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Influence of groundwater levels on zero river flow: A study in Ashburton River North Branch, New Zealand

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Timing and quantity flows in many alluvial rivers of the Canterbury Plains, New Zealand are influenced by abstraction for irrigation, damming, gravel mining and other activities. Water demand in New Zealand has been increasing significantly since the 1980's, mainly due to an explosion in dairy farming and intensification of irrigated agriculture.

In this study a statistical model was constructed for the highly-allocated, and abstracted, Ashburton River North Branch, to predict the duration of low flows and the occurrence and expansion/contraction of dry (no flow) reaches. Regression analysis was undertaken combining existing data on concurrent river flows at specific locations with additional flow measurements to verify the hypothesis that highlights the influence of groundwater level on zero river flow. Considering all available information, intensification of irrigated agriculture abstracting from groundwater is probably the main driver of the increase in the number of days of low flow/dry days at one river cross section.

Problems with periodically dry river beds are not only limited to the Ashburton North Branch but can be expected to occur all over the Canterbury Plains in the near future. With extensive research into groundwater surface water interactions it will be possible to provide solutions for safe allocation and the appropriate residual river flows.