# FLOODS OF MARCH 1982 IN INDIANA, OHIO, MICHIGAN, AND ILLINOIS

Report prepared jointly by the U.S. Geological Survey
and the National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF THE INTERIOR

U.S. DEPARTMENT OF COMMERCE

U.S. GEOLOGICAL SURVEY PROFESSIONAL PAPER 1467

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# FLOODS OF MARCH 1982 IN INDIANA, OHIO, MICHIGAN, AND ILLINOIS

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UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, Secretary

GEOLOGICAL SURVEY

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UNITED STATES
DEPARTMENT OF COMMERCE

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NATIONAL OCEANIC AND
ATMOSPHERIC ADMINISTRATION

William E. Evans, Administrator



**Library of Congress Cataloging in Publication Data**

Glatfelter, D.R. (Dale R.)
Floods of March 1982 in Indiana, Ohio, Michigan, and Illinois.

(Geological Survey professional paper ; 1467)
Bibliography: p.
Supt. of Docs. no.: I 19.16:1467
1. Floods—Middle West. I. Chin, Edwin H. II. Geological Survey (U.S.) III. United States. National Oceanic and Atmospheric Administration. IV. Title. V. Series.
GB1399.4.M6G53 1988 551.48'9'0977 87–600017

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# FACTORS FOR CONVERTING INCH-POUND UNITS TO THE INTERNATIONAL SYSTEM OF UNITS (SI)

For the convenience of readers who prefer metric (International System) units rather than the inch-pound units used in this report, the following conversion factors may be used:

| *Multiply inch-pound unit* | *By* | *To obtain SI unit* |
|---|---|---|
| acre-foot (acre-ft) | 1,233 | cubic meter ($m^3$) |
| foot (ft) | 0.3048 | meter (m) |
| cubic foot per second ($ft^3/s$) | 0.02832 | cubic meter per second ($m^3/s$) |
| cubic foot per second per square mile [$(ft^3/s)/mi^2$] | 0.01093 | cubic meter per second per square kilometer [$(m^3/s)/km^2$] |
| gallon (gal) | 3.785 | liter (L) |
| inch (in) | 2.54 | centimeter (cm) |
| mile (mi) | 1.609 | kilometer (km) |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |

Temperature in degrees Fahrenheit (°F) can be converted to degrees Celsius (°C) as follows: °C = 5/9 (°F−32).

# GLOSSARY

**Backwater.** The resulting water surface upstream from an obstruction.

**Continuous-record station.** *See* **Gaging station.**

**Contributing drainage area.** The portion of drainage area that contributes directly to surface runoff.

**Crest-stage partial-record station.** A particular stream location where limited peak data are collected systematically over a period of years.

**Cubic foot per second ($ft^3/s$).** The rate of discharge representing a volume of 1 cubic foot of water passing a given point in 1 second. This rate is equivalent to a 24-hour volume of 86,400 cubic feet or 646,317 gallons or 1.983471 acre-feet.

**Cubic foot per second per square mile [$(ft^3/s)/mi^2$].** The number of cubic feet of water flowing per second per square mile of area drained.

**Dike.** An embankment constructed along a riverbank to prevent flooding.

**Discharge.** A volume of water passing a given point within a given period of time, in cubic feet per second.

**Drainage area.** The area of a stream basin upstream from a specified location, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the stream above the specified point. Drainage areas given in this report exclude the part of the total drainage area that does not contribute directly to surface runoff.

**Drainage basin.** The area drained by a given stream and its tributaries.

**Flood hydrograph.** A graphical representation of stream discharge at a given point as a function of time.

**Front.** The transition zone between two air masses having different densities.

**Gage height.** The water-surface elevation referred to some arbitrary gage datum.

**Gaging station.** A particular site on a stream or lake where observations of gage height are continuously recorded.

**Hydrograph.** A graph showing relation of stage, discharge, or other characteristics of water to time.

**Levee.** *See* **Dike.**

**NWS.** National Weather Service, National Oceanic and Atmospheric Administration, Department of Commerce.

**Precipitation-distribution map.** A map showing distribution of precipitation of a specified period drawn as lines of equal rainfall.

**Recurrence interval.** The average number of years within which a flood stage or discharge is statistically expected to be exceeded once. In terms of probability, for example, there is a 2-percent chance that a 50-year flood will occur in any given year.

**Snowmelt.** Runoff from melting snow.

**Snowpack.** Accumulated snow on the ground at a given time.

**Stage.** *See* **Gage height.**

**Streamflow.** *See* **Discharge.**

**Water equivalent.** The depth of water that would result from the melting of a snowpack, in inches of water.

**Water year.** The period from October 1 through September 30.

# FLOODS OF MARCH 1982 IN INDIANA, OHIO, MICHIGAN, AND ILLINOIS

By Dale R. Glatfelter, U.S. Geological Survey, and Edwin H. Chin, National Weather Service, National Oceanic and Atmospheric Administration

ABSTRACT

Rapid melting of a snowpack containing up to 6 in of water equivalent, occurring at the same time as moderate rainfall of up to 3 in, caused major flooding in March 1982 in northern Indiana, northwestern Ohio, southern Michigan, and northeastern Illinois. The floods resulted in the loss of at least six lives, caused millions of dollars in property damage, and forced the evacuation of more than 15,000 people.

Peak discharges during that period at several gaging stations in the Wabash River, St. Joseph River, River Raisin, Maumee River, and Kankakee River basins have recurrence intervals of 50 yr to greater than 100 yr. Particular attention is given in this report to the Maumee River basin, where flooding on most large streams was the worst since the devastating flood of 1913. In Fort Wayne, Ind., flooding of the Maumee River and its tributaries, the St. Marys and the St. Joseph Rivers, damaged 1,500 homes and 100 businesses, forced the evacuation of 9,000 people, and caused $51 million in damage. A major flood-fighting effort prevented millions of dollars of additional damage.

Data collected by the National Weather Service document the severity and the sequence of the meteorological conditions that provided the potential for and triggered the floods. Included in the report are weather maps, atmospheric soundings, temperature data, snow-depth and water-equivalent data, and precipitation data.

Streamflow data were collected by the U.S. Geological Survey at 83 gaging stations and partial-record sites in the area affected by the floods. The report contains peak stage and discharge data, discharge hydrographs, monthly streamflow statistics, and flood-frequency analyses.

## INTRODUCTION

In March 1982, moderate rainfall of up to 3 in, which occurred at the same time as melting of a snowpack containing up to 6 in of water equivalent, caused major flooding in northern Indiana, northwestern Ohio, southern Michigan, and northeastern Illinois. The floods caused at least six deaths and forced the evacuation of about 15,000 people. The region affected by the March 1982 floods is shown in figure 1. Peak discharges recorded at several gaging stations in the Wabash River, St. Joseph River, River Raisin, Maumee River, and Kankakee River basins have recurrence intervals of 50 yr to greater than 100 yr (Glatfelter and others, 1984).

Flooding in the Wabash River basin was primarily confined to the Little, Eel, and Tippecanoe Rivers, major tributaries draining from the north into the Wabash River. The snowpack south of the Wabash River was less dense and less extensive than the snowpack farther north. Therefore, runoff was less in tributaries draining from the south.

Streamflow in the St. Joseph River in Michigan and Indiana was the highest since the flood in April 1950. Prairie River, Fawn River, Pigeon Creek, and Elkhart River, major tributaries draining the southeastern part of the St. Joseph River basin, experienced floods having recurrence intervals of 50 yr or greater. The highest stage and discharge at the gaging station on the Elkhart River at Goshen, Ind. (site 40), for the period of record (1932–82)—11.94 ft and 6,180 $ft^3/s$—were recorded on March 14. (Site numbers are given in table 2.) These values exceed the stage and discharge of April 1950—10.15 ft and 5,440 $ft^3/s$.

Severe flooding occurred in the River Raisin basin in southeastern Michigan. The highest stage and discharge at the gaging station on the River Raisin near Monroe, Mich. (site 49), for the period of record (1938–82) were recorded in March 1982. A peak stage of 11.16 ft caused by backwater from ice was recorded on March 15; peak instantaneous discharge of 15,300 $ft^3/s$ was recorded on March 16.

Flooding in March 1982 on most large streams in the Maumee River basin in northeastern Indiana and northwestern Ohio was the worst since the devastating flood of March 1913. The Maumee River basin was the scene of major flood-fighting efforts, particularly in the vicinity of Fort Wayne, Ind. The peak stage of 25.93 ft, recorded March 17 at the gaging station on the Maumee River at Fort Wayne (site 59), was only 0.2 ft lower than the March 1913 peak of 26.10 ft, which was the worst flood known in the area. Flooding in Fort Wayne was compounded because the river remained above flood state (15.0 ft) from March 12 through March 26. The prolonged high stage saturated and strained the dikes protecting the city.

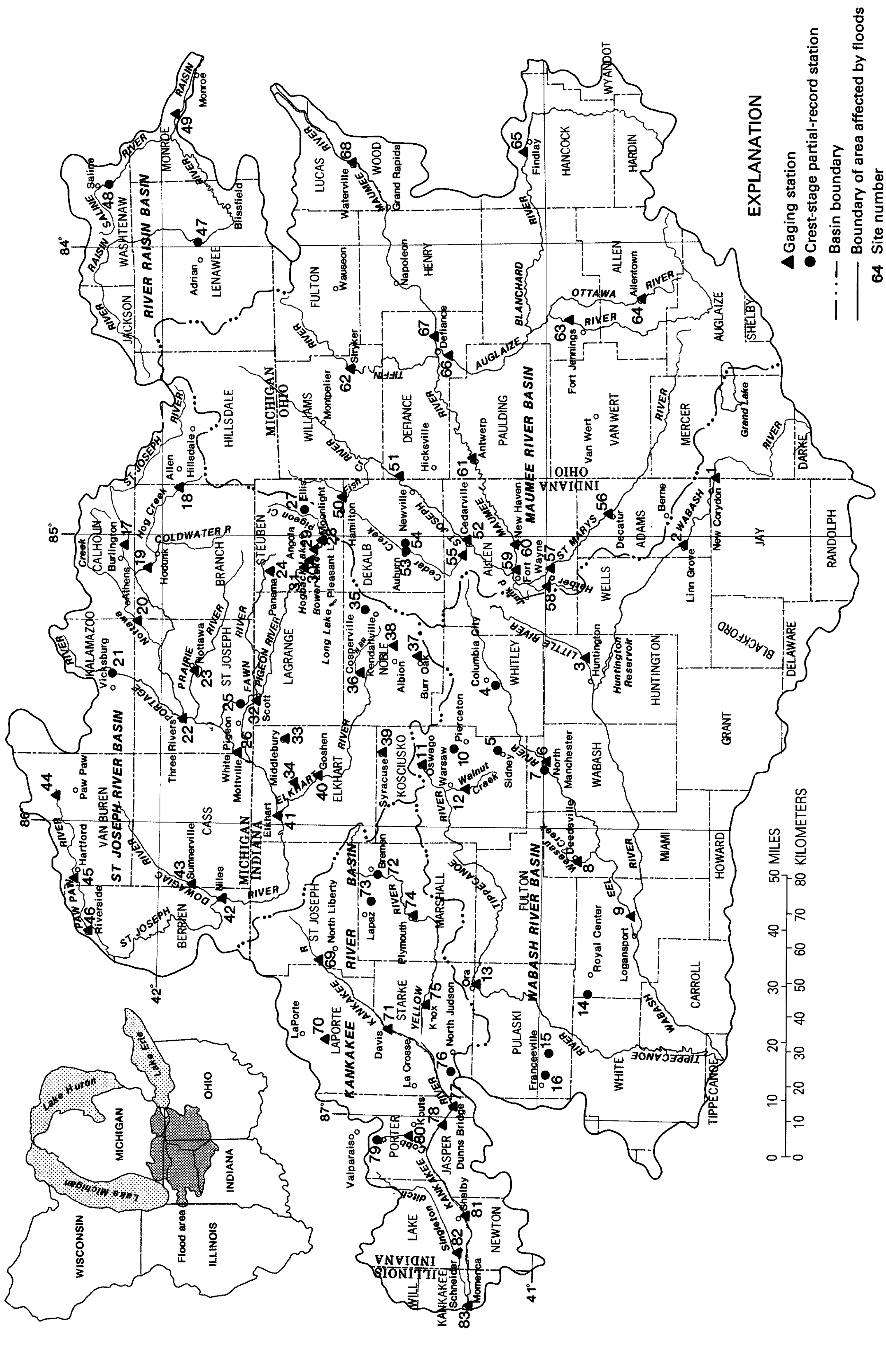



FIGURE 1.—Flood area and locations of streamflow data sites in Indiana, Ohio, Michigan, and Illinois.

Peak discharges that have recurrence intervals of greater than 100 yr were recorded at gaging stations on the Kankakee River and its major tributary, the Yellow River. Flooding on the Yellow River was the worst since October 1954. The Kankakee River at Shelby, Ind. (site 81), remained above flood stage (9.0 ft) from March 12 through May 6. This prolonged period of high water caused numerous breaks in the levee system, resulting in the flooding of thousands of acres of farmland in northwestern Indiana.

### PURPOSE AND SCOPE

This report is one of a continuing series of flood reports written jointly by the National Weather Service, National Oceanic and Atmospheric Administration, Department of Commerce and the Water Resources Division, U.S. Geological Survey, Department of the Interior. The purpose of the report is to document meteorological conditions and resultant floods in March 1982 in northern Indiana, northwestern Ohio, southern Michigan, and northeastern Illinois. Particular attention is given to the events around Fort Wayne, Ind., where 1,500 homes and 100 businesses were damaged, 9,000 people were evacuated, and $51 million in damage was reported.

Data collected by the National Weather Service (NWS) document the severity and the sequence of meteorological conditions that provided the potential for and triggered the floods. This report includes weather maps, atmospheric soundings, temperature data, snow-depth and water-equivalent data, and precipitation data.

Streamflow data were collected by the U.S. Geological Survey at 83 gaging stations and partial-record sites in the area affected by the floods. Included in the report are peak stage and discharge data, discharge hydrographs, monthly streamflow statistics, and flood-frequency analyses.

Compilation of the meteorological and hydrologic data in this report is intended to provide a convenient reference for hydraulic planning. Analysis of floods such as the one in March 1982 can aid in promoting prudent development in any river basin where the potential for severe flooding exists.

### ACKNOWLEDGMENTS

Estimates of damage and additional information were supplied by the U.S. Army Corps of Engineers, Detroit District, and by the Federal Emergency Management Agency, Region V. Photographs contained in the report were taken by staff photographers of *The Fort Wayne Journal-Gazette* and *The Fort Wayne News-Sentinel.*

## METEOROLOGICAL CONDITIONS

### METEOROLOGICAL SETTING

March 1982 floods affected areas in nine NWS climatic divisions in four States (National Oceanic and Atmospheric Administration, 1981–82a—1981–82d): Indiana—Northeast, North Central, and Northwest; Ohio—Northwest; Michigan—Southwest Lower, South Central Lower, and Southeast Lower; and Illinois—Northeast and East. Average precipitation over these climatic divisions from December 1981 through February 1982 and the departure from normal are shown in table 1. For the Indiana Northeast division, where flooding was most severe, average precipitation from December through February was 34 percent above normal.

Above-average autumnal precipitation resulted in moist soil conditions at the onset of the first significant snowfall over the region on December 17. Additional snowfall during the remainder of the month produced a snow cover of 6 to 15 in throughout the region. Snow cover decreased the first week of January 1982 as temperatures rose to above 40 °F. Soil moisture increased as the unfrozen ground absorbed some of the melted snow.

Record snowfall and low temperatures prevailed during the remainder of January. High winds removed snow cover from unprotected locations and caused heavy drifting in shielded areas. Exposed ground froze quickly as temperatures plunged to record lows of -10 to -20 °F at many locations on January 10 and remained near or below 0 °F for almost 2 days. Another mass of cold air accompanied by high winds and temperatures near -20 °F moved into the region January 17 and froze exposed soils to depths of up to 3 ft.

Moderate to heavy rainfall on January 23 and January 30 saturated and compacted the snowpack. Subzero temperatures after each rain formed an ice layer at least 1 in thick between the snow and the ground surface.

Heavy snowfall and temperatures below 32 °F from January 31 through February 10 produced and maintained an extensive snowpack. Temperatures below -10 °F were recorded at most locations in the study area on February 10. Snow depth decreased by monthend as moderating temperatures and rainfall compacted the snowpack. Additional snow and rain during the period March 1–9 added to a snowpack that already contained a high water equivalent.

Temperature and snow depth for three NWS stations—Montpelier, Ohio; Fort Wayne, Ind.; and Berne, Ind.—(figs. 2–4) represent conditions in the Maumee River basin from December 1981 through March 1982. At Fort Wayne, in particular, an all-time record of 71.2 in of snow fell during the winter of 1981–82 through March 15. Extremely low temperatures and high water equivalent of an excessive winter snowfall combined to provide the potential for the March 1982 floods.

TABLE 1.—*Average precipitation and departures from normal for December 1981 through February 1982 in affected NWS climatic divisions in four States*

[In inches]

| Month | Indiana | | | | | | Ohio | |
|---|---|---|---|---|---|---|---|---|
| | Northeast | | North Central | | Northwest | | Northwest | |
| | Average precipitation | Departure from normal | Average precipitation | Departure from normal | Average precipitation | Departure from normal | Average precipitation | Departure from normal |
| Dec. | 2.64 | 0.38 | 2.22 | 0.00 | 1.88 | −0.38 | 2.67 | 0.49 |
| Jan. | 3.69 | 1.43 | 4.27 | 2.13 | 3.18 | 1.15 | 3.45 | 1.22 |
| Feb. | 2.21 | .34 | 1.60 | −.22 | 1.29 | −0.54 | 2.06 | .19 |
| Total | 8.54 | 2.15 | 8.09 | 1.91 | 6.35 | .23 | 8.18 | 1.90 |

| Month | Michigan | | | | | | Illinois | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Southwest Lower | | South Central Lower | | Southeast Lower | | Northeast | | East | |
| | Average precipitation | Departure from normal | Average precipitation | Departure from normal | Average precipitation | Departure from normal | Average precipitation | Departure from normal | Average precipitation | Departure from normal |
| Dec. | 1.46 | −0.96 | 1.34 | −0.60 | 1.88 | −0.17 | 1.04 | −0.89 | 1.89 | −0.20 |
| Jan. | 3.48 | 1.26 | 2.27 | .45 | 2.80 | .99 | 2.40 | .59 | 3.65 | 1.80 |
| Feb. | .79 | −.95 | 1.21 | −.34 | 1.43 | −.25 | .76 | −.69 | 1.41 | −.35 |
| Total | 5.73 | −.65 | 4.82 | −.49 | 6.11 | .57 | 4.20 | −.99 | 6.95 | 1.25 |

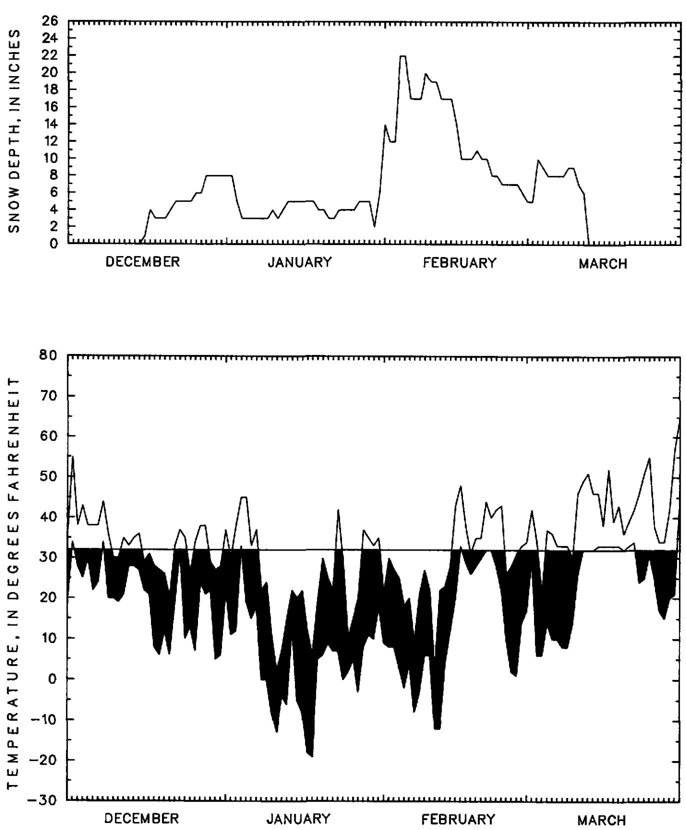



FIGURE 2.—Daily temperature and snow depth, December 1981 through March 1982, Montpelier, Ohio.

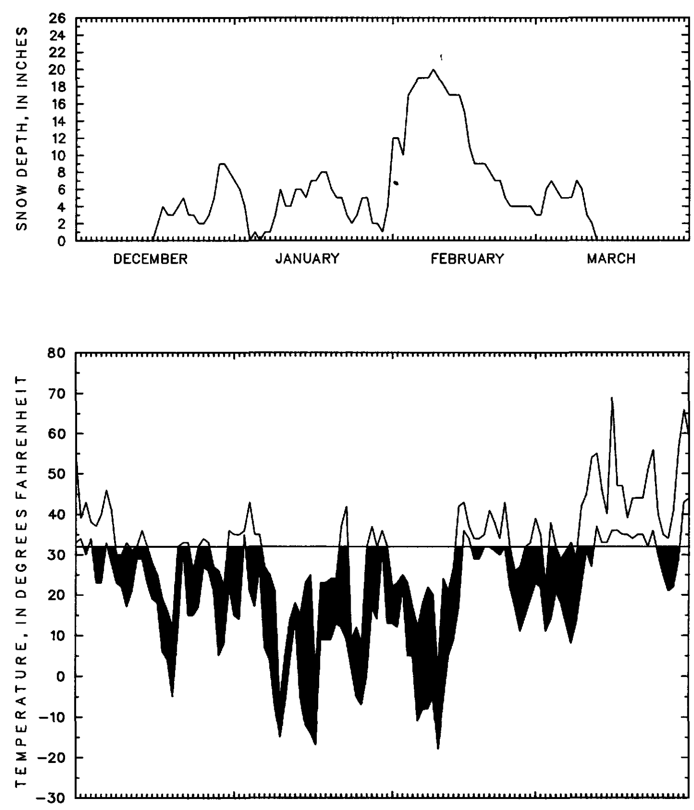



FIGURE 3.—Daily temperature and snow depth, December 1981 through March 1982, Fort Wayne, Ind.

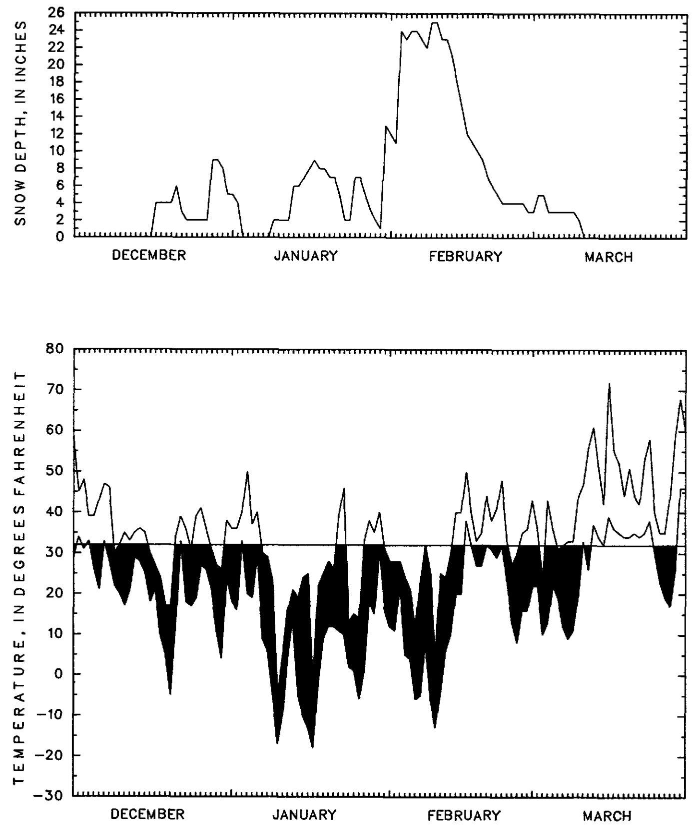



FIGURE 4.—Daily temperature and snow depth, December 1981 through March 1982, Berne, Ind.

## WATER EQUIVALENT OF SNOWPACK

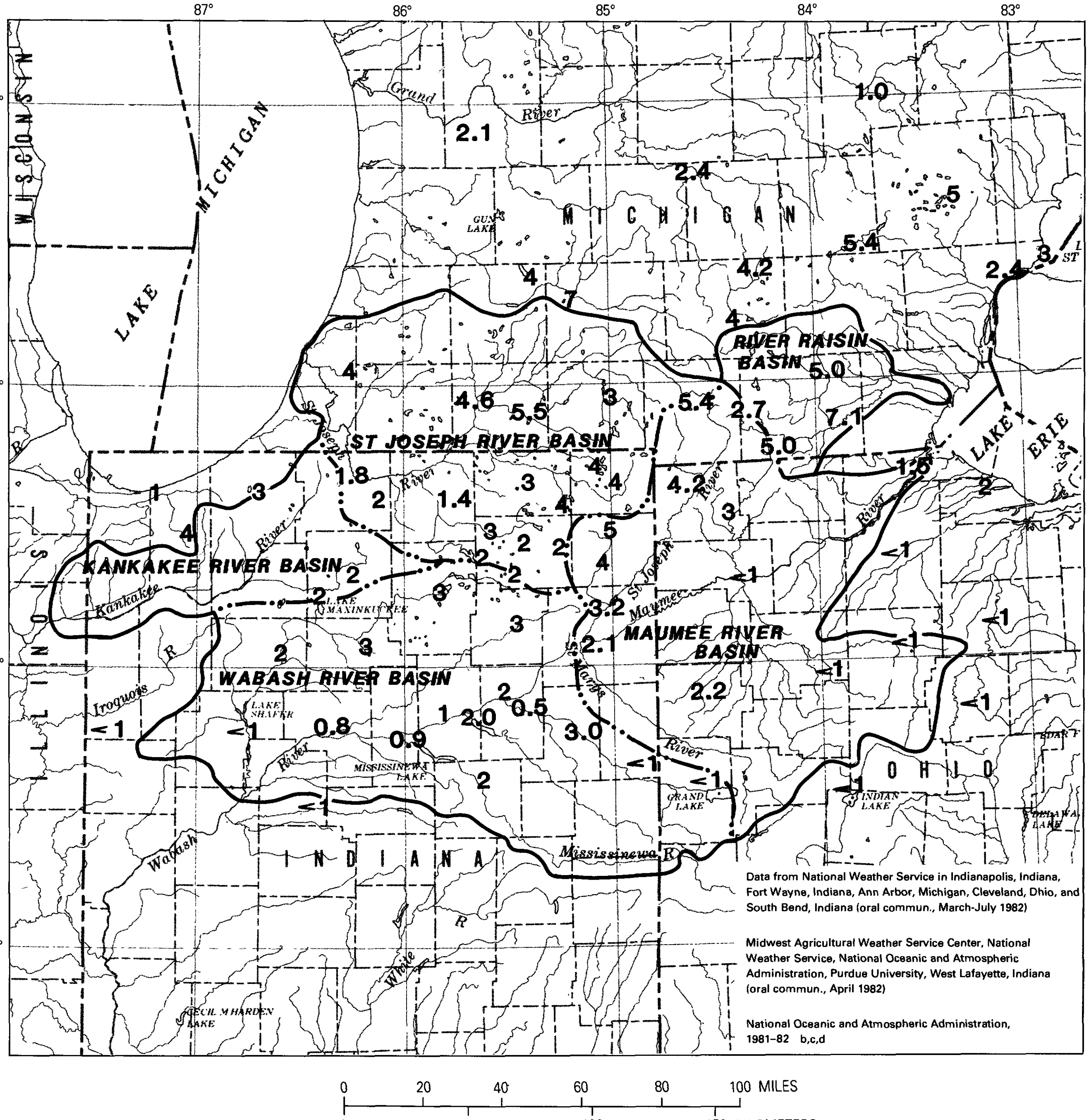
Water-equivalent measurements of a snowpack are uncommon in the region; however, supplemental snow surveys were made by the NWS to determine flood potential. A snow survey on February 9, 1982, indicated a water equivalent of 1.1 in at Hicksville, Ohio, 1.5 in at Van Wert, Ohio, 3.5 in at Montpelier, Ohio, and 4.2 in at Fort Wayne, Ind., and at Wauseon, Ohio. Snow cover was 1 to 3 ft across the region at this time. A snow survey on February 17 indicated a water equivalent of 3.0 in at Hicksville, 1.7 in at Van Wert, 2.3 in at Napoleon, Ohio, 2.9 in at Defiance, Ohio, and 4.0 in at Montpelier and at Fort Wayne.

Rainfall and rising temperatures produced a partial snowmelt during the last 2 weeks of February. Snowmelt was more significant in southern areas than elsewhere and produced bankfull stage on some streams. Water equivalent had decreased to 1.4 in at Van Wert, 1.5 in at Fort Wayne, and 2.2 in at Wauseon by February 26. However, the northern snowpack still contained excessive moisture. For example, a 4.7-in water equivalent was measured at Montpelier on February 26.

Rain and snow during the first week of March increased the water equivalent of the snowpack by 1 to 2 in at most locations. Runoff into streams was minimal because of absorption by the snowpack. As much as 15 in of snow and at least 1 in of ice that covered frozen, saturated ground were reported by the NWS for March 5–10. Measured water equivalents during this time are shown in figure 5; where more than one measurement was available at a given location, the latest one is shown. Water equivalent was highest in the St. Joseph River and River Raisin basins—namely, 7.1 in at Blissfield, 5.5 in at Nottawa, and 5.4 in at Hillsdale, all in Michigan. Because of the small number of measurements, a ratio of 1 in of water equivalent to 3 in of snow was used to estimate additional water equivalents for locations reporting only snow cover. This ratio was determined from sites where both water equivalent and snow depth had been measured. Estimated and measured water equivalents in figure 5 show 3 to 6 in of water equivalent across the River Raisin basin, much of the St. Joseph River basin, and the northern half of the Maumee River basin. Water equivalents of 2 to 4 in were common in the Kankakee River basin, the northern Wabash River basin, and parts of the southern Maumee River basin. These lower water equivalents are attributed to partial snowmelts in January, February, and early March 1982, especially in the Wabash River and southern Maumee River basins. The Kankakee River basin also contained low water equivalents, because fewer severe winter storms occurred there than elsewhere in the region.

Even though the March 1982 floods were significant, the flooding could have been much worse had the snowmelt and coincident rainfall occurred in February, when water equivalent of the snowpack was much higher. For example, a record snow depth of 20 in, with a water equivalent of 4.2 in, was observed on February 9, 1982, at Fort Wayne, Ind. General thawing had reduced the snow depth to 15 in and the water equivalent of the snowpack to 3.2 in by February 15. Light rain and snow during the period February 16–19 had compacted the snow depth to 9 in but had increased the water equivalent to 4.4 in by February 19. Gradual melting of the snowpack had reduced the snow depth to 4 in and the water equivalent to 1.1 in by February 28. Snow, or snow mixed with rain, on March 2, 4, and 8 had increased the snow depth to 7 in and the water equivalent to 2.4 in by the morning of March 9. Daily values of water equivalent at the NWS station at Fort Wayne are shown in figure 6.

The water content of the snow cover over the Maumee River basin from Fort Wayne to Lake Erie on March 9 varied from less than 1 in to greater than 5 in. Water equivalent of the snowpack in the northwestern part of the basin drained by the St. Joseph and Tiffin Rivers was about 3.5 in; water equivalent of the snowpack in the southwestern part of the basin drained by the St. Marys and Auglaize Rivers was about 2.5 in (fig. 5).




EXPLANATION

| | | | |
|---|---|---|---|
| **4.2** | Measured water equivalent, in inches | — · · — | Basin boundary |
| **3** | Estimated water equivalent, in inches | ——— | Boundary of area affected by floods |

FIGURE 5.—Water equivalent of snowpack, March 5–10, 1982.

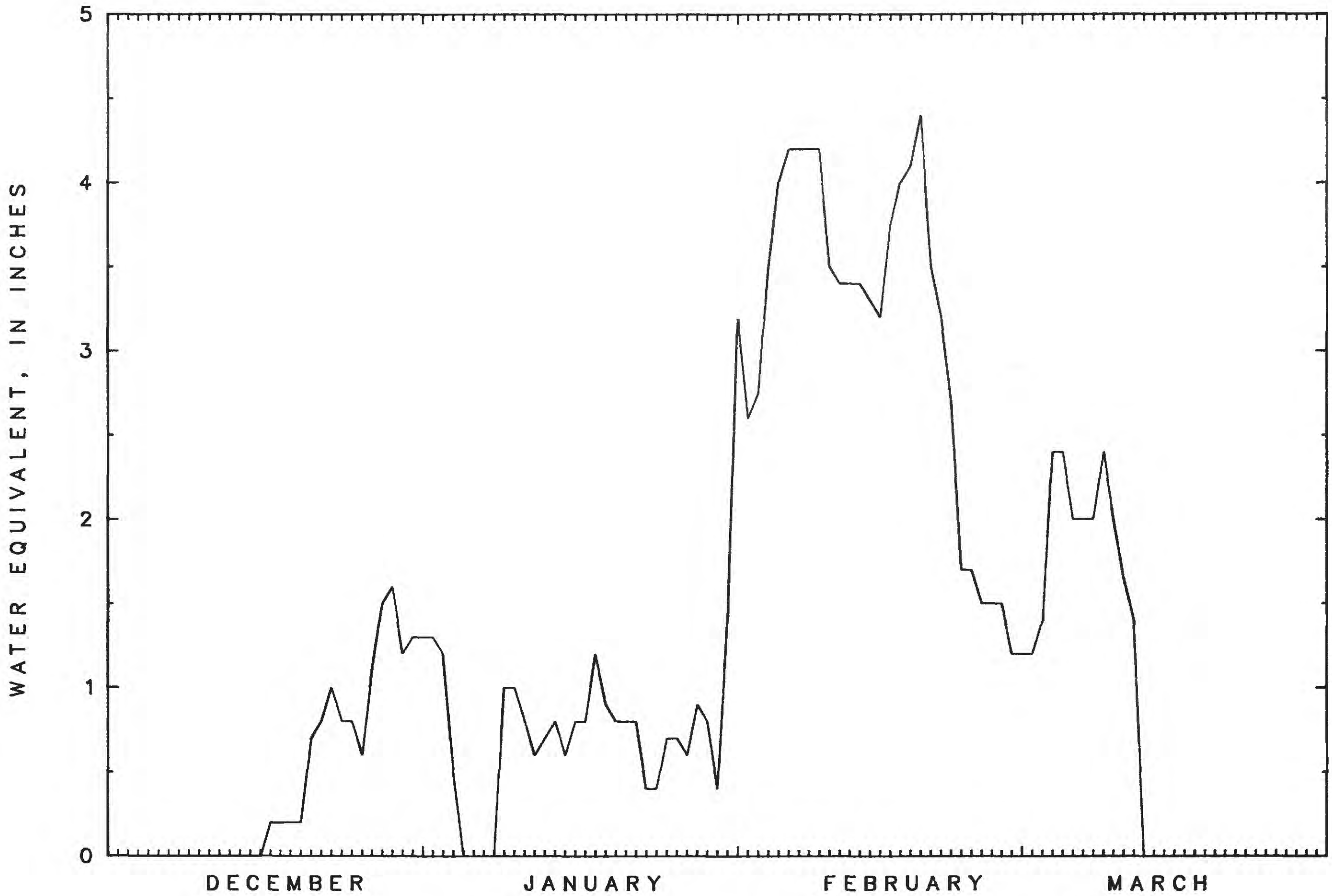


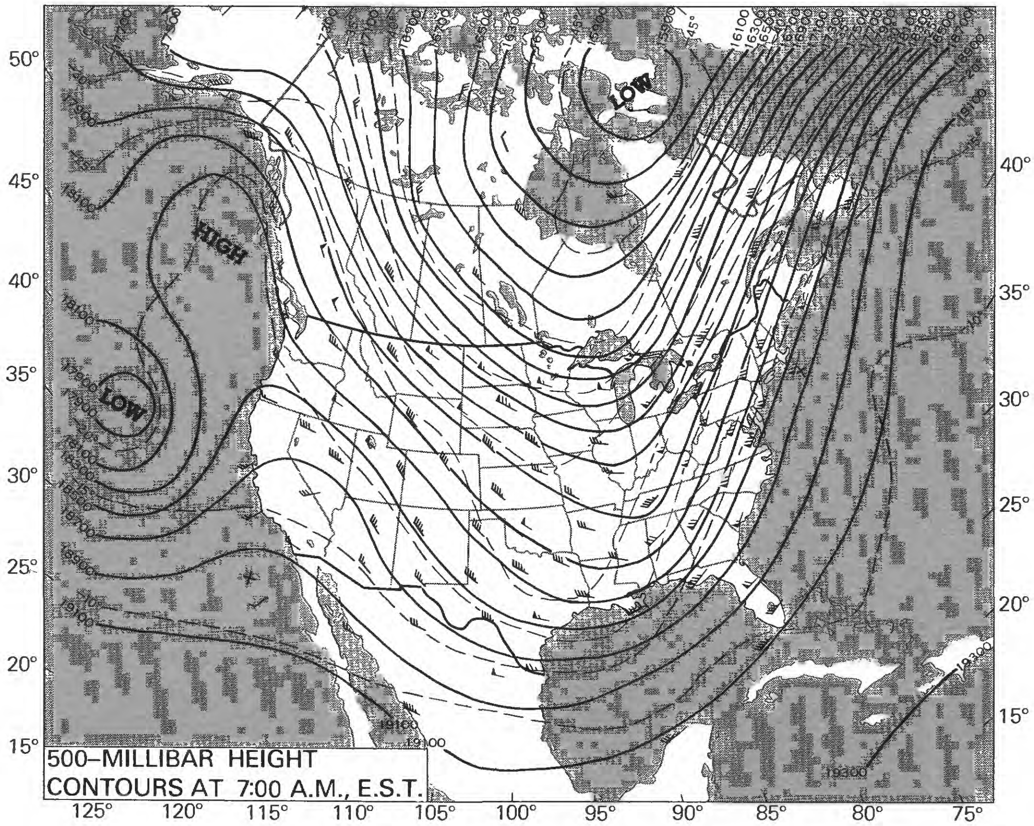

FIGURE 6.—Water equivalent of snowpack, December 1981 through March 1982, Fort Wayne, Ind.

## WEATHER PATTERNS, MARCH 5–20, 1982

During the period March 5–8, 1982, the upper air flow over the North American continent was characterized by high-amplitude waves and a deep trough progressing from just east of the Rocky Mountains to the Central Plains and then to the Appalachian Mountains. The 500-mb (millibar) analysis for 0700[1] on March 7 is shown in figure 7. Large amounts of arctic air were being driven into the Midwest, causing temperatures to drop much below normal over the region. For example, during the period March 5–9 the average daily temperature was 10 °F below normal at Fort Wayne, Ind. Thawing of the snow cover was retarded by this cold spell.

The amplitude of the upper air wave pattern began to decrease on March 9, and circulation had become much more zonal by the morning of March 10 as cold advection ceased over the region. The 500-mb and surface analyses for 0700 on March 10–12 are shown in figures 8 and 9, respectively. At the surface, an area of high atmospheric pressure (high) over the northeastern seaboard of the United States strengthened on the morning of March 10, causing southeasterly winds to prevail over the Midwest (fig. 9*A*). This combination of circulation features initiated a warming trend, and the average daily temperature over most of the region increased more than 10 °F from March 9 to March 10. At 1900 on March 10, a weak warm front was moving through the region as southerly flow brought in a modified maritime air mass that had originated over the Gulf of Mexico. Surface-temperature differences across the front were from 5 to 10 °F. By 0700 on March 11, Ohio and southeastern Indiana were in the warm sector as the warm front had passed and a cold front approached from the northwest (fig. 9*B*). By 1900 on March 11, this weak cold front had moved out and the region was under a high. Surface winds were northerly. The high had progressed to the northeast by 0700 on March 12 and southerly surface winds predominated again (fig. 9*C*). Another warm front was moving northward toward the region.

[1]Twenty-four hour and eastern standard time are used throughout the report. For example, 1410 is 2:10 p.m. e.s.t.



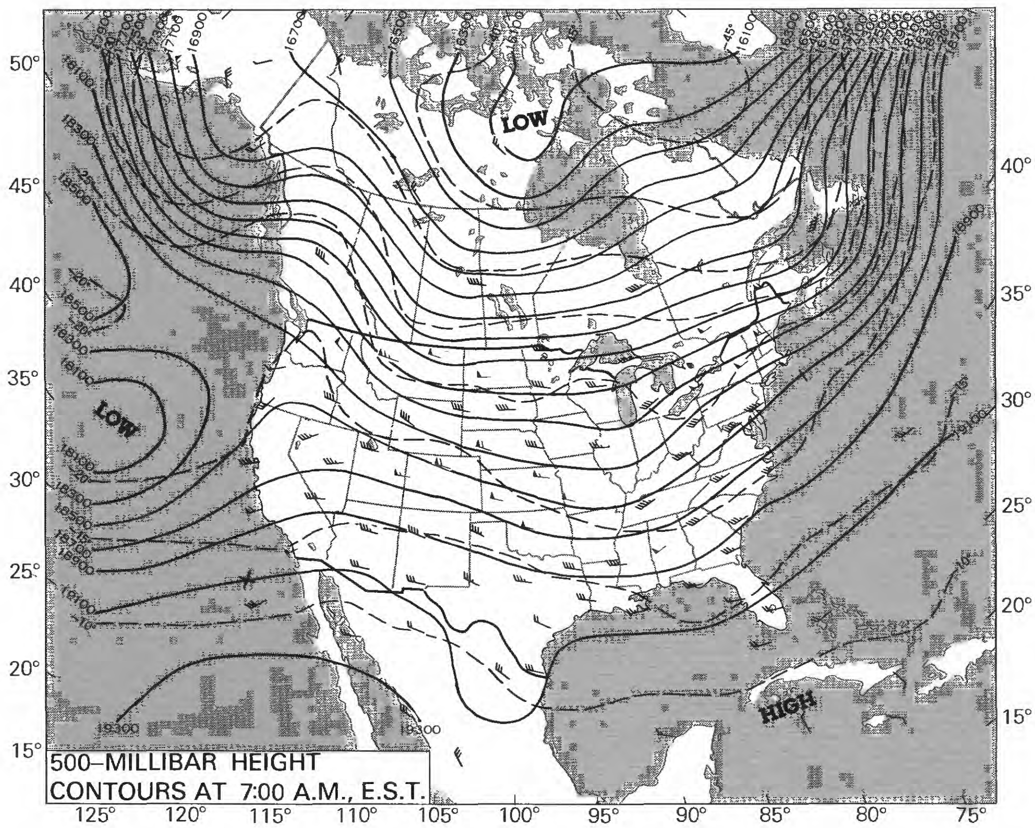

## EXPLANATION

Line of equal height of 500–millibar atmospheric pressure. Interval 200 feet. Datum is sea level.

Line of equal temperature at 500–millibar atmospheric pressure. Interval 5 °C.

Wind arrow showing speed and direction. Arrows "fly" with the wind to indicate true wind direction. Speed is indicated by feathers and flags. A half-feather indicates 5 knots, a full feather 10 knots, and a flag 50 knots.

FIGURE 7.—Height contours at the 500-mb level, 0700, March 7, 1982.



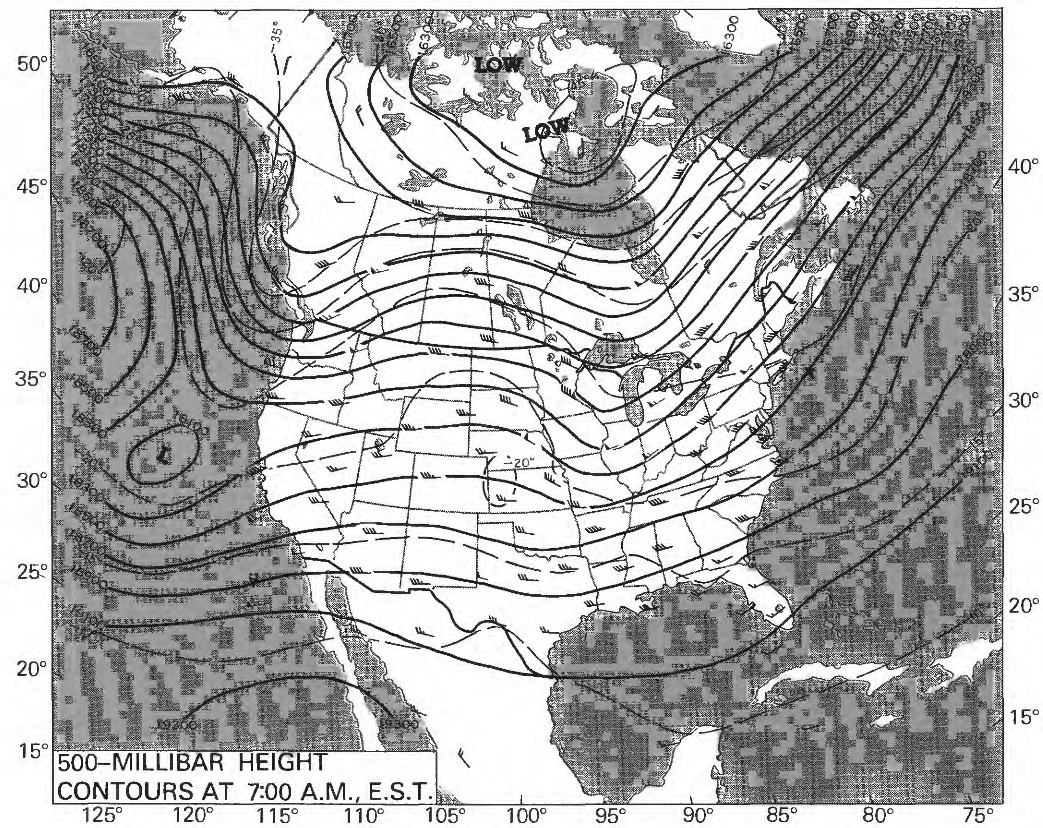

## EXPLANATION

Line of equal height of 500–millibar atmospheric pressure. Interval 200 feet. Datum is sea level.

Line of equal temperature at 500–millibar atmospheric pressure. Interval 5 °C.

Wind arrow showing speed and direction. Arrows "fly" with the wind to indicate true wind direction. Speed is indicated by feathers and flags. A half-feather indicates 5 knots, a full feather 10 knots, and a flag 50 knots.

FIGURE 8A.—Height contours at the 500-mb level, 0700, March 10, 1982.



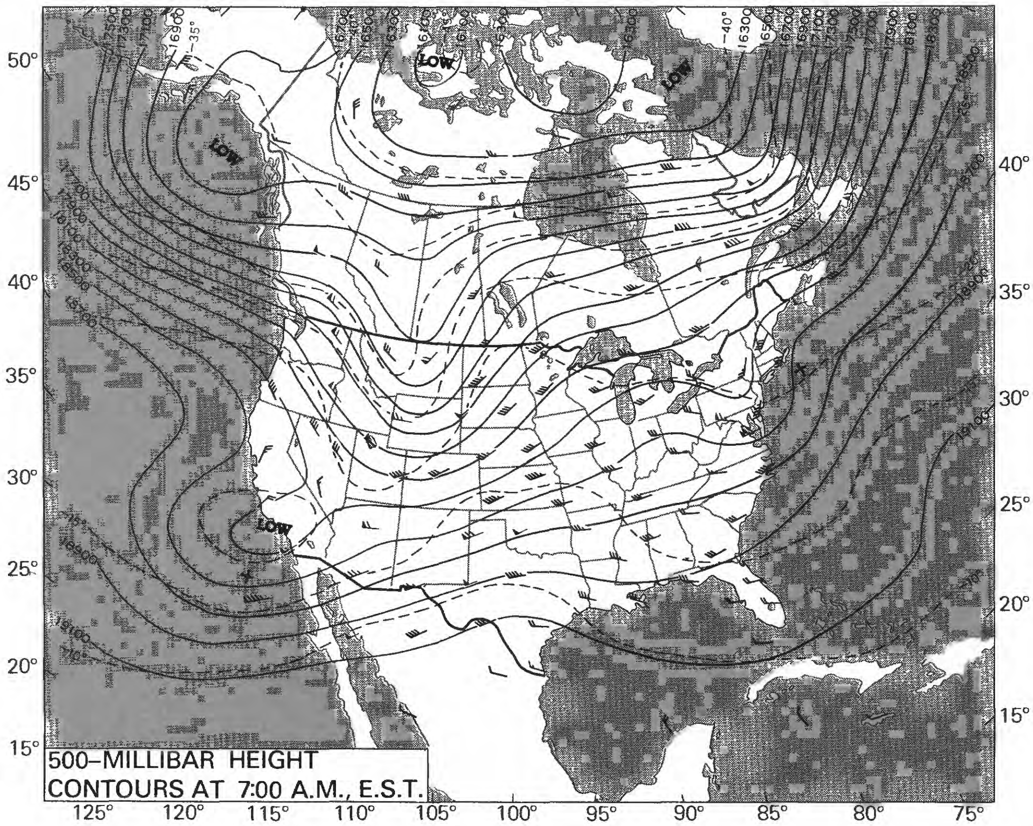

## EXPLANATION

Line of equal height of 500–millibar atmospheric pressure. Interval 200 feet. Datum is sea level.

Line of equal temperature at 500–millibar atmospheric pressure. Interval 5 °C.

Wind arrow showing speed and direction. Arrows "fly" with the wind to indicate true wind direction. Speed is indicated by feathers and flags. A half-feather indicates 5 knots, a full feather 10 knots, and a flag 50 knots.

FIGURE 8B.—Height contours at the 500-mb level, 0700, March 11, 1982.



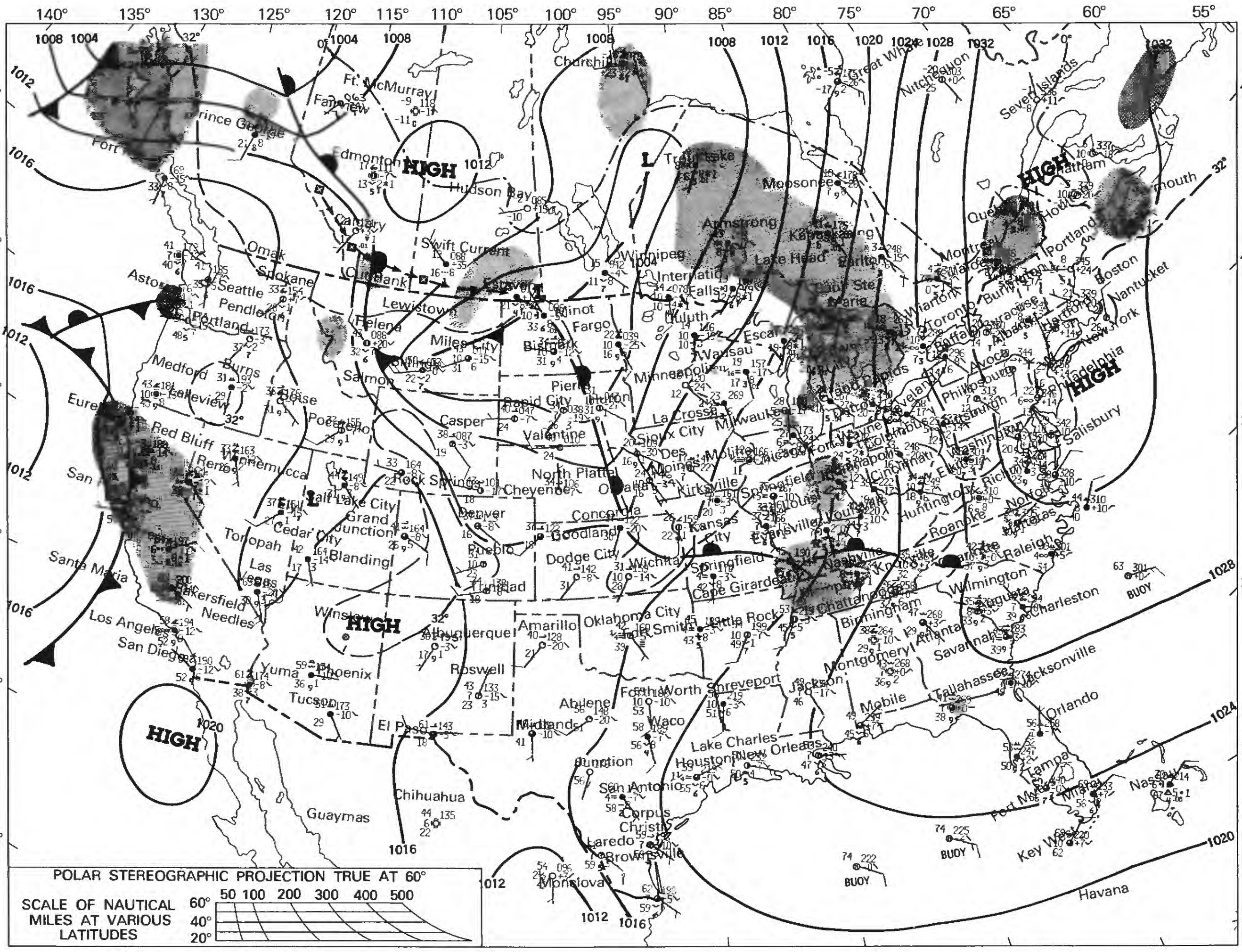

## EXPLANATION

Line of equal height of 500–millibar atmospheric pressure. Interval 200 feet. Datum is sea level.

Line of equal temperature at 500–millibar atmospheric pressure. Interval 5 °C.

Wind arrow showing speed and direction. Arrows "fly" with the wind to indicate true wind direction. Speed is indicated by feathers and flags. A half-feather indicates 5 knots, a full feather 10 knots, and a flag 50 knots.

FIGURE 8C.—Height contours at the 500-mb level, 0700, March 12, 1982.

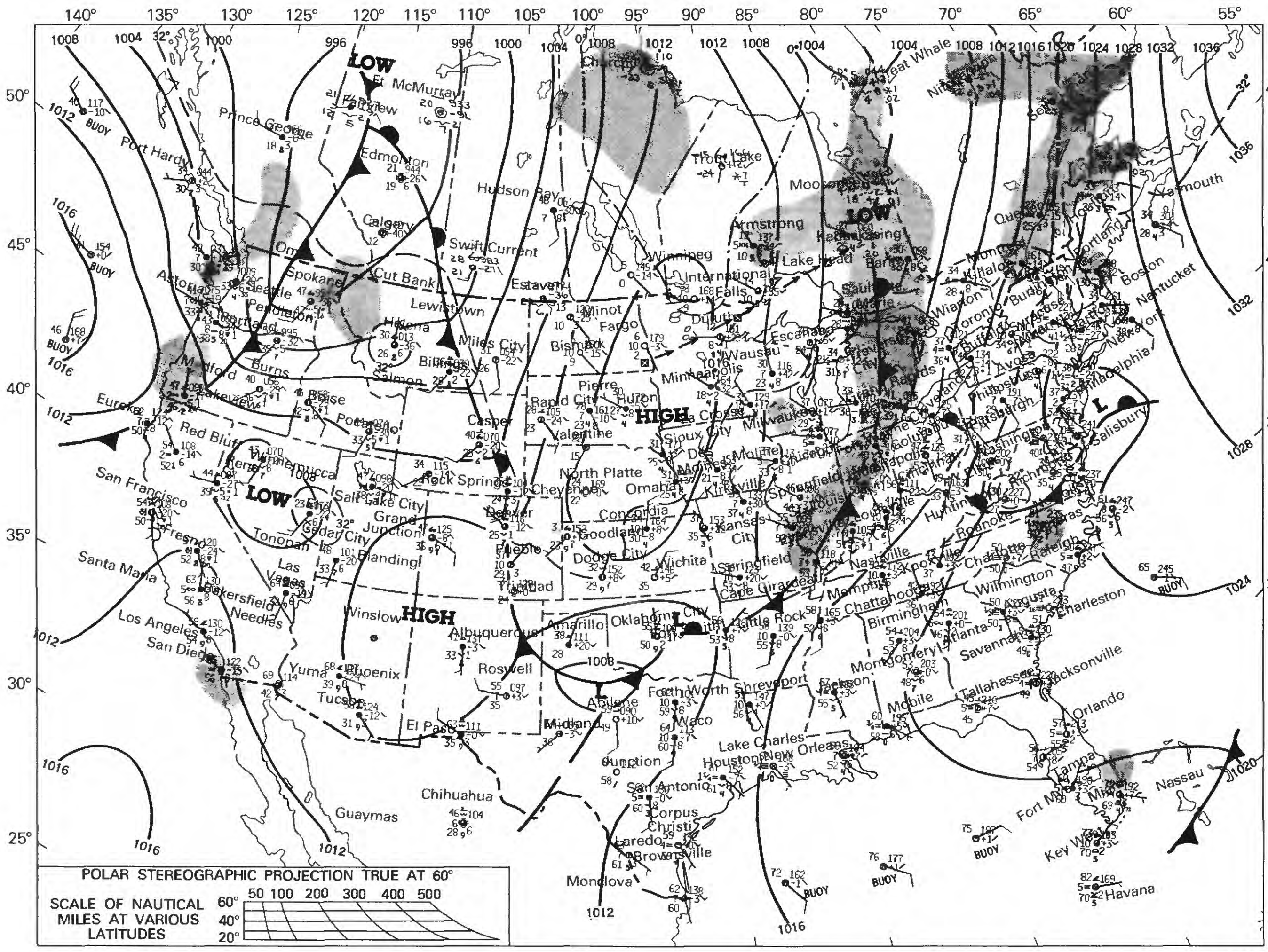



SURFACE WEATHER MAP
AND STATION WEATHER
AT 7:00 A.M., E.S.T.

EXPLANATION

- Occluded front
- Warm front
- Cold front
- Stationary front
- Line of equal pressure in millibars
- Line of 32 °F temperature
- Line of 0 °F temperature
- **HIGH or H** Center of high atmospheric pressure area
- **LOW or L** Center of low atmospheric pressure area
- Area of precipitation

FIGURE 9A.—Surface weather, 0700, March 10, 1982.

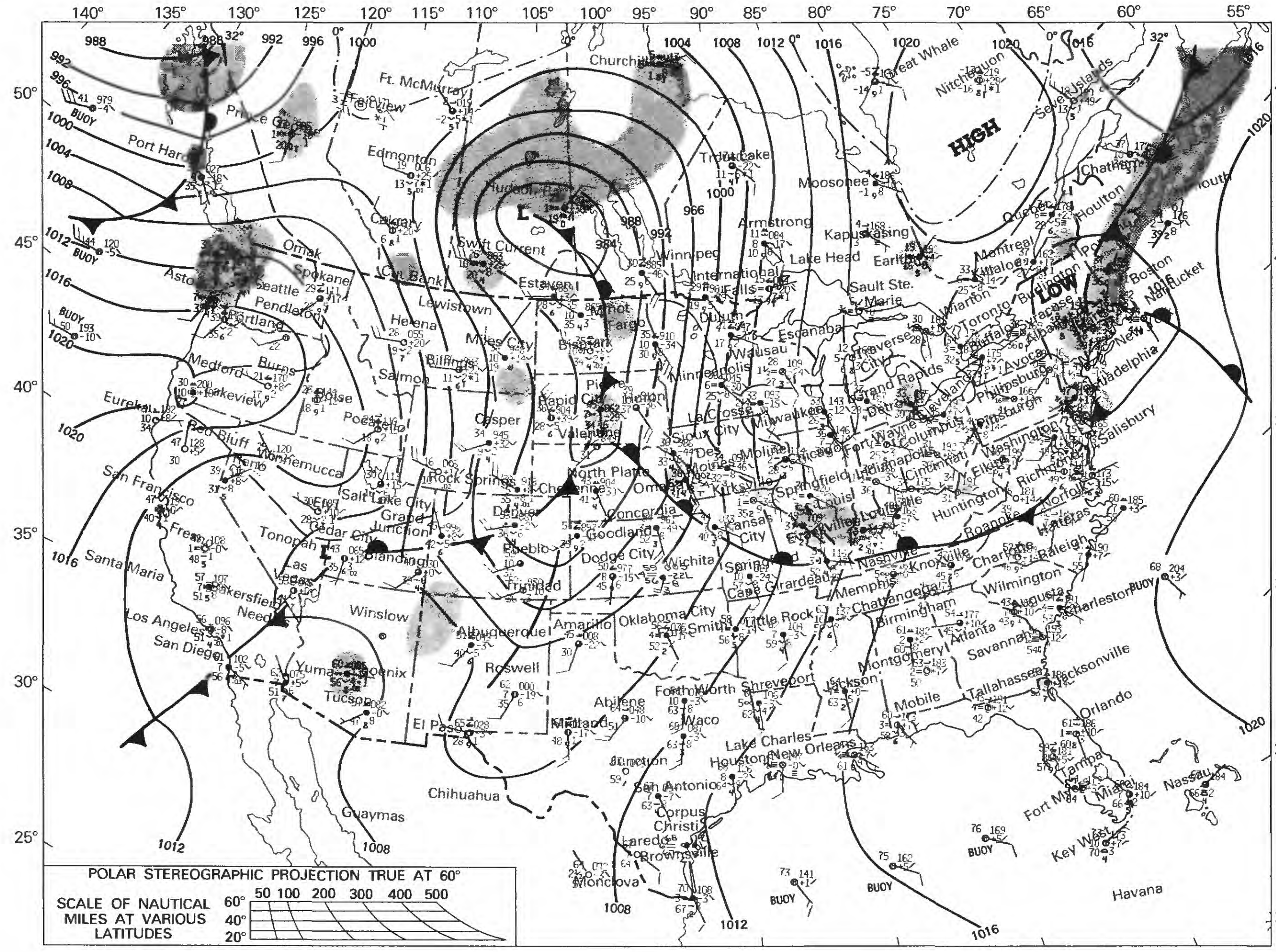



SURFACE WEATHER MAP AND STATION WEATHER AT 7:00 A.M., E.S.T.

EXPLANATION

- Occluded front
- Warm front
- Cold front
- Stationary front
- Line of equal pressure in millibars
- Line of 32 °F temperature
- Line of 0 °F temperature
- **HIGH or H** Center of high atmospheric pressure area
- **LOW or L** Center of low atmospheric pressure area
- Area of precipitation

FIGURE 9B.—Surface weather, 0700, March 11, 1982.




SURFACE WEATHER MAP AND STATION WEATHER AT 7:00 A.M., E.S.T.

EXPLANATION

- Occluded front
- Warm front
- Cold front
- Stationary front
- Line of equal pressure in millibars
- Line of 32 °F temperature
- Line of 0 °F temperature
- **HIGH or H** Center of high atmospheric pressure area
- **LOW or L** Center of low atmospheric pressure area
- Area of precipitation

FIGURE 9C.—Surface weather, 0700, March 12, 1982.

The GOES (Geostationary Operational Environmental Satellite) infrared-enhanced image of Eastern North America at 0700 on March 12, with superimposed major surface features, is shown in figure 10. This figure depicts a typical no-storm situation in the early part of the warming period over the region. Dense radiation fog covered the region, which was free of clouds except for a patch of altostratus clouds over the corners of northeastern Indiana and southeastern Michigan. A weak warm front extended from Nebraska through northeastern Kansas, south-central Missouri, southern Illinois, southern Kentucky, and into southern Virginia. Moderate rain was falling in Tennessee and North Carolina at that time.

At 0700 on March 12, a short-wave trough at 500-mb was moving past the lee of the Rocky Mountains (fig. 8*C*). The surface map for the same time (fig. 9*C*) shows a well-defined windflow pattern associated with a storm in southern Canada. Surface temperatures in the central and eastern part of the United States increased substantially as the storm in Canada moved eastward, while a warm front associated with warm, moist air from the Gulf of Mexico advanced northward. The positions of weather fronts across Indiana and adjacent States at 1900 on March 12 and at 0100 on March 13 are shown in figure 11. The warm front across central Illinois, Indiana, and Ohio produced a striking contrast of temperatures at 1900 on March 12 as temperatures ranged from 68 °F south of the front to 36 °F north of the front. After passage of the warm front through the region, temperatures exceeded 50 °F at most locations. At Fort Wayne, temperatures increased from 27 °F on the morning of March 12 to 55 °F following passage of the warm front (National Oceanic and Atmospheric Administration, 1981–82e). Lower level winds over the region continued to be southerly until the morning of March 13, when passage of the cold front shifted wind direction to westerly.

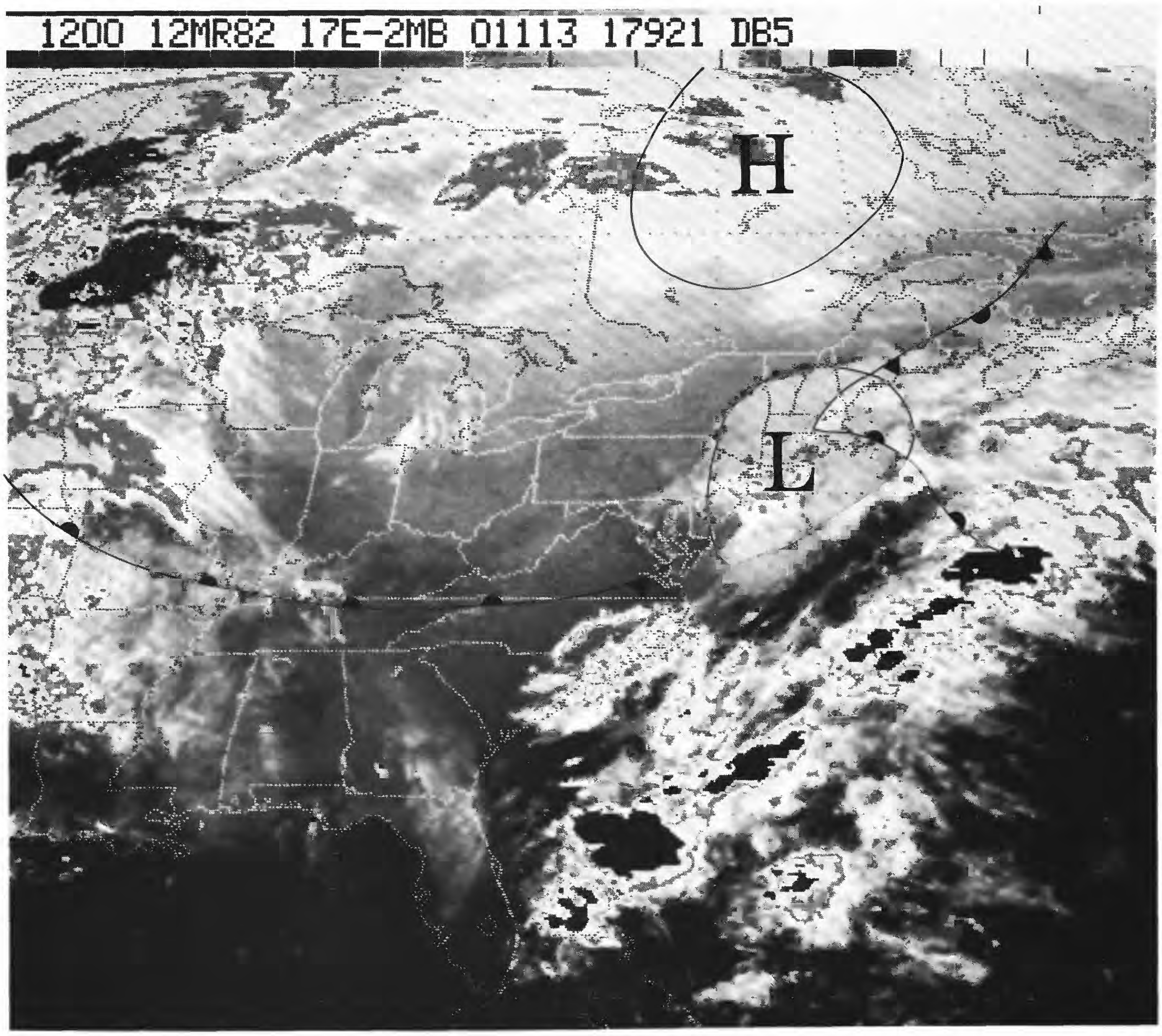
The increased temperatures and light to moderate rainfall associated with the weather patterns of March 9–13 caused the snowpack over most of the region to melt rapidly. Surface runoff from the melting snowpack and rainfall was nearly 100 percent because the saturated ground was frozen. Much of the snow in the Wabash River, Kankakee River, and Maumee River basins had melted by 0700 on March 13. Several inches of snow remained at that time in the St. Joseph River and River Raisin basins, although snow depth in these basins had been considerably reduced. The decrease in snow depth at three NWS stations representative of the Maumee River basin (figs. 2–4) shows the effect of the increase in temperature from March 9 through March 13. For example, on March 9 at Fort Wayne, snow depth was 7 in, with a water equivalent of 2.4 in. By the morning of March 13, this snow cover had completely melted.

An upper air short-wave trough over Iowa and Missouri on the morning of March 16 produced strong, southwesterly winds aloft. At the surface, southerly flow predominated from the lower Mississippi Valley northward, bringing warm, moist maritime air into the region. Moderate rain fell and temperatures increased. On March 16 at Fort Wayne, the maximum temperature reached 69 °F and the average daily temperature was 53 °F. Rainfall totaled 0.63 in.

The circulation pattern had changed by the morning of March 17 and cold advection prevailed over the region. The average daily temperature on March 17 at Fort Wayne dropped to 42 °F, or 5 °F above normal. Cold advection in the lower layer continued for the next 2 days over the region. The average temperature had decreased to near normal by March 20 as the warming trend was ending.

Total rainfall for the period March 10–20 over the region was moderate. Most of the Maumee River basin had a total rainfall of 1.5 to 2.0 in, but several locations received up to 2.5 in. Cumulative rainfall data for the NWS stations at Berne, Ind., Montpelier, Ohio, and Fort Wayne, Ind. (fig. 12), represent the amounts and timing of precipitation in the Maumee River basin from March 10 through March 20. Comparison of the graphs in figure 12 shows higher rainfall amounts on March 11–12 in the southwestern part of the basin (represented by Berne) than in the west-central and northwestern parts of the basin (represented by Fort Wayne and Montpelier). This rainfall, coupled with temperatures above 40 °F, started the snowmelt in the southern half of the Maumee River basin in advance of the snowmelt farther north. In fact, most of the snow in the southern half of the basin had melted prior to passage of the warm front on the evening of March 12.

Although the rainfall during the period March 10–20 was only a secondary factor, it did contribute to the flooding. Streams that peaked early because of rapid snowmelt had slower recessions or additional rises because of the rainfall. Flood peaks on streams that rose later because of delayed snowmelt or that characteristically have a broad flood peak also were increased by the rainfall. At Fort Wayne, the Maumee River was kept above flood stage (15.0 ft) from March 12 through March 26 by runoff from the melting snow and by rainfall.




EXPLANATION

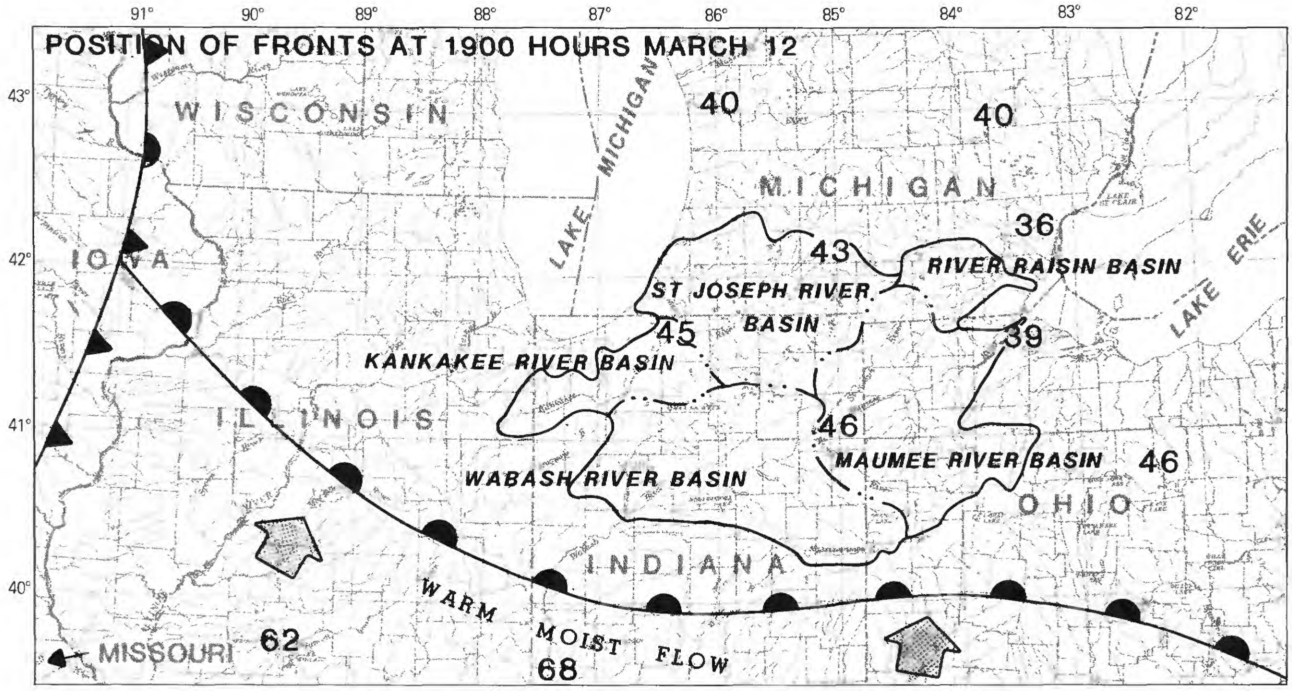
Warm front

Occluded front

H Center of high atmospheric pressure area

L Center of low atmospheric pressure area

FIGURE 10.—GOES infrared-enhanced image, 0700, March 12, 1982.



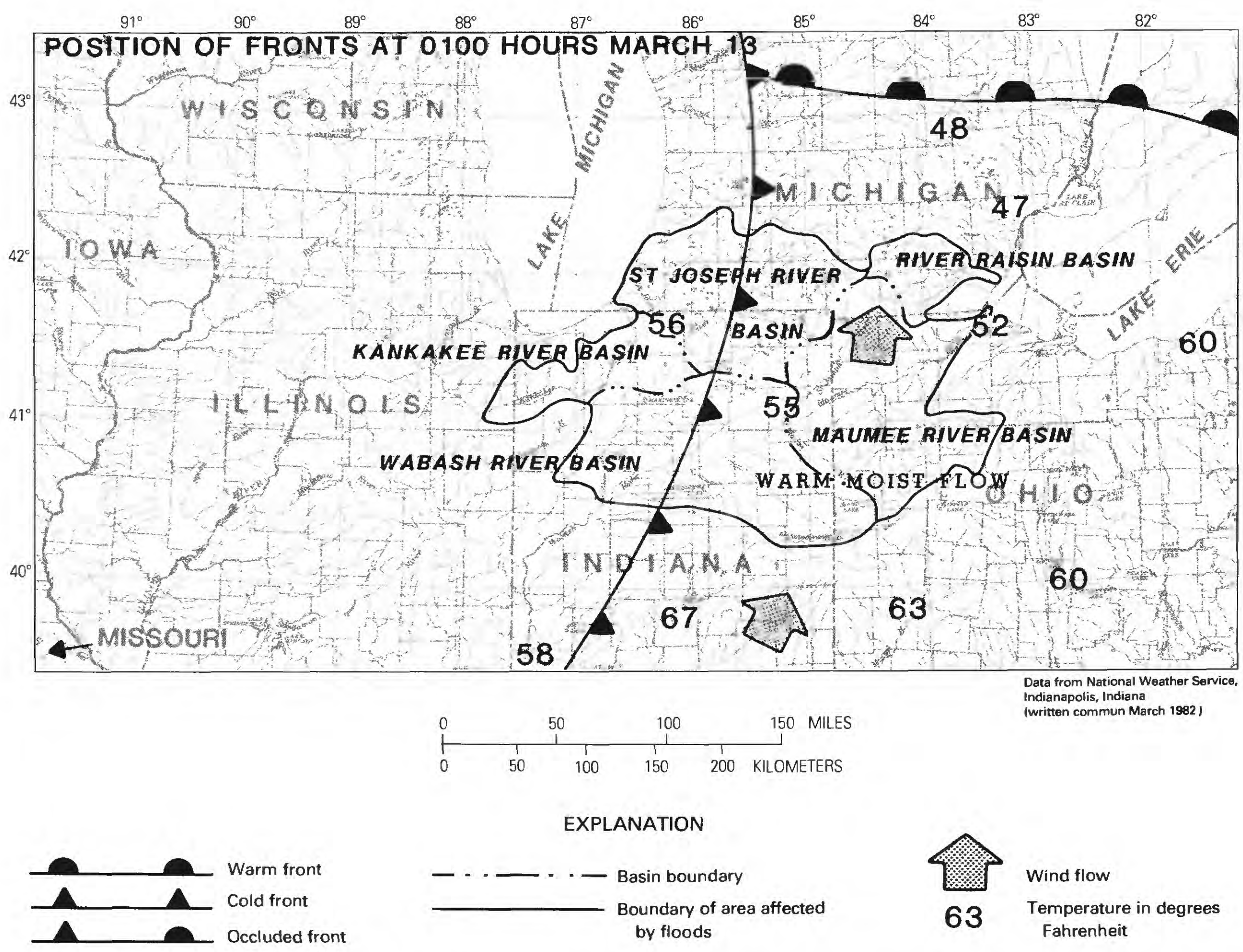




FIGURE 11.—Surface weather maps, 1900, March 12, 1982, and 0100, March 13, 1982.

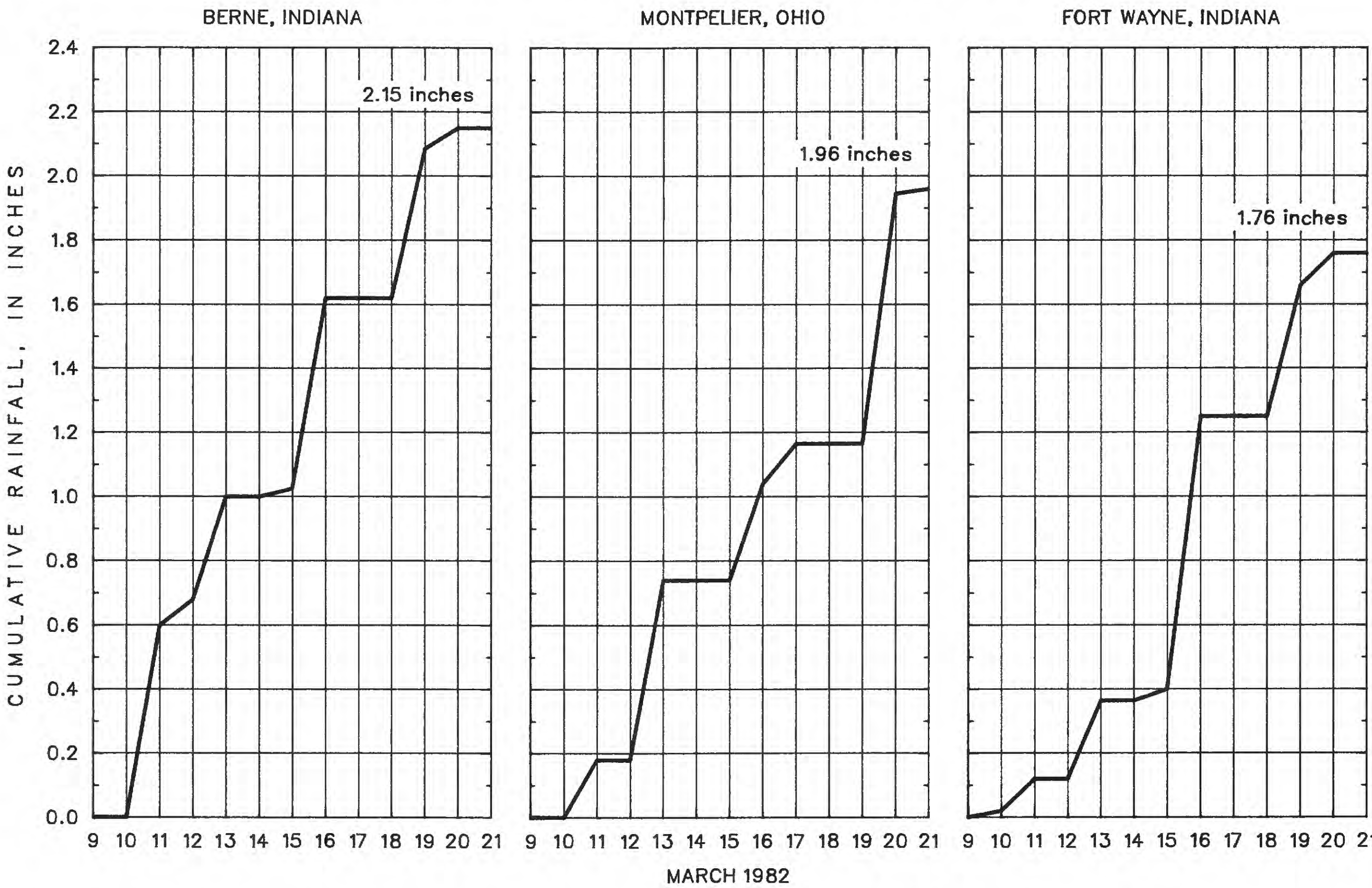



FIGURE 12.—Cumulative rainfall, March 9–21, 1982, Berne, Ind.; Montpelier, Ohio; and Fort Wayne, Ind.

## DESCRIPTION OF THE FLOODS

### MAGNITUDE AND FREQUENCY

Flood frequency is generally expressed in terms of the probability of occurrence of floods of a given magnitude (discharge). The probability of occurrence is the percent chance of a given flood magnitude being exceeded in any one year. The recurrence interval (the reciprocal of the probability of occurrence multiplied by 100) is the average number of years between exceedances of a given flood magnitude. The recurrence interval is an average interval, and the occurrence of floods is random in time; no schedule of regularity is implied. Thus, the occurrence of a flood having a 50-yr recurrence interval (2-percent chance of occurrence) is no guarantee that a flood of equal or greater magnitude will not occur the following year, or even the following week.

Data on drainage area, period of record, maximum flood previously recorded, and the March 1982 flood are presented in table 2 for 83 continuous-record stations and crest-stage partial-record sites in five river basins. Locations of the gaged sites and river basins are shown in figure 1. From table 2 it can be seen that flooding was widespread in northern Indiana, southern Michigan, northwestern Ohio, and northeastern Illinois. Peak discharges recorded at gaged sites in the Wabash River, St. Joseph River, River Raisin, Maumee River, and Kankakee River basins have recurrence intervals of 50 yr to greater than 100 yr.

Discharge-frequency determinations in Indiana are coordinated by a memorandum of understanding among the U.S. Geological Survey, the U.S. Soil Conservation Service, the U.S. Army Corps of Engineers, and the Indiana Department of Natural Resources to ensure consistency of estimates among the agencies. Flood-frequency values have not been coordinated for all streams in Indiana. For streams having coordinated values, the recurrence intervals given in table 2 for the floods of March 1982 are estimates from the Indiana Department of Natural Resources (1981). For streams for which flood frequencies have not been coordinated and at least 10 yr of peak data have been collected, a log-Pearson type III statistical analysis was done by techniques described by the U.S. Water Resources Council (1981) to determine recurrence intervals of the peaks.

TABLE 2.—*Summary of peak stage and discharge data*

[R, river; nr, near; Cr, creek; $mi^2$, square miles; ft, feet; $ft^3/s$, cubic feet per second; $(ft^3/s)/mi^2$, cubic feet per second per square mile; dashes indicate missing or unknown value]

| Site number | Station number | Station name | Contributing drainage area ($mi^2$) | Period of record (water years) | Maximum flood previously recorded: Date | Maximum flood previously recorded: Gage height (ft) | Maximum flood previously recorded: Discharge ($ft^3/s$) | Maximum flood previously recorded: Discharge $(ft^3/s)/mi^2$ | Maximum during 1982 flood: Date | Maximum during 1982 flood: Gage height (ft) | Maximum during 1982 flood: Discharge ($ft^3/s$) | Maximum during 1982 flood: Discharge $(ft^3/s)/mi^2$ | Recurrence interval (years) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Wabash River Basin* | | | | | | | | | | | |
| 1 | 03322500 | Wabash R nr New Corydon, Ind. | 262 | 1952–82 | 1–22–59 | 20.47 | 8,720 | 33 | 3–11 | 17.50 | 3,580 | 14 | [1]< 5 |
| 2 | 03322900 | Wabash R at Linn Grove, Ind. | 453 | 1965–82 | 3–17–78 | 13.87 | 9,560 | 21 | 3–13 | 12.63 | 5,770 | 13 | [1]< 5 |
| 3 | 03324000 | Little R nr Huntington, Ind. | 263 | 1944–82 | 2–11–59<br>1– 4–50 | 18.43<br>– – – | – – –<br>5,990 | 23 | 3–14 | 19.39 | 5,700 | 22 | [1]50 |
| 4 | 03327790 | Eel R tributary nr Columbia City, Ind. | .17 | 1973–82 | 6– 4–80 | 7.71 | 50 | 294 | 3–13 | 6.21 | 11 | 65 | < 5 |
| 5 | 03327930 | Koontz ditch nr Sidney, Ind. | 2.50 | 1973–82 | 6–13–81 | – – – | 375 | 150 | 3–13 | – – – | 260 | 104 | 5 |
| 6 | 03328000 | Eel R at North Manchester, Ind. | 417 | 1930–82 | 2–27–36<br>12–22–67 | 14.00<br>– – – | – – –<br>7,940 | 19 | 3–13 | 13.72 | 8,180 | 20 | [1]45 |
| 7 | 03328020 | Otter Cr tributary nr North Manchester, Ind. | .92 | 1973–82 | 4–14–81 | 6.92 | 195 | 212 | 3–13 | 6.79 | 175 | 190 | 10 |
| 8 | 03328430 | Weesau Cr nr Deedsville, Ind. | 8.87 | 1971–82 | 3– 3–79 | 5.86 | 284 | 32 | 3–13 | 7.37 | 464 | 52 | 50 |
| 9 | 03328500 | Eel R nr Logansport, Ind. | 789 | 1944–82 | 12– 9–66 | 12.20 | 14,200 | 18 | 3–14 | 11.74 | 13,400 | 17 | [1]20 |
| 10 | 03330290 | Shanton ditch nr Pierceton, Ind. | .70 | 1973–82 | 6–13–81 | 6.52 | 35 | 50 | 3–13 | 5.42 | 10 | 14 | < 5 |
| 11 | 03330500 | Tippecanoe R at Oswego, Ind. | 113 | 1950–82 | 10–17–54 | 8.64 | 700 | 6 | 3–21 | 9.25 | 950 | 8 | 100 |
| 12 | 03331110 | Walnut Cr nr Warsaw, Ind. | 19.6 | 1970–82 | 6–13–81 | 5.38 | 561 | 29 | 3–13 | 4.72 | 411 | 21 | 20 |
| 13 | 03331500 | Tippecanoe R at Ora, Ind. | 856 | 1944–82 | 6–15–81 | 15.08 | 8,660 | 10 | 3–15 | 14.98 | 8,460 | 10 | [1]40 |
| 14 | 03332300 | Little Indian Cr nr Royal Center, Ind. | 35 | 1960–82 | 3– 5–63 | – – – | 500 | 14 | 3–13 | 6.75 | 329 | 9 | < 5 |
| 15 | 03332340 | Weltzin ditch tributary nr Francesville, Ind. | .50 | 1973–82 | 3–21–78 | 7.98 | 68 | 136 | 3–13 | 5.29 | 9 | 18 | < 5 |
| 16 | 03332400 | Big Monon Cr nr Francesville, Ind. | 152 | 1960–82 | 12–25–65 | 15.14 | 2,750 | 18 | 3–13 | 15.66 | 1,910 | 12 | < 5 |
| | | *St. Joseph River Basin* | | | | | | | | | | | |
| 17 | 04096400 | St. Joseph R nr Burlington, Mich. | 201 | 1963–82 | 3– 6–76 | 5.31 | 1,030 | 5 | 3–21 | 5.78 | 1,340 | 7 | 45 |
| 18 | 04096515 | Hog Cr nr Allen, Mich. | 48.7 | 1970–82 | 6–28–78 | 5.78 | 426 | 9 | 3–17 | 5.63 | 524 | 11 | 45 |
| 19 | 04096600 | Coldwater R nr Hodunk, Mich. | 293 | 1963–82 | 6–28–78 | 7.77 | 1,930 | 7 | 3–18 | 8.25 | 2,260 | 8 | 25 |
| 20 | 04096900 | Nottawa Cr nr Athens, Mich. | 162 | 1967–82 | 6–29–78 | 6.47 | 1,120 | 7 | 3–18 | 5.02 | 900 | 6 | 15 |
| 21 | 04097170 | Portage R nr Vicksburg, Mich. | 68.2 | 1947–51<br>1965–82 | 4– 7–47 | 5.66 | 356 | 5 | 3–21 | 5.48 | 292 | 4 | 10 |
| 22 | 04097500 | St. Joseph R at Three Rivers, Mich. | 1,350 | 1952–82 | 3– 7–76 | 9.08 | 5,810 | 4 | 3–21 | 10.69 | 8,180 | 6 | 60 |
| 23 | 04097540 | Prairie R nr Nottawa, Mich. | 106 | 1963–82 | 3– 6–76 | 5.66 | 523 | 5 | 3–20 | 6.12 | 698 | 7 | 55 |
| 24 | 04097970 | Lime Lake outlet at Panama, Ind. | 13.8 | 1970–82 | 6–14–81 | 4.62 | 38 | 3 | 4–03 | 4.85 | 46 | 3 | 50 |
| 25 | 04098500 | Fawn R nr White Pigeon, Mich. | 192 | 1958–82 | 3– 6–76 | 4.75 | 613 | 3 | 3–21 | 5.18 | 725 | 4 | 50 |
| 26 | 04099000 | St. Joseph R at Mottville, Mich. | 1,866 | 1924–82 | 4–27–50 | 10.76 | 10,700 | 6 | 3–21 | 9.81 | 10,100 | 5 | [1]50 |
| 27 | 04099060 | Pigeon Cr tributary nr Ellis, Ind. | 1.22 | 1973–82 | 6–14–81 | 7.89 | 110 | 90 | 3–20 | 7.86 | 110 | 90 | 20 |
| 28 | 04099200 | Long Lake at Moonlight, Ind. | 67.9 | 1946–82 | 4– 7–50 | 16.41 | – – – | – – – | 3–21 | 17.42 | – – – | – – – | 60 |
| 29 | 04099250 | Bower Lake nr Pleasant Lake, Ind. | 84.6 | 1946–70<br>1977–82 | 4– 7–50 | 15.70 | – – – | – – – | 3–21 | 17.13 | – – – | – – – | 50 |
| 30 | 04099500 | Hogback Lake nr Angola, Ind. | 103 | 1946–73<br>1976–82 | 4– 8–50 | 14.93 | – – – | – – – | 3–21 | 17.07 | – – – | – – – | 100 |
| 31 | 04099510 | Pigeon Cr nr Angola, Ind. | 83.5 | 1946–82 | 4– 8–50 | 14.95 | 744 | 9 | 3–22 | 13.90 | 795 | 10 | 95 |
| 32 | 04099750 | Pigeon R nr Scott, Ind. | 307 | 1969–82 | 6–15–81 | 7.27 | 1,980 | 6 | 3–21 | 7.85 | 2,370 | 8 | 35 |
| 33 | 04099808 | Little Elkhart R at Middlebury, Ind. | 91.7 | 1980–82 | 7–26–81 | 9.58 | 1,690 | 18 | 3–17 | 9.40 | 1,560 | 17 | – – – |
| 34 | 04099850 | Pine Cr nr Elkhart, Ind. | 31.0 | 1980–82 | 7–26–81 | 9.73 | 177 | 6 | 3–14 | 7.18 | 509 | 16 | – – – |
| 35 | 04100165 | Wible Lake inlet nr Kendallville, Ind. | 2.47 | 1973–82 | 6– 1–80 | 5.51 | 48 | 19 | 3–14 | 5.87 | 50 | 20 | 20 |
| 36 | 04100222 | North Branch Elkhart R at Cosperville, Ind. | 142 | 1972–82 | 4– 7–78 | 7.41 | 682 | 5 | 3–23 | 8.12 | 919 | 6 | 40 |
| 37 | 04100252 | Forker Cr nr Burr Oak, Ind. | 19.2 | 1970–82 | 4–15–81 | 6.60 | 328 | 17 | 3–14 | 6.71 | 338 | 18 | 25 |
| 38 | 04100295 | Rimmel Branch nr Albion, Ind. | 10.7 | 1980–82 | 4–14–81 | 12.82 | 399 | 37 | 3–13 | 12.31 | 360 | 34 | – – – |
| 39 | 04100465 | Turkey Cr at Syracuse, Ind. | 43.8 | 1970–82 | 6–14–81 | 5.37 | 170 | 4 | 3–19 | 5.06 | 154 | 4 | 5 |

TABLE 2.—*Summary of peak stage and discharge data*—Continued

[R, river; nr, near; Cr, creek; $mi^2$, square miles; ft, feet; $ft^3/s$, cubic feet per second; $(ft^3/s)/mi^2$, cubic feet per second per square mile; dashes indicate missing or unknown value]

| Site number | Station number | Station name | Contributing drainage area ($mi^2$) | Period of record (water years) | Maximum flood previously recorded: Date | Gage height (ft) | Discharge ($ft^3/s$) | Discharge $(ft^3/s)/mi^2$ | Maximum during 1982 flood: Date | Gage height (ft) | Discharge ($ft^3/s$) | Discharge $(ft^3/s)/mi^2$ | Recurrence interval (years) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *St. Joseph River Basin*—Continued | | | | | | | | | | | |
| 40 | 04100500 | Elkhart R at Goshen, Ind. | 594 | 1932–82 | 4– 4–50 | 10.15 | 5,440 | 9 | 3–14 | 11.94 | 6,180 | 10 | [1]80 |
| 41 | 04101000 | St. Joseph R at Elkhart, Ind. | 3,370 | 1948–82 | 4– 5–50 | 27.82 | 18,400 | 5 | 3–21 | 27.91 | 18,600 | 6 | [1]45 |
| 42 | 04101500 | St. Joseph at Niles, Mich. | 3,666 | 1931–82 | 4– 5–50 | 15.10 | 20,200 | 6 | 3–21 | 14.97 | 19,900 | 5 | [1]45 |
| 43 | 04101800 | Dowagiac R at Sumnerville, Mich. | 255 | 1961–82 | 6–26–68 | 8.78 | 1,280 | 5 | 3–17 | 8.33 | 1,150 | 5 | 15 |
| 44 | 04102320 | Paw Paw R nr Paw Paw, Mich. | 195 | 1981–82 | 5–11–81 | 5.73 | 1,230 | 6 | 3–14 | 6.26 | 1,540 | 8 | --- |
| 45 | 04102420 | Paw Paw R nr Hartford, Mich. | 311 | 1981–82 | 2–21–81 | 9.76 | 1,760 | 6 | 3–17 | 10.37 | 2,500 | 8 | --- |
| 46 | 04102500 | Paw Paw R at Riverside, Mich. | 390 | 1952–82 | 3– 9–79 | 10.11 | 2,830 | 7 | 3–18 | 10.11 | 2,650 | 7 | 45 |
| | | *River Raisin Basin* | | | | | | | | | | | |
| 47 | 04176000 | River Raisin nr Adrian, Mich. | | 1933–38 | | | | | | | | | |
| | | | 463 | 1954–82 | 4–30–56 | 14.87 | 5,580 | 12 | 3–15 | 15.77 | 6,660 | 14 | > 100 |
| 48 | 04176400 | Saline R nr Saline, Mich. | 94.6 | 1966–82 | 6–26–68 | 13.37 | 3,990 | 42 | 3–14 | 11.84 | 1,990 | 21 | 10 |
| 49 | 04176500 | River Raisin nr Monroe, Mich. | | | | | | | 3–15 | 11.16 | Ice jam | | |
| | | | 1,042 | 1938–82 | 9– 6–81 | 10.22 | 14,500 | 14 | 3–16 | --- | 15,300 | 15 | 50 |
| | | *Maumee River Basin* | | | | | | | | | | | |
| 50 | 04177720 | Fish Creek at Hamilton, Ind. | 37.5 | 1970–82 | 3–23–78 | 10.79 | 497 | 13 | 3–17 | 11.52 | 603 | 16 | 35 |
| 51 | 04178000 | St. Joseph R nr Newville, Ind. | 610 | 1947–82 | 4– 6–50 | 17.05 | 9,710 | 16 | 3–17 | 17.96 | 9,190 | 15 | [1]50 |
| 52 | 04179000 | St. Joseph R at Cedarville, Ind. | | | 3–24–78 | 18.62 | --- | | | | | | |
| | | | 763 | 1956–82 | 5– 1–56 | --- | 10,100 | 13 | 3–17 | 21.94 | 14,500 | 19 | [1]> 100 |
| 53 | 04179500 | Cedar Cr at Auburn, Ind. | 87.3 | 1943–82 | 4– 5–50 | 9.90 | 1,520 | 17 | 3–14 | 10.63 | 2,100 | 24 | [1]> 100 |
| 54 | 04179510 | Cecil Metcalf ditch nr Auburn, Ind. | .78 | 1973–82 | 6–13–81 | --- | 90 | 115 | 3–14 | 10.50 | 140 | 179 | 20 |
| 55 | 04180000 | Cedar Cr nr Cedarville, Ind. | 270 | 1947–82 | 4– 5–50 | 11.67 | 4,870 | 18 | 3–14 | 12.98 | 5,340 | 20 | [1]45 |
| 56 | 04181500 | St. Marys R at Decatur, Ind. | 621 | 1947–82 | 2–10–59 | 24.22 | 11,300 | 18 | 3–14 | 24.40 | 10,900 | 18 | [1]20 |
| 57 | 04182000 | St. Marys R nr Fort Wayne, Ind. | 762 | 1931–82 | 2–11–59 | 19.42 | 13,600 | 18 | 3–14 | 19.66 | 12,600 | 17 | [1]25 |
| 58 | 04182590 | Harber ditch at Fort Wayne, Ind. | 21.9 | 1965–82 | 6–13–81 | 11.67 | 916 | 42 | 3–14 | 12.25 | 900 | 41 | 10 |
| 59 | 04182900 | Maumee R at Fort Wayne, Ind. | 1,926 | 1907–82 | 3–26–13 | 26.10 | --- | --- | 3–17 | 25.93 | --- | --- | --- |
| 60 | 04183000 | Maumee R at New Haven, Ind. | 1,967 | 1947–82 | 3–24–78 | 23.58 | 22,400 | 11 | 3–17 | 25.49 | 26,600 | 14 | [1]80 |
| 61 | 04183500 | Maumee R at Antwerp, Ohio | 2,129 | 1922–82 | 5–20–43 | 20.29 | 26,200 | 12 | 3–17 | 21.70 | 26,100 | 12 | [1]40 |
| 62 | 04185000 | Tiffin R at Stryker, Ohio | | 1922–28 | | | | | | | | | |
| | | | 410 | 1941–82 | 4–25–50 | 15.45 | 6,640 | 16 | 3–15 | 18.36 | 7,760 | 19 | 50 |
| 63 | 04186500 | Auglaize R nr Fort Jennings, Ohio | | 1922–36 | | | | | | | | | |
| | | | 332 | 1941–82 | 1–23–59 | 20.30 | 12,000 | 36 | 3–13 | 15.05 | 5,850 | 18 | < 5 |
| 64 | 04187500 | Ottawa R at Allentown, Ohio | | 1924–35 | | | | | | | | | |
| | | | 160 | 1943–82 | 1–22–59 | 10.88 | 7,740 | 48 | 3–12 | 8.70 | 3,640 | 23 | < 5 |
| 65 | 04189000 | Blanchard R nr Findlay, Ohio | | 1924–36 | | | | | | | | | |
| | | | 346 | 1941–82 | 6–14–81 | 17.43 | 13,000 | 38 | 3–13 | 12.35 | 6,320 | 18 | < 5 |
| 66 | 04191500 | Auglaize R nr Defiance, Ohio | | | 2–13–59 | 27.65 | Ice jam | | | | | | |
| | | | | | 2–16–50 | --- | 52,500 | 23 | | | | | |
| | | | 2,318 | 1916–82 | 2–12–59 | --- | 52,500 | 23 | 3–14 | 27.39 | 52,300 | 23 | 20 |
| 67 | 04192500 | Maumee R nr Defiance, Ohio | | 1925–36 | | | | | | | | | |
| | | | | 1939–75 | | | | | | | | | |
| | | | 5,545 | 1979–82 | 2–16–50 | 13.70 | 87,100 | 16 | 3–15 | 15.87 | 104,000 | 19 | > 100 |
| 68 | 04193500 | Maumee R at Waterville, Ohio | | 1900–01 | | | | | | | | | |
| | | | | 1922–36 | | | | | | | | | |
| | | | 6,330 | 1939–82 | 2–16–50 | 14.52 | 94,000 | 15 | 3–15 | 17.18 | 120,000 | 19 | 90 |
| | | *Kankakee River Basin* | | | | | | | | | | | |
| 69 | 05515000 | Kankakee R nr North Liberty, Ind. | | | 6–27–68 | 9.04 | --- | | | | | | |
| | | | 116 | 1951–82 | 6–14–81 | --- | 780 | 7 | 3–17 | 9.01 | 908 | 8 | [1]> 100 |
| 70 | 05515400 | Kingsbury Cr nr LaPorte, Ind. | 3.01 | 1971–82 | 7–26–81 | 6.83 | 73 | 24 | 3–13 | 6.31 | 63 | 21 | 10 |
| 71 | 05515500 | Kankakee R at Davis, Ind. | | | | | | | 3–17 | 12.98 | --- | | |
| | | | 400 | 1932–82 | 7–29–81 | 12.52 | 1,580 | 4 | 3–20 | --- | 1,920 | 5 | [1]> 100 |
| 72 | 05516000 | Yellow R nr Bremen, Ind. | 131 | 1955–82 | 5–15–78 | 17.68 | 2,750 | 21 | 3–16 | 15.17 | 2,800 | 21 | [1]> 100 |

TABLE 2.—*Summary of peak stage and discharge data*—Continued

[R, river; nr, near; Cr, creek; $mi^2$, square miles; ft, feet; $ft^3/s$, cubic feet per second; $(ft^3/s)/mi^2$, cubic feet per second per square mile; dashes indicate missing or unknown value]

| Site number | Station number | Station name | Contributing drainage area ($mi^2$) | Period of record (water years) | Maximum flood previously recorded | | | | Maximum during 1982 flood | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Date | Gage height (ft) | Discharge ($ft^3/s$) | Discharge $(ft^3/s)/mi^2$ | Date | Gage height (ft) | Discharge ($ft^3/s$) | Discharge $(ft^3/s)/mi^2$ | Recurrence interval (years) |
| | | *Kankakee River Basin*—Continued | | | | | | | | | | | |
| 73 | 05516150 | Walt Kimble ditch nr Lapaz, Ind. | 1.50 | 1973–82 | 3–18–77 | 9.85 | 265 | 177 | 3–13 | 10.08 | 290 | 193 | 15 |
| 74 | 05516500 | Yellow R at Plymouth, Ind. | 272 | 1949–82 | 10–12–54 | 17.13 | 5,390 | 20 | 3–16 | 16.37 | 4,730 | 17 | [1]>100 |
| 75 | 05517000 | Yellow R at Knox, Ind. | 384 | 1944–82 | 10–15–54 | 13.75 | 5,660 | 15 | 3–18 | 13.25 | 5,280 | 14 | [1]>100 |
| 76 | 05517400 | West Arm Payne ditch nr North | | | | | | | | | | | |
| | | Judson, Ind. | 2.58 | 1973–82 | 6–13–81 | 8.33 | 230 | 89 | 3–13 | 6.63 | 92 | 36 | <5 |
| 77 | 05517500 | Kankakee R at Dunns Bridge, Ind. | | | | | | | 3–20 | 13.38 | --- | | |
| | | | 1,160 | 1949–82 | 10–22–54 | 13.20 | 5,300 | 5 | 3–23 | --- | 5,870 | 5 | [1]100 |
| 78 | 05517530 | Kankakee R nr Kouts, Ind. | 1,182 | 1975–82 | 6–18–81 | 13.59 | 4,630 | 4 | 3–24 | 14.52 | 6,420 | 5 | >100 |
| 79 | 05517780 | Cobb ditch nr Valparaiso, Ind. | .39 | 1973–82 | 6–13–81 | 9.13 | 76 | 195 | 3–13 | 9.46 | 81 | 208 | 10 |
| 80 | 05517890 | Cobb ditch nr Kouts, Ind. | | | | | | | 3–13 | 17.71 | Ice jam | | |
| | | | 30.3 | 1969–82 | 3– 5–76 | --- | 777 | 26 | 3–13 | --- | 751 | 25 | 10 |
| 81 | 05518000 | Kankakee R at Shelby, Ind. | | | 6–22–81 | 12.51 | --- | | 3–24 | 12.98 | --- | | |
| | | | 1,578 | 1923–82 | 2–21–27 | --- | 7,200 | 5 | 3–26 | --- | [2]7,650 | 5 | [1]>100 |
| 82 | 05519000 | Singleton ditch at Schneider, Ind. | | | 6–25–75 | 12.37 | --- | | | | | | |
| | | | 123 | 1949–82 | 3– 5–76 | --- | 3,550 | 29 | 3–13 | 11.41 | 1,910 | 16 | [1]10 |
| 83 | 05520500 | Kankakee R at Momence, Ill. | 2,093 | 1915–82 | 3– 6–79 | 10.51 | 16,000 | 8 | 3–20 | 6.03 | 11,000 | 5 | [1]50 |

[1]From Indiana Department of Natural Resources (1981).
[2]Mean daily discharge.

TABLE 3.—*Maximum, minimum, and median monthly mean discharges for the period of record through the 1981 water year at eight gaging stations in the Maumee River basin, and monthly mean discharges for October 1981 through March 1982*

[Discharge in cubic feet per second]

| Month | Maximum | | Minimum | | Median | Mean, |
|---|---|---|---|---|---|---|
| | Amount | Water year | Amount | Water year | | October 1981–March 1982 |
| | *St. Joseph River near Newville, Ind. (site 51)* | | | | | |
| Oct. | 877 | 1955 | 21.0 | 1964 | 81.2 | 425 |
| Nov. | 1,311 | 1973 | 30.5 | 1965 | 170 | 376 |
| Dec. | 2,085 | 1968 | 31.1 | 1964 | 425 | 303 |
| Jan. | 2,545 | 1950 | 38.3 | 1963 | 422 | 597 |
| Feb. | 2,302 | 1976 | 41.4 | 1963 | 608 | 750 |
| Mar. | 2,290 | 1978 | 312 | 1964 | 1,213 | 3,512 |
| | *Cedar Creek near Cedarville, Ind. (site 55)* | | | | | |
| Oct. | 805 | 1955 | 19.8 | 1965 | 40.1 | 210 |
| Nov. | 750 | 1973 | 24.0 | 1965 | 85.6 | 168 |
| Dec. | 908 | 1967 | 24.7 | 1964 | 179 | 117 |
| Jan. | 1,393 | 1950 | 25.9 | 1963 | 151 | 281 |
| Feb. | 1,290 | 1959 | 28.5 | 1963 | 336 | 346 |
| Mar. | 1,108 | 1978 | 146 | 1957 | 471 | 1,724 |
| | *St. Marys River near Fort Wayne, Ind. (site 57)* | | | | | |
| Oct. | 1,299 | 1955 | 8.3 | 1964 | 45.4 | 76.5 |
| Nov. | 2,612 | 1973 | 16.9 | 1965 | 86.5 | 102 |
| Dec. | 2,349 | 1978 | 16.7 | 1964 | 235 | 341 |
| Jan. | 4,897 | 1950 | 21.3 | 1977 | 403 | 1,358 |
| Feb. | 3,404 | 1959 | 45.4 | 1964 | 738 | 2,234 |
| Mar. | 4,070 | 1978 | 87.0 | 1941 | 1,297 | 3,972 |
| | *Maumee River at New Haven, Ind. (site 60)* | | | | | |
| Oct. | 1,615 | 1973 | 62.3 | 1964 | 242 | 947 |
| Nov. | 5,308 | 1973 | 102 | 1965 | 591 | 810 |
| Dec. | 6,292 | 1968 | 96.4 | 1964 | 1,624 | 902 |
| Jan. | 6,008 | 1974 | 119 | 1963 | 1,132 | 2,666 |
| Feb. | 7,649 | 1976 | 161 | 1964 | 2,207 | 3,668 |
| Mar. | 8,103 | 1978 | 1,181 | 1981 | 4,025 | 11,460 |

| Month | Maximum | | Minimum | | Median | Mean, |
|---|---|---|---|---|---|---|
| | Amount | Water year | Amount | Water year | | October 1981–March 1982 |
| | *Tiffin River near Stryker, Ohio (site 62)* | | | | | |
| Oct. | 315 | 1927 | 10.2 | 1964 | 48.1 | 552 |
| Nov. | 742 | 1973 | 14.6 | 1954 | 121 | 257 |
| Dec. | 1,785 | 1928 | 18.4 | 1964 | 203 | 181 |
| Jan. | 1,597 | 1950 | 20.2 | 1963 | 235 | 334 |
| Feb. | 1,569 | 1976 | 21.9 | 1963 | 416 | 462 |
| Mar. | 1,591 | 1978 | 135 | 1964 | 701 | 2,563 |
| | *Auglaize River near Defiance, Ohio (site 66)* | | | | | |
| Oct. | 3,445 | 1955 | 23.6 | 1953 | 138 | 999 |
| Nov. | 7,856 | 1973 | 7.3 | 1953 | 258 | 794 |
| Dec. | 8,510 | 1967 | 9.3 | 1977 | 767 | 1,943 |
| Jan. | 13,350 | 1950 | 48.5 | 1977 | 1,403 | 4,311 |
| Feb. | 10,170 | 1976 | 111 | 1964 | 2,167 | 5,164 |
| Mar. | 12,930 | 1978 | 382 | 1941 | 4,200 | 13,090 |
| | *Maumee River near Defiance, Ohio (site 67)* | | | | | |
| Oct. | 8,314 | 1955 | 63.9 | 1929 | 495 | 3,254 |
| Nov. | 16,410 | 1973 | 110 | 1954 | 1,156 | 2,267 |
| Dec. | 18,040 | 1967 | 158 | 1964 | 2,251 | 3,507 |
| Jan. | 30,150 | 1950 | 219 | 1945 | 3,517 | 7,377 |
| Feb. | 26,600 | [1]1976 | 363 | 1964 | 5,112 | 13,390 |
| Mar. | 26,200 | [1]1978 | 1,455 | 1941 | 9,190 | 33,950 |
| | *Maumee River at Waterville, Ohio (site 68)* | | | | | |
| Oct. | 9,041 | 1955 | 40.6 | 1901 | 422 | 4,122 |
| Nov. | 18,750 | 1973 | 68.0 | 1923 | 1,015 | 2,832 |
| Dec. | 23,830 | 1967 | 177 | 1964 | 2,655 | 4,350 |
| Jan. | 34,010 | 1950 | 235 | 1945 | 4,498 | 8,336 |
| Feb. | 30,000 | 1976 | 424 | 1934 | 6,031 | 12,730 |
| Mar. | 29,000 | 1978 | 1,759 | 1941 | 12,450 | 38,210 |

[1]Gage not operated during water years 1975–78. Monthly mean flows shown in table were estimated on the basis of correlation with downstream station. Maximum recorded monthly mean flows for this station are 22,460 $ft^3/s$ (1959) for February and 18,030 $ft^3/s$ (1973) for March.

## MAUMEE RIVER BASIN, INDIANA, OHIO, AND MICHIGAN

Although a large part of the Midwest was affected by the March 1982 floods, no area was hit harder than the Maumee River basin in Indiana, Ohio, and Michigan. Flooding in the basin was the worst since the historic flood of March 1913. Rapid melting of a snowpack containing as much as 5 in of water equivalent combined with moderate rainfall to cause flooding on major tributaries as well as on the main stem Maumee River. At Fort Wayne, Ind., 1,500 homes and 100 businesses were damaged, 9,000 people were evacuated, and more than $50 million in damages were reported.

Antecedent precipitation for the period December 1981 through February 1982 for the Indiana Northeast and Ohio Northwest NWS climatic divisions, which contain the Maumee River basin, was about 34 percent and 30 percent, respectively, above normal (table 1). Monthly mean flows for the period October 1981 through March 1982 at eight gaging stations in the basin are compared with the maximum, minimum, and median monthly mean flows for the period of record through the 1981 water year (table 3). Partial snowmelts and rainfall in January and February 1982 caused streamflow in the Maumee River and its major tributaries to be above normal even before the severe flooding began in March. For example, monthly mean streamflow in January and February 1982 at the gaging station on the St. Marys River near Fort Wayne (site 57) was 337 percent and 303 percent of the median flow for those months for the period of record (1931–81).

Streams in the southern half of the Maumee River basin showed the effect of the snowmelt and rainfall before streams farther north. Climatological data from the NWS explain this earlier increase in streamflow. Rainfall on March 11 and 12 at Berne, Ind., was more than 0.5 in greater than that recorded at Fort Wayne or at Montpelier, Ohio (fig. 12). Because of warm temperatures and the greater rainfall, the snowpack at Berne had completely melted by the morning of March 11, while at Fort Wayne and Montpelier several inches of snow and ice remained (figs. 2-4).

The Maumee River basin is shown in figure 13. A narrow belt along the western boundary of the basin is drained by the St. Marys and the St. Joseph Rivers. The St. Marys River—flowing from the south—and the St. Joseph River—flowing from the north—combine to form the Maumee

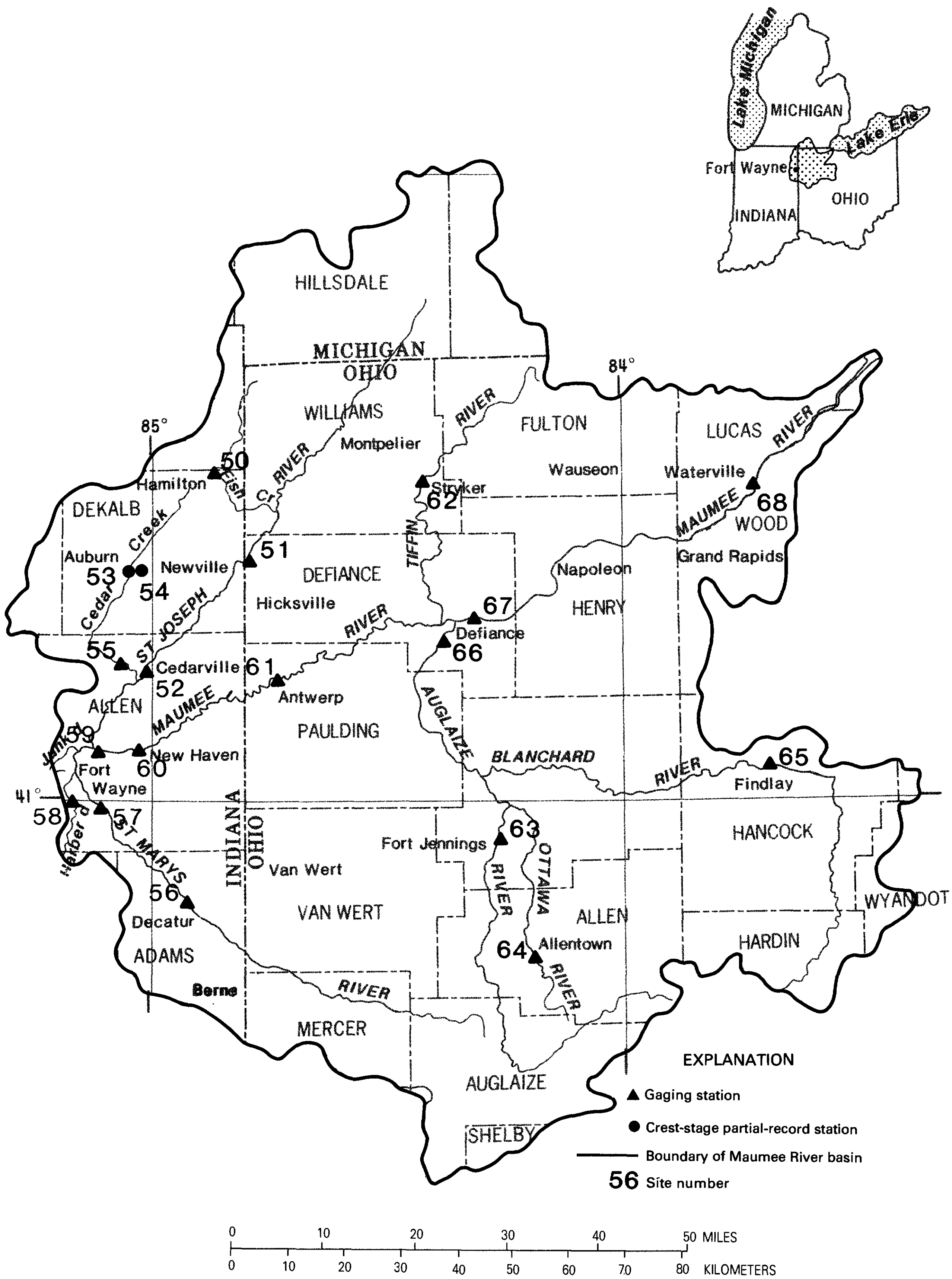



FIGURE 13.—Maumee River basin showing locations of stations within the basin.


FIGURE 14.—Discharge hydrograph, March 10–31, 1982, St. Marys River at Decatur, Ind. (site 56).

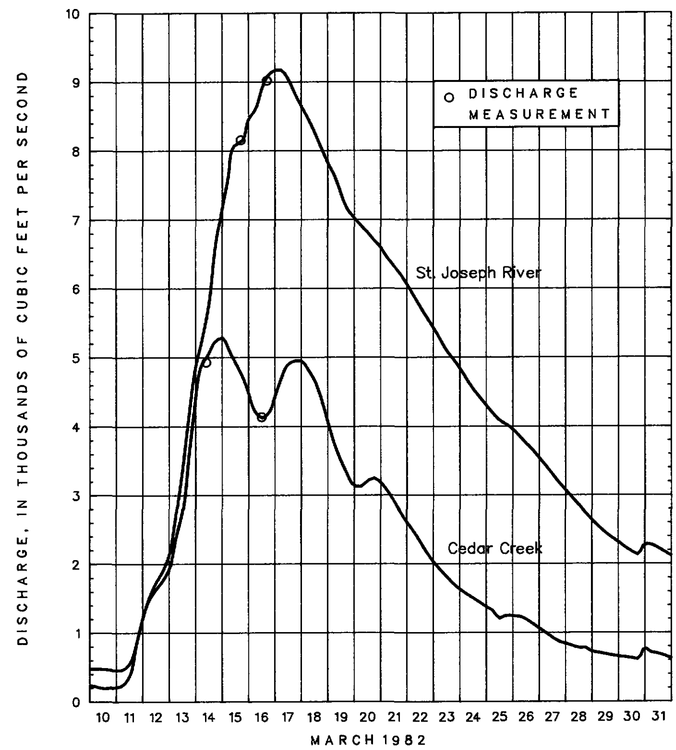



FIGURE 15.—Discharge hydrographs, March 10–31, 1982, St. Joseph River near Newville, Ind. (site 51), and Cedar Creek near Cedarville, Ind. (site 55).

River at Fort Wayne. At Defiance, Ohio, two more major tributaries enter the Maumee River—the Auglaize River flowing from the south and the Tiffin River flowing from the north. From Defiance, the Maumee River continues its northeasterly flow into Lake Erie.

The St. Marys River, a southern tributary, is gaged at Decatur, Ind. (site 56), and near Fort Wayne (site 57), as shown in figure 13. The discharge hydrograph for the St. Marys River at Decatur (fig. 14) shows the rapid rise in streamflow from March 10 through March 13. Peak discharge of 10,900 $ft^3/s$ at the Decatur gage was recorded at 0100 on March 14. At the Fort Wayne gage, the peak was 12,600 $ft^3/s$ and also occurred on March 14, 3 days before the peak on the St. Joseph River, a northern tributary. The recurrence intervals of the peaks on the St. Marys River range from 20 to 25 yr.

Discharge from the St. Joseph River and its major tributary, Cedar Creek, also contributed to the flooding in Fort Wayne. Headwaters of both the St. Joseph River and Cedar Creek are in the area where the water equivalent was more than 4 in (fig. 5). Melting of the dense snowpack in combination with moderate rainfall on March 13 and 16 produced large peak discharges in the streams. The St. Joseph River is gaged near Newville, Ind. (site 51), and at Cedarville, Ind. (site 52), as shown in figure 13. The discharge hydrograph for the gaging station near Newville (fig. 15) shows a broad crest caused by slower melting of the snowpack. Peak discharge of 9,190 $ft^3/s$ at the Newville gage was recorded at 0100 on March 17. The gaging station at Cedarville was inundated during the flood, but high-water marks recovered at the site were used to determine the peak discharge of 14,500 $ft^3/s$. Recurrence intervals are 50 yr for the peak discharge at the Newville gage and greater than 100 yr for the peak discharge at the Cedarville gage.

Cedar Creek enters the St. Joseph River downstream from the Cedarville gage (fig. 13). The crest-stage partial-record site on Cedar Creek at Auburn, Ind. (site 53), recorded a peak discharge of 2,100 $ft^3/s$, which has a recurrence interval of greater than 100 yr. The gaging station on Cedar Creek near Cedarville (site 55) recorded a peak discharge at 2100 on March 14 of 5,340 $ft^3/s$, which has a recurrence interval of 45 yr. March 14 is the same date the peak occurred on the St. Marys River. The discharge hydrograph of the Cedarville gage (fig. 15) shows the March 14 peak but also shows another peak of about 5,000 $ft^3/s$ at 2200 on March 17, the same date the St. Joseph River crested. Examination of figures 14 and 15 shows that the prolonged flooding in the Fort Wayne area was caused not only by the magnitude of the peak discharges on the St. Marys River, Cedar Creek, and the St. Joseph River but also by the timing of the peaks.

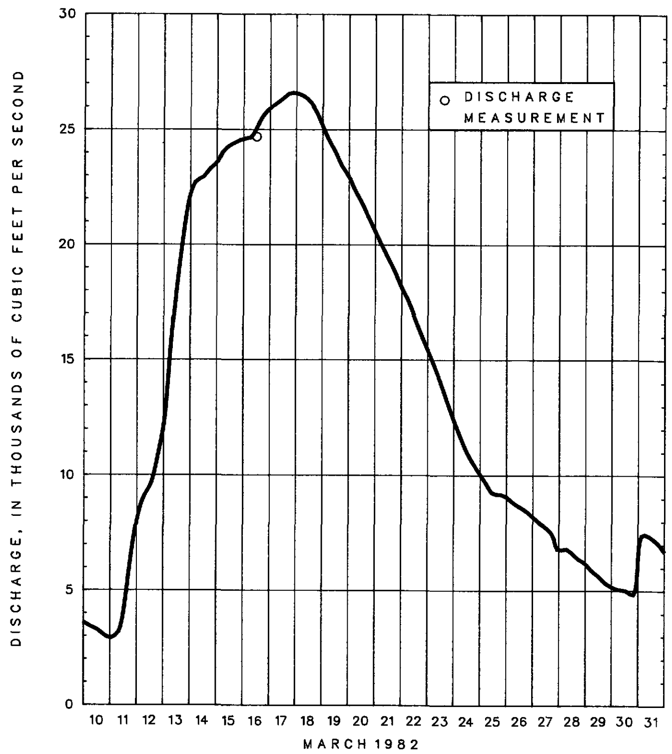



FIGURE 16.—Discharge hydrograph, March 10–31, 1982, Maumee River at New Haven, Ind. (site 60).

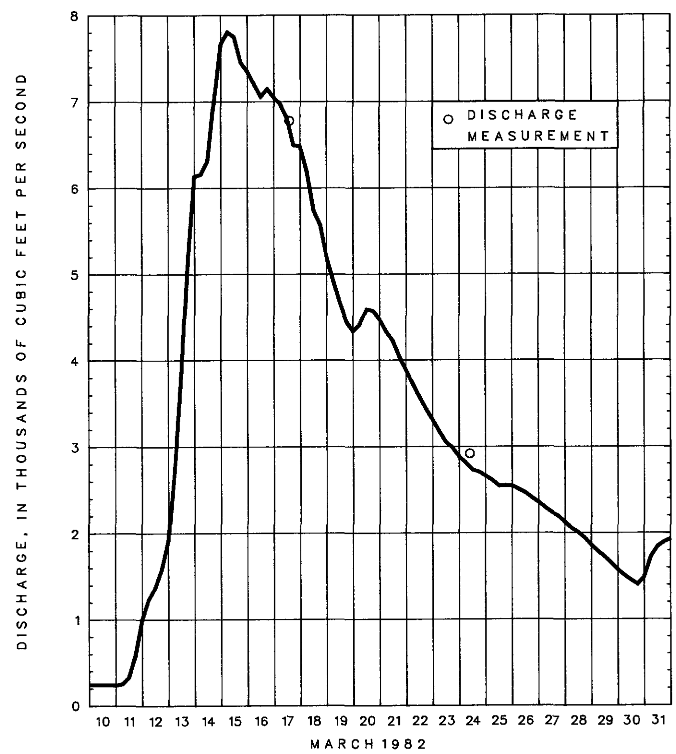



FIGURE 17.—Discharge hydrograph, March 10–31, 1982, Tiffin River at Stryker, Ohio (site 62).

Flooding along the Maumee River downstream from the confluence of the St. Marys and the St. Joseph Rivers at Fort Wayne received national attention and prompted a Presidential visit. The efforts of thousands of volunteers, many of them school children, who filled, transported, and placed sandbags to build or reinforce dikes, prevented much damage to the city. Damage still exceeded $50 million in Allen County, mostly in Fort Wayne.

The peak stage of 25.93 ft on March 17, 1982, at the gaging station on the Maumee River at Fort Wayne (site 59) was only 0.2 ft lower than the devastating flood of March 1913, which was the worst flood known in the area. The flooding in Fort Wayne was compounded because the river remained above flood stage (15.0 ft) from March 12 through March 26. The prolonged high stage saturated and strained the dikes protecting the city.

The gaging station on the Maumee River at New Haven, Ind. (site 60), was inundated during the flood. High-water marks recovered at the site were used to determine the peak discharge of 26,600 $ft^3/s$, which has a recurrence interval of 80 yr. The discharge hydrograph of the station (fig. 16) was constructed using recorded and observed gage-height data. Based on the observations of gage height, the peak discharge occurred late on March 17 or early on March 18. The broad crest is the result of the magnitude and timing of the peaks on the St. Marys River, Cedar Creek, and the St. Joseph River.

The peak discharge of the Maumee River attenuated slightly downstream from New Haven. The gaging station at Antwerp, Ohio (site 61), is located about 20 mi downstream from the gage at New Haven (fig. 13). Peak discharge of 26,100 $ft^3/s$ at the Antwerp gage was recorded at 0900 on March 17.

Downstream from Antwerp two major tributaries enter the Maumee River near Defiance, Ohio (fig. 13)—the Tiffin River from the north and the Auglaize River from the south. The peak discharge of 7,760 $ft^3/s$ recorded at the gaging station on the Tiffin River at Stryker, Ohio (site 62), has a recurrence interval of 50 yr—the same as that of the peak discharge recorded at the gaging station on the St. Joseph River near Newville, Ind. (site 51), to the west. The gaging station on the Auglaize River near Defiance (site 66) was submerged and inoperative during the flood. High-water marks recovered at the site were used to determine a peak discharge of 52,300 $ft^3/s$. This discharge has a recurrence interval of 20 yr—the same as that for the St. Marys River at Decatur, Ind. (site 56), to the west.

High flow of the Maumee River on March 14 was substantially increased by peak discharges of the Tiffin and Auglaize Rivers. Timing of the peak discharge at gaging stations in the Tiffin and Auglaize River basins is shown in figures 17 and 18. The effect of these peak discharges on streamflow in the Maumee River is shown in the hydrograph of discharge of the Maumee River near Defiance,

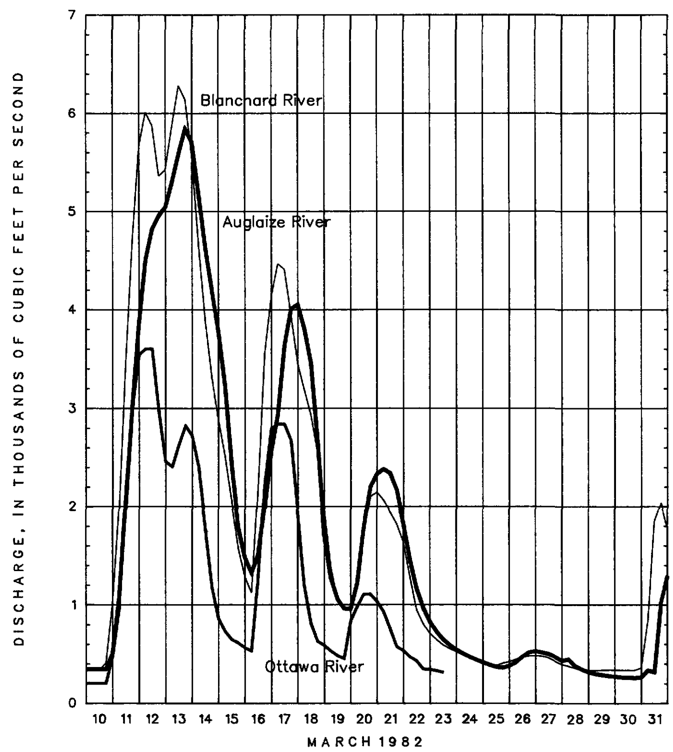



FIGURE 18.—Discharge hydrographs, March 10–31, 1982, Auglaize River near Fort Jennings, Ohio (site 63); Ottawa River at Allentown, Ohio (site 64); and Blanchard River near Findlay, Ohio (site 65).


FIGURE 19.—Discharge hydrograph, March 10–31, 1982, Maumee River near Defiance, Ohio (site 67).

Ohio (fig. 19). Peak discharges at gaging stations on the Maumee River near Defiance (site 67) and at Waterville, Ohio (site 68), were 104,000 $ft^3/s$ and 120,000 $ft^3/s$, respectively, late on March 14 or early on March 15, 3 days before the river crested upstream at New Haven, Ind. Discharge from the St. Joseph River and Cedar Creek on March 17 had minimal effect at downstream Maumee River stations even though it caused the crest at New Haven. The severe flood experienced in Defiance, therefore, was caused primarily by the Tiffin and Auglaize Rivers.

## FORT WAYNE, INDIANA

After the record amounts of snowfall recorded at Fort Wayne, Ind., in the winter of 1981–82, there was no question that a spring flood was probable. As early as mid-February, NWS bulletins warned of the increasing flood potential. Local officials planned how Fort Wayne would deal with the floods. Some people felt that the city was prepared for a flood they knew was coming. The question was when it would occur and how bad it would be. Partial snowmelts in late February 1982 reduced the snow cover, but low temperatures and additional snow and rain during the first week of March maintained a high water content in the snowpack. Then came the warmer temperatures, moderate rainfall, and the March snowmelt.

On March 11, rivers in Fort Wayne began to rise as light rain fell and the temperature rose to 45 °F. That night the temperature dropped below freezing for the last time until March 25. On March 12, the temperature kept rising, melting more of the snow cover. Mayor Winfield Moses called his task force members together that afternoon to review the flood-fighting plans. The Emergency Operations Center was activated to coordinate the response to the rising flood waters. Early on March 13, thunderstorms dropped a quarter-inch of rain on Fort Wayne. The rainfall and runoff from the last of the melting snow caused the St. Marys, St. Joseph, and Maumee Rivers to rise quickly. At 0600 on March 13, the Maumee River at Fort Wayne was 5 ft over flood stage and still rising. Water bubbled into the streets as sewers backed up. Low areas began to flood and warnings were issued via radio and television. For part of the city, it was already too late. A map (fig. 20) shows the location of rivers and streets in downtown Fort Wayne.

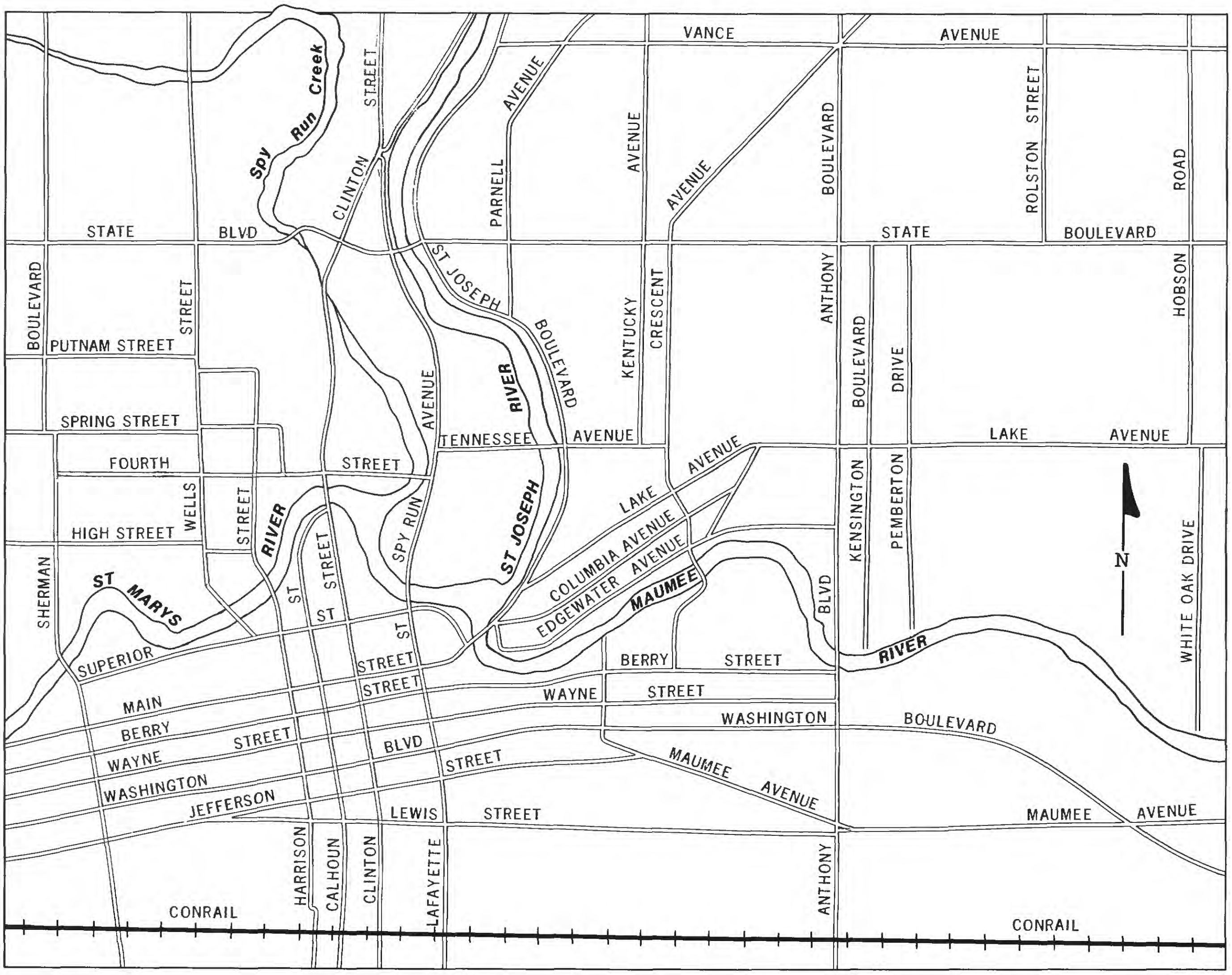



FIGURE 20.—Downtown Fort Wayne, Ind.

FIGURE 21.—Flooding on Elm Street in the Nebraska neighborhood, Fort Wayne, Ind., during the early stages of the flood. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

The St. Marys River was the first river to crest, and the Nebraska neighborhood in the western part of Fort Wayne became the first battleground. During the night of March 13 the river quickly rose. Water backed up into the Fairfield ditch and Junk ditch. As water spilled over the lowest dikes, sandbags were hastily laid, but the dikes gave way or were overtopped and water surged into the surrounding areas. Emergency teams called for rescue boats and more than 3,000 people were forced from their homes by the morning of March 14. Nebraska had been lost, and other areas were being threatened. Photographs show the early flooding western Fort Wayne experienced (figs. 21–25).

Fed by the St. Marys and St. Joseph Rivers, the Maumee River continued to rise. Concern also rose as to the stability of the dikes protecting many areas of the city. The river remained above flood stage (15.0 ft) from March 12 through March 26, and this prolonged high stage saturated and strained many of the dikes. Thousands of volunteers, most of them students, spent days filling, transporting, and placing more than a million sandbags in an effort to reinforce the dikes. The best known of their efforts was at Pemberton Drive dike, which protects the Lakeside area in northeastern Fort Wayne. On March 17, the Maumee River threatened to top the dike and flood thousands of homes and businesses. More than 6,000 people already had been evacuated from the area as a safety precaution. However, through the efforts of the volunteers, the Pemberton Drive dike held and an estimated $25 million in additional damages was prevented. Their labors won them the cheers of the Nation and of President Reagan, who had visited Fort Wayne on March 16 (fig. 26). Photographs show the extent of the sandbagging effort (figs. 27-30).

FIGURE 22.—Flooding on West Main Street in the Nebraska neighborhood, Fort Wayne, Ind. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

After the Maumee River crested on March 18, unsettled weather patterns threatened to compound the already critical situation by raising the flood levels even higher. The river was slowly receding during this time, but close attention was given to weather and river-level predictions from the River Forecast Center in Cincinnati, Ohio. Luckily, heavy rains did not develop and the river level dropped.

Before the flood emergency was over, residents, businesses, and local governments in the Fort Wayne-Allen County area experienced more than $51 million in damages and lost business. Approximately $10 million were expenses and damages incurred by the local governments. These costs do not include intangible costs, such as social and economic disruption, environmental deterioration, and personal stress in coping with the flood.

## SUMMARY

Flooding in March 1982 in northern Indiana, northwestern Ohio, southern Michigan, and northeastern Illinois was preceded by above-average autumnal precipitation, frozen, saturated ground, and rapid melting of a record winter snowfall. By early March, a snowpack containing water equivalent of up to 6 in covered most of the area. Rainfall during March 10–12 and the passage of a warm front through the area on March 12–13 triggered rapid melting of the snowpack and generated the floods. Subsequent rainfall during March 15–20 maintained high streamflow and produced additional peaks on some streams.

FIGURE 23.—Aerial view looking east along West Main Street toward downtown Fort Wayne, Ind. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

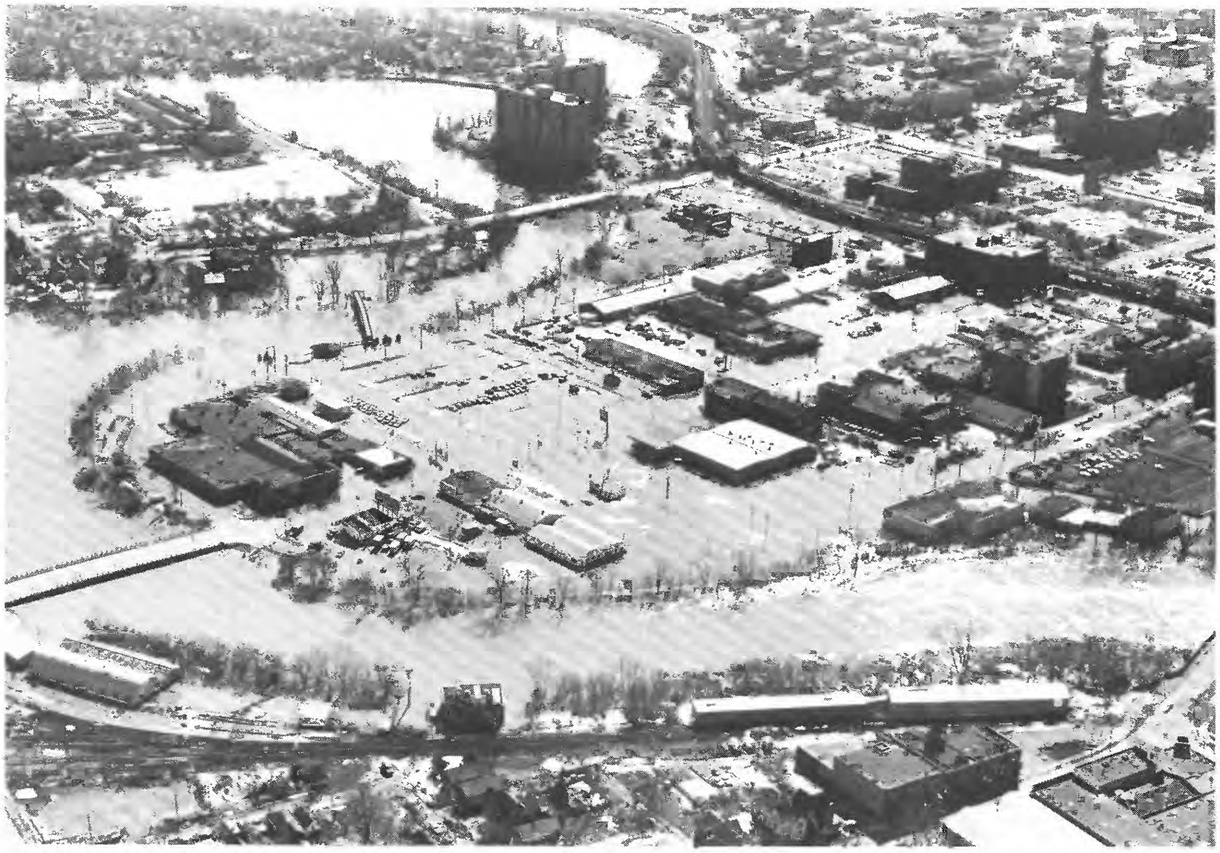


FIGURE 24.—Aerial view looking southeast at the "thumb" area of downtown Fort Wayne, Ind. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

FIGURE 25.—Aerial view looking southwest at the "thumb" area of downtown Fort Wayne, Ind. Photograph courtesy of *The News-Sentinel*, Fort Wayne, Ind.

FIGURE 26.—President Reagan passing sandbags to reinforce the dike at Sherman Boulevard and Herman Street, Fort Wayne, Ind. Photograph courtesy of *The News-Sentinel*, Fort Wayne, Ind.

Data collected by the National Weather Service document the severity and the sequence of meteorological conditions that provided the potential for and triggered the floods. This report includes weather maps, atmospheric soundings, temperature data, snow-depth and water-equivalent data, and precipitation data.

Streamflow data collected by the U.S. Geological Survey document the peak stage and discharge at 83 gaging stations and crest-stage partial-record sites from five drainage basins affected by the flooding. Also included are discharge hydrographs, monthly streamflow statistics, and flood-frequency analyses.

Flooding in the Maumee River basin in Indiana and Ohio was the worst since 1913. Particular attention is given in the report to the Fort Wayne, Ind., area, where 1,500 homes and 100 businesses were damaged, 9,000 people were evacuated, and $51 million in damage was reported. Major flood-fighting efforts in the city prevented millions of dollars of additional damages.

FIGURE 27.—Convoy of trucks filled with sandbags. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

FIGURE 28.—Aerial view of Pemberton Drive dike, Fort Wayne, Ind. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

FIGURE 29.—Volunteers passing sandbags to reinforce Pemberton Drive dike, Fort Wayne, Ind. Photograph courtesy of *The News-Sentinel*, Fort Wayne, Ind.

FIGURE 30.—Results of the sandbagging effort at the Pemberton Drive dike, Fort Wayne, Ind. Photograph courtesy of *The Journal-Gazette*, Fort Wayne, Ind.

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☆ U.S. GOVERNMENT PRINTING OFFICE: 1988 – 242-338 – 226/80048

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