

IHD BULLETIN

NEW ZEALAND

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The International Hydrological Decade Bulletin is an official publication of the New Zealand National Committee for the International Hydrological Decade and presents, twice annually, a survey of programmes, activities and findings of hydrology in New Zealand, carried out under the auspices of the IHD; and also a summary of international activities.

TECHNICAL SUBCOMMITTEE ON SNOW* REPORT SUMMARY

Snow surveying in New Zealand is of very recent origin. The following principal recommendations are designed to provide a national coverage by using a system of regional classification.

TERMS OF REFERENCE

1. Select a small number of areas in the South Island where standard snow courses may be established to obtain snow data representative of broad, tentatively defined regions.
2. Recommend standards for general use in snow observations in New Zealand.
3. Recommend techniques, particularly for use in Central Otago, to give information for making water supply forecasts generally similar to those issued by the U.S. Weather Bureau.

CLASSIFICATION OF SNOW REGIONS

Firstly a provisional classification of snow regions was made according to the following general criteria:

A Permanent Snow and Ice

- i. Snow above summer snowline.
- ii. Glacier ice below summer snowline.
This includes glaciers and alpine areas where most snow or ice persists throughout summer and autumn in most years.

*Membership given in I.H.D. Bulletin No. 1, publ. in J. Hydrol. (N.Z.) Vol. 3 (1), June 1964.

B Seasonal Snow Cover

In these areas snow lies for an appreciable period in the spring. The lower boundary has been taken as 3,000-3,500 ft in the south of the South Island and 4,500-5,000ft in the North Island.

C Occasional Snow Cover

These areas extend below category B, reaching sea level in the south and east of the South Island. The lower boundary has not been mapped according to any definite criteria.

D Snow-free Areas

Snow never, or very rarely, lies in these areas.

REGIONAL BOUNDARIES

The following criteria were employed in broadly defining boundaries of regions (Fig. 1): (a) apparant uniformity in the meteorological situations accompanying snowfalls; (b) the pattern of snow cover; (c) physiography and altitude.

Sub-regions are areas of permanent or seasonal snow for which measurements from a particular snow course are reasonably representative. Some tentative boundaries have been drawn (Fig. 1).

Extension of present data is necessary — through aerial photography, snowfall records and snow course measurements — for more accurate definition of regional and sub-regional boundaries.

SNOW COURSES

Basic considerations governing the establishment of snow courses should be:

- (a) First attention to those regions in which snow is important in relation to power, irrigation or flooding.
- (b) Prior establishment of snow courses for which current techniques and instrumentation may be adequate.
- (c) Preference to established snow courses.

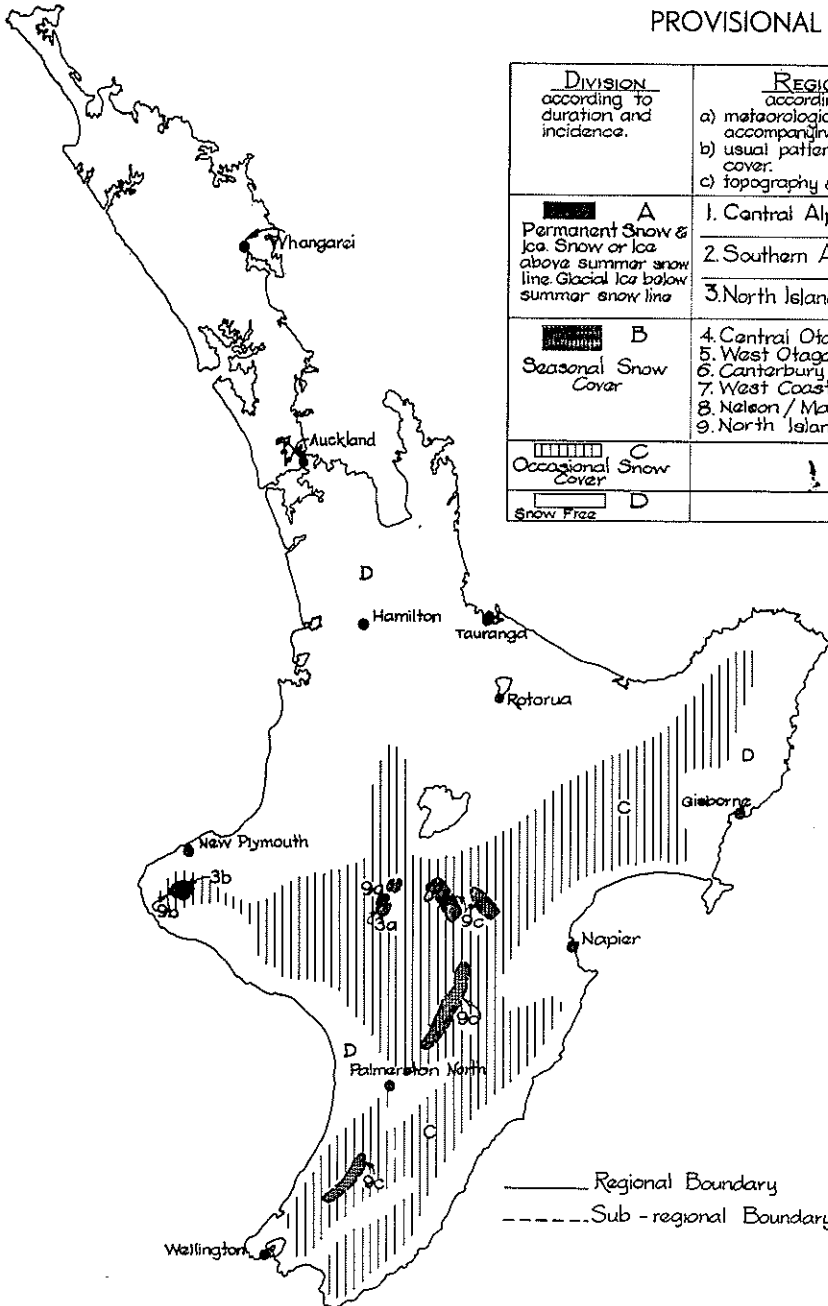
Using these criteria the following four snow courses, currently operative or being established, are recommended as IHD projects.

Tasman Glacier: Permanent Snow and Ice — Central Alpine — Tasman (Ala).

Measurement of snow pack as part of a glacier budget study of the Tasman should provide snow data which will have additional value in obtaining a better understanding of regions 2 and 3.

Fraser Basin: Seasonal Snow Cover — Central Otago — Old Man (B4a).

PROVISIONAL MAP OF



<u>DIVISION</u> according to duration and incidence.	<u>REGION</u> according to meteorological situations accompanying snowfall, usual pattern in snow cover, topography & altitude.
A Permanent Snow & Ice. Snow or Ice above summer snow line. Glacial Ice below summer snow line	1. Central Alpine 2. Southern Alpine 3. North Island Alpine
B Seasonal Snow Cover	4. Central Otago 5. West Otago/Southland 6. Canterbury 7. West Coast 8. Nelson/Marlborough 9. North Island
C Occasional Snow Cover	
D Snow Free	

—— Regional Boundary
 - - - - Sub-regional Boundary

NEW ZEALAND SNOW REGIONS

SUB-REGION

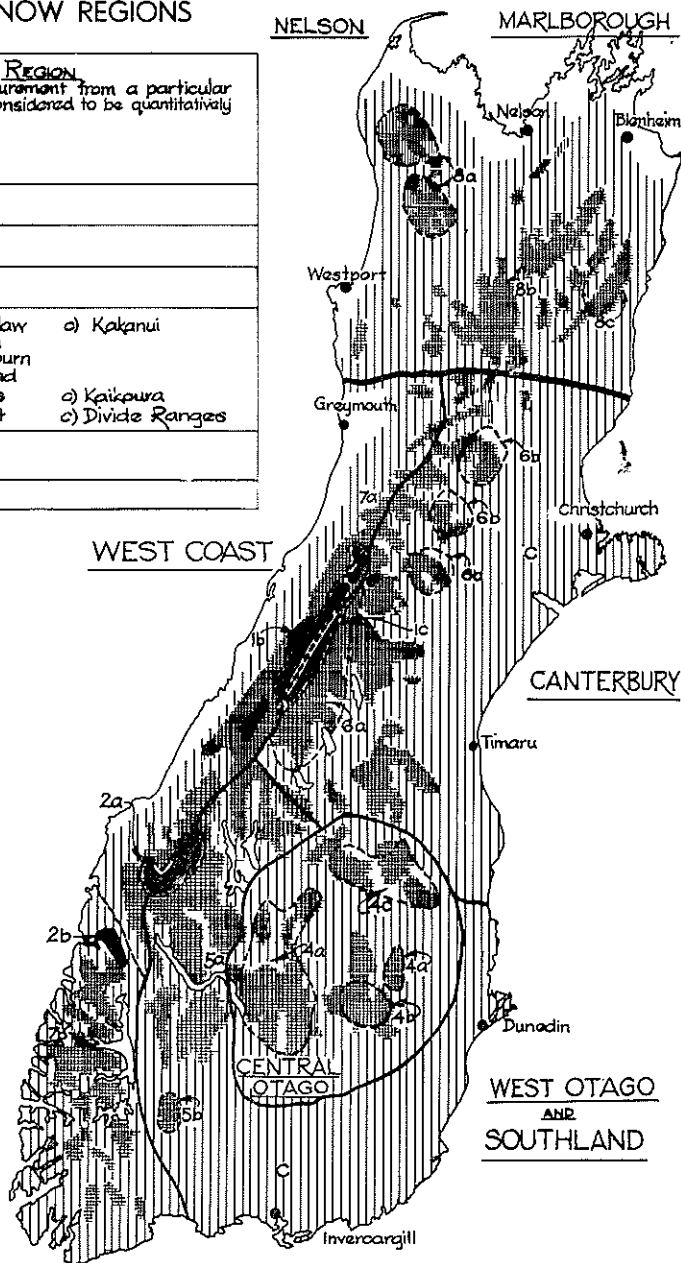
within which measurement from a particular snow course is considered to be quantitatively representative.

Tasman
Franz Josef

Aspiring
Darran

Ruapahu
Egmont

Old Man	b) Lammerlaw	a) Kakanui
Lakes	b) Takitimu	
Waitaki	b) Craigieburn	
Westland	b) Fiordland	
Cobb	b) Travers	c) Kaikoura
Tongariro	b) Egmont	c) Divide Ranges



Tracing of Map Prepared by POWER DESIGN OFFICE in 1966

Data obtained will also be applicable to other "a" sub-regions of 4 and in part of 4b and 4c sub-regions. In region 4 snow is a factor of current importance to flooding, irrigation and power.

Camp Stream: Seasonal Snow Cover — Canterbury — Craigieburn (B6b).

Data will apply also in part to sub-region 6a.

Round Hill: Seasonal Snow Cover — Canterbury — Waitaki (B6a).

The Devil's Elbow snow course is in this region. In view of current difficulties its use for an IHD snow course is not recommended. A more suitable snow course has been established in the Round Hill district.

It is recommended that further snow courses be established in the following priority, and be considered later for IHD stations:

- | | |
|----------------|-----------------|
| 1. Lammerlaw | 6. Temple Basin |
| 2. Lakes | 7. Kaikoura |
| 3. Travers | 8. Cobb |
| 4. Kakanui | 9. Aspiring |
| 5. Franz Josef | |

PROCEDURES IN SNOW OBSERVATION

A limited number of snow courses have been under study in the South Island for the last year or two. The starting point in each case has been the adoption of procedures and instrumentation established elsewhere, particularly in the Northern Hemisphere. From this it seems clear that a provisional procedure developed for the Camp Stream Snow Course is likely to be applicable to many regions with similar catchments.

Regions with characteristics differing significantly from those of Craigieburn require quite different approaches. For instance, the mobility of snow on the Old Man Range coupled with its inaccessibility, except by helicopter or ski-plane, makes traditional snow coursing either impracticable or productive of misleading data. Consequently, a second provisional procedure is necessary for the Old Man and comparable regions.

A further procedure is necessary for areas of permanent snow and ice where the annual snow pack is deep and a fixed reference point in the snow-ice profile cannot be secured.

WATER SUPPLY FORECASTS

There is at present in New Zealand insufficient data or experience on which to make firm recommendations on techniques.

Examination of procedures used overseas shows clearly that a procedure must be developed for each basin and that parameters which directly affect one area do not necessarily influence another.

Reliable predictions of the effect of snow upon water for power and irrigation and upon flooding depend on adequate records of: basin mean snow depth at a given time; water equivalent at that time; mean temperature of the snow pack; the kind and degree of energy sources such as air and ground temperature, insolation, wind speed over snow pack, and precipitation; the recording of hydrological data other than snow which are required to establish the run-off from sources other than snow; stream or lake gauging; mathematical procedures or multiple correlation, regression analysis and probabilities; predictions based upon the normal annual climatic conditions modified progressively by actual snowfall, rainfall and climatic conditions in any particular year; hydrometeorological studies of snowfall and snow melt events on selected sites.

GENERAL

Other aspects of the continuing work of the subcommittee include: glossary of terms, further development of techniques, and publication of standard techniques and observed data.