

# State and Trends in Freshwater Macroinvertebrate Community Health in Southland

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## Introduction

Environment Southland has been monitoring invertebrates in streams and rivers in Southland since 1997 as part of State of Environment (SOE) programme. Macroinvertebrate communities have been sampled in riffle habitat in lotic wadeable freshwater bodies annually. There is a network of 124 sites with invertebrate data in the council's data base. Of these, 81 sites had sufficient data for state assessment and 72 for trend assessment.

Here, we use the Macroinvertebrate Community Index (MCI) to report on state (current condition summer 2010 - 2014), compliance with Regional Water Plan standard and trends in macroinvertebrates of streams and rivers in Southland from 1997 to 2014.

## Objectives

- Classify the state of macroinvertebrate community health in Southland streams and rivers using the MCI index and Regional Water Plan standard.
- Use the MCI index scores to identify long-term trends in macroinvertebrate community health in Southland streams and rivers.

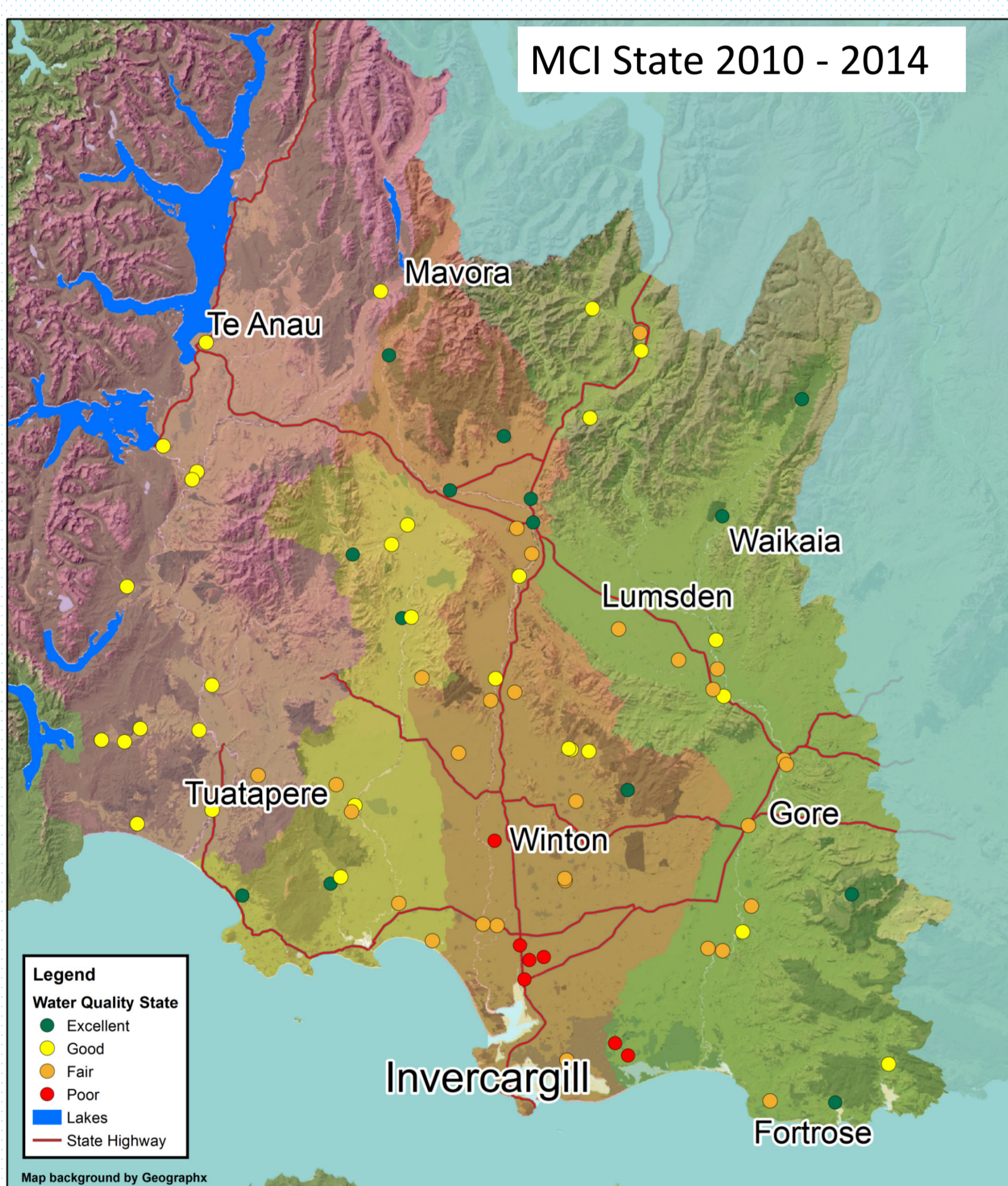


Figure 1. State of MCI scores from 81 sites in Southland for five-year time period of 2010 – 2014., using median MCI scores (Stark and Maxted 2007)

## Results

- The state of MCI at 18% and 9% of sites indicated excellent and poor water quality respectively, and rest of sites (73%) equally shared good and fair water quality (Fig. 2).
- 72% of sites were in compliance with the MCI thresholds defined by Environment Southland (2010) for RWP-MU (Fig. 2).
- Of the sites with sufficient data for trend analysis, 28% of had decreasing MCI trend with no sites showing an improving trend. Trend was not established for majority of sites (73%) (Fig. 4). A median degrading trend magnitude of 0.37% per year was observed for MCI of all 72 sites in Southland.

## Methods

- Macroinvertebrates were sampled once a year from up to 124 sites in Southland region from both hard and soft bottomed streams and rivers.
- Macroinvertebrate samples were collected using methods in Hamill (1997) prior to 2002, and using methods in Stark et al. (2001) since 2002.
- Macroinvertebrate samples were processed by Ryder Consulting Ltd. by spreading over a large tray with marked quadrates and counting 3 quadrates prior to 2002. Fixed count of 200 individuals with a scan for rare taxa following protocol P2 of Stark et al. (2001) was used since 2002.
- Macroinvertebrate Community Index (MCI) were calculated using tolerance values assigned for taxa following Stark and Maxted (2007).

## Analysis

Median MCI scores of 124 monitoring sites were calculated to assess invertebrate community health following Stark and Maxted (2007).

### State Analysis

- Of 124 sites, 81 sites were retained for state analysis for

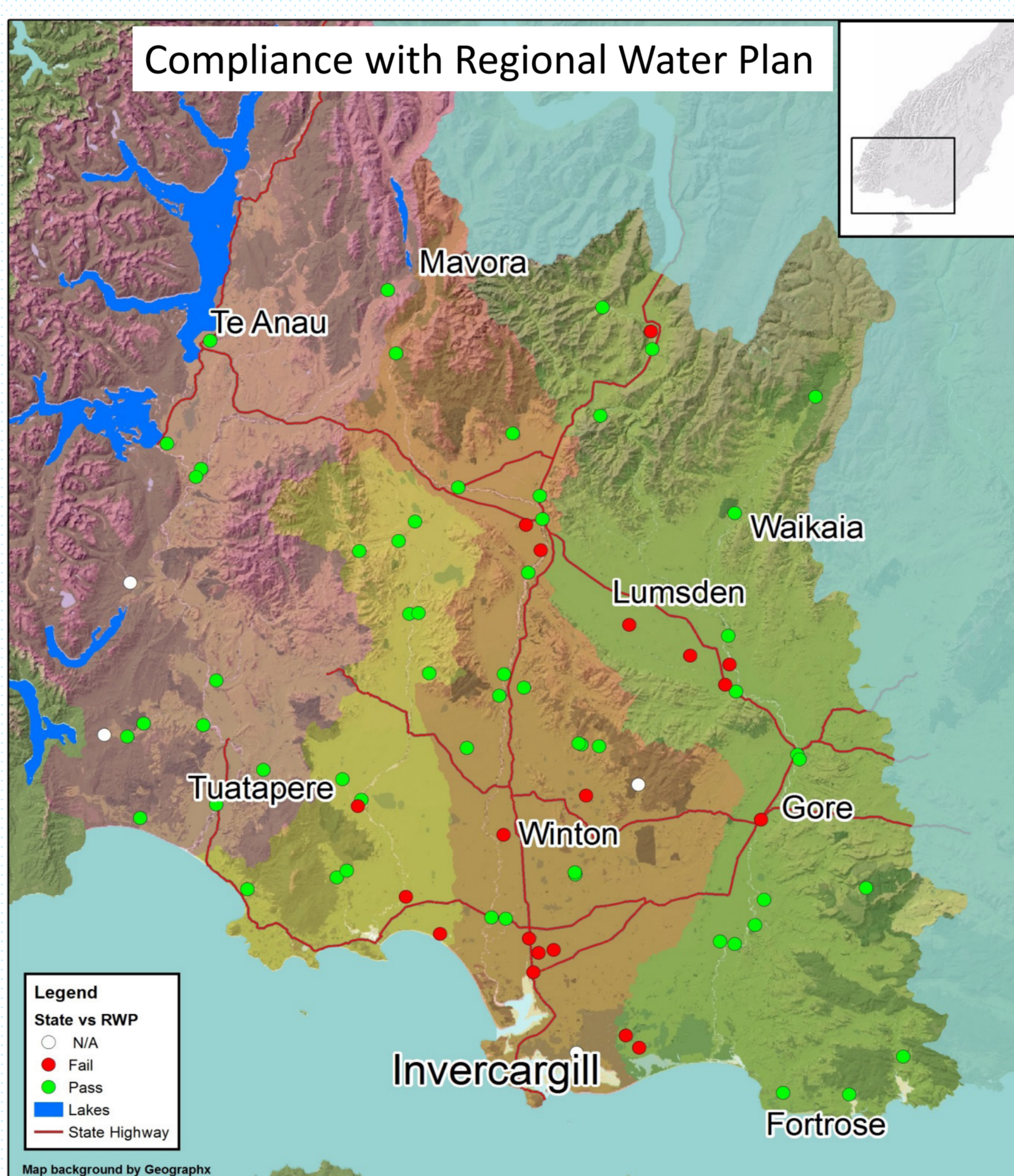


Figure 2. Compliance with Southland Regional Water Plant thresholds for the time period of 2009 – 2014, using median MCI scores (Stark and Maxted 2007).

## Conclusions

- Macroinvertebrate metrics are a useful tool to assess invertebrate community health and can be used to indicate water quality.
- The current state indicated that MCI of majority of Southland streams and rivers are still under thresholds defined for Regional Water Plan for Management Units by Environment Southland.
- Almost one-third of study sites showed long-term degrading trend in MCI.
- More data is needed to have a better resolution in studying long-term trends in MCI in Southland waterways as trends were not established with confidence for many sites in this study.

the period of 2010 – 2014 as these sites had > 3 MCI samples during the time period.

- Median MCI scores for 2010 - 2014 were used to identify water quality class following Stark and Maxted (2007).
- Median MCI scores (state) of 81 sites were compared to the MCI thresholds defined in Environment Southland (2010) for each site (based on Regional Water Plan Management Unit, RWP-MU). If the median MCI score of a site was greater than its corresponding MCI threshold then the site was considered to 'pass' and to be in compliance with the Regional Water Plan, if the median score was less than the corresponding threshold it was considered to 'fail'.

### Trend Analysis

- Of 124 sites, 72 sites were retained for trend analysis for the period of 1997 – 2014 as these sites had a minimum of 10 data points for this time period with no more than 1 year of missing data.
- We followed the statistical approaches described in Larned et al. (2015) for trend analysis. If confidence intervals obtained from Mann-Kendall test did not include zero, trend direction was established with confidence, otherwise no trend direction was established (uncertainty).

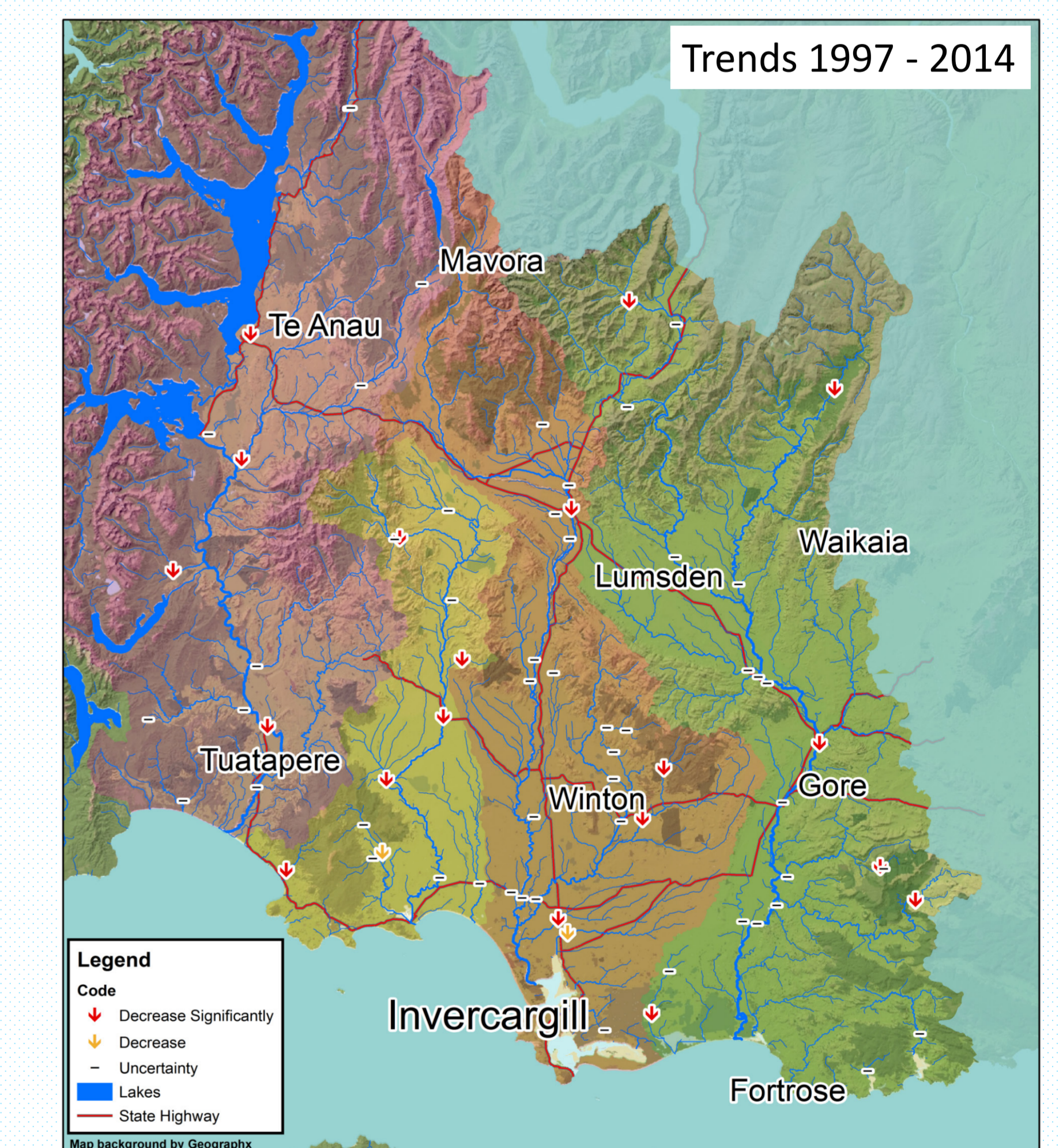


Figure 3. Trends in MCI scores 72 sites in Southland for the time period of 1997 – 2014 following statistical approaches in Larned et al. (2015).

## Acknowledgements

Ton Snelder, Graham McBride, Scott Larned, Michael Pिंगram, Joanne Clapcott, Lisa Pearson, Matt Couldrey

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