Estimating low flow statistics in ungauged basins of New Zealand using a mechanistic approach

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Low flow, and particularly the 7-day mean annual low flow (MALF), is used in many New Zealand regions as an index of hydrology relevant to in-stream habitat assessment, as well as being the basis of rules about water allocation, abstraction and minimum flows. We report on the application of a new low flow model to all streams on a digital stream network for New Zealand.

The model is a conceptual physical representation of average low flow conditions, that provides for a separation of the two major and distinct components of low flow: climatic drivers (and hydrological parameters that depend on them) that are relatively smoothly varying over wide areas of the country; and catchment physical characteristics that modulate the release of stored water, and are discontinuous in the landscape.

1. Climate parameters are: the average length of a dry season, the number of rain events in that season, the amount of rain in the dry season.

2. Flow parameters are: the mean flow, the average flow at the start of the dry season, the fraction of that rain that affects the stream flow (the sole calibration parameter).

3. Catchment parameters are: a dimensionless parameter related to catchment storage, and a parameter with units of time related to water release.

Application of the model (with flow in mm/day, $\log_{10}$) to 612 catchments gives bias = 0.00, rmse = 0.40, outperforming both the previous published New Zealand-

wide methods. The largest single error contribution is from estimation of the catchment storage parameter.