

LOW FLOW CHARACTERISTICS OF THE RANGITIKEI RIVER

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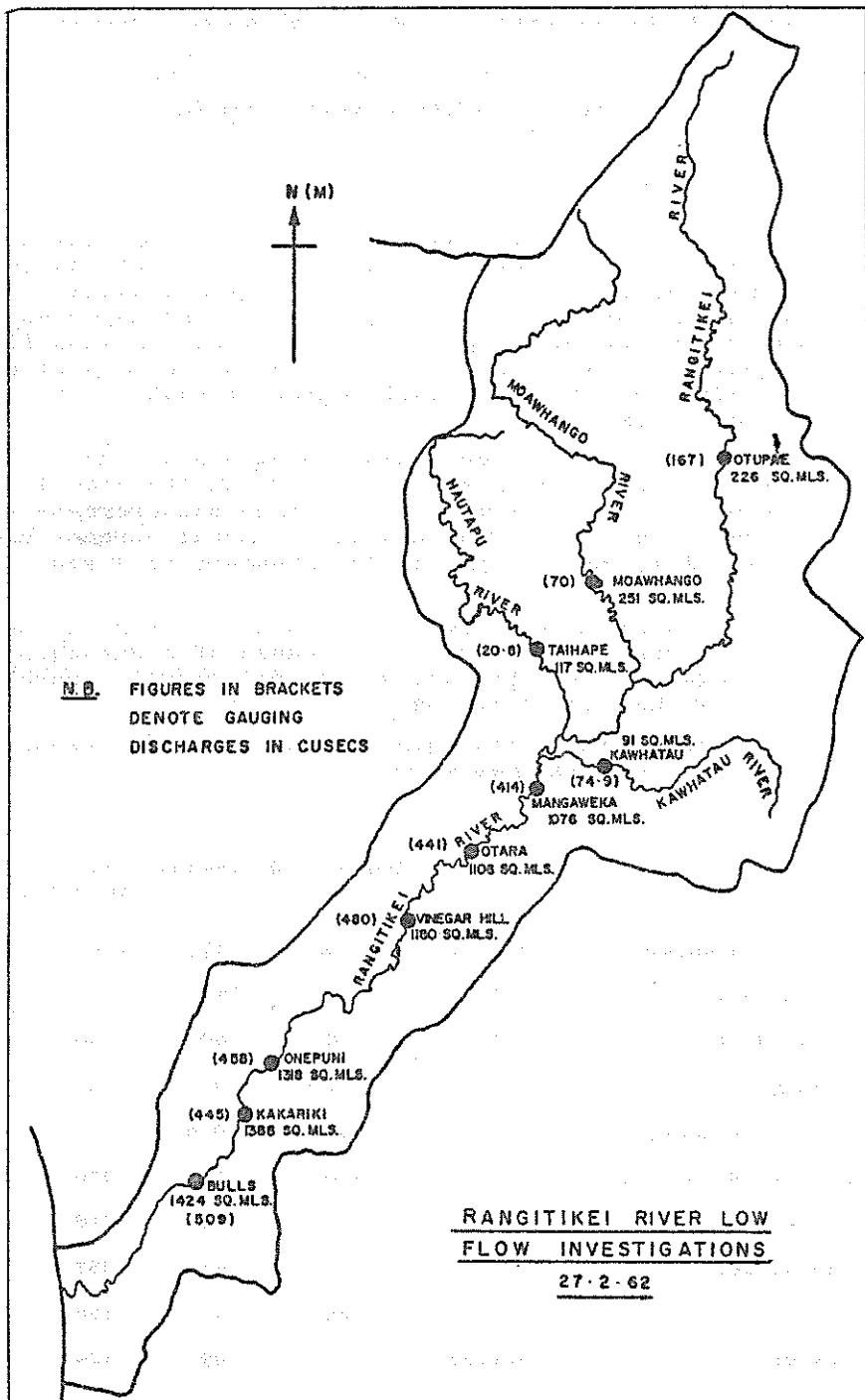
It has been observed that many rivers with alluvial channels and braided lower reaches show a tendency to lose quite large quantities of water to underground water reserves in the region of the flood plain, and may even go completely dry in the lower reaches in periods of low flow. Many examples of this can be seen along the east coast of the South Island and to a lesser degree in Hawke's Bay (P.J. Grant, pers. comm.).

An opportunity to check this phenomenon on the Rangitikei River arose in February 1962, at the end of a very dry period and a series of discharge measurements was carried out (see map). The majority of local streams had no visible flow, so no appreciable tributary flow was missed.

Unfortunately rain prevented a further check on the discharge measurements made, and because of a subsequent rise in stage of the tributaries, several gaugings were omitted from the investigation.

The discharge measurements included in the investigation are as follows (see map):

Site	Date	Time(hrs)	Q(cusecs)	Area,A (Sq.mls)	Q/A
Otupae Outstation	27.2.62	0910	167	226	0.74
Kawhatau Br.	"	1130	74.9	91	0.82
Vinegar Hill	"	1150	480	1180	0.41
Moawhango	"	1150	70.0	251	0.28
Hautapu (Taihape)	"	1300	20.8	117	0.18
Mangaweka Br.	"	1410	414	1076	0.38
Onepuhi Br.	"	1430	458	1318	0.35
Kakariki Br.	"	1610	445	1388	0.32
Otara Br.	"	1620	441	1106	0.40
Bulls Br.	28.2.62	1125	509	1424	0.36



The measured increase in Q between Kakariki and Bulls may be misleading since rain fell for several days beginning on the afternoon of 27 February, and even though the effect of upper catchment rainfall would not be felt so soon, the flow at Bulls could have been affected to a minor degree by increased local runoff.

With no major tributaries joining the Rangitikei River below Mangaweka and no visible flow in many of the local streams during the period of the investigation, the calculation of flow variations between Mangaweka and Bulls becomes straightforward. After applying a $\pm 4\%$ error to the discharge measurement, any variations in Q are only minor and may be summarised as an increase in Q between Mangaweka and Vinegar Hill, and a possible decrease in Q between Vinegar Hill and Kakariki.

CONCLUSIONS

The results of this investigation are interesting even if negative in nature and warrant further fieldwork and a close study of flow duration curves when they become available. A loss of flow to underground water reserves in the lower reaches of the river was not observed. Any substantial variations in measured low flows in the Rangitikei River are really of a very minor nature when the possible errors in discharge measurements are considered, and at this stage the low flow characteristics of the river cannot be likened to those of some of the gravel rivers of say, Canterbury or Hawke's Bay.

ACKNOWLEDGMENT

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Editor's Note:

Large variations of Q may be expected from site to site on the main limb of a gravel river due solely to variations in site characteristics - in particular, the cross-sectional area and permeability of gravels in the overall channel that are about and below water level. Major differences in this feature may result in significantly different quantities of sub-surface flow and, consequently, marked differences in surface flow.

For stricter comparison measured discharges should be adjusted to instantaneous values for a given time by making some allowance for flow recession. A simple approach is to establish a "discharge close" by starting and finishing measurements at one suitable site. This affords an average recession rate for general application. Where the study extends over several days this procedure is a minimum essential.