ABSTRACTS

SYMPOSIUM ON CATCHMENT CHARACTERISTICS AND STREAM FLOW

The following are abstracts of other papers to be presented.

The Problem of Variable Bed Levels on Gauging Sites. T. J. Chinn, Ministry of Works.

A method is proposed which may reduce the need to construct a new stage/discharge rating curve after each change in control or cross section at unstable water-level recorder sites. By plotting the hydraulic radius, R, against discharge, Q, a rating curve is constructed which may hold true for various control changes at the site.

Some Hydrological Effects of Burning and Clipping Narrow-Leaved Snow Tussock, *Chionochloa rigida.* J. A. Rowley, University of Otago.

The effects of burning and clipping on the water balance of snow tussock grassland dominated by *Chionchloa rigida* (Raoul) Zotov were studied at about 3,000 ft on the Rock and Pillar Range, Central Otago. Untreated snow tussock showed a greater potential water surplus than did burnt or clipped snow tussocks, or blue tussock (*Poa colensoi*). Rain-gauge measurements indicate that this may be due to greater interception of precipitation and fog. There was no significant difference within or between treatments. Potential evapotranspiration measured using non-weighing lysimeters did not differ significantly from calculated values.

A formal paper was not presented.

Bankfull Frequency in Rivers in New South Wales (with Mention of Mathematical Models of Daily Maximum Stream Levels). K. D. Woodyer, Division of Land Research, C.S.I.R.O., Canberra.

Studies have been undertaken to examine the claim that there is a constancy in bankfull frequency for diverse streams. Twenty-five sites in New South Wales with records ranging from 86 to 5 years have been examined. Three depositional levels were found and classified as "high", "middle" and "low". The "high" bench corresponds to the usual concept of the flood plain and was found to have a bankfull return period of 1.24–1.62 years. The return period for the "middle" bench was 1.02–1.15 years. Methods of analysis are mentioned and the results obtained with Markov, exponential and gamma models compared with each other and with the observed exceedances.

Preliminary Water-Balance Studies of the Rotorua Lakes. R. J. Pittams, Ministry of Works.

This set of studies is a quantitative statement of rainfall, evapotranspiration, lake levels, ground-water storage, and outflow for Lakes Rotoma, Rotoehu, Rotorua and Rotoiti in the Rotorua area (Bay of Plenty, North Island, New Zealand). Four assumptions have been made to enable water balances to be calculated. All basic relationships were investigated using data from Lake Rotoma, a lake which has no open outlet. Individual techniques, with possible sources and magnitudes of error, are discussed in detail, and future investigations suggested. Techniques found valid for Rotoma have been applied to Rotoehu, which similarly has no open outlet, and to Rotorua and Rotoiti, both of which do have river outflows. The annual water balances are included for comparison with Rotoma. Inadequacies are due to oversimplification, especially for ground-water storage, but further refinement awaits the results of future investigations.

Infiltration Characteristics of Some Pumice-Land Soils. M. J. Selby, University of Waikato.

Using a stainless steel infiltration ring nine inches in diameter with a 12-inch buffer ring, and using six replications for each test, the following infiltration occurred in one hour: under mature pine forest, 24.85 and 36.75 inches; under young pine forest with a pasture-grass ground layer which is not grazed, 1.85 and 1.11 inches; under ungrazed native grasses, 11.8 inches; under manuka, 16.70 and 15.65 inches; the buried black humic layer of gully floors, 4.75 inches; grazed pasture grasses, 1.35 inches. The soils were all sandy and developed on pumice from the Taupo eruptions of A.D. 130. Percentage content of organic matter, penetration resistance and shear strengths were measured. Preliminary conclusions are that pasture grasses, even when ungrazed, greatly reduce infiltration although native grasses do not. The implications for erosion and conservation measures are discussed.

Makara Experimental Basin — Some Initial Results. C. Toebes and F. Scarf, Ministry of Works.

The effect of oversowing and topdressing unimproved pastures on small catchments of a few acres each is discussed. Analyses are of a preliminary nature only and have as their object the determination of hydrological tendencies. Detailed studies to clarify hydrological processes are to follow.

The land-management change indicated has, together with a doubling of the production, had a considerable hydrological effect. The total annual flow has been reduced, and in particular

the smaller storms are affected (before treatment about 14% of the storms had insignificant run-off as compared with a control catchment; after treatment this percentage increased to over 50). Individual hydrographs have been greatly modified. Peak discharges have been reduced for the smaller storms, and in all the hydrographs the run-off that occurs before the peak has been reduced to about one-fifth of its value before treatment.

The depth of surface detention after treatment is about three times that needed to produce the same peak discharge as before treatment, and infiltration rates have increased significantly for the higher infiltration rates.

It is suggested that the present land management be maintained for a further year to obtain detailed quantitative data on vegetative and soil factors which, when related to hydrological factors, may lead to a direct translation of some of the above results to other areas.

Storm Discharge and its Dependence on Antecedent Soil Moisture. R. J. Jackson, Soil Bureau, D.S.I.R.

The storm discharges of the Exotic and Native Forest catchments at Taita Experimental Station are compared for the years 1961 to 1966. This comparison is made in order to find what effect the establishment of the exotic forest (which was planted in 1960) had on the flow from that catchment. Although there is a long-term effect following the growth of the exotic forest, seasonal variations attributed to the effect of antecedent soil moisture are larger and than this long-term effect. Indices of the soil moisture level are discussed, and the relation to infiltration theory is considered.

A formal paper was not presented.

Infiltration in the Puketurua Experimental Basin. G. J. Blake and G. D. Mallinson, Ministry of Works.

During the three years 1965–67 the North Fork infiltrometer has been used extensively in the Puketurua Experimental Basin to examine the infiltration characteristics of the soil units present. This paper evaluates the field technique and presents a system for the processing of data.

Some Measures of the Incidence of Wet Weather. J. Finkelstein, Meteorological Service.

For many purposes, such as in contracting, raindays are not an adequate measure of the incidence of wet weather; an account is given of some other measures for 14 New Zealand stations. The English "wet-weather hours by day" is found to be fairly closely correlated with rainfall, but much more closely correlated with an empirical combination of rainfall and raindays.

Hydrological Characteristics of Catchments. W. C. Boughton, Lincoln College, University of Canterbury.

The systematic description and classification of catchment characteristics has never been adequately treated in any hydrological text. This paper summarizes available measures for the quantitative description of catchments, and points to aspects of catchment mensuration where deficiencies occur. Measures and definitions of catchment characteristics which have appeared in hydrological literature are described in five groups, these being topographical characteristics, vegetation, soils, climatic characteristics, and human effects. Those characteristics, such as the unit hydrograph, which are contained in the stream-flow record are noted, and areal and temporal variations in characteristics are briefly discussed.