DEVELOPMENT OF A STATE RAINGAUGE NETWORK

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INTRODUCTION

Statewide raingauge networks are of great benefit, not only to weather modification projects, but also to the many state agencies which are directly and indirectly involved with the natural resource of water. In South Dakota, where a major portion of the annual precipitation occurs in the form of localized convective showers and thunderstorms during the spring and summer months, it is necessary to employ a large scale network of raingauges to accurately map precipitation events. The rapid and timely collection of data, also a concern to many South Dakota agencies, can also best be accomplished by a properly organized raingauge network. Because the task of developing and operating a large network of raingauges can become quite complex and time-consuming, we believe that it will be helpful to examine several aspects of the South Dakota network and how they evolved.

DEVELOPMENT OF THE NETWORK

The South Dakota raingauge network was started in 1971 and was expanded each succeeding year. Placement of the original 150 raingauges was performed by Ralph Dennis, who accomplished this task through personal contact with potential cooperative observers which required a great deal of travel and several months of effort. Although this effort was commendable it was realized that a great many more gauges would be required to accomplish the goals of the program. In addition to the increased difficulty of collecting and organizning data from several hundred raingauges, placement became an arduous task, no longer possible by leg-work alone.

Proper preplanning is essential to the efficient and systematic placement of raingauges. The following suggestions are offered to accomplish this goal:

1. Determine how much money and time can be dedicated to the establishment of the network. Basic costs include the gauges (adequate gauges can be obtained from $2.00 to $5.00 each), postage and manpower for their distribution, printing of data collection forms (including postage), organization and preliminary reduction of incoming data, and the archiving of data upon magnetic computer tape in order to make the mass of data easily accessible and usable.

2. Develop a goal for raingauge distribution - i.e. one gauge for every 10 square miles.

If your goal cannot be attained in one year, then one of two choices may be elected. The network can be developed section by section or partial coverage can be placed over the entire area of concern with the gaps being filled in later. Each approach has both benefits and drawbacks, but one

may fit your needs better than the other.

In South Dakota, the primary use of the raingauge network was to evaluate statewide weather modification efforts. The latter of the two placement plans was utilized. This permitted limited evaluation of the program after the first year of operation.

METHOD OF SELECTING SITES

Several techniques may be employed to locate new gauges in the network. Following are methods which have been utilized in South Dakota; listed in order of preference:

a) County Directories: by far the most efficient and effective technique. Permits the planner to arbitrarily establish raingauge distribution and then find persons in the immediate area who are potential cooperative observers. Personal contact, by letter, can then be made.

b) County Agents: When Directories are not available, the County Agent can be most helpful. Furnish the County Agent with a detailed map of his county clearly indicating desired location of raingauges. Include a detailed cover letter so that the County Agent will know what is being requested and why. Once the County Agent supplies the list of names of potential cooperative observers, proceed as in (a) with personal letters.

c) FFA and or 4H: Can be extremely effective, but has the disadvantage of spotty placement of gauges - often concentrated around urban areas. Provides less control of gauge placement but brings enthusiastic young people into the program. Disadvantage - When these young people graduate from high school the raingauge is often abandoned.

d) Radio, TV, Newspapers: This is effective in getting responses for raingauges, but there is no control over the distribution or numbers. Use caution in such advertising to insure that the free raingauge has strings attached.

e) Personal Contact: Distribution can be controlled and the personal contact is beneficial but this approach is most time consuming and expensive.

f) Public Meetings: It is relatively easy to obtain volunteers at public meetings but there are at least two drawbacks to this approach. The volunteer may be responding spontaneously and reconsider after he gets home and there is no control over the placement of the gauge. This method can get out of hand and may lack coordination with the record keeping function.

Once a system has been developed, a station history file and location-identifier map must be created and maintained. It is helpful to use established boundaries such as county name or number coupled with an assigned number to identify gauges. A station identifier number is used only once. If a station is removed from the network its number is retired permanently. The South Dakota network stations are located on county maps which show

buildings and section boundaries. These allow for an accurate plot of the raingauge and its later relocations. The county maps also allow for an easy transfer of locations to maps of larger scale.

USE OF RAINFALL DATA

The primary reason that this raingauge network was instituted in South Daktoa was for the purpose of providing data to evaluate the effectiveness of the cloud seeding efforts.

Other uses of this kind of data should not be overlooked.

Precipitation data can be of great value in supporting general hydrologic studies. For example, if a dense raingauge network exists on a given watershed the rainfall pattern can be corrected with historical and current streamflow data to determine what areas of the watershed are more susceptible to rapid runoff.

There are numerous state agencies which can significantly benefit from such detailed, supplemental precipitation data. Several Divisions within the Department of Agriculture have found this data useful, especially during the drought cycle which the northern Great Plains has been experiencing. The Department of Transportation (highways) has profited as has the Department of Tourism and Economic Development. The water quality section of the Department of Environmental Protection also finds this data somewhat useful. Within the Department of Natural Resource Development the Divisions of Water Rights and Resource Management both have found this specific rainfall data to be of considerable value in the development of the State Water Plan and associated specific problem areas.

In addition, the processed data, in the form of weekly, monthly, or seasonal rainfall maps is of great interest to the general public and can be used effectively in support of a public information program.

The point is that there could be much value in maintaining a dense, supplemental raingauge network in a given state whether or not a cloud seeding program is in progress or even anticipated. The South Dakota raingauge network will be maintained and expanded, hopefully to over 1500 gauges, under the auspices of the Department of Natural Resource Development.

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