

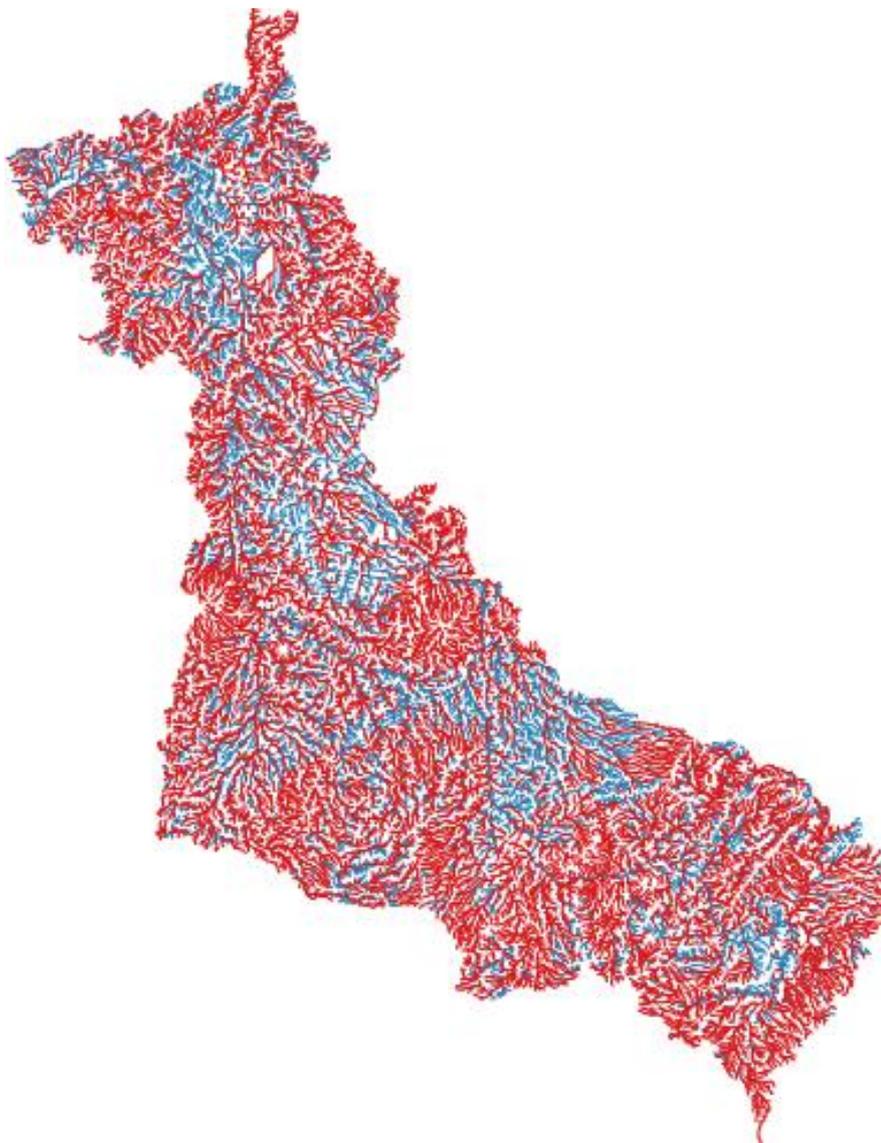
## Follow-up Information for the Healthy Rivers Commissioners (Block 1)

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15.07.2019

### Information on the 'hard bottomed' streams covered by PC1:

1. Figure 1 shows, in red, the river/stream reaches predicted to naturally have less than 20% fine sediment cover (i.e., at least 80% hard bottomed) using the model developed by Clapcott *et al.* (2011).



**Figure 1.** Naturally hard bottomed (<20% fine sediment cover) reaches shown in red.

## Comment

2. In my Block 1 evidence at [3.33] – [3.41], I discussed using modelled data to set desired nutrient concentrations, based on the paper attached to my evidence “*Clean but not green: a weight-of-evidence approach for setting nutrient criteria in New Zealand rivers*”. I explained that this paper used several lines of evidence on links between invertebrates and nutrients, fish and nutrients, periphyton and nutrients ([3.36]). To clarify, the stimulatory effects on periphyton is not the only mechanism by which nutrients can affect ecosystems. Therefore I do not propose managing nutrients only for the purpose of managing periphyton growth. I would be happy to expand on this if the Panel requires it.
3. Further, in relation to periphyton, rivers that are largely soft bottomed but retain patches hard substrate can still support conspicuous periphyton. Whilst periphyton is almost certainly growing at the river reaches in red, it is also likely growing at many, if not most, of the reaches in blue (Figure 1). Only a river that is completely soft bottomed with no instream hard structures would not support conspicuous periphyton. For these reasons, I consider the vast majority of river reaches would be able to support conspicuous periphyton, and require nutrient limits for that purpose.
4. (I note that the NPS-FM, also requires nutrient limits to provide for downstream receiving environments, such as lakes and estuaries.)

## Reference

CLAPCOTT, J., YOUNG, R., HARDING, J. S., MATTHAEI, C. D., QUINN, J. & DEATH, R. G. 2011. *Sediment Assessment Methods: Protocols and guidelines for assessing the effects of deposited fine sediment on in-stream values*. New Zealand: Cawthron Institute.