

Memo

Date	12 September 2018
To	OTOP zone committee
cc	Craig Davison, Dan Clark
From	Shirley Hayward

Subject: Assessment of Temuka Catchment Working Party (TCWP) and ZIPA options on ecological flows

Purpose

The purpose of this paper is to:

- Inform the zone committee of the implications of the TCWP preliminary scenarios for minimum flows and allocation regime, along with ZIPA steps 1 and 2 on ecological values of the catchment.
- Support the Zone committee decisions on their recommendations for a flow and allocation regime for the Temuka catchment.

Background

Dan Clarke has provided a complementary memo evaluating the current, ZIPA step 1 and 2, and proposed TCWP minimum flow and allocation regimes (Clarke 2018). This paper draws on the NIWA study to evaluate the impacts of ZIPA step 1 and 2 and TCWP proposed regimes on ecological flows.

NIWA study

The NIWA study initially set up their site in the same location at the Manse Bridge flow recorder, but after the damage to the site caused by the February cyclone, the study site was moved 2.5 km downstream to the reach accessed off Domain Road via the Temuka Golf course.

While the original NIWA study included sites on the lower reaches of the Waihi and Hae Hae Te Moana rivers, it was not possible to continue this work after the flooding damage in February. The priority was then to ensure the study was completed on the Temuka River as this represented the reach downstream of most abstractions, is an ecologically and culturally valuable river reach and has implications for flows into the lower Opihi River and the lagoon. While it would be valuable to have a greater understanding of the specific ecological flow needs of the main tributaries, the absence of this additional information does not preclude the ability to review and set minimum flows and allocations for this catchment.

Most abstractions in the Temuka catchment are currently tied to the minimum flows set at the Manse Bridge flow recorder site.

Figure 1 shows the results of NIWA's habitat assessment for the Temuka River as percentages of the maximum habitat retained at different flow steps for each species/life stage. The maximum habitat was determined over the flow range from minimum to median flows. Graduated colours are used to illustrate the transition from maximum % habitat retention (dark blue) to minimal % habitat retention (orange-red). The colour graduations are reversed for undesirable periphyton growths.

Temuka River minimum flow options and evaluation

The current minimum flow in the Temuka River for A-block abstractions is 700 L/s in summer time (October to March) and 1,000 L/s in April to September.

The draft ZIPA recommended the summertime minimum flow is increased to 1,050 L/s as a first step and to 1,400 L/s as a second step.

The TCWP's preliminary minimum flow options are:

- Option 1 summertime minimum flows of 1,050 L/s and increasing to 1,500 L/s over winter
- Option 2 summertime minimum flow of 850 L/s increasing to 1,500 L/s over winter.

Findings from the NIWA study indicate that the current summertime minimum flow of 700 L/s does not provide sufficient habitat (far less than 80% of maximum habitat) for any of the desirable species (Figure 1). The ZIPA Step 1 and TCWP Option 2 start to provide close to, or more than, 80% of maximum habitat for small eels and some other native fish (Canterbury galaxias, bullies) as well as for juvenile trout and salmon. ZIPA Step 2 provides incrementally improved proportion of habitat for a wider range of species. The TCWP Option 1 summertime minimum of 850 L/s provides only marginal increased habitat over the existing minimum flow.

The TCWP wintertime minimum flow of 1,500 L/s provides greater than 80% of maximum habitat for many of the native species and for trout and salmon spawning, although the Temuka River site overall has limited suitable trout and salmon spawning habitat.

Flows in the order of 1,700 to 2,200 L/s provide at least 80% of maximum habitat for large eels and lamprey.

In the assessment of ecological values of the Temuka River, Kilroy and Jellyman (2018) noted that the Temuka River mainstem has the highest fish diversity of all the Opihi sites surveyed in the NIWA study. A total of 10 fish species have been recorded in the Temuka River, eight of which are native species. This is in part because of its proximity to the sea, and therefore has a mix of migratory and non-migratory species. This indicates high ecological and biodiversity values of the Temuka River system.

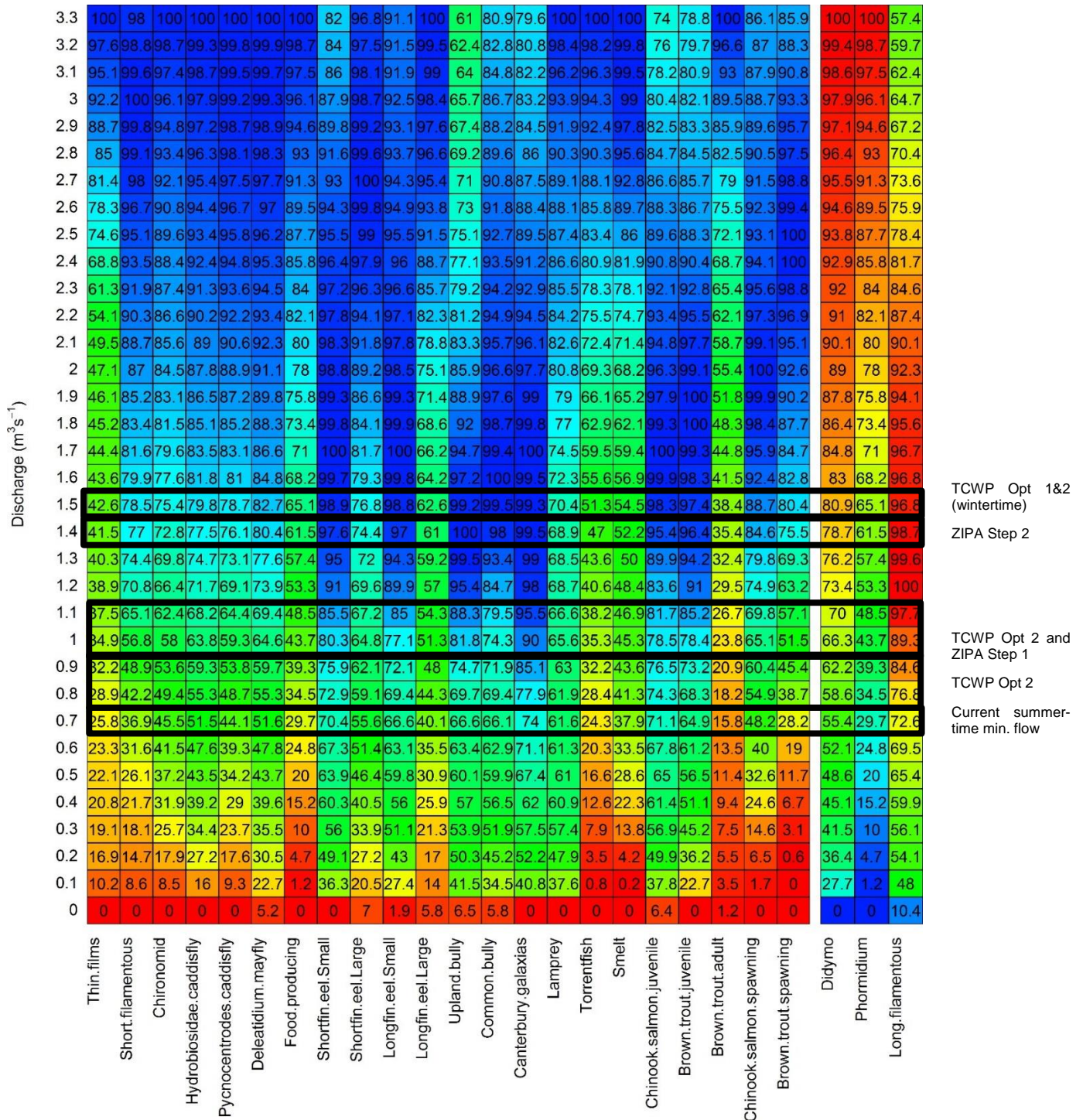


Figure 1 Relative level of maintenance of instream ecological values for a range of flows (zero to median flow has been modelled) in the Temuka River. The numbers in the table are the % of maximum habitat that is retained at each flow step (discharge). The traffic light colouring ranges red being low percentage of habitat retained to blue being high habitat retention for desirable species. The colour spectrum is reversed for nuisance periphyton because high habitat retention is considered undesirable (from Jellyman 2018).

Flow and allocation impacts

The impacts of current levels of abstraction on residual flows in the Temuka River (i.e., measured flows at Manse Bridge) extend the low flow period (days below naturalised MALF) from about 28 days to about 59 days. All of the scenarios modelled ZIPA 1 and 2 minimum flows (with stacked A and B allocation) and TCWP Option 1 and 2 improve the low flow conditions compared to current measured flows. The TCWP and ZIPA Step 2 have the least impact on extending low flows, to about 36 days.

The impact of current abstraction on median flows show a 19% reduction in mid-range flows compared to naturalised flows, indicating the current levels of abstraction may be having a moderate impact on ecological processes influenced by mid-range flows (e.g., such as invertebrate production). However, all of the scenarios potentially could reduce median flows by around 36% indicating a moderate to high degree of mid-range flow reduction. This would only occur if full allocations were taken consistently.

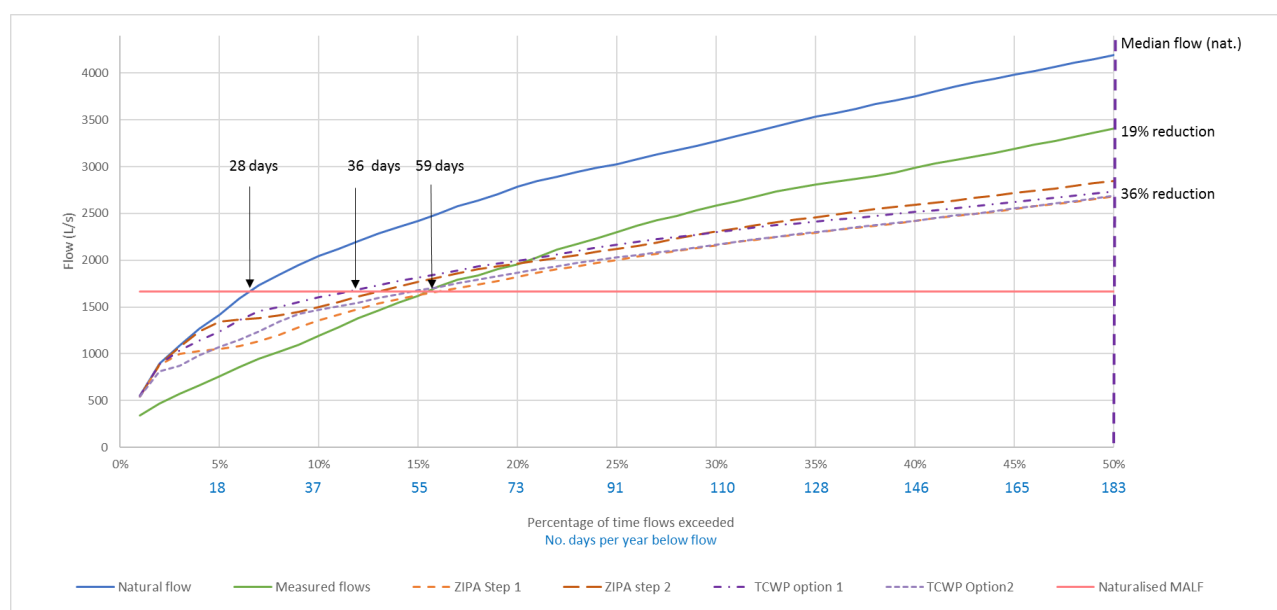


Figure 2 Flow duration curves for the Temuka River at Manse Bridge flow recorder for various flow and allocation scenarios (see Clark 2018 for explanation of scenarios).

Kilroy and Jellyman (2018) assessed the flows required to scour periphyton was about 10 x the median flow (~42 m³/s). Flood events of this size only occur about 2-3 times per year on average. None of the flow regimes affect the frequency of these events.

References

- Clark, D 2018: Hydrological evaluation of options to address the flow regime in the Temuka Catchment. 11 September 2018.
- Jellyman, P. (2018) Opihi catchment ecological flow assessment. For Environment Canterbury. NIWA Client Report No: 201858CH.
- Kilroy, C., Jellyman, P. (2018) Review of the hydrological characteristics and instream ecological values of the Opihi catchment. For Environment Canterbury. NIWA Client Report No: 2018068CH.