.—Discharge hydrograph for the Red Cedar River at East Lansing.

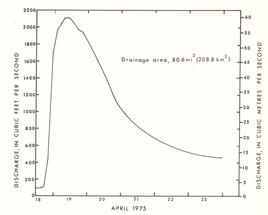



Figure 4.—Discharge hydrograph for Sycamore Creek near Holt.

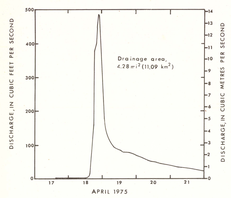



Figure 5.—Discharge hydrograph for Mud Lake Drain at Lansing.

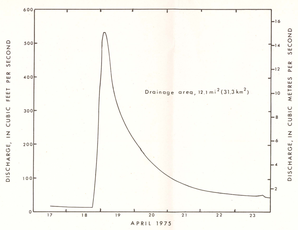



Figure 6.—Discharge hydrograph for Carrier Creek near Lansing

EXPLANATION

Area flooded April 1975

Boundary of April 1975 flood (Boundary dashed where estimated)

Direction of flow

200 0 200 400 600 800 1000 FEET

100 0 100 200 300 METRES

APPROXIMATE SCALE

Photograph by Norris Ingalls, The State Journal

FIGURE 9.--Overflow of the Red Cedar River at Pennsylvania Avenue and the Grand Trunk Railroad.



# FLOOD OF APRIL 1975 AT LANSING, MICHIGAN

By
J.B.Miller and L.A.Swallow

1975