



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.

NEW ZEALAND'S PROGRAMME FOR THE DECADE

National participation in the International Hydrological Decade will embrace the basic components set out in the Final Report of the Intergovernmental Meeting of Experts at Paris, 1964 (Unesco/NS/188), i.e., collection of basic data, inventories and water balances, research, education, and systematic exchange of information. New Zealand's programme has been submitted to the IHD Headquarters in Paris and is summarized in this bulletin.

The major part of the Decade programme will be carried out within the framework of already established hydrological activities and the entire programme is coincident with national requirements. This is as intended by IHD authorities who state that "the programme will focus on science but will give strong consideration to utilitarian factors."

COLLECTION OF BASIC DATA

For Decade Stations, New Zealand has chosen stations that are representative of averages and extremes of run-off and precipitation in New Zealand. For stream gauging stations, emphasis is placed on regional stations* because these are the main stations in New Zealand's national system for the collection of hydrological data.

Figures 1 and 2 show the location of all stations where Decade observations will be made, and Tables 1, 2 and 3 list respectively the stream gauging stations, precipitation stations and ground water observation areas and give brief descriptions of the equipment used and observations made.

* Regional stations are the stream gauging stations in Representative Basins.

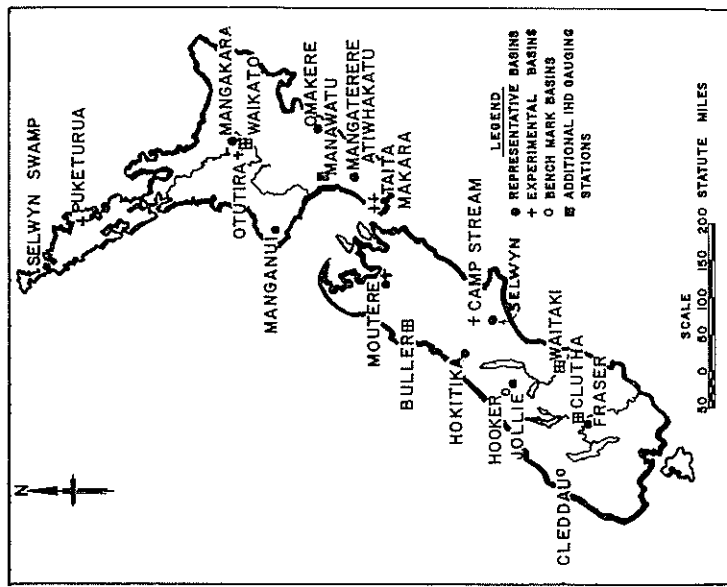


Fig. 1—IHD BASINS and GAUGING STATIONS.

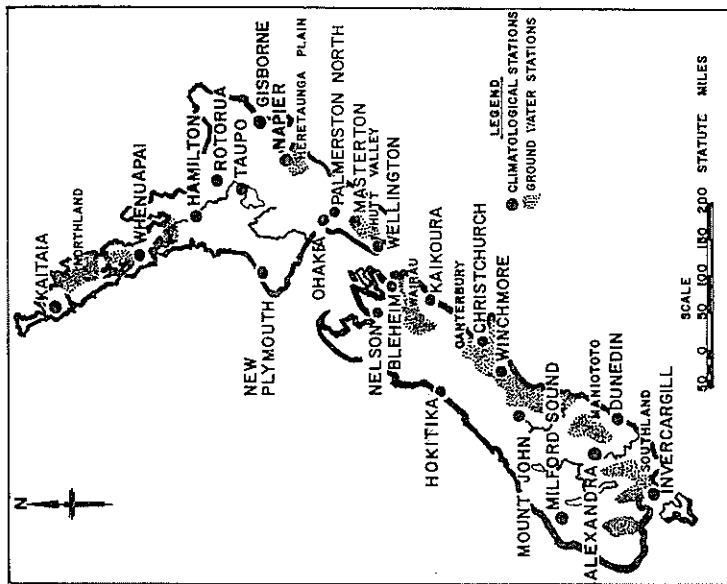


Fig. 2—IHD CLIMATOLOGICAL STATIONS and GROUND WATER BASINS.

TABLE 1—IHD Gauging Stations

River	Site	Date of Installation	Map Reference
Clutha	Clyde Cableway	1959	S33:1351
Waitaki	Kurow	1964	S44:1014
Buller	Te Kuha	1964	S31:178632
Manawatu	Fitzherbert Bridge	1929	N149:115331
Waikato	Taupo	1965 (Lake levels since 1905)	N94:557349
Selwyn Swamp	Big Flat Road	1965	N6:672925
Mangakara	Hirsts	1964	N85:659780
Manganui	Tariki Road	1961	N109:843727
Omakere	Fordale	1963	N145:141731
Mangateretere- atiwhakatu	Mt Holdsworth	1965	N158:022695
Moutere	Regional Base Station	1962	S14:377347
Hokitika	Whitcombe Junction	1965	S46:5720
Selwyn	Whitecliffs	1961	S74:347651
Jollie	Mount Cook	1965	S89/5:841164
Fraser	—	1965	S33:0349
Hooker	Ball Hutt Road Bridge	1960	S35:7831
Cleddau	Milford	1964	S14:9011

NOTE: Observations at these stations include flow and suspended sediment where possible.

Inventories and Water Balances

New Zealand is especially interested in inventories and water balances which will be computed for all Representative Basins, Experimental Basins, and Benchmark Basins where observations are being made for the Decade.

Representative Basins

New Zealand has been divided into 89 hydrological regions and the intention, irrespective of the IHD, is to record and publish data from one basin in each region. Such basins are termed Representative Basins and initially 10 have been selected for IHD purposes (Fig. 1 and Table 4).

TABLE 2—IHD Precipitation Stations

NAME	STATION DETAILS				STANDARD EQUIPMENT					
	Latitude (S) °	Longitude (E) °	Elevation (feet)	Air Thermometers	Recording Rain gauge	Anemo- meter	Sunshine Recorder	Evapori- meter		
Kaitia Aerodrome	35	04	173	17	261	X	X	X	X	
Whenuapai Aerodrome	36	47	174	38	102	X	X	XX	X	
Hamilton (Ruakura)	37	47	175	20	131	X	X	XX	X	
Rotorua (Whakarewarewa)	38	10	176	16	1006	X	X	X	X	
Taupo	38	41	176	04	1232	X	X	X	X	
Gisborne Aerodrome	38	40	177	59	13	X	X	X	X	
New Plymouth Aerodrome	39	02	174	11	142	X	X	XX	X	
Ohakea Aerodrome	40	12	175	23	155	X	X	XX	X	
Napier	39	30	176	55	5	X	X	X	X	
Palmerston North	40	23	175	37	110	X	X	X	X	
Masterton	40	59	175	37	340	X	X	X	X	
Wellington	41	47	174	46	415	X	X	XX	X	
Nelson Aerodrome	41	18	173	13	6	X	X	X	X	
Blenheim	41	30	173	58	14	X	X	X	X	
Kaikoura	42	25	173	42	326	X	X	X	X	
Hokitika	42	43	170	59	125	X	X	X	X	
Milford Sound	44	40	167	55	16	X	X	X	X	
Christchurch Airport	43	29	172	33	94	X	X	X	X	
Winchmore	43	48	171	48	526	X	X	XX	X	
Mount John	43	59	170	28	3307	X	X	XX	X	
Alexandra	45	15	169	23	461	X	X	X	X	
Dunedin Airport	45	56	170	12	4	X	X	X	X	
†Invercargill Airport	46	25	168	19	1	X	X	X	X	
*Rarotonga, Cook Islands	21	12	159	48W	15	X	X	XX	X	
*Raoul Island	29	15	177	55W	120	X	X	XX	X	
*Chatham Island	43	58	176	31W	150	X	X	X	X	
*Campbell Island	52	33	169	07E	49	X	X	X	X	

NOTES: Stations with XX in the SUNSHINE RECORDER column also record total radiation received on a horizontal surface.
 † At Invercargill Airport an International Reference Precipitation Rain gauge is installed.
 * Not shown on accompanying map.

TABLE 3—IHD Hydrogeological Observation Areas

North Island	Nature of Aquifers	Period of Observation	Uses	Hydrogeological Work	Agency	Proposals
Northland	Recent alluvium, Tertiary basalts, gravels, argillaceous limestones, sandstones, siltstones, conglomerates & greywackes	Few past obs; no permanent well records	Industrial & agricultural	Part of area studied in detail. Several publications	N.Z. Geol. Survey	Well level recordings in some parts
Franklin County	Recent alluvium gravels, sandstones, claystones & greywackes	No past obs	Agricultural	No detailed studies	Underground Water Authority; N.Z. Geol. Survey	Detailed studies
Heretaunga Plains	Recent and late Quaternary greywacke gravels	Since 1961 on free ground water surface—only a few irregular well records	Industrial, agricultural & domestic	Detailed studies in progress	Underground Water Authority; Catchment Board; N.Z. Geol. Survey	Continuing detailed studies
Hutt Valley	Recent and Quaternary greywacke gravels	Obs on wells for over 30 years	Industrial & domestic	Detailed studies in progress	Underground Water Authority; N.Z. Geol. Survey	Continuing detailed studies
South Island						
Wairau	Greywacke gravels	No long-term obs	Industrial & agricultural	No detailed work	N.Z. Geol. Survey	Detailed studies
Canterbury	Greywacke gravels	Long period (20 yrs) of obs at Christchurch	Industrial, domestic, agricultural	Detailed work on several areas	Catchment Board; N.Z. Geol. Survey	Continuing present studies
Maniototo	Schist & quartz gravels	No long-term obs	Agricultural & domestic	Detailed studies under way	Dept. of Agriculture; N.Z. Geol. Survey	Continuing present studies
Southland	Greywacke, schist, volcanic & quartz gravels	Some long period obs	Industrial, domestic & agricultural	Detailed studies on a few small areas	Catchment Board; N.Z. Geol. Survey	Continuing water level obs

TABLE 4—Representative Basins

Name	Date of Installation	Area sq. miles	Rock Type	Cover	Approx. Annual Rainfall (in.)	Topographic Range (ft)
Selwyn Swamp	1965	0.8	Sand	Improved grassland	40	100-225
Mangakara	1964	8.7	Rhyolite	Improved grassland	60	1000-2300
Manganui	1961	31.2	Andesite	Native forest	130	800-8260
Omakere	1963	21	Mudstone	Improved grassland	45	300-1600
Mangateretere- atiwhakatu	1965	33	Weathered Greywacke	Native forest	150	800-4800
Moutere	1962	24.1	Gravels	Improved grassland	60	100-1000
Hokitika	1965	145	Greywacke Schist	Native forest	350	1000-7000
Selwyn	1961	58.4	Greywacke	Improved grassland	40	950-4600
Jollie	1965	57	Greywacke	Tussock grassland	130	2000-9000
Fraser	1965	46	Schist	Tussock grassland	30	3000-5500

NOTE: Observations will include flow, suspended sediment, and precipitation.

Experimental Basins

Such Basins are composed of one or more small catchments (< 1 sq. mile) where detailed soil-water-vegetation studies are made under various types of land use and land management. Certain catchments have been studied over a number of years, more or less in the manner proposed for such Basins but, stimulated by the IHD, recent studies have produced a comprehensive plan for the establishment of Experimental Basins (N.Z. IHD Bull. No. 2). Six such Basins are already in operation and details are given in Fig. 1 and Table 5.

Benchmark Basins

IHD Benchmark Basins are catchments which are still in their natural state and where the hydrological regimen is unlikely to be affected by Man for a considerable period. So far two such catchments have been selected as IHD Benchmark Basins (Fig. 1 and Table 6).

TABLE 5—Experimental Basins

Name	Date of Installation	Catchments and Approx. Areas (sq. miles)	Soil Type	Approx. Altitude (ft.)	Projected Land Use Comparisons
Puketurua	1963-65	Main catchment .96 Sub-catchment .17 Sub-sub-catchment .009	Northern yellow-brown earth	200	Conversion from scrub to grass and subsequent contouring
Otutira	1965-66	Main catchment .96 3 interior sub-catchments of .15, .08 and .008 1 control catchment of .386	Yellow-brown pumice soil	130	Conversion from scrub to grass and subsequent soil conservation practices
Taita	1955-65	6 catchments varying from .015 to .058	Central yellow-brown earth	100	Comparison of native forest with exotic forest and with grass
Makara	1957	3 catchments with numbers 1, 2 and 10. Areas are .003, .005 and .02 resp.	Central yellow-brown earth	890	Comparison of grassland management practices
Moutere	1959	4 catchments with numbers 5, 13, 14 and 15. Areas are .027, .026, .008 and .017 resp.	Central yellow-brown earth	295	Comparison of grassland with scrub and with exotic forest
Camp Stream	1963-65	1 catchment of .386	High country yellow-brown earth	2600	Alpine native forest with and without browsing animals

NOTE: Observations include all aspects of the hydrological cycle where possible.

RESEARCH

The major research interests of New Zealand have been stated as follows (N.Z. IHD Bull. No. 1):

“The activities in which New Zealand is likely to do most work are the following: Soil-water-plant relationships; water resources; erosion and stream-bed evolution; ground water hydrology; hydro-meteorology; and quality of water. Of these, the first three are subjects on which New Zealand’s problems and proposed scientific activities give prospects of significant contributions to the international programme; with other activities the interests of New Zealand are mainly to obtain benefit from the adoption of techniques used overseas.”

A number of technical subcommittees are either proposed or already working to clarify methods and improve inter-agency coordination.

TABLE 6—Benchmark Basins

Name	Date of Installation	Area (sq. miles)	Rock Type	Cover	Approx. Annual Rainfall (in.)	Topographic Range (ft)	Water Level Recorder	Gauging Structure	Control	Rainfall Stations	Observations Made
Cleddau	1964	60	Gneiss	Bare rock Native beech Alpine scrub	275	Very steep 0-9000	Analog to digital	Cableway	Natural	2 Auto 6 Manual	Flow, suspended sed., total sed. load, basin rainfall, climate
Hooker	1960	47	Greywacke Schist	Bare rock Snowfields Glaciers	200	Very steep 2200-12000	Analog to digital	Bridge	Artificial	2 Auto ? Manual	Flow, suspended sed., basin rainfall, snow, climate, glacier studies

All observations to be standardized.

It has been stated that New Zealand would willingly cooperate in regional or inter-country discussions, and our interests in specific research have been quoted in relation to IHD general proposals listed in the IHD final programme for the Decade (NS 188 Amend. II pp. 5-12). Specific interests classified according to the IHD system have been stated to include the following:

I. RESEARCH DOMAINS IN HYDROLOGICAL PHENOMENA

- A. Air-land interface
 - 1. Precipitation
 - 2. Evaporation and transpiration
 - 3. Soil moisture
- B. Surface water
- C. Ground water
 - Ground water occurrence and movement
- D. Dynamics of lakes and reservoirs
- E. Geomorphological and geochronological problems
 - 1. Sediment transport and production
 - 2. Archaeohydrology
- F. Snow, ice, periglacial, glaciers and ice caps
- G. Research on quality and geochemistry of water
- H. Influence of Man's activities on the hydrological processes

II. METHODOLOGICAL SUBJECTS

- A. Modern processing of data
 - Use of computers and analog-digital recorders
- B. Methods of hydrological forecasting and synthesis
- C. Experimental basins for research
- D. Radio-isotopic methods and materials

EDUCATION

The Coordinating Council for IHD is taking the initiative in overall planning for coordination of higher education and associated research and has circulated a specific questionnaire (relating to surface water and ground water hydrology) on which New Zealand's possible participation has been indicated as follows:

General information on existing facilities for higher education and associated research:

- (i) A listing of New Zealand universities and mention of the inclusion of some hydrology in the curricula of courses in engineering, agriculture, geology, and geography, together with courses available at five polytechnic institutes and a technical correspondence institute.
- (ii) Opportunities given by the establishment of Experimental Basins to create focal areas for research.
- (iii) Standard texts, comprising the "Handbook of Hydrological Procedures" and the specially written text "Applied Hydrology".

Information on assistance that may be given to other countries:

- (i) Mention of the opportunities for special research because of the presence of various extremes of hydrological phenomena.
- (ii) Opportunities for two or three overseas students to receive in-service training here in hydrological field activities.
- (iii) The possibility, at an appropriate time, of New Zealand supplying a small specialist team to an overseas country, for a short period (about two months) to direct refresher courses or to act as consultants.

Information on the need for assistance in New Zealand:

- (i) In response to the enquiry on students likely to accept overseas opportunities created during the Decade for study, research, fellowship, etc., it has been indicated that New Zealand has a definite interest and numbers concerned might be about 5-10 in a three-year period.
- (ii) On the possibility of teachers, advanced research workers, etc., being available for work in New Zealand, it has been stated that New Zealand has a strong interest in such opportunities.

EXCHANGE OF INFORMATION

In response to the request for proposals for the systematic exchange of information, New Zealand proposals have been given as follows:

- (i) Data from Decade stations established in the basic science programme to be forwarded to IHD Headquarters for incorporation in an international basic science publication.
- (ii) Data from the normal programme—comprising standard national publications of various agencies—will be made available to those countries who are interested in receiving copies. Such national publications are likely to include the following:

Surface Water: "Handbook of Hydrological Procedures" (individual provisional procedures now available).

Hydrology Annuals: Data and results from Experimental Basins (proposed).

Meteorology: Meteorological observations (annual publication).
The frequency of high intensity rainfalls in New Zealand.

Hydrology and Quality of Water: Proposals for future publications are being investigated.

A comprehensive bibliography of hydrological publications of New Zealand is also available.