

# Public perceptions of river flows and water allocation

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**Boffa Miskell has been subcontracted to study public perceptions of natural and modified river flow regimes as part of a research project being carried out by NIWA. The research programme, called 'Water Allocation and Protection of Instream Values', is being funded by the Foundation for Research, Science and Technology to support improved approaches to water allocation.**

The public perception research is aimed at better understanding the way that river attributes are affected by changes in flow regime, how people perceive such changes, and what levels of water allocation they consider appropriate. The research results will be used to:

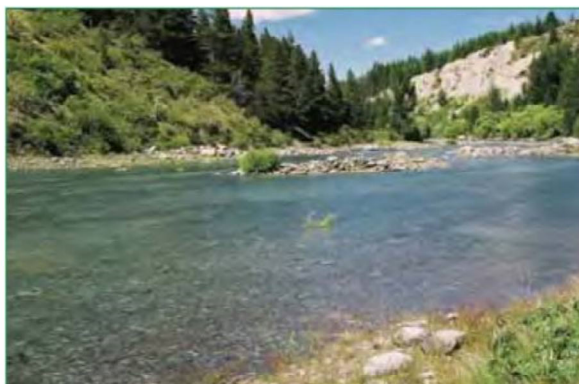
- develop more reliable assessment methods which incorporate landscape and visual values;
- better inform decision makers about what constitutes acceptable low river-flow thresholds to stakeholders; and
- provide a set of guidelines for decision makers.

One part of the perception research was an online perception survey that was placed on the Internet for three months in early 2007. Invitations to participate in the online survey were sent out to various stakeholders, including: recreational user groups; hydro electricity providers; water and river scientists; and councils. It was also advertised in the NZWWA newsletter Pipeline.

The online survey used photographs of six representative New Zealand rivers to assess people's ability to perceive changes in flow, identify the principle indicators of flow change, and define key characteristics likely to trigger low flow concern within different river types. The six rivers (the Selwyn, Hurunui, Waimakariri, Waipara, Halswell and Tekapo Rivers) were selected to show a variety of river types and were photographed from a number of representative viewpoints per river. A minimum of three different flows were photographed from the same viewpoints to allow for comparison.

The online survey was divided into two parts. The first part of the survey asked participants to rank three scenes of the same view according to their preference of the flows depicted. The second part of the survey was designed to establish participants' ability to estimate flow in quantitative terms. In both parts of the survey three photos were shown with the level of flow identified in one photograph per set. Flow was supposed to be the main variable, however seasonal and atmospheric variation of scenes could not be completely avoided. In both parts, respondents were asked to nominate up to three decision criteria that influenced their flow preference or that served as an indicator for their flow estimate.

Similar to previous studies, the online survey found that participants had a preference for high-medium flows for small rivers and medium-low flows for large rivers. Flows lower than the Mean Annual Low Flow were generally disliked by most user groups in all river types. The results also indicated that the smaller the river the more sensitive people are to differences in flow, because smaller rivers typically have narrower flow ranges. With these rivers, respondents appeared to be more sensitive to subtle changes in flow with a preference for consistency (nominally about or above the mean). In contrast, the results indicated a preference for lower flows in larger rivers in mountain settings (close to the mean annual low flow).



*One of the photo sets respondents were asked to rank in the survey - taken from the true right bank of the river approximately 300m from the State Highway 8 bridge and Lake Tekapo control gates.*

Similar to previous studies, the survey also indicated that respondents considered scenic beauty to increase with stream flow, to a mid point, and then diminish. There was also a frequent direct correlation between respondents' flow preferences and their main interest in river use. For instance, jet boaters often preferred higher flows.

The effects of flow fluctuation on perceived landscape values were found to vary depending on the river type and channel form. The results suggest that changes in flow are most apparent in single thread reaches with gently shelving banks that are exposed during low flows. Flow fluctuations in rivers with steep vertical or near vertical banks are less apparent. In the case of braided rivers, the perception of water loss is less obvious because, in most natural low flow conditions, exposed gravel banks comprise a significant proportion of the bed.

The reasons for preference were consistent across all user groups. As hypothesised, river flow preference, in relation to landscape quality, was primarily determined by the amount of water in the river. Criteria, such as water clarity, the amount of bank or beach exposed, and water movement, were considered to be secondary factors even though they relate to and reflect the amount of water in the river. Landscape attributes beyond the river channel were only identified as significant factors influencing flow preference when the proportion of wider landscape beyond the river channel shown in the photograph was more dominant than the river itself.

For respondents to estimate flows it proved important for certain characteristics to be shown, such as depth and movement. The visibility of the river bed enabled the depth of the river to be estimated and viewing distance from the water surface influenced respondents' ability to use water movement as an indicator of flow. Both of these characteristics were used by respondents to compare flow and depth in relation to reference points, such as exposed rocks. The results also confirmed the difficulty of depicting braided rivers in still photographs, as the braids are often far apart and can rarely be displayed together from viewpoints in the riverbed. Similarly, photographs taken from distant viewpoints, to show all braids, lose the necessary visual information about the flow within each braid.

The results of the second part of the survey reflected a correlation between the accuracy of flow estimates and river size. In general, all respondents found it easier to estimate low flows in small rivers in absolute numbers. As expected, lay people who were not familiar with rivers, had more difficulty to accurately assess river

flows for all river types. Increase in river width appeared to be easier for lay people to detect than an increase in depth and speed, which were more frequently used as decision criteria by respondents who were familiar with rivers. Small rivers with shallow banks and exposed rocks lead to most accurate flow estimates. It could be assumed from the results that more people would be able to estimate a flow in a small river in quantitative terms than in a deep, fast-flowing, big river.

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People's ability to detect and sequentially order the flow volumes depicted did depend on their familiarity with rivers but the results showed that the difference in flow volume has to be significant before most people could judge the difference. For all river types, respondents used exposed river banks as their first indicator of flow change. However, movement and water clarity were particularly important indicators where flows were above mean annual low flow in large catchments, such as the Hurunui and the Waimakariri Rivers.

In conclusion, the findings of the online survey emphasised the visual complexity of riparian environments. Flow is only one factor which contributes to people's experience of river environments. Scenic beauty, or aesthetic value, of a river is influenced by a range of wider landscape attributes, such as vegetation, seasonal colour and light.

River characteristics that are dependent on flow, such as water colour and clarity also influence a river's aesthetic appeal. Perceptions of river flows are influenced by the observer's familiarity with river environments and personal interests.

People's sensitivity to flow fluctuations is also dependent on river type, channel shape and stakeholder needs or expectations. Water allocation decisions, therefore, require careful consideration of the factors that influence river flow perceptions - in particular river and channel type, stakeholder needs and sensitivities, river accessibility and the characteristics of viewing populations.

For those of you who participated in the online perception survey earlier in the year, Boffa Miskell wishes to thank you for your time. ■

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