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PHYSIOGRAPHIC CONTROLS OVER SOUTHLAND'S GROUND AND SURFACE WATER HYDROCHEMISTRY AND QUALITY

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Abstract

The Physiographic Project is a component of Environment Southland's Water and Land 2020 and Beyond (WAL2020) programme, and their response to the National Policy Statement for Freshwater Management (NPS-FM). The physiographic work is a novel approach, which characterises the landscape based on water origin, soil type, geology and topography to provide a better understanding of the relationships between these factors, the drivers of water quality and hydrochemical variability. Nine Physiographic Units were identified; hydrochemistry and water quality outcomes differ in each of these units due to their unique physiographic features. This study was approached in two different ways. Firstly a "Bottom Up" approach, which was based upon analysis of a large hydro-biogeochemical and isotopic dataset (26,615 samples) was used to let the water tell the story of its evolution (Rissmann et al., 2016a). The hydrochemical data were complimented by a strong conceptual understanding of the physical hydrology and hydrogeology developed over the last 20 years. In the "Bottom Up" approach an understanding of the key drivers of regional hydrochemistry was developed (Figure 1). These drivers were then used to produce a conceptual model to predict water quality outcomes spatially.

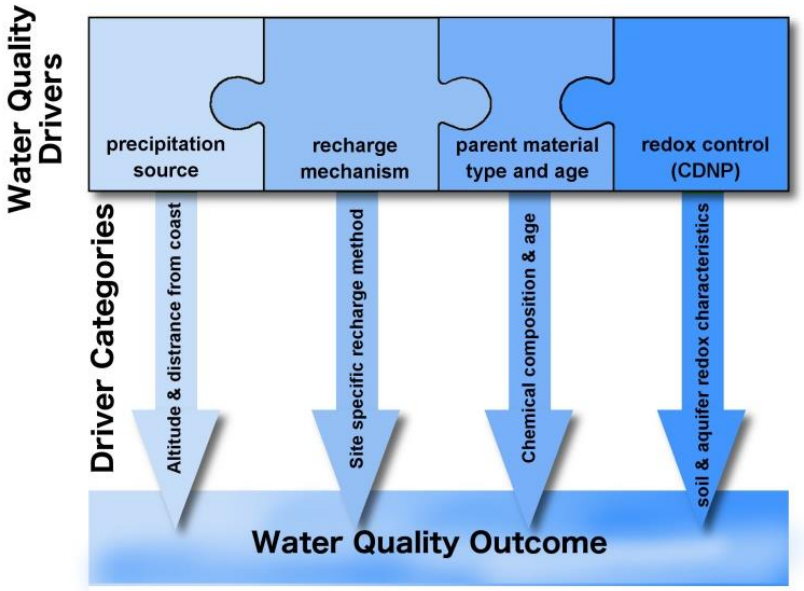

Figure 1: Conceptual diagram showing the four key drivers of regional hydrochemistry. The drivers identified for Southland are: precipitation source; recharge mechanism; geology and soil age/parent material composition and finally soil and aquifer redox characteristics.

Secondly, the "Bottom Up" approach was complimented by a "Top Down" approach to spatially map areas with similar inherent properties that influence regional water quality (Rissmann et al., 2016b). This involved using soil, geological, hydrological and topographical information to generate mapping rules that could be applied in an objective manner to classify Southland into 9 unique "Physiographic Units" (Figure 2), whilst adhering to the results of the "Bottom Up" approach. The mapped units are intended to help facilitate targeted and effective management and protection of regional freshwater resources.

This work is presented in two reports referenced above. These will be available mid 2016 www.es.govt.nz.

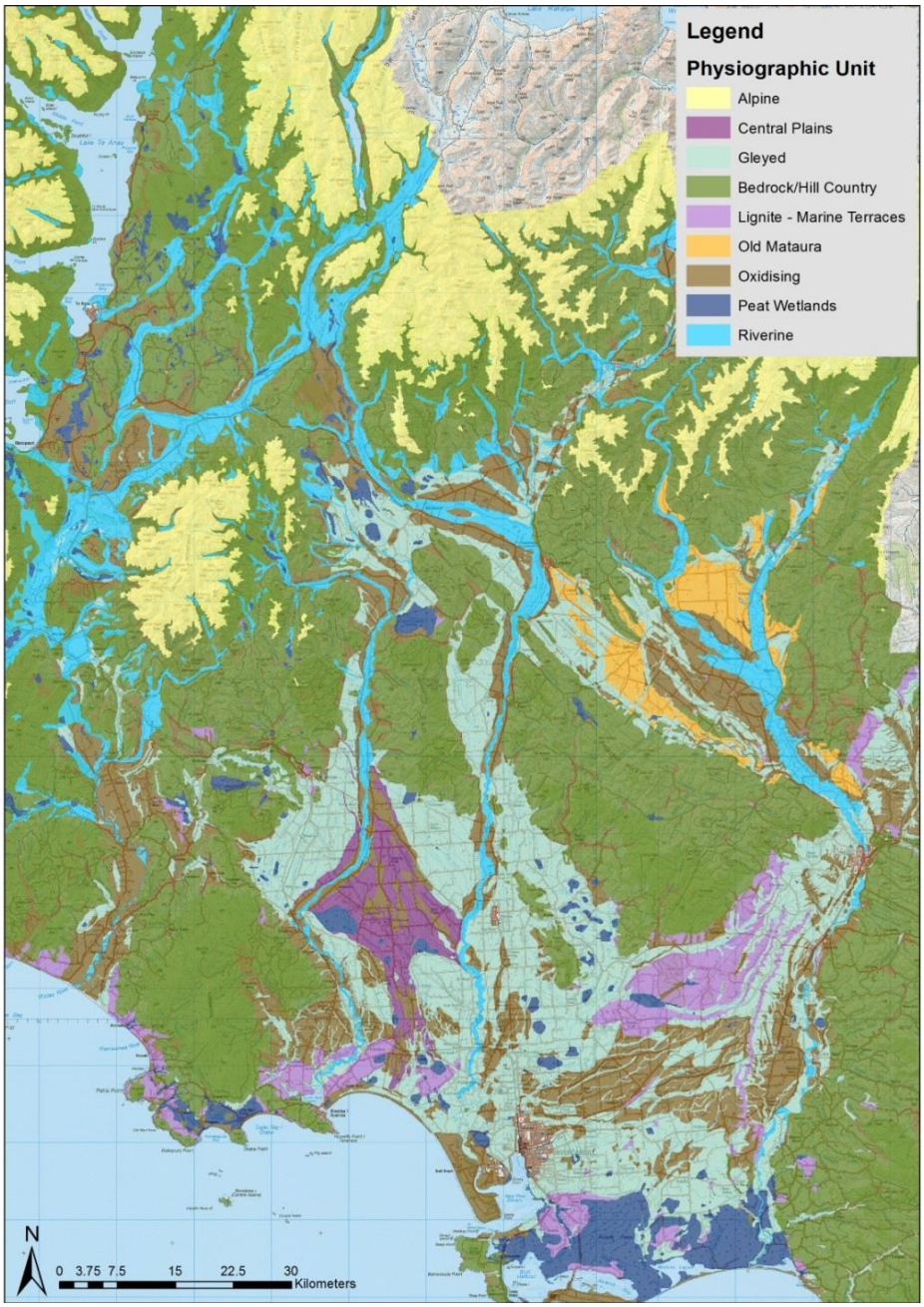

Figure 2: Regional map depicting the nine Physiographic Units. For further detail regarding the characteristics of each of these units see Rissmann et al. (2016b) and Hughes & Wilson. (2016).

References

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