

## THE PRESENT STATUS OF THE MISSISSIPPI PROBLEM

BY

W. H. HAAS

*Northwestern University, Evanston.*

Few people appreciate the stupendous task that confronts man in his attempted mastery over the Mississippi. The effort to make the stream more navigable and less destructive in time of flood has been a long, weary fight and the end is not yet in sight. Every effort at control has been attended by new difficulties. With the passing of the years subsidiary problems have become more numerous rather than fewer, until now there is held little hope for a complete solution. The appreciation of this fact has come slowly and only very recently. Conditions may be ameliorated and some of the subsidiary problems solved, but there probably never will come a time when the mighty Father of Waters will be entirely subject to man's commands. There is also a growing appreciation of the fact that the mounting costs due to increasing difficulties will soon exceed the productive capacity of much of the land protected.

One of the things to be kept in mind is that many of the problems related to the general control are man made. Man made in the sense that one attempted correction here brings about a new complication elsewhere. Man made also in the sense that there is little or no unity of interest to look at the problem as a whole and thus difficulties are multiplied. Even where one government bureau has charge of one line of development, it is difficult for another bureau to do what should be done because the two see the problems from different points of view. It seems especially difficult for an individual, no matter what his rank or position, to dissociate himself from alliances and look at a problem only from the standpoint of its solution as a whole.

The geographer is always interested in a project that promises to eliminate certain physical handicaps. In such so-called improvements the question uppermost, of course, is, are the results commensurate with the costs, will they pay a reasonable dividend on the investment? Small projects are for the most part profitable investments because the results may be fairly accurately pre-determined. They are found

profitable in large part, however, because the costs must be borne by those bringing about the change. If there is any erring it is usually on the side of being too conservative. In large projects, on the other hand, like that of the Panama Canal, or that of the Mississippi, there is always an uncertainty of results. Moreover, in such cases certain benefits may be derived which cannot be measured in dollars and cents. In the case of the Mississippi where these elements are present there is a tendency by those who benefit most to push the project so long as the whole nation can be induced to pay.

As no single agency has been willing to assume the cost burden it is not surprising that one of the most striking things in an attempted solution is the lack of united effort. This is strikingly evidenced when it is realized that six separate agencies have been building levees and that ten U. S. Government agencies have had authority in the development and control of streams.<sup>1</sup> This authority has been divided between the departments of War, Interior, Commerce, and Agriculture. It is really too much to expect that, working for separate ends, the officials should always be in harmony, working for the solution of the problem as a whole. In fact engineers have testified that their "plans have frequently conflicted with the general interests."<sup>2</sup> This status is very gradually and very slowly changing but the millennium is still far distant.

This lack of unity and the shifting of responsibilities from one group to another is only natural considering the evolution of the whole situation; and therefore the unification of interests is still one of the major problems.<sup>3</sup> Those who look to making the stream into a great commerce way work for their interests, those interested in flood control work for the things that benefit them. Unfortunately these interests, in many cases, are not only conflicting but actually antagonistic. This phase of the situation is of more recent development. The earliest pioneers in the region settled on the natural levee lands nearest the river. This area had not only better soil but was also nearer to a natural outlet. The river depth was adequate for the commerce, but the more or less annual floodings were a severe handicap. The solution for their problem was the elevation of certain levees. These private efforts gradually grew into group control, levee districts, and state control each with its own interests and ideas in the foreground relative to flood control. There were no conflicts.

The question of the part of the Federal Government in flood control came later and has never been settled. The War Department

<sup>1</sup> House Committee on Flood Control, Hearing, 1916, p. 191.

<sup>2</sup> Cong. Rec. 70th Cong., 1st Session, Pt. 6, 1925, p. 4254.

<sup>3</sup> Haas, W. H., *The Mississippi Problem, a Conflict in Economic Emphasis*, Annals Assoc. Amer. Geographers, Vol. 19, pp. 1-7, 1929.

early assumed authority over the river because of the vital importance of its navigability in time of war. Congress, however, has always strenuously opposed any participation in the flood problem, contending that the responsibility was local, not national. This responsibility has never been fully settled and has brought about many a bitter debate when appropriations were needed. There have been many arguments on both sides. The chief of these in favor of Federal control has been (1) that the War Department already has taken control of navigation and that the question of navigation and flood control can not be separated, (2) that the river was bought with the purchase of Louisiana and has never been parcelled out to the states, (3) that the magnitude of the problem makes of it one affecting the welfare of the whole nation, (4) that the waters of other states create the problems, and (5) that Congress through its increasing appropriation in recent years tacitly assumes such responsibility.

The part being played by the Federal Government in flood control has been actually forced upon it. It began with the introduction of the steamboat nearly one hundred years ago. The unfitness of the stream for the newer type of transport and the enormous toll of boats exacted led to an official survey for the possible elimination of hazards. The conclusion reached in this survey was that cross-currents in the stream caused undercutting of banks with resultant accumulation of snags and silt banks. A proper building of "dikes" (levees) it was urged would prevent cross currents, undercutting, and the silting up of the stream bed. From this beginning started the movement of the building of levees for the purpose of making the river navigable. This policy so strictly adhered to until the disastrous flood of 1927 has become quite famous as the "levees only" policy. It is to be noted especially that the participation of the Federal Government in the building of levees has been under the guise of aiding navigation.

With this policy has arisen a very strange and ineffective control of the river. The War Department has taken upon itself to keep the river at a depth of nine feet at all hazards. To individuals, to local boards, or districts or states was left the problem of flood control. The one has been interested chiefly in the periods of low water, the other in the periodic floodings. The one has been interested in concentrating the waters into the narrowest possible channel to increase erosive power, the other has found that the progressive narrowing of the river bed between levees has been accompanied by a progressive rising in flood heights. Both sides have been levee building agencies but with an entirely different end in view. Now that the "levees only" policy has broken down the situation has been improved tremendously.

The general situation today is vastly improved over what it has been on the average in the past. The rapid development of the flood plain section, however, has intensified the clamor for better flood protection and a more effective outlet. For this reason also each new flood period brings about greater suffering. Before the Civil War considerable progress had been made in improving conditions, but during the war period everything gained seems to have been lost. In addition, during that and the reconstruction period there was a most remarkable series of floods, 1858, 1859, 1862, 1865, 1874, 1882, and each found the levees in worse condition than the one before. Toward the end of this period floods "went through and over" levees without restraint. To save the situation if possible, Congress created the Mississippi River Commission in 1879 to "improve and give safety and ease to the navigation thereof, prevent destructive floods,"<sup>4</sup> etc. The prevention of destructive floods, however, was not to be a dominant duty for the first appropriation in 1881 definitely stipulated that "no portion of the sum hereby appropriated shall be used for the purpose of preventing injury to lands by overflow or for any purpose whatever, except as a means of deepening or improving the channel of the river."<sup>5</sup>

During the 50 years of the commission's activity much has been done and much more could have been done but for the handicaps. The Mississippi River Commission, composed of three U. S. Army Engineers, one Coast and Geodetic Survey Engineer, and three civil engineers is only advisory in capacity. The Secretary of War, through the chief engineer, actually controls all construction. Up to 1917 all expenditures have been on a fifty-fifty basis, one-half supplied from local sources, the other half from the national treasury. From 1917 to 1927 the Federal Government has supplied two parts to one locally. Since the flood of 1927 with many of the districts bankrupt and with a debt greater than the present assessed valuations of the land protected, the Federal Government has been forced to take over the entire responsibility and expense. The Jones-Reid bill passed on May 15, 1928, held, however, that the principle of local contribution was sound, yet the U. S. Government, under the circumstances, should bear the entire expense for the present. The Commission is still advisory and the corps of U. S. engineers are still in a position to dominate. In the matter of control the present situation is not radically different from what it has been.

One of the most striking things in a study of this attempted control is the lack of plan. The lack of a unified organization and action; the

<sup>4</sup> House Committee on Flood Control, Hearing, 1916, p. 8.  
<sup>5</sup> Quoted in *World's Work*, Vol. XXX, p. 236, 1915.

opportunistic reaction to the sentiment of the day, which almost amounts to hysteria during flood periods; the lack of research by a scientific staff to discover causes; the lack of laboratories and a system of accurate measurements in order to procure accurate data necessary for a true comprehension and solution of the problem; the disregard for topographic maps, although through such large scale maps thousands of head of live stock could have been saved during the 1927 flood; the indecision and delay through congressional tactics, the idea that all research requirements are fulfilled when a group of congressmen with the title of Commission take a jaunt up and down the river; the indifference of the public at large except at periods of disaster; the muddling through the long series of years without the gathering and piling up of an enormous mass of basic data, all this seems incomprehensible.

Physically man has done little in turning natural laws to his benefit. The stream distance from Cairo to the head of the passes is 1060 miles. The shortest route from Cairo to the Gulf is less than one-half that distance; yet in this part, there are more than 2500 miles of levees, although there are no levees where the stream course is near the bluffs. The land in general slopes away from the river for five or six miles at the rate of three or four feet per mile, while the slope of the land toward the gulf is only about eight inches per mile, the gradient of the river being about three inches.<sup>6</sup> The gradient of the river varies greatly with the varying heights of the water but in the main the stream is at grade. The balance between aggradation and degradation is so delicate that the slightest change brings about the one or the other. The waters have been gradually hedged in more and more until the drainage waters of 41 per cent of continental United States, or 1,240,000 square miles, are concentrated upon a narrow belt of shifting alluvium less than a mile wide whereas the natural bed at flood periods was formerly 50 miles wide. This has been done, it must be remembered, not to redeem or protect overflow lands but to keep the stream navigable during the period of low stages. Little more is known relative to the laws underlying the above than was accepted half a century ago.

However, the point of view relative to corrective measures has changed radically since the disastrous flood of 1927. Up to that time the entire reliance was based on the building of the levees higher and wider and better. But the "levees only" policy has broken down. Levees have practically reached their limits, both structurally and eco-

<sup>6</sup> House Committee on Flood Control, 70th Cong. 1st Sess., 1927-28, Committee Doc. No. 17, p. 30.

nomically. After reaching a certain height the cost of building higher becomes prohibitive as the slope must be decreased from the order of about one on four to one on ten or even more. The upkeep is also tremendously increased. Structurally the height is limited also because of the character of the base upon which it is built, and the material available for its construction. Levees must be built with what is on hand and this is rarely even mid-grade levee material. Built on the natural foundation it may hold under a certain weight but give way when several feet are added to the height. When it is remembered that the average life of the levee is not more than ten years the cost of levee maintenance becomes so stupendous that the value of much of the area protected is by no means equal to the cost.

Even if the "levees only" policy has broken down completely, nevertheless levees are bound to play an important part always as far as we can see. For the present some of the existing levees are to be lowered, others to be raised somewhat. However, it has been estimated that to prepare for the next superflood, if the whole dependence should be placed in levees, the levee at Cairo would have to be raised twelve feet, the one at Arkansas City nineteen feet, the one at Angola twelve feet, and the one at New Orleans six feet. Such heights, it is believed, are entirely impracticable. To seek other means in flood control is, therefore, absolutely necessary.

The problem has been approached from two angles. The one is to slow up the waters before they reach the river, the other is to take care of the waters after they have reached the main channel. The one would slow up the waters by reforestation and the building of storage reservoirs, the other would increase the efficiency of the main channel by speeding up the waters or by providing more space for the flowing waters either between the levees or by providing spill ways either within or outside the outer levees.

There doesn't seem to be any effective way to slow up the waters sufficiently to be of material value. The Forest Service has recommended the acquisition of some 8,500,000 acres of land in the upper Mississippi Valley, but the retention of one inch of rainfall over this area would reduce the flood stage only one inch. The total amount of water in possible flood stages is so great (3,000,000 second feet, enough to fill Lake Erie in two weeks, and the flood stage in 1927 lasted forty-five days<sup>7</sup>) that the entire run-off for such an area would not materially affect the superflood stage. The capacity of possible water storage reservoirs is also relatively insignificant on this scale. To use these conjointly with water power projects does not seem feasible.

<sup>7</sup> Kelly, William, *Am. Soc. of Civ. Engs.*, Paper No. 1709, p. 954, 1929.

Projects for the slowing up of the waters may be found helpful and feasible when in conjunction with other purposes but not for flood control alone.

One of the things that helps to narrow down the problem is that the superfloods are not caused by the rainfall in the upper valley. The floods are due rather to a series of lows that originate in Mexico or our southwest and pass up across Texas and more or less along the Ohio Valley. When the Mississippi, already high with the spring high water stage, is forced to receive in addition this run-off, a superflood stage is almost sure to result. Efforts to slow up the waters must therefore be concentrated in the Ohio basin and on other streams reaching the Mississippi south of Cairo. Work of this type may be alleviatory to a degree, but in no sense important enough to think of it as a solution.

The problem, therefore, is narrowed down almost entirely to the channel area below Cairo. The plans for this area have not yet been definitely fixed as the basic information is not available. The general plan is to remove certain bottle necks. It calls for additional water space horizontally rather than vertically. For example the levee between Cairo and Madrid will be lowered and a new and higher levee is to be built about five miles to the rear. The land between the two levees is to be cultivable in most years but not in superflood years, which come only every seven to ten years. To do this many complications naturally arise; the land in private hands will have to be bought, stream courses and roads will all have to be taken care of. The cost of protection, therefore, is mounting rapidly and the time will soon come when some of the leveed lands will have to be abandoned.

Another part of the plan is the building of spillways. In the section between the Red and the Arkansas it has been estimated that the levees would have to be raised twenty feet to be safe from the predicted heights possible. This is out of the question because of the problems arising. Instead there is to be built a so-called "fuse-plug-levee" about fifteen miles long which can be blown up when the danger line is being reached. The waters then will be permitted to reach the Gulf through the shorter channel of the Beuf River. The problem of course will be to prevent excessive erosion. However, the spillway is still about 60 per cent low timber country which will be left uncut in order to break the force of the water. These spillways will have to be leveed also, of course.

It is evident that the problem of flood control is by no means solved. Disregarding the transportation problem entirely which complicates the whole situation immensely, the whole problem requires the

most serious attention and research. One of these lines of research must direct its attention to a method of bank protection, effective but not prohibitive in cost. The time must come when the entire stream course between Cairo and the gulf will be revetted. Many of the bends are already protected but chiefly for the prevention of cut-offs. Another line of research and the more important of these two is the development of the stream course into a more efficient silt bearer. There are many possibilities here, possibly an unkinking of bends. Revetment will reduce the amount of silt from a third to a fifth. The elimination of present bends would almost double the gradient and increase the efficiency greatly.

In conclusion it may be stated that the present status as to a complete solution is one of pessimism rather than optimism, rather one of bewilderment than confidence. On the other hand, at no time have the prospects been brighter for a real scientific attack on the problem than they are at present.