

CRH SSD
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CENTRAL REGION TECHNICAL ATTACHMENT 91-06

THE OHIO RIVER FLOOD OF JANUARY 1937¹

"Conditions on this river are simply hell. The people refuse to evacuate ahead of the time of serious danger, and then the rescue load comes all at once. The army engineers stepped into this strange job of rescue and evacuation in great style. They are doing all that is humanly possible to bring order out of chaos. I have seen it happen right here today.

Report filed by H. W. Richardson, Associate Editor, *Engineering News-Record*, February 4, 1937"

DECEMBER PRESAGED JANUARY'S DISASTER

The great flood of January-February 1937 in the Ohio Valley had its beginning in the latter part of December 1936 when moderate to heavy rains began over the entire Ohio River watershed. A general rise began in the lower portion of the river during the last week of December 1936 and developed within one month's time into the greatest flood of record on that river.

JANUARY RAINS UNPRECEDENTED

The flood resulted from excessive rains which followed during the month of January. There was practically no snow on the ground at the beginning of the month, and whatever small amounts fell subsequently were absorbed in the general rains and had no appreciable effect on the flood. The greatest concentration of rainfall occurred in the lower portions of the Ohio Valley, with the month's totals in this area being more than four times the normal amount for January. Practically all the precipitation that occurred over the Ohio Valley during January occurred within the period from the 1st to the 24th, inclusive. Especially during the period 13th-24th, the rainfall was exceedingly heavy (see Figure 2); and the greatest intensity was located along the Ohio River from Cincinnati, Ohio, to the mouth. The axis of this area followed the Ohio River from Cincinnati to Louisville, Kentucky; and from there, it lay a very short distance south of the course of the main stream.

By the morning of the 18th, the Ohio River was in flood from the mouth upstream to Cincinnati. Heavy excessive rains which had begun on the 17th continued almost without exception until the morning of the 25th. The area of heaviest precipitation wavered back and forth across the Ohio River, and it was seldom during this period that the precipitation area moved far enough

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20 FEB 1991

from the river that the downpours did not affect it. It was eventually determined that precipitation of 16 inches or more had occurred over two areas of 10,000 square miles each, and of 12 inches or more over an area of about 100,000 square miles.

This 1937 flood surpassed all previous floods during 175 years of civilized occupancy of the lower valley. The previous great flood occurred in 1884 at Louisville, and an earlier monstrous flood had occurred in 1773. Nonetheless, even geologic evidence suggests that in lower parts of the valley, this 1937 flood exceeded any previous flood.

The runoff from heavy rains falling in such close proximity to the Ohio River passed quickly into the main stream which was already full, and resulted in a rapid rise over a long reach in the river; and by the morning of the 24th, which was probably the darkest moment in the history of the flood, the entire Ohio River was above flood stage, and all records had been broken from Cairo, Illinois, to Portsmouth, Ohio. The greatest 24-hour rise from 7 AM to 7 AM occurred after exceptionally heavy rains on the 20th-21st when the water rose 6.7 feet at Cincinnati (see Figure 3) and 6.3 feet at Louisville. On the morning of the 24th occurred the final downpour of the flood. The effective rains of the flood ended shortly after this period, and within a day or two the river crested at most points along the river, except at the lower portion.

All previous records were broken along the Ohio River from slightly below Point Pleasant, West Virginia, to the mouth at Cairo, Illinois. At Cincinnati, with a stage of 80 feet on January 26, the flood stage was exceeded by 28 feet; and the previous highest stage there, 71.1 feet in 1884, was exceeded by 8.9 feet. The height of the flood was greatest in the Louisville district, where stages were about 30 feet above flood stage and more than 11 feet above the previous highest stages of record. At Cairo, Illinois, the crest reached was 19.6 feet above flood stage and 3.2 feet above the highest stage previously recorded there.

EVACUATION, LOSSES TREMENDOUS

The loss and damage that occurred in the Ohio Valley from this flood was tremendous. The hardest hit of the larger cities was Louisville, where nearly 70 percent of the city was under water, and about 175,000 people were forced to vacate their homes. Cincinnati, because of its higher elevation, was fortunate in that only 10 percent of its area was covered by water. However, the city was practically paralyzed by loss of water, power, heat, and light, and nearly helpless to combat fires that broke out. A number of smaller cities along the lower Ohio River were completely submerged. The whole city of Paducah, Kentucky, with a population of about 35,000, was evacuated. Jeffersonville, Indiana, across the river from Louisville, was 90 percent inundated; and 13,000 people fled their homes, while in the Evansville, Indiana, area, about 90,000 people were forced to flee their homes. Many

smaller towns actually suffered more than the larger ones. Brookport, Illinois, for one, was completely inundated.

The city of Portsmouth, Ohio, was supposedly protected by a famous 60-foot wall, which had safely withheld the flood of March 1936, just ten months earlier. However, in this 1937 flood, the height of the water exceeded the top of the wall by more than 14 feet. As soon as it became apparent that the river stage would exceed the top of the wall, action was taken to permit the water to enter the city through wall openings in order to minimize the force of the current flowing over the wall. However, the rise of the river was so rapid that this action was only partially successful, and considerable damage occurred from water rushing over the wall. The first flow of water over the wall created a fearful raging torrent through the hapless town's streets. Overall, Portsmouth's physical damage was probably the greatest in the valley.

Cairo, Illinois, on the other hand, was safe behind its 60-foot wall as the crest of the river went up to 59.6 feet, a rise to a mere 0.4 foot below the wall's top!

MISSISSIPPI VALLEY SPARED

The February 4, 1937, *Engineering News-Record* ran the following headline and remark:

FLOOD PLAN TESTED - The costly plans for control of floods in the lower Mississippi River Valley, begun after the 1927 flood, are being tested by a flood greater than that of 1927. How well the strengthened levee system, cutoffs and floodways will function is of great interest to engineers concerned with river control.

Thanks in part to the prolonged rains that caused the flood, the flood crest out of the Ohio River, entering the Mississippi River at Cairo, was one of unusual flatness, or length of crest. That may have helped in "breaking in" the new floodway system of the Mississippi. At any rate, downstream along the Mississippi River, damage was confined almost entirely to the overflow between the banks and the levees and in the backwater areas of the tributaries. The Mississippi levee system, improved and constructed after the disastrous flood of 1927, withstood the exceptionally high stages remarkably well; and no prominent levee breaks occurred.

REFERENCES

1. *Monthly Weather Review and Annual Summary*, Volume LXV - 1937; pages 71-86.
2. *Engineering News Record*, Volume 118, No. 4; January 28, 1937; pages 142-144, "Floods Break All Records in Lower Ohio Valley."

3. *Engineering News-Record*, Volume 118, No. 5; February 4, 1937; pages 151-156, 205-206; "Super Flood Devastates Lower Ohio and Now Threatens Mississippi Levee System."
4. *Engineering News-Record*, Volume 118, No. 10; March 11, 1937; pages 380-383; "Rehabilitation of Ohio Valley."
5. *Transactions of the American Society of Civil Engineers (ASCE)*, Volume CVIII - 1943; page 290, "Unusual Events and Their Relation to Federal Water Policies."
6. *Transactions of the American Society of Civil Engineers (ASCE)*, Volume CV - 1940; page 1740, "Important Events, and Trends in Water Supply Engineering During the Decade Ending with the Year 1939 - Report of the Committee on Water Supply Engineering of the Sanitary Engineering Division."
7. *U.S. Geological Survey Water-Supply Paper 838, Floods of Ohio and Mississippi Rivers*. January-February 1937.

FLOOD STAGES -- OHIO RIVER -- JANUARY, FEBRUARY 1937

| Station | Flood Stage | Above Flood Stage | | | Crest | |
|----------------|-------------|-------------------|--------|------|-------|---------|
| | | From | To | Days | Stage | Date |
| Portsmouth, OH | 50 ft | Jan 18 | Feb 3 | 17 | 74.1 | Jan 27 |
| Cincinnati, OH | 52 ft | Jan 18 | Feb 5 | 19 | 80.0 | Jan 26 |
| Louisville, KY | 51 ft | Jan 16 | Feb 7 | 23 | 81.4 | Jan 27 |
| Evansville, IN | 35 ft | Jan 10 | Feb 19 | 40 | 53.8 | Jan 31 |
| Paducah, KY | 39 ft | Jan 10 | Feb 22 | 43 | 60.6 | Feb 2 |
| Cairo, IL | 40 ft | Jan 9 | Feb 27 | 49 | 59.6 | Feb 3,4 |

COMPARISONS TO PREVIOUS RECORD FLOODS

| Station | 1937 | | Previous Year | Record Stage |
|----------------|-------|---------------|---------------|--------------|
| | Stage | Discharge | | |
| Portsmouth, OH | 74.1 | | 1913 | 67.9 |
| Cincinnati, OH | 80.0 | 950,000 cfs | 1884 | 71.1 |
| Louisville, KY | 81.4 | 1,100,000 cfs | 1884 | 70.0 |
| Evansville, IN | 53.8 | | 1884 | 40.4 |
| Paducah, KY | 60.6 | 1,980,000 cfs | 1913 | 54.3 |
| Cairo, IL | 59.6 | | 1927 | 56.9 |



Figure 1. Precipitation for January 1-12, inclusive, 1937.

FEBRUARY 1937

MONTHLY WEATHER REVIEW

75

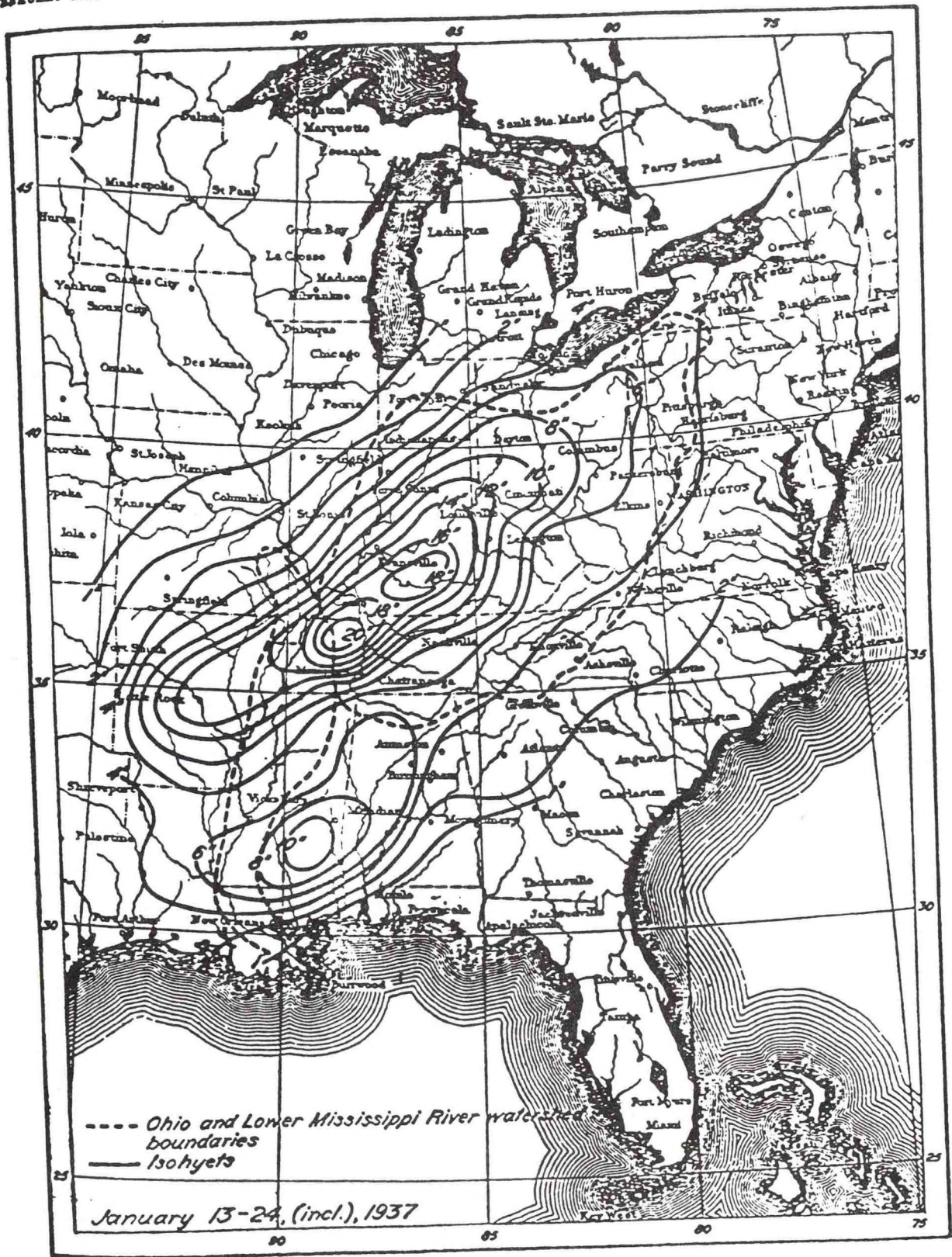


Figure 2. Precipitation for January 13-24, inclusive, 1937.

GENERAL FEATURES OF THE FLOODS

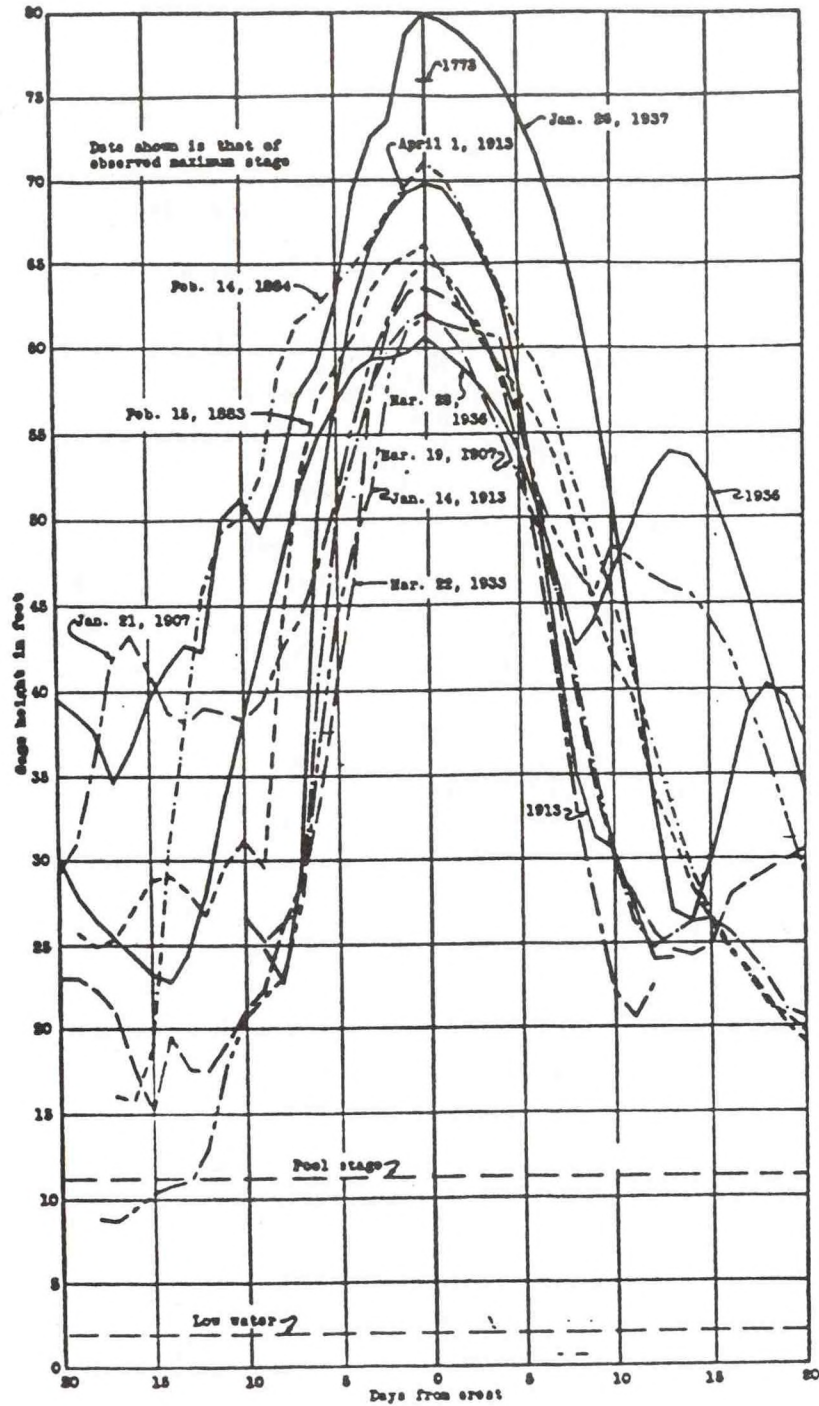


Figure 3. Hydrographs of the Ohio River at Cincinnati, Ohio, showing stages reached by the flood of January-February 1937 and selected previous floods.