ABSTRACTS

SYMPOSIUM ON FLOODS AND DROUGHTS

A total of 18 papers was presented at this symposium. Five have been printed in full in this issue, and the following are abstracts of some of the others.

Estimation of Rainfall in Sparsely Gauged Areas. P. Hutchinson, University of Otago.

In areas of accentuated relief some of the basic assumptions made in the use of standard methods of assessing areal mean rainfall are often untenable. It is shown in this paper that, not only does topography affect the actual rainfall distribution, but that the areal variability, measured as the correlation between any two points, is also dependent on the relief. Two methods are used to show this. One method compares the areal variability of a flat area to one of accentuated relief, while the second method relates areal variability to topographic factors using a multiple regression technique.

The conclusions reached are then used for three purposes. The first is to develop a method of ascribing objectively areas or points to a particular rain gauge, taking into account the nature of the terrain. The second is to establish a procedure for estimating the rainfall at ungauged points, by taking into account the rainfall at a selected nearby rain gauge and the topographic situation of the point, and the third purpose is to provide means of establishing a correction factor to be applied to a rain-gauge reading in order that the reading may more accurately represent the area ascribed to it.

South Canterbury Snowstorm of November 1967. T. J. Chinn, Ministry of Works.

During the three days following immediately after this storm, a comprehensive snow survey was made covering as much of the South Canterbury area as was possible under the prevailing conditions. Point snow depths and densities were taken by snow corer, and these data were later supplemented from other sources by measured depths at the time of the snowfall. A method of obtaining an extrapolated value for the initial snow depth is described. By relating the storm damage to snow properties, snow density during the fall rather than snow depth appears to be responsible for the degree of structural damage.

Catchment Response. V. J. Bidwell, University of Auckland.

This paper is an account of current research into catchment response to rainfall inputs being undertaken at the University of Auckland. An explanation of the background theory is given which includes catchment losses, baseflow, and non-linearity. Experimental results at the time of writing are still incomplete.

Slope Failure During Heavy Rainfall in Eastern Otago. M. J. Crozier, University of Otago.

The long-term relationship between slope failure and rainstorms is examined for landslips dating from prehistoric times to the present day. To this end an attempt is made to establish a chronology of events.

Some landslips are shown to occur independently of rainstorms, and to differ radically from landslips occurring during rainstorms. Correlation of slope failure with climatic events is discussed from the point of view of the three main groups of landslips prevalent in Eastern Otago — namely the extensive flows, the deep slumps, and the regolith landslips. Some general observations are made on the relevant processes occurring during the two Otago rainstorms of early 1968.

Use of the Water Balance in the Estimation of Irrigation and Drainage Requirements and in Predicting the Effect of Subsoiling. A. N. Gilchrist, Ministry of Works.

A monthly water balance is used to show that subsoiling is unlikely to obviate the need for tile drainage in orchards on Mapua soils in Waimea County, Nelson.

The limitations of the monthly water balance, especially when based on the hypothetical 'average' year, in the design of irrigation and drainage schemes are stressed. A daily water balance over a period of seven irrigation seasons is used to estimate the amount of water storage required in a dam per acre of orchard irrigated. The minimum catchment area required to fill the dam is calculated from the water surplus in the monthly water balance for an average year, though a daily water balance calculated throughout the winter for several years would provide a sounder basis.

The Agricultural Significance of Drought. D. S. Rickard and P. D. Fitzgerald, Winchmore Irrigation Research Station, Department of Agriculture.

Agricultural drought is defined as existing when the soil moisture in the root zone is at wilting point or below. The occurrence and distribution of agricultural drought was determined for 41 seasons in mid Canterbury by calculating the day-to-day changes in soil moisture. This calculation was based on a Thornthwaite

estimate of daily evapotranspiration modified to allow for the effect of decreasing soil moisture, and programmed for the Elliot 503 computer.

The average number of days of agricultural drought per season was 39, varying from none to 86. Approximately two-thirds of all drought days occurred during the summer months. Highly significant correlations were obtained between the seasonal non-irrigated pasture and lucerne production and the number of drought days.

Two equations obtained for pasture were:

$$P = 6884 - 43.0\,D \qquad r = -0.82^{**}$$

and $$P = 6139 - 35.9\,D \qquad r = -0.94^{**}$$

where P is the pasture production in lb D.M./acre, and D is the number of days of agricultural drought per season. A comparable equation for lucerne was:

$$P = 10{,}153 - 76.4\,D \qquad r = -0.90^{**}$$

where P is the lucerne production in lb D.M./acre.

Drought in Northland — a Study in Water Supply. J. R. Waugh, Ministry of Works.

Flow data from catchments with uniform geology are used to show that in Northland the geology of the catchment area is the most important influence on the low flows occurring during a drought. For each major hydrological region the baseflow recessions form a distinct group, recognizable by the slope of the recession curves (as shown by the recession constant K) and/or the minimum flows.

Antecedent rainfall is shown to be the most important factor in accounting for the differences in minimum flows observed at the end of various droughts.

Monthly Rainfall Records Used to Evaluate Low-Flow Data. R. A. Dakin, Ministry of Works.

This paper describes an attempt to devise a simple and readily applied method for estimating the frequency of low river flow, using monthly rainfall records. The method developed involves determining the lowest value for the sum of any consecutive three months of rainfall during any year. This value is then used as an index to measure the rank of the annual low stream flow. Thus, by ranking the index corresponding to a particular annual low flow with the index values for each year, for the whole of the period of rainfall record, the frequency of low flow can be determined.

The results are not very satisfactory and it is doubtful whether the method is of much practical value. Unfortunately, time does not permit the investigation of other possible refinements which may give a more satisfactory answer to this method.