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COMMENT ON 'COARSE SEDIMENT YIELDS FROM THE UPPER WAIPAWA RIVER BASIN, RUAHINE RANGE' BY P. J. GRANT

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The paper on coarse sediment yields from the upper Waipawa River Basin, Ruahine Range, by Grant (1982) provides an interesting examination of flood effects on two river-bed study reaches; however the applicability of the results to gravel resource management is probably limited. Results presented by Grant (1982) support the concept of an idealized fluvial system where river-sediment movement occurs within zones of production, transfer and deposition (Schumm, 1977). The upper Waipawa River Basin is clearly a zone of sediment production and the given sediment yield estimates may be relevant to "mountainland" erosion rates but do not necessarily indicate downstream sediment movement rates.

Grant (1982) attributes to cyclone Alison (10 - 12 March 1975) the generation of a substantial quantity of coarse eroded material, and to a large flood on the 15 June 1975 the subsequent deposition of some of this material in two river channel study reaches. In the entire main North Branch study reach 44,400 m^3 of alluvium was deposited while the total alluvial deposit for the Armstrong tributary is estimated at 5,700 m^3. The Armstrong tributary study reach is said to be an inefficient sediment trap, so the sediment yield for the main North Branch is emphasised. Grant (1982) attributes the bulk of the sediment supply to erosion of highly-shattered greywacke, and sediment transport from the North Branch study reach is largely attributed to floods with a recurrence interval in excess of 4 years. Sediment volumes attributed to cyclone Alison are compared with estimated 1965 flood deposit volumes, and a 1959 flood deposit volume is estimated from the 1975 and 1965 figures. The resulting figures are then used to predict an average annual sediment yield for the upper Waipawa region of approximately 4,500 $m^3/km^2/yr$ between 1959 and 1975.

The upper Waipawa sediments yields drived by Grant (1982) should be viewed cautiously as these estimates depend on the catchment area considered as the sediment source, and the efficiency of the "representative" study reach in trapping sediment, as this efficiency determines both sediment aggradation and degradation. For example, the Otaki sediment yield quoted by Grant (1982) of 1,100 $m^3/km^2/yr$ is an estimate of total catchment erosion and relates to greywacke parent material. This erosion can produce bedload boulders and gravels as well as suspended and dissolved sediment for river transport, where 1 m^3 of parent material erosion can produce 1.5 m^3 of boulder and gravel material due to bulking. The writers therefore suggest that although Grant (1982) provides a useful

analysis of sediment production in an upper catchment area and suggests that thresholds exist for river-sediment movement, his figures should be interpreted carefully. For aggregate management purposes, the Manawatu Catchment Board is currently studying bedlevel changes in several rivers and determining gravel extraction effects on channel stability.

REFERENCES

Grant, P. J. 1982: Coarse Sediment Yields from the upper Waipawa River Basin, Ruahine Range. *Journal of Hydrology (N.Z.)* 21(2): 81-97.
Schumm, S. A. 1977: *The Fluvial System.* Wiley-Interscience U.S.A. 338 p.

REPLY

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McLennan and O'Connor seem concerned that my preliminary study of coarse sediment yield from the upper Waipawa River basin (Grant 1982) probably has limited application to gravel resource management and should be interpreted carefully. With the latter I agree.

Sound downstream gravel resource management and river control depend, in the long-term, on a good knowledge of:

(a) Sediment source areas and erosion processes.
(b) Sediment yields.
(c) Quantitative changes with time of alluvium stored in channels.
(d) Patterns of downstream sediment transport with time.
(e) The degree to which different facets of the entire system are amenable to human control.

From this it follows that my paper on coarse sediment yields (about which very little is known in New Zealand) makes only a small contribution, as stated therein (Grant, 1982, p. 82). However, it does deal with the head of the chain of subsequent downstream effects. (A more comprehensive sediment yield assessment based on photogrammetry is to follow). When interpreted with other information from the upper Waipawa (Grant 1977, 1983) and from downstream flood plain reaches (Hawkes Bay Catchment Board reports) the present sedimentation regime of the headwaters is not only indicative of the downstream situation (where there are major sedimentation problems) but it may be used for long-term prediction of downstream trend. This statement does not contradict the concepts of Dr. S. A. Schumm with whom I have held discussions on the bed of the upper Waipawa River itself.

Cyclone Alison (March 1975) rainfalls and flood waters were responsible for the transport of sediment both from source areas into channels and through channels to downstream locations (Grant, 1982, Fig. 5). The flood of June 1975 did not form the deposits of Fig. 5 as interpreted by McLennan and O'Connor, but it did transport much of the deposited material further downstream (Grant, 1982, p. 87).

I fail to understand the reason for much of the comment. And, after 28 years of measuring channel morphology changes, I am at a loss to understand how from ". . . studying bed level changes . . .", particularly on a a short term basis, one can satisfactorily manage gravel resources.

REFERENCES

Grant, P. J. 1977: Recorded channel changes of the upper Waipawa River, Ruahine Range, New Zealand. *Water and Soil Technical Publication No. 6,* Ministry of Works and Development.

Grant, P. J. 1982: Coarse sediment yields from the upper Waipawa River basin, Ruahine Range. *Journal of Hydrology (N.Z.),* 21(2): 81-97.

Grant, P. J. 1983 (in press): Recently increased erosion and sediment transport rates in the upper Waipawa River Basin, Ruahine Range, New Zealand. *Soil Conservation Centre, Aokautere, Publication No. 5,* Ministry of Works and Development.

FORTHCOMING EVENTS

20 May - 8 June 1984: Course on Estimation of Hydrological Variables. Institute of Hydrology, Wallingford, Oxfordshire, U.K.

11-13 September 1984: Fourth Congress of the Asian and Pacific Regional Division (APD) of the IAHR, Chiang Mai, Thailand. Subjects include Water Resources Systems, Hydrology and Hydraulics. Contact: Dr Ashim Das Gupta, Executive Secretary, A.I.T., G.P.O. Box 2754, Bangkok 10501, Thailand. Telex 84276 TH.

NOTICE

Volunteer Service Abroad is seeking to recruit two hydrological engineers for soil erosion and volcanic debris control projects in Indonesia.

Contact VSA, 31 Pipitea St., Wellington. Tel. 725-759.