THE PROBLEM OF SAMPLING RAINFALL IN MOUNTAINOUS AREAS

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A GENERAL APPROXIMATION of the rainfall on a given unit of land surface can be obtained from a single rain gage placed at some convenient spot within the land unit. The rain caught by the gage is assumed to represent the amount of rain caught by the whole land unit. The single gage, however, provides no measure of the variations in amount of rainfall on different slopes and at different altitudes in the unit. For the management of a mountain area in which water is an important product, it is necessary to have an adequate estimate of precipitation, not only for the area as a whole but for each of its component drainage basins.

The San Dimas Experimental Forest in the mountains of southern California is a field research center set apart for the study of water yield from forest watersheds [**5**].[1] Here it is necessary to make accurate determinations of the amount of water produced by the streams and springs. These are fed by rainfall in the mountains, and the facility with which rainfall is transformed into streamflow is dependent on the varying soil, vegetation, and geological composition of the many mountain slopes comprising the watershed. Hence we must know not only the total amount of rainfall reaching the mountains but also how it is distributed on the component slopes of each watershed. This calls for representative sampling by means of rain gages.

By way of definition, a rain gage may be described as a vertical cylinder with an orifice eight inches in diameter, usually placed so that this orifice is about three feet above the ground.

The map reproduced as figure 1 indicates the intensity of rainfall sampling over the entire Experimental Forest, which comprises an area of about 25 square miles, or 16,000 acres. Here some two hundred gages have been installed in order to establish a lateral and vertical distribution of samples.

Let us narrow the problem of sampling to the small shaded area, the Bell Multiple Watersheds. These four small drainage basins, ranging in area from 38 to 100 acres, have been selected for certain intensive studies of streamflow, erosion, and the like, and for this purpose it is necessary to know the rain catch of their various slopes. The surface runoff, subsurface runoff, evaporation, interception by vegetation, and transpiration by plants must, in their sum, equal the rainfall, plus or minus the loss or gain, during any given period, of the stock of water stored in catchment, that is, in soil, rock, streams, lakes, marshes, and reservoirs [**1**].

The Bell Watersheds are characterized by the steep slopes, the narrow canyons, and in general the sharply dissected topography typical of southern

[1] Boldface numbers in brackets refer to references at the end of the paper (p. 475).