

# The 1937 Flood in Southern Illinois

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The great flood which swept down the Ohio Valley during late January and early February, 1937, brought home to the entire nation a realization of the value of engineering data applicable to the situation. This paper stresses in particular the demonstrated usefulness of topographic maps which were available, covering the entire area of southern Illinois that was involved in the disaster. The need for a detailed map of the Illinois flood area was apparent as soon as it became evident that the water would reach an unprecedented height. It was likewise apparent that such a map could be prepared most quickly and accurately by the use of standard quadrangle topographic maps as a base for plotting the extent of the inundation throughout the region. Fortunately, all the necessary maps were at hand, having been prepared over a period of some thirty years as a cooperative project of the Illinois State Geological Survey and the U. S. Geological Survey. Representing three-dimensional portrayal of land relief and the works of man, these maps supplied, on a scale of one inch to the mile, a perfect base on which to plot the flood coverage. Measurements and observations made at selected points, together with logical interpolations of the situation at other points, gave the data needed for superimposing on the topographic base an almost photographic reproduction of the flooded region. The composite map totalled eight by six feet in size.

**Data shown on the map.**—The map shows not only the extent of the flood in southern Illinois, but also the depths of the water throughout the flooded areas. Furthermore, it shows the mileages of flooded roads and railroads, the location and configuration of high points isolated by the flood, and most of the houses and other buildings invaded by the water.

Reference to the map shows that at least 1200 square miles of land in Illinois alone were covered by the flood waters. This land represents, for the most part, the most fertile farming areas of that part of the State. The losses in stock, equipment, buildings and furnishings can hardly be calculated. In addition, at least 43 cities and towns were directly involved in the disaster in the same area. More than 125 miles of railroad right-of-way was also under water before the crest of the flood was reached.

Several mines in the famous Harrisburg coal mining region were flooded, either through the shafts or by percolation through their roofs. Flooding of any coal mine is a serious matter, often necessitating its abandonment; and it is feared that some of these mines may never be reopened. The locations of most of these mines are shown on the map.

The full size map is on display in the offices of the State Geological Survey in Urbana, and is available for examination by any one interested in securing data that may be shown on it.

**Procedure.**—The original map of the flood was made for reference use at Illinois National Guard Flood Headquarters at Eldorado. It was plotted from data secured at various points along and within the margins of the flooded area, observation trips being made by automobile, boat and airplane. So far as possible, the mapping was done by noting the relation of the flood to points of known elevation. In other cases the water line was sketched with reference to topographic features, houses, known mileage of flooded roads, et cetera. It was also necessary, in order to prepare a working map as soon as possible, to interpolate the elevation of the flood stage between points of known elevation. In spite of the necessity for haste, in quickly preparing a map for emergency use, later checking of the map proved the soundness of the methods employed in its preparation.

Following the completion of the field map for headquarters use, similar maps were made in the offices of the State Geological Survey, at Urbana, for use in the offices of Governor Horner, at Springfield, and for permanent reference use in the Geological Survey technical files. With more time and better facilities available for the preparation of these latter copies, more care was taken in their drafting.

**Causes of the flood.**—Examination of the flood map reveals many surprising facts—facts that at first glance may appear to be founded on faulty observations. With this situation in mind it seems advisable to include in this report a summary presentation of the factors involved in causing the flood, as it was expressed in the lowland areas of southern Illinois. With these factors outlined in proper relation to each other, seemingly unbelievable situations in regard to the flood become understandable.

**Abnormal rainfall.**—Over a large area drained by the lower reaches of the Ohio a moderately heavy snowfall took place during the period immediately preceding that of the flood. Followed by warmer weather with rain and thawing, great quantities of water were dumped into numerous tributary streams which normally disgorge into the Ohio without difficulty, but which on this occasion found their outlets blocked by high water in the major valley.

For the most part, however, the flood in the Ohio Valley proper resulted from the unchecked runoff of a record rainfall over a much greater area, including all or considerable portions of Illinois, Indiana, Ohio, Pennsylvania, West Virginia, Kentucky and Tennessee. In these

states the ground was already well saturated with water as a result of the unseasonable and frequent rains of December. When, during the last three weeks of January, the entire region was again subjected to still heavier rainfall, the situation became serious. The already saturated soil could not retain this new supply of water. Furthermore, prevailing temperatures, far above the freezing point, allowed the runoff to take place unchecked. Figures secured from the U. S. Weather Bureau show that throughout the region in question from two up to more than sixteen inches of rainfall were recorded in the period from January 6 to January 26. More significant still is the fact that the heaviest precipitation was recorded in the areas immediately adjacent to the Ohio River, on both sides of the valley. The total rainfall for the three-weeks period was equal to more than a third of the annual average, over an area of many thousands of square miles.

Examination of the weather maps for the month of January, 1937, reveals the explanation for this long spell of rainy weather. The maps show that throughout most of the month high pressure areas persisted over the lower Atlantic coast and over the north central states. Between these two highs a low pressure trough stretched from Texas to Pennsylvania, thus allowing warm, moisture-laden air from the Gulf of Mexico to spread northeastward, where it came in contact with the colder high pressure atmosphere, thus causing the almost continuous precipitation. The twenty-day storm is estimated to have been fifty per cent greater than that of March, 1913, which resulted in the disastrous flood of that year.

**Backwater flooding.**—The flood map of southern Illinois shows an extensive area under water in Saline, Gallatin and White counties, covering the alluvial flats in the lower valleys of the Wabash, Saline and Little Wabash drainage systems. Inasmuch as the water flooded this region at elevations up to twenty feet higher than in the nearby Ohio Valley it must be immediately evident that this particular area was not inundated by water overflowing from the main river. The only possible explanation for this apparently anomalous situation is that the minor streams named above, having their outlets blocked by the flood in the Ohio, impounded their waters in their own valleys. These smaller streams, already swollen by excessive runoff, rapidly flooded the large areas of bottom land through which they normally flowed, while still maintaining a flow gradient of from two to six inches per mile. This situation was undoubtedly responsible for the plight of Harrisburg, Equality, Omaha, Texas City, and a number of other smaller towns, none of which would have been flooded directly by overflow from the Ohio. Measurements made on January 27, in the vicinity of Harrisburg, showed the water to be rising at the rate of  $\frac{3}{4}$  of an inch per hour, indicating how quickly these ponded waters were accumulated.

**Reoccupation of ancient Ohio Valley.**—One of the most striking features of the flood in southern Illinois was the reoccupation of a

stretch of the Ohio Valley which has been abandoned for many thousands of years. This ancient valley was cut through the hills of Pope, Massac, Pulaski and Alexander counties, extending from a point about four and a half miles downstream from the present town of Golconda, in a westerly direction, to where it joined the Mississippi about eight miles northwest of Cairo. This old valley, generally referred to as "the Cache River Basin," is some fifty miles in length, and is from two to five miles in width, broadening to the westward in the direction of flow. It exhibits a slope of approximately five inches per mile along its floor, which throughout its extent maintains an elevation some forty feet higher than the normal water level elevation in the present valley of the Ohio, a few miles to the south.

Between the old and new valleys lies an isolated ridge of the Illinois Ozark Uplands, rising nearly three hundred feet above the lowlands that surround it, and varying in width from two to twelve miles.

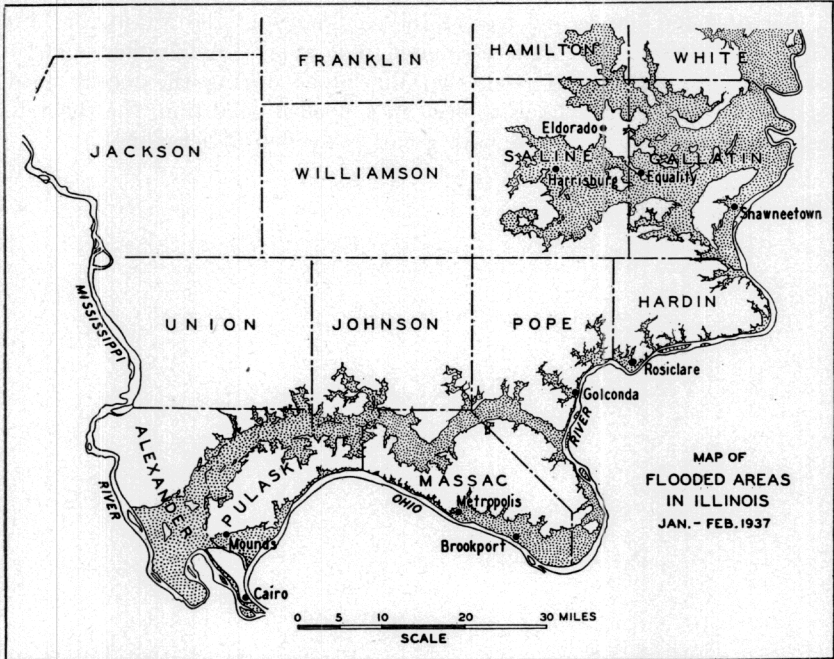
Although it is commonly known that the Cache River Basin was once a part of the main Ohio Valley, the details of its history are more or less obscure, inasmuch as no careful investigation has yet been made of the sequence of events involved in that history. The main facts are more or less evident, however, and can be supported by logic.

It is probable that the Ohio flowed through the old valley until some time near the close of the Great Ice Age (Pleistocene Time). With the melting of the ice sheets that had covered the Great Lakes region, tremendous quantities of water poured into the Ohio and Mississippi valleys, bringing about annual floods of amazing volume and duration, often filling the valleys entirely. With the waters overflowing the valley walls themselves, changes in stream configurations were inevitable.

Study of the topographic maps of southern Illinois suggests a plausible explanation of the situation which led to the abandonment of the old valley there. To begin with, we may assume that super-floods were probably coincident in both the Ohio and Mississippi valleys, near the close of the Great Ice Age. A Mississippi flood equal to or greater than one in the Ohio Valley would have caused a damming of the latter, with overflow into adjacent areas through low points in the valley walls, provided that a sufficiently high flood stage was attained. At the point near Golconda, where the old and new valleys branch apart, a narrow divide formerly existed between a right angle curve of the Ohio and what was probably a northward-trending valley tributary to the Cumberland River. During one of the glacial super-floods the Ohio waters undoubtedly overflowed at that locality, and in time lowered the divide below the elevation of the main valley at the curve. The Ohio thus took over the lower valleys of the Cumberland and Tennessee rivers, abandoning its former outlet to the Mississippi.

Since that time numerous floods have probably caused overflow waters from either the Mississippi or Ohio, or both, to reoccupy the old

valley trench; each flood depositing a layer of silt and silty clay on the old valley floor, gradually building up a considerable fill. In the meantime, erosion has deepened the present main valley to some extent, so that now there is a considerable difference in elevation between the two. The floor of the old valley, for instance, has an elevation of approximately 340 feet above sea level, at its upstream end. The present river flows past this point at an elevation of about 295 feet, making a difference of 45 feet. The recent flood, which attained a stage of a few inches less than sixty feet, thus caused the inundation of the old



valley to depths up to fifteen feet, and even more, where erosion by the small streams now draining the old valley has lowered the general level of the flat. The accompanying map shows clearly how the ancient stream bed was reoccupied by the flood waters of 1937.

A number of towns are located within the old valley trench, namely: Tansill, Brownfield, Reevesville, McNoel, Mermet, Belknap, Karnak, Perks, Ullin, Pulaski, Tamms, Sandusky, Unity, and Olive Branch. All of these towns were flooded, either wholly or to a considerable extent, in addition to the many farms located along the Cache River Basin. The resulting distress constituted a real disaster; but if the flood waters had not been allowed to occupy this basin (that is, if levees had been built to close off the valley entrance) the flood crest

would certainly have been considerably higher in the present valley, and in the towns and cities situated on its banks. Metropolis, Paducah and Smithland, for instance, would have been in a much more serious plight and it is probable that the city of Cairo would have been completely wiped out. This is a point to be considered in planning future flood control measures for the region under discussion.

It is evident that the plan of the flood control project begun in 1928, and virtually completed at the time of the 1937 flood, will need to be revamped to some extent. The project was carried through on the assumption that no flood would exceed a theoretical "super flood" having a flow of 2,400,000 second feet at the confluence of the Mississippi and Ohio rivers, at Cairo. It is estimated that approximately that amount of water was discharged from the Ohio alone during the recent flood. If the Mississippi had likewise been in a flooded condition, the theoretical "super flood" would have been greatly exceeded in actuality.