

Memo

Date	28.7.2017
To	Matt Dodson
CC	Adrian Meredith, Shirley Hayward, Adam Martin
From	Duncan Gray

Introduction

In the Land and Water Regional Plan (LWRP) for Canterbury a critical tool for managing freshwaters is Table 1a (Freshwater Outcomes for Canterbury Rivers). This table sets out numeric objectives for water quality and aquatic ecosystem health indicators for the different river type classifications or management units in Canterbury. Table 1a and the river type classifications were carried over with only minor modifications from the Natural Resources Regional Plan (NRRP). However, when the river classification planning maps for the NRRP/LWRP were drawn and classified the Opihi, Waimakariri Hurunui and Waiau catchments were not included because these areas were covered by existing catchment plans that sat outside the NRRP/LWRP (Opihi River Regional Plan 2001; Waimakariri River Regional Plan 2011; Hurunui Waiau River Regional Plan 2013). With the advent of a sub-regional planning process that includes the Waimakariri River catchment it has become apparent that a classified stream network is required.

Stream network classification for Canterbury

The LWRP classified network for Canterbury was originally developed to inform the Natural Resources Regional Plan (NRRP). The starting point for the NRRP network was the River Environment Classification (REC) developed by NIWA on behalf of the Ministry for the Environment (MfE). The REC is under constant development and has some widely known deficiencies in predicting stream networks in areas of low relief and groundwater upwelling. The REC network is predicted primarily on surface topography. Accordingly in flat areas with many spring-fed creek it was necessary to amend the network to remove streams that did not in reality occur and add in those that were known about or could be observed on aerial photographs. In addition to the REC network, consideration of the existing water quality, ecological health and instream values, along with local knowledge of land cover was used to refine the water quality classification process (Hayward et al., 2009). The process was undertaken by an expert panel of ECan water quality, ecology and hydrology scientists and produced a 'best available information' stream network.

The REC has an inbuilt hierarchical classification system based on climate, geology, topography etc. However, it was considered that this system did not provide adequate resolution for the classification of different stream types in Canterbury. The REC classifications are also quite technical in nature and difficult to apply in the context of ground water fed stream. Accordingly, the expert panel developed a stream type classification based broadly on the underlying information in the REC, but with modification (Table 1). An initial classification was produced using the algorithms derived from the REC. This network

was subsequently amended based on local knowledge and aerial photography subsequent to classification.

*Table 1. River types and criteria used to develop river type management units used in table 1a of the LWRP.
Denotes information derived from the REC.

River type	REC and expert panel criteria
Natural	River network lies entirely within DOC land $\geq 3,000,000$ m ² . Cuts off at the block boundary
Alpine Upland	Source of Flow* Glacial Mountain or Mountain, Upland classification for all alpine rivers except the main stems of the major alpine rivers that flow across, and interact with, the plains (Rangitata, Rakaia, Hurunui, Waiau rivers)
Alpine Lower	Source of Flow* Glacial Mountain or Mountain – main stems of the Rangitata and Rakaia rivers that flow across the Canterbury Plains
Hill-fed Lower	Source of flow* in Hill or lowland and Landcover* in Pastoral, Exotic forest, Bare, Indigenous forest, Tussock, Scrub and Gradient* equals high Gradient and tributaries start at < 500 m a.s.l.
Hill-fed Upland	Source of flow* in Hill or lowland and Landcover* in Pastoral, Exotic forest, Bare, Indigenous forest, Tussock, Scrub and Gradient* equals high Gradient and tributaries start at > 500 m a.s.l.
Hill-fed Urban	Source of flow* in Hill or lowland, dominant land use urban (~40%)
Spring-fed upland	Source of flow* in Hill and geology* in Alluvium or Hard sedimentary and Valley Form* in Medium Gradient or Low Gradient and Elevation* > 400 m a.s.l. Local knowledge of stream form and hydrology, spring-head locations and aerial photography. Upland classification based on the generally low intensity land uses of the inland basins of the McKenzie Basin, Ashburton Lakes, Lees Valley and spring-fed streams in the upper valley floors of the Rangitata, Rakaia, and Waimakariri alpine rivers.
Spring-fed Lower Basin	Source of flow* in Hill and geology* in Alluvium or Hard sedimentary and Valley Form* in Medium Gradient or Low Gradient and Elevation* < 400 m a.s.l. Local knowledge of stream form and hydrology, spring-head locations and aerial photography. Lower basin classification based on recognition of lower altitude basins and river valleys such as Hakataramea catchment, Amuri Basin and Hanmer Basin.
Spring-fed Plains	Source of flow* in Hill and geology* in Alluvium or Hard sedimentary and Valley Form* in Medium Gradient or Low Gradient and Elevation* < 400 m a.s.l. Local knowledge of stream form and hydrology, spring-head locations and aerial photography. Plains classification based on groundwater dominated streams that arise on the open plains across Canterbury.
Spring-fed Plains - Urban	Source of flow* in Hill and geology* in Alluvium or Hard sedimentary and Valley Form* in Medium Gradient or Low Gradient. Local knowledge of stream form and hydrology, spring-head locations and aerial photography. Dominant land use Urban.
Lake Fed	Source of Flow* Lake

A stream network classification for the Waimakariri River

The intention for the development of a stream classification for the Waimakariri River catchment was to follow the approach used for the NRRP, such that the water quality classification of the Waimakariri river network would not be inconsistent with the regional water classification. On 2nd May 2017 an expert panel was convened to edit and classify an initial stream network produced by an REC Vs 2.3 based algorithm. The panel consisted of Adrian Meredith, Principle Water Quality Scientist, Shirley Hayward, Senior Canterbury Water Management Strategy Scientist, Adam Martin, Senior Hydrology Scientist and Duncan Gray, Senior Ecology Scientist. The initial stream network and classification was viewed on a GIS map and edited with consensus. Key decisions from the panel were classification of spring-fed streams throughout the Rangiora and Kaiapoi areas as Spring-fed Plains or Spring-fed Plains Urban. However, it was agreed that due to the complicated nature of the stream networks in these areas that ground truthing of the presence and form of some mapped streams was needed. This work was undertaken by Adrian Meredith in June and July 2017. Network editing and classification was subsequently completed on 28 July 2017 (Figure 1).

Application of the Waimakariri network classification

Despite the effort expended on the development of this river classification network it is important to realise that it represents 'the best available information' at the time of writing. It is quite conceivable that streams are drawn and classified on the accompanying maps that in truth do not exist or are located elsewhere. It is also possible that permanently or intermittently flowing streams do exist and are not currently mapped. As such it is important that pragmatism is applied in the use of this classification network. This classification network should be used as a guide for the appropriate management of streams and rivers in the Waimakariri catchment, but should also be informed by any additional information.

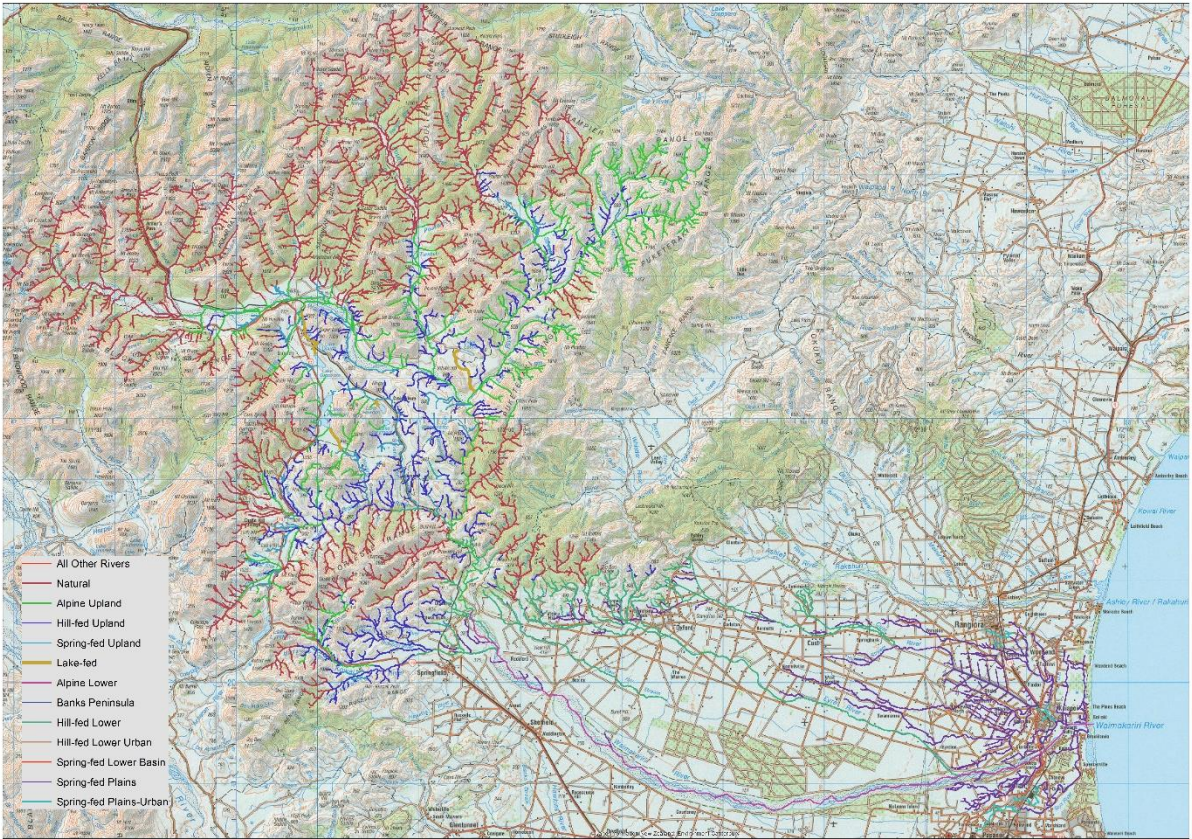


Figure 1. Management unit classification for rivers in the Waimakariri catchment.

References

Hayward, S. Meredith, A. Stevenson, M. 2009: Review of proposed NRRP water quality objectives and standards for rivers and lakes in the Canterbury region. Environment Canterbury technical report R09/16.

Attachments:

File reference: