

OPERATION OF THE RIVER FORECAST PROGRAM
IN THE UNITED STATES

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The purpose of this discussion is to present a report on the status of the river forecasting program of the United States Weather Bureau at the present time. Particular attention will be given to the program in the Northeastern United States.

The organic act that established the United States Weather Bureau specifically included the rivers. It is the responsibility of the Weather Bureau to report and forecast the rivers for public use. This does not, of course, preclude the making of river forecasts by other agencies, both public and private, for their own use, but the public responsibility remains that of the Weather Bureau. It is obvious that for river forecasts to be clear and unconfused that some single agency must bear this responsibility.

As the economy of our country has expanded, we have encroached further upon the flood plains of our rivers, and we have used those rivers more and more intensively for all manner of purposes. This means that we must have an effective system of river forecasting. The river services program of the Weather Bureau has expanded to meet this challenge, and most rapidly in the last ten years.

The present organization of the River Forecasting program is shown in Figure 1. This figure shows a River Forecast Center as the central unit in forecasting. The fundamental office at the field level, however, is the River District Office which receives reports of river stages and rainfall, and issues the forecasts to press and radio, the general public, flood committees, and other interested parties. In the event that a River Forecast Center is not available because either one has not been established or time or communications do not permit consulting it, the River District Office prepares the river forecasts. In the majority of cases nowadays, the River Forecast Center receives reports of stages and precipitation from the River District Office and makes the river forecasts. These forecasts are then transmitted back to the River District Office and to the Central Office in Washington. In major river systems reports and forecasts may be received from an upstream River Forecast Center and transmitted to a downstream River Forecast Center.

Figure 1 shows the operational structure of the river services program rather than the organizational structure. In the organizational structure the Central Office and its Hydrologic Services Division are the top level, and direct and supervise the entire program. The Regional Office is primarily concerned with administrative matters, and is on a level between the Central Office and the field. On the field level is the River District Offices and the River Forecast Centers. They are equal in rank with no supervisory function of one over the other, although, of course, their work is highly interdependent and closely coordinated.

This picture of the river services program as it exists today differs in one important respect from the program as it was originally established. That respect is the River Forecast Center. The sole function of the River Forecast Center is to prepare river forecasts. The means used are the best that they can devise, and it is an important and time consuming part of their work to establish those means. The reason that these River Forecast Centers were estab-

lished is simply to provide the time and manpower necessary to make the best possible river forecasts. It should be realized that the River District Office is a busy Weather Bureau Office which has many other functions besides river forecasting. The peak loads in river forecasting coincide in time with the peak loads in weather forecasting. The River Forecast Center was designed to take some of this peak load off the River District Office, and the Center has done this successfully. In addition to the time problem during peak load periods, there is also the problem of finding manpower and time to study the problems of river forecasting thoroughly in the River District Office. The River Forecast Center has proven a vast step forward in the development of river forecasting procedures for two simple reasons: first, that time is made available in which to carefully and methodically make the necessary studies and second, that the staff of the River Forecast Center consists primarily of hydrologists rather than meteorologists as is the case in the River Districts.

Figure 2 shows the present status of the River Forecast Center system in the United States. It is obvious that most of the United States is now covered by these River Forecast Centers. The most obvious omissions are the lower Mississippi, the west Gulf basins, the Great Basin, the Colorado, California and the Great Lakes drainage. By examining the Hartford area, you will see that the area of the Hartford River Forecast Center comprises all of New England plus the Hudson River Basin. As time permits and if service demands exist, the rest of the Great Lakes and St. Lawrence drainage in New York and coastal basins in New Jersey will probably be included.

The Hartford and Augusta Centers were established in the fall of 1955 shortly after the disastrous hurricane floods of August. The Washington Center is in the process of establishment. The events that led directly to their establishment, however, were the hurricanes of 1954 which demonstrated an already well known fact - that all of the Gulf and Atlantic Coasts of the United States are subject to hurricanes. One of the results of hurricanes are torrential rains which, in turn, can produce floods. There had never been any question in the Weather Bureau that their River Forecast Center program should include most of the United States but the hurricanes of 1954 provided the impetus to appropriations permitting the expansion of the program into the Northeastern and South Atlantic areas.

The establishment of the Hartford River Forecast Center was not an instantaneous process. Not only was it necessary to assemble the personnel and the equipment, but it was also necessary to begin the study of river forecasting problems. Five river districts are in its area - Portland, Concord, Burlington, Albany and Hartford. As rapidly as the Hartford River Forecast Center can devise forecasting procedures which they believe to be substantially better than those now in use, they will assume the job of forecasting. This forecasting will be undertaken on a piecemeal basis, basin by basin and district by district.

At the present time, work is progressing to establish procedures for the southern half of the Hartford River District comprising the basins between the Housatonic and the Taunton, with the exception of the Connecticut Basin

above Springfield. This is largely the area where the inundations of August 1955 occurred. There were several reasons for this scheduling. In the first place, except for the main stem of the Connecticut River no river forecasting procedures were available for this area. In the second place, public interest in this area was at a high pitch because of the floods. While it is undoubtedly true that hurricane-caused floods can occur almost anywhere in the Northeastern United States this area deserved some extra consideration because of this factor. In the third place, there were obvious advantages technically in considering a river forecasting project in a small area. The personnel at Hartford are inexperienced in terms of the Hartford area. It is true that they are experienced river forecasters, but they needed to study the specific problems they would encounter at Hartford. It is quite possible that the studies in this particular area will lead to discoveries that will help further studies in other parts of their territory. Even more specifically, from a technical point of view, this area has a less severe winter climate than the rest and is, therefore, the best source of data on rises where snow melt is not an important factor. A relationship between rainfall and runoff, a basic tool, could best be derived there.

It is hoped that it will be possible to begin some forecasting in the southern area this spring. The target date is March 1, or shortly thereafter. The River Forecast Center at Hartford will then proceed to establish river forecasting procedures and assume river forecasting responsibilities for the rest of the area as rapidly as possible. Priority of attack is by no means fixed. It is possible that some of the members of the Eastern Snow Conference can make concrete suggestions based on their intimate knowledge of the area, but at the present time the program is planned as follows: first, the rest of the Connecticut basin and the Merrimack River Basin, second, the Vermont part of the Lake Champlain drainage and the rivers in southeastern Maine. At the present time the River Forecast Center in Cincinnati is studying river forecast problems in the Hudson River Basin and when these studies are completed that forecasting will be assumed by Hartford.

This program might be considered to be our primary and immediate goal. After it is completed we will then enter a period of study and refinement as our problems in operation indicate. This period does not have any termination point. We will also study specific applications of river forecasts at various localities with respect to flood histories and flood damage potential, and possible applications of

river forecasts in specific communities and localities that are affected by flash floods. It should be possible to make specific studies in order to provide local representatives with forecasting procedures for use in flash flood warnings. Such procedures used in conjunction with a reporting network that reports directly to some local individual or agency can be a very valuable tool, particularly in regards to the saving of lives.

Eventually, the Center may also have time to study particular problems such as low flow forecasts for water supply, volume forecasts for reservoir operations and other engineering applications for our procedures.

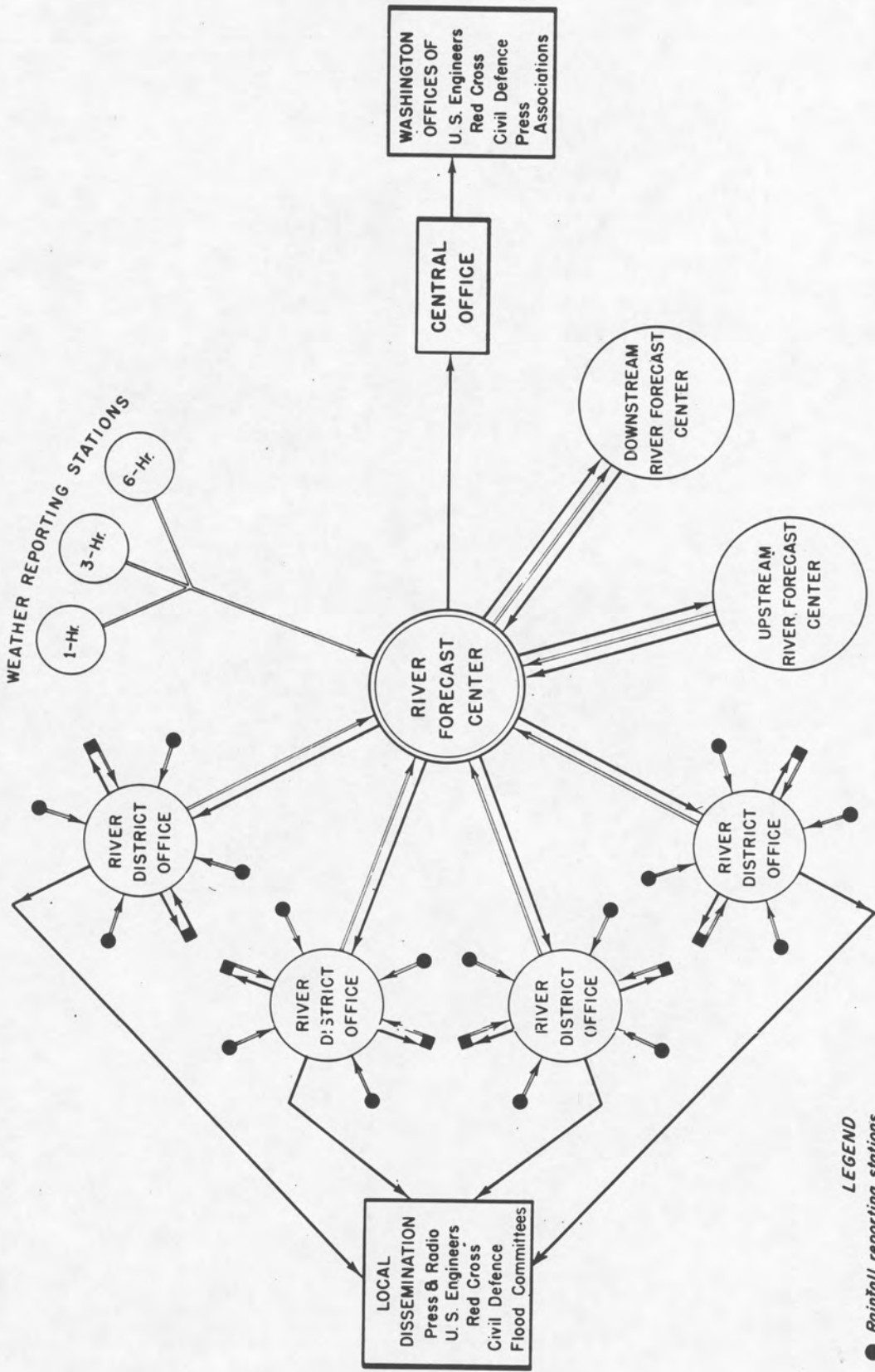
The purpose of this picture of the status of the river forecast program in the United States is that the members of the Eastern Snow Conference may gain an understanding of the program as it affects them, their interests, and their communities. There are many benefits to be gained in this program but the principal and overriding purpose is to help alleviate the economic loss, the misery, and the deaths that accompany great floods. A decade has hardly passed in the recent history of our country when such floods have not occurred. Even those who entered the river program after the late war are veterans of major catastrophes. The personal experience of the speaker has included the 1948 floods in the Columbia Basin and the 1951 floods in the Middle West — both of which were floods of tremendous magnitude, to say nothing of other smaller floods.

The Northeast can expect to have a serious flood on the average of once every five years. It is our earnest hope that we can help alleviate the effects of these floods in the future. In flood fighting, whether it be the operation of flood control reservoirs and dike and levee systems, or evacuation and rescue, a proper intelligence system so that the community can know what to expect is beyond price. The Eastern Snow Conference is comprised of individuals many of whom will be quite directly concerned with the fighting of a flood. This paper is intended to assure them that they will have the help that can be given by a modern river forecasting system.

In future years, when the Hartford River Forecast Center has some specific accomplishments to present, the speaker hopes that members of its staff may have the opportunity to bring them to this conference. It is only by a great deal of help not only in developing the means to forecast floods but in applying those means that the mission of the Hartford River Forecast Center can be fulfilled.

WEATHER BUREAU RIVER AND FLOOD SERVICE

Collection of Reports and Dissemination of Forecasts and Warnings



- LEGEND**
- Rainfall reporting stations.
 - River stage reporting stations.
 - ⇄ Flow of rainfall and river stage reports.
 - Flow of forecasts and warnings.

Figure 2

U. S. DEPARTMENT OF COMMERCE

