Hurunui District Water Quality Review

Report for Hurunui District Landcare Group

July 2024

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Executive Summary

Water quality is currently monitored by Environment Canterbury at 45 sites distributed across the Hurunui District. Two additional sites are monitored by NIWA as part of the National River Water Quality Network (NRWQN). A further 19 sites have water quality data recorded over the past 10-years but are no longer monitored. Water quality at these sites is measured using a range of physical, chemical and ecological indicators, the combination of which varies between individual monitoring locations. This report describes an assessment of the water quality state and trends in the Hurunui District using the data set available up to June 2023. Water quality state is graded with respect to regional and national objectives including numeric criteria in the Hurunui Waiau River Regional Plan (HWRRP), the Canterbury Land and Water Regional Plan (CLWRP) and attribute bands (including national bottom lines) in the National Policy Statement for Freshwater (NPS-FM) 2020.

Key findings of the assessment include:

- Ammonia toxicity is not a significant issue in the Hurunui District.
- Nitrate toxicity fails the HWRRP criteria and exceeds the national bottom line in several streams draining the Culverden Basin. Increasing trends are also observed in many lower catchment areas.
- Periphyton fails the HWRRP criteria in the Hurunui River at SH7, at least sometimes fails CLWRP criteria in the Conway and Waipara Rivers, and at times exceeds the national bottom line in the Leader River. Increasing trends in periphyton biomass and cover are also observed at several sites.
- *E. coli* concentrations fail the CLWRP criteria in the Waipara and Conway Rivers and exceed the national bottom line at several other sites in the Conway, Hurunui, Waiau, Mason and Leader Rivers, and at times the Jed, Waipara, Crystal Brook and Dry Stream. *E. coli* concentrations generally increase in lower catchment areas with many sites showing increasing trends.
- Water clarity is good at many sites but fails the national bottom line at some sites in the Mason, Waiau and Conway Rivers, and at times also the Hurunui and Jed Rivers. Several sites in lower catchment areas show declining trends.
- Ecological condition indicators fail the CLWRP criteria and national bottom line at several sites including in the Leader and Waipara Rivers. Ecological condition indicators generally decline in lower catchment areas with many sites also showing declining trends.
- The current state of water quality in the Hurunui District generally compares favourably compared to equivalent sites elsewhere in the Canterbury Region and Nationally. However, while the distribution of trends within the Hurunui District is slightly better than those observed regionally or nationally for Ammonia and DRP, they are slightly worse for nitrate and *E. coli*.

1 Introduction

Water quality refers to the condition and characteristics of water that determine its suitability for various uses and its ability to maintain the health of aquatic ecosystems. It encompasses the chemical, physical, and biological properties of water, as well as the presence of specific contaminants such as pathogenic bacteria.

Land-based activities can have detrimental effects on freshwater due to the loss of sediment, nutrients or microbial contaminants into water, and these effects are often compounded by pressures such as urbanisation and the intensification of agriculture. In response to an overall reduction in water quality evident in many areas of New Zealand, the regulatory framework for managing water quality at a national level has undergone significant changes in recent years. Such changes are likely to continue as consequent objectives, policies and rules are implemented at a regional and catchment scale.

The Hurunui District Landcare Group (HDLG) is an independent catchment group of over 300 North Canterbury farmers. The group is run as an incorporated society which provides support to farmers to enable compliance with increasingly complex environmental regulations while protecting their land, water and native biodiversity for future generations.

LWP Ltd was commissioned under the Ministry for the Environment Access to Experts programme (A2E) to undertake a review of available water quality data in the Hurunui District. This will help HDLG provide relevant information to its members to assist in the determination of appropriate land management actions to maintain or improve water quality.

1.1 Purpose

The purpose of the report was to:

- Collate water quality data available in the Hurunui District.
- Provide an analysis of the current state of water quality with respect to regional and national objectives including numeric criteria in the Hurunui Waiau River Regional Plan (HWRRP), the Canterbury Land and Water Regional Plan (CLWRP) and the National Policy Statement for Freshwater (NPS-FM) 2020).
- Provide a comparison of the current state of water quality in the Hurunui District against comparable waterways elsewhere in the Canterbury Region and nationally.
- Evaluate current trends in water quality across the Hurunui District.

We note that the HWRRP (2013) is the currently operative plan for the Hurunui, Waiau and Jed River catchments, while the CLWRP (2017) is the currently operative plan for all other waterways in the Hurunui District (e.g., Conway and Waipara Rivers). The NPS-FM (2020) was developed later and contains more attributes than the criteria defined in the HWRRP and CLWRP. While the HWRRP and CLWRP numeric criteria are currently operative and are therefore a relevant test for water quality in the Hurunui District today, Environment Canterbury's next future review of these regional plans will be required to incorporate all the compulsory attributes of the latest NPS-FM. To help inform HDLG we have therefore also included gradings using NPS-FM (2020) attributes for all sites with available data.

While this study reports state and trends, it is beyond the scope to interpret causes of any failing states or trends at any particular site, or for parts or whole of the Hurunui District.

The overall intention of the analysis was to provide a resource which can be utilised by HDLG to interpret and present water quality to catchment group members to assist identification of appropriate on the ground actions for water quality improvement.

2 Data

The river water quality data used in this study includes data collected between 1973 and the present day by both Environment Canterbury (ECan) and by the National Institute of Water and Atmosphere (NIWA) as part of the national river water quality network. The available data comprised 43,965 observations at 60 sites of 15 physical, chemical, microbiological or ecological variables for which there are freshwater outcomes set in one or more of the Hurunui Waiau River Regional Plan (HWRRP), Canterbury Land and Water Regional Plan (CLWRP) or the National Policy Statement for Freshwater Management 2020 (NPS-FM). Of the 60 monitoring sites, 16 are state of the environment (SoE) reporting sites, and a further four sites are SoE sites for only ecology. SoE sites are typically used by regional councils and central government organisations for regional and national reporting. SoE sites have generally been selected by regional councils to cover a range of catchment conditions so that they collectively provide a reasonable representation of a larger area (region, national) as a whole. In addition to SoE sites, monitoring agencies will often operate additional water quality monitoring sites for other purposes (i.e., monitoring consent compliance, science programmes, etc). A map of the water quality monitoring sites in the Hurunui District is shown in Figure 1.

Table 1: River water quality variables, measurement units and site numbers (total, and current) used in this study.

Water quality variable	Number of sites		Units
	Total	Current	
Ammonia (NH_4)	53	31	mg l^{-1}
DRP (dissolved reactive phosphorus)	53	31	mg l^{-1}
Nitrate (NO_3)	53	31	mg l^{-1}
ASPM (macroinvertebrate average score per metric)	11	11	-
MCI (macroinvertebrate community index)	11	11	-
QMCI (quantitative macroinvertebrate community index)	11	11	-
Cyanobacteria	29	20	%
E. coli (Escherichia coli)	42	24	cfu 100ml^{-1}
Periphyton (biomass)	19	10	mg chl-a m^{-2}
Periphyton (cover)	31	20	%
Clarity	30	19	M
Sedimentation (bed fine sediment)	37	21	% cover
Dissolved Oxygen	39	18	%
Water Temperature	46	25	^{O}C
pH	39	19	-

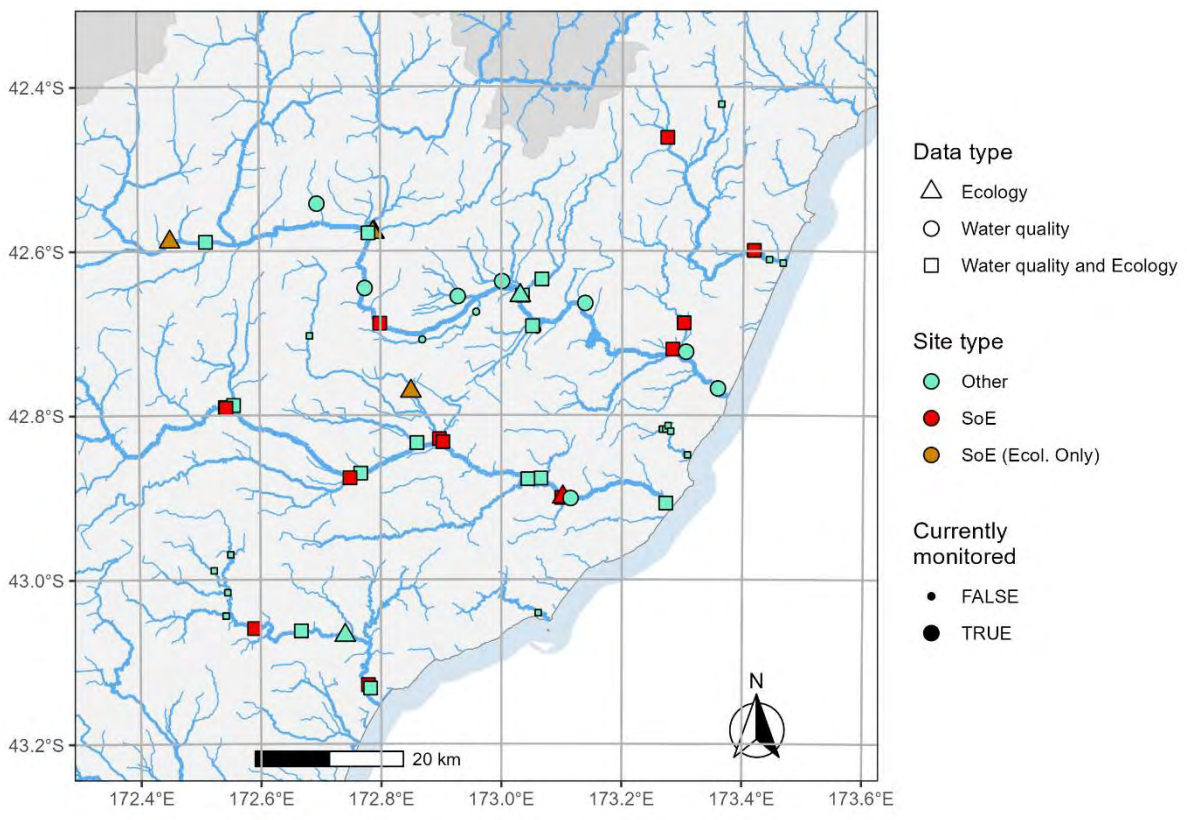

Figure 1: Monitoring site location map including details of the data type collected, the site type and whether the site is currently monitored

3 Methods

3.1 State

3.1.1 Grading of monitoring sites

Water quality state for river monitoring sites in the Hurunui District was graded based on attributes and associated attribute state bands defined by the National Objectives Framework (NOF) of the NPS-FM (Ministry for Environment, 2020), as well as minimum acceptable outcomes outlined in the HWRRP (Environment Canterbury, 2013) and the CLWRP (Environment Canterbury, 2017). The relevant text and tables containing numeric criteria from the HWRRP and CLWRP are provided in Appendix A and Appendix B.

Each table of Appendix 2 of the NPS-FM (2020) represents an attribute that must be used to define an objective that provides for a particular environmental value. For example, Appendix 2A, Table 6, defines the nitrate toxicity attribute, which is defined by nitrate-nitrogen concentrations that will ensure an acceptable level of support for the "Ecosystem health (Water quality)" value. Objectives are defined by one or more numeric attribute states associated with each attribute. For example, for the nitrate-nitrogen attribute there are two numeric attribute states defined by the annual median and the 95th percentile concentrations.

For each attribute, the NOF defines categorical attribute states in four (or five) attribute bands, which are designated A to D (or A to E, in the case of the *E. coli* attribute). The attribute bands represent a graduated range of support for environmental values from high (A band) to low (D

or E band). The ranges for attribute states that define each attribute band are defined in Appendix 2 of the NPS-FM (2020). For most attributes, the D band represents a condition that is unacceptable (with the threshold between the C and the D band being referred to as the "national bottom line") in any waterbody nationally. In the case of the nitrate (toxicity) and ammonia (toxicity) attributes in the 2020 NPS-FM, the C band is the national bottom line, and for the DRP attribute, no bottom line is specified.

For the HWRRP and CLWRP, attributes are only assigned a minimum acceptable outcome (which can vary spatially), and as such, sites are graded simply as "pass" or "fail" depending on whether the state is better or worse than the specified minimum acceptable outcome.

A site can be graded for each NOF attribute by assigning it to attribute bands (e.g., a site can be assigned to the A band for the nitrate toxicity attribute) and graded for each CLWRP and HWRRP attribute by assigning it a pass/fail grade (e.g., a site can be assigned a pass grade for filamentous algae cover). Site grading is done by using the numeric attribute state (e.g., annual median nitrate-nitrogen) as a compliance statistic. The value of the compliance statistic for a site is calculated from a record of the relevant water quality variable (e.g., the median value is calculated from the observed monthly nitrate-nitrogen concentrations). The site's NOF compliance statistic is then compared against the numeric ranges associated with each attribute band and a grade assigned for the site (e.g., an annual median nitrate-nitrogen concentration of 1.3 mg/l would be graded as "B-band", because it lies in the range >1.0 to ≤2.4 mg/l).

For a HWRRP or CLWRP attribute, the compliance statistic is compared against the numeric target specific in the plan (e.g., an annual median nitrate-nitrogen concentration of 1.3 mg/l would be graded as "pass" for a site in the Hurunui mainstem downstream of the Mandamus flow recorder, because it is less than 2.3 mg/l). Note that for attributes with more than one numeric attribute state, we have provided a grade for each numeric attribute state (e.g., for the nitrate (toxicity) attribute, grades are defined for both the median and 95th percentile concentrations), as well as an "overall" grade, which is evaluated as the worst grade across all numeric attribute states for an attribute.

Table 2 ,Table 3 and Table 4 provide summaries of the NOF, CLWRP and HWRRP attributes and numeric attribute states calculated as part of this study.

Table 2: Attributes and numeric attribute states defined in the NOF NPS-FM

NPS-FM Reference – NOF Attribute	**Numeric attribute state description**	**Units**
A2A; Table 2 – Periphyton (trophic state)	92nd or 83rd percentile of chlorophyll-a biomass	mg chl-a/m^2
A2A; Table 5 – Ammonia (toxicity)	Median concentration of Ammoniacal-N	mg l^{-1}
	95th percentile concentration of Ammoniacal-N	mg l^{-1}
A2A; Table 6 – Nitrate (toxicity)	Median concentration of Nitrate-Nitrogen	mg l^{-1}
	95th percentile concentration of Nitrate-Nitrogen	mg l^{-1}
A2A.; Table 8 - Suspended fine sediment	Median visual clarity	m
A2A; Table 9 - *Escherichia coli*	% exceedances over 260 cfu 100 mL^{-1}	%
	% exceedances over 540 cfu 100 mL^{-1}	%

	Median concentration of *E. coli*	cfu 100 ml^{-1}
	95th percentile concentration of *E. coli*	cfu 100 ml^{-1}
A2B; Table 14 – Macroinvertebrates (1 of 2)	Median MCI score	-
	Median QMCI score	-
A2B; Table 14 – Macroinvertebrates (2 of 2)	Median ASPM score	-
A2B; Table 20 - DRP	Median concentration of DRP	mg l^{-1}
	95th percentile concentration of DRP	mg l^{-1}

Table 3: Attributes and numeric attribute states defined in the CLWRP

Attribute type	Attribute	Numeric attribute state description	Units
Ecological Health	QMCI	Minimum score	-
	Dissolved oxygen	Minimum saturation	%
	Temperature	Maximum temperature	^oC
Periphyton	Periphyton (biomass)	Maximum Chlorophyl-a biomass	mg chl-a/m^2
	Periphyton (cover)	Filamentous algae >20mm maximum cover of bed	%
	Cyanobacteria	Cyanobacteria maximum mat cover of bed	%
Situation	Sedimentation	Fine sediment <2mm diameter maximum cover of bed	%
Human Health	E. coli	Median concentration of *E. coli*	cfu 100 ml^{-1}
		95th percentile concentration of *E. coli*	cfu 100 ml^{-1}

Table 4: Attributes and numeric attribute states defined in the HWRRP

Attribute	Numeric attribute state description	Units
Periphyton (biomass)	Maximum Chlorophyl-a biomass	mg chl-a/m^2
Periphyton (cover)	Filamentous algae >20mm maximum cover of bed	%
Nitrate (toxicity)	Median concentration of Nitrate-Nitrogen	mg l^{-1}
	95th percentile concentration of Nitrate-Nitrogen	mg l^{-1}
DRP	Mean concentration of DRP	mg l^{-1}

3.1.2 Calculation of state compliance statistics

When grading sites based on water quality attributes, it is general practice to define consistent time periods for all sites and to define the acceptable proportion of missing observations (i.e., data gaps) and how these are distributed across sample intervals so that site grades are assessed from comparable data. The time period, acceptable proportion of gaps and representation of sample intervals by observations within the time period are commonly referred to as site inclusion or filtering rules. In this study, we adopted the time period and filtering rules used by LAWA and in national state of the environment reporting (Whitehead et al., 2021). The grading assessments were based on a compliance statistic, (e.g., the median

value of the observations), made for the 5-year time period to the end of June 2023, with inclusion rules requiring at least 90% of monthly observations over the 5-year period, or 4 out of 5 annual observations for macroinvertebrate observation.

To maximise information gained from the monitoring records in the district, we also include information about sites that comply with more relaxed filtering rules (30 observations in the 5-year period) and specify these as “interim” grades in the results. Finally, we also provide grades for sites that do not meet the final or interim inclusion criteria but have at least one observation in the 5-year period. These grades are specified as “insufficient” and while they are likely to be uncertain, they are included to provide some indication of possible state.

Additionally, we performed rolling state grading assessments for 5-year period windows between July and June over the full length of the records. This involved starting with the first 5-year window of the record, evaluating the state, then shifting the 5-year window incrementally by 1-year and reevaluating state until the end of the record (which aligns with the current state assessment).

3.2 Trends

The purpose of trend assessment is to evaluate the direction (i.e., increasing or decreasing) and rate of the change in the central tendency of the observed water quality values over the period of analysis (i.e., the trend). Because the observations represent samples of the water quality over the period of analysis, there is uncertainty about the conclusions drawn from their analysis. Therefore, statistical models are used to determine the direction and rate of the trend and to evaluate the uncertainty of these determinations.

We evaluated trends using the LWPTrends functions (Snelder and Fraser, 2021) that are implemented in the R statistical computing software (R Core Team, 2023). These functions are also used in the LAWA and national state of environment evaluations of trends. Trend assessment analyses produced estimates of trend rate made with the Sen slope estimator, and estimates of the confidence in the trend direction, from Kendall tests. The seasonal version of the Sen slope estimator was used for variables measured seasonally (i.e., monthly, bi-monthly or quarterly), and for which seasons accounted for a significant amount of the variability in a site × variable combination.

Trends were evaluated for 10- and 20-year periods ending in June 2023. We applied the same data requirement filtering rules as used by LAWA and in national state of the environment reporting to ensure that evaluated trends were commensurate in terms of their statistical power and representativeness of the time period. The filtering rules required data in at least 90% of years, and 90% of sample intervals (i.e., 108 monthly samples in a 10-year period).

Following the approach of LAWA, the trends for all site × variable combinations were classified in into five confidence categories on basis of the confidence that a given trend was degrading (Table 5).

Table 5. Level of confidence categories used to convey trend confidence and direction.

Categorical level of trend confidence and direction	Value of C_i (%)
Very likely improving	0.90–1.00
Likely improving	0.67–0.90
Low confidence in direction	0.33–0.67
Likely degrading	0.10–0.33
Very likely degrading	0.0–0.10

The aggregate proportion of sites in each category shown in Table 5 were calculated for sites and for each variable and these values were plotted as colour coded bar charts. These charts provide a graphical representation of the proportions of improving and degrading trends at the levels of confidence indicated by the categories. As improvement cannot be clearly associated with a particular direction of pH, it has been excluded from results reported based on improvement/degradation.

In addition to the level of confidence categories outlined in Table 5, trends can also be classified as "not analysed" for two reasons:

1) When a large proportion of the values were censored (data has <5 non-censored values and/or <3 unique non-censored values). This arises because trend analysis is based on examining differences in the value of the variable under consideration between all pairs of sample occasions. When a value is censored, it cannot be compared with any other value and the comparison is treated as a "tie" (i.e., there is no change in the variable between the two sample occasions). When there are many ties there is little information content in the data and a meaningful statistic cannot be calculated.

2) When there is no, or very little, variation in the data because this also results in ties. This can occur because laboratory analysis of some variables has low precision (i.e., values have few or no significant figures). In this case, many samples have the same value, and this then results in ties.

In most cases, trends classified as "not analysed" are associated with sites with very good water quality.

3.3 Comparison of state and trends with regional and national performance

In addition to examining state within the Hurunui district, we have explored how the performance within the District compares against water quality state and trends observed at the regional (Canterbury) and national scales. To do this, we made use of the analysis from the most recent national state of the environment report[1] (Whitehead et al., 2021). The report provides state and trend assessments for a limited number of water quality variables up to the end of 2020. Further, the national assessment only includes a limited number of monitoring sites within the Hurunui District (sites identified as "state of the environment" sites). The sites included in the regional and national comparison are highlighted in Figure 1. Because land use is a primary driver of water quality outcomes, comparisons are made between sites with

[1] https://environment.govt.nz/publications/water-quality-state-and-trends-in-new-zealand-rivers-analyses-of-national-data-ending-in-2020/

the same dominant land use category. The Hurunui District SoE sites have dominant land use categories of either ‘Pasture’ or ‘Natural’,

Comparisons were made through box and whisker plots of median state and trend rates for the district, region and nationally. These provide a graphical comparison of the distribution of the state and trend magnitudes observed. We also present stacked bar charts of grades and trend categories for the district, region and nationally. It is also noted, that at the time the 2020 report was produced, the Ammonia (toxicity) attribute was represented in the NPS-FM (2020) by two numeric attribute states, the median and annual maximum. In 2022 the annual maximum numeric attribute state in the NPS-FM was replaced by a 95th percentile numeric attribute state.

4 Results

The following sections provide summaries of the state and trend results. Full outputs are also provided in supplementary file (described in Appendix C).

4.1 State

4.1.1 Hurunui District state

Figure 2 provides a graphical summary of the water quality grades assigned to each site and variable combination for criteria in the NPS-FM, HWRRP and CLWRP. Where there is more than one numeric attribute state associated with the attribute, an overall grade is shown.

Stacked bar charts demonstrating the proportion of sites assigned to each grade (with interim or final grades) are provided in Figure 3 and Figure 4, for ECan HWRRP and CLWRP, and for NPS-FM attributes, respectively. Maps of sites coloured by their grades for each attribute are provided in Figure 5 to Figure 7.

Figure 2: Assessed state for river monitoring sites. Colours indicate state grade for each site and attribute. Coloured squares indicate the state grade where there are sufficient observations to meet the formal requirement for grading. Large coloured circles indicate "interim" grades for sites. Small coloured circles indicate sites with fewer observations than the requirement to define interim grades. No colour indicates either no data, or that the attribute is not required to be evaluated at the site.

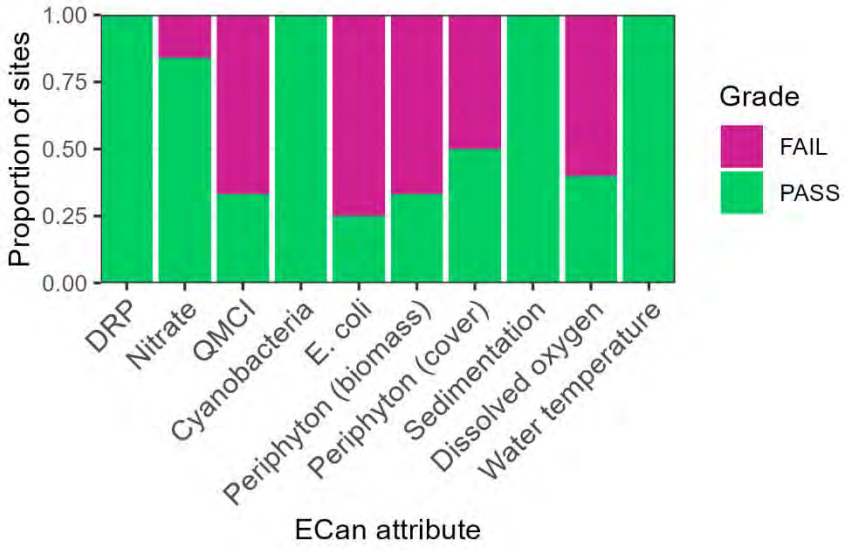

Figure 3: Stacked bar chart of the proportion of sites assigned either a pass or fail grade under the HWRRP or CLWRP.

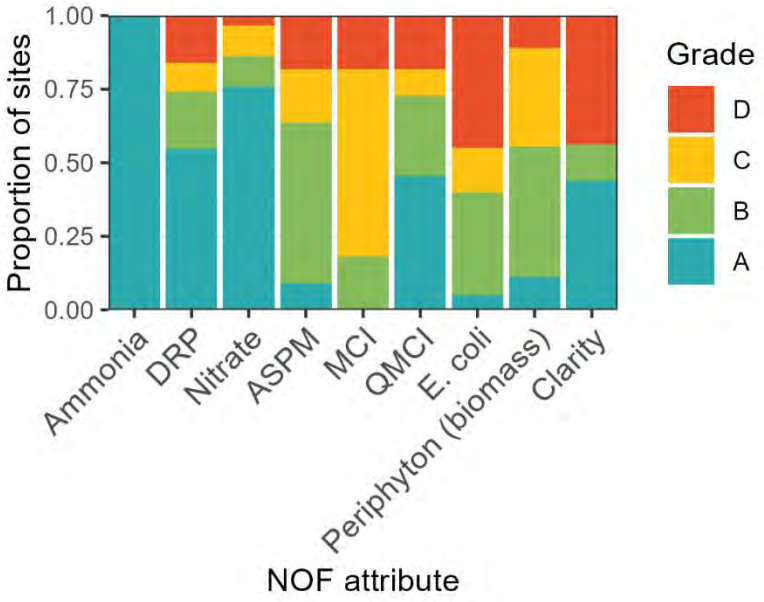

Figure 4: Stacked bar chart of the proportion of sites assigned to each NPS-FM grade, by attribute.

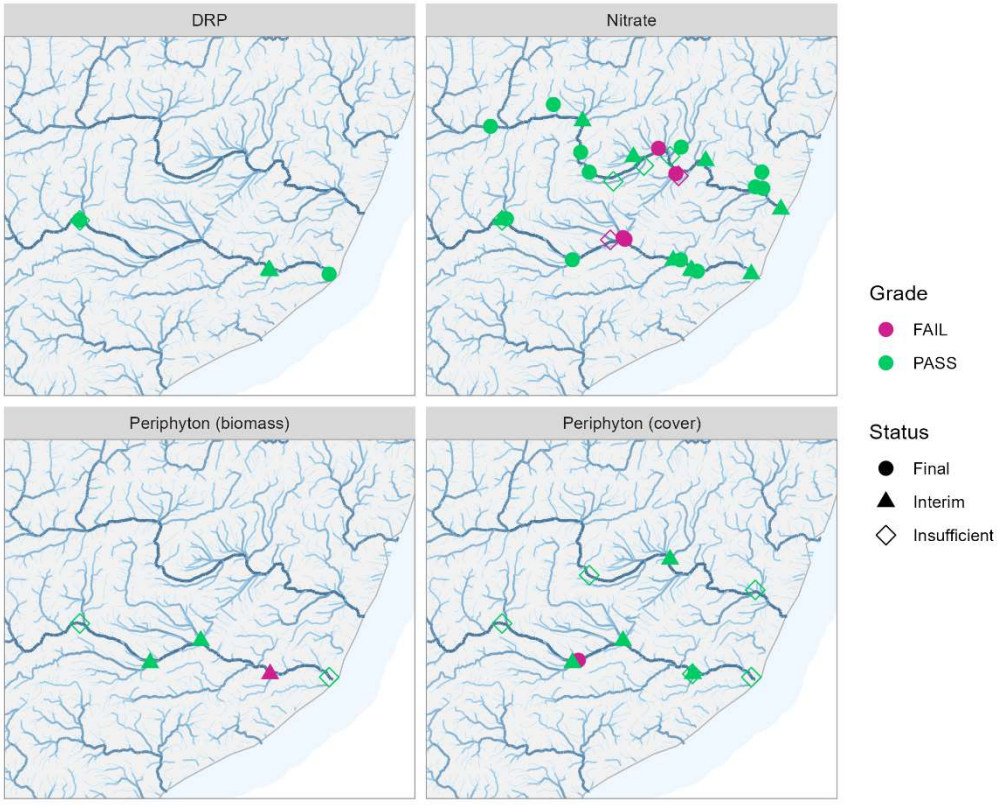

Figure 5: Map of HWRRP water quality state grades. Status describes the data inclusion criteria described in section 3.1.2.

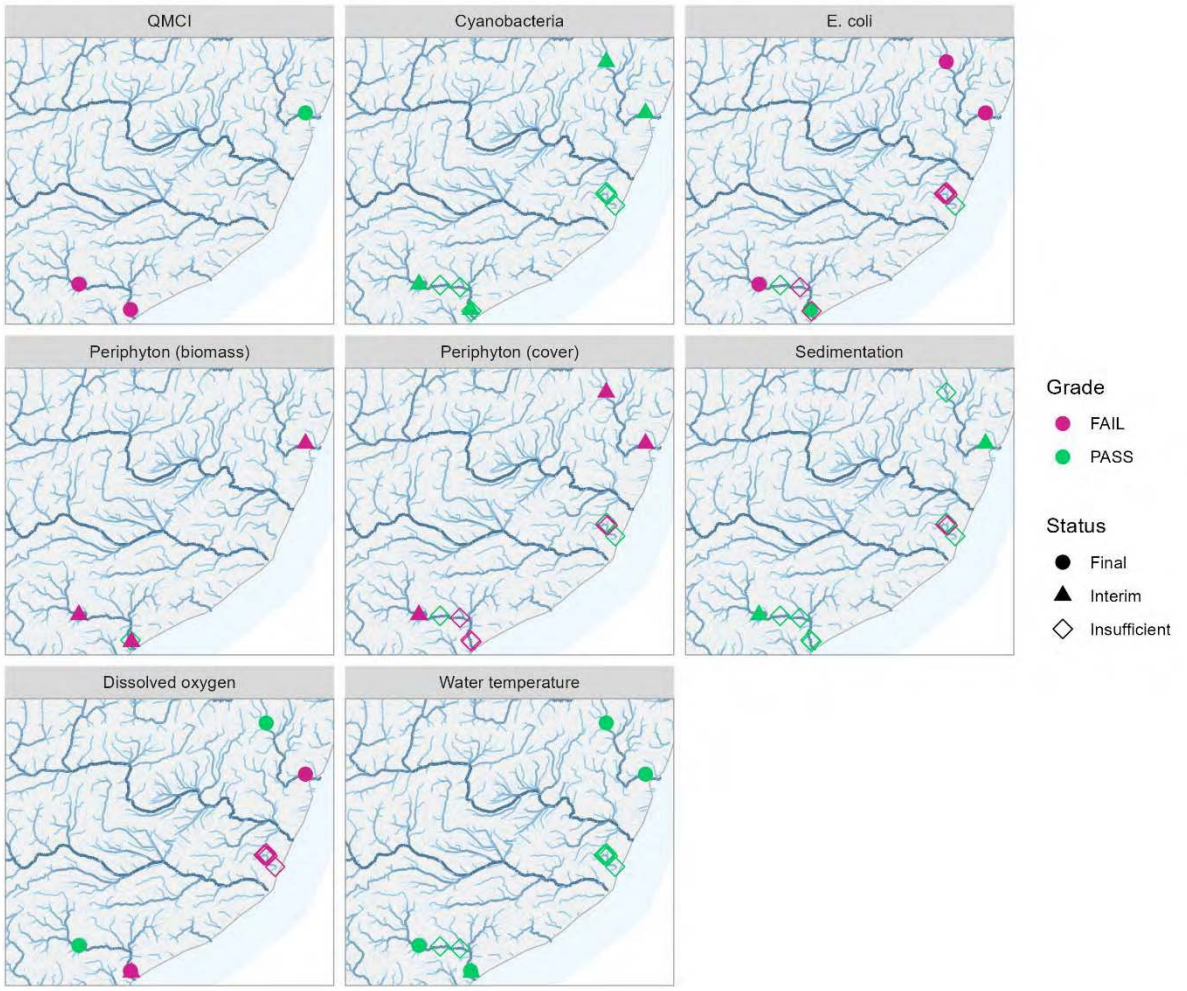

Figure 6: Map of CLWRP water quality state grades. Status describes the data inclusion criteria described in section 3.1.2.

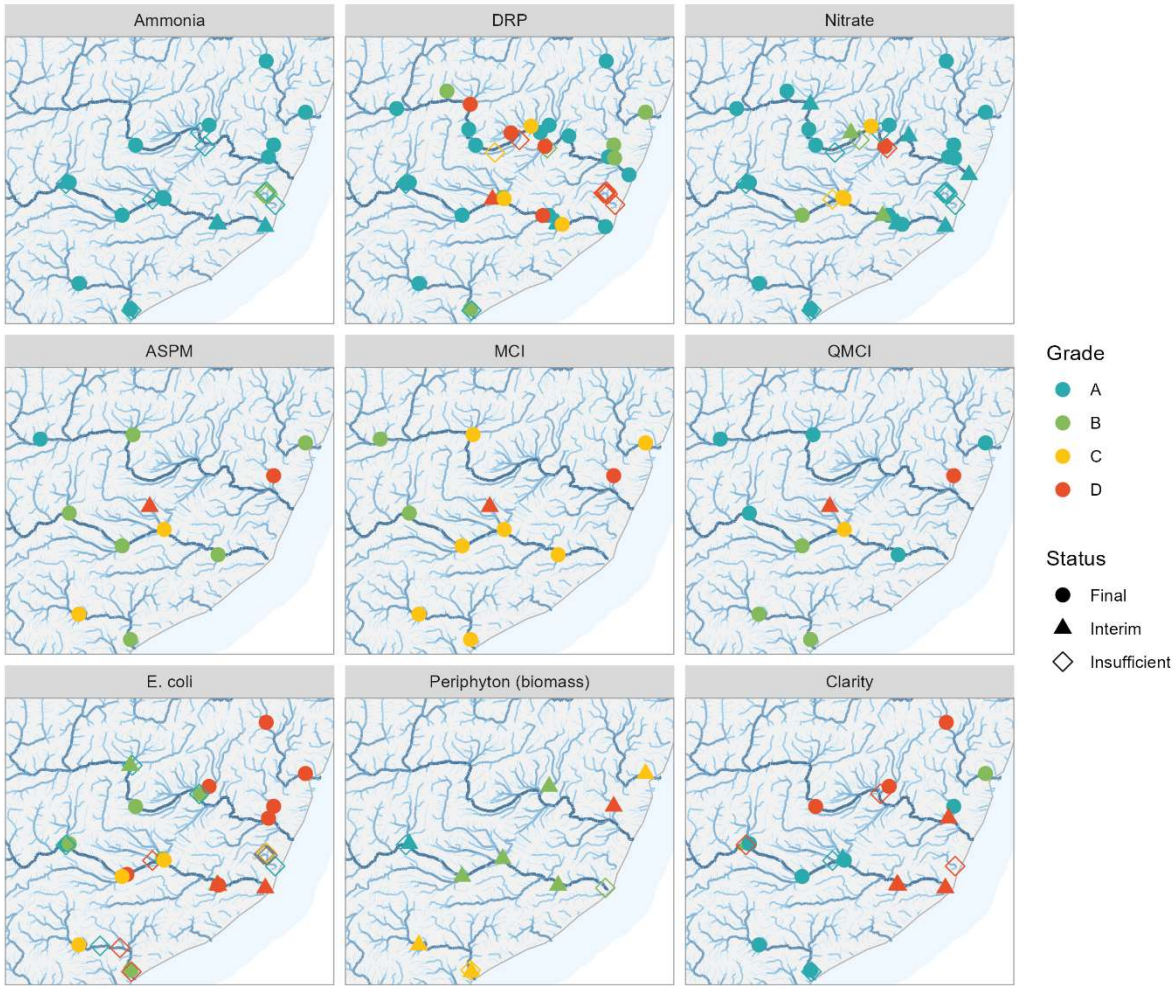

Figure 7: Map of NPS-FM water quality state grades. Status describes the data inclusion criteria described in section 3.1.2.

4.1.2 Comparison of Hurunui District state against regional and national state

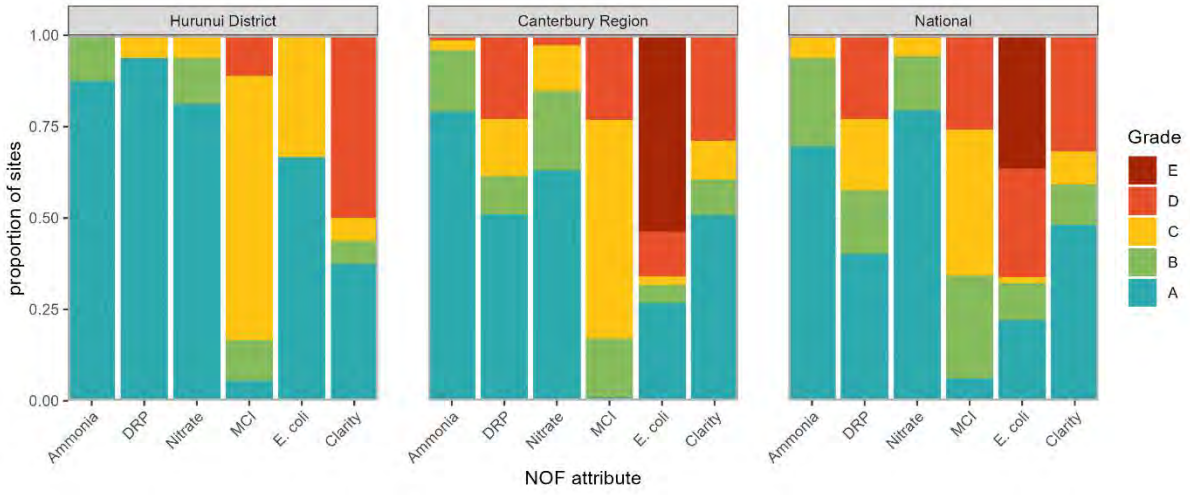

Figure 8 provides a summary comparison of the NPS-FM attribute grades observed within the Hurunui District, Canterbury region and New Zealand. Overall, the summary suggests that the distribution of grades within the Hurunui District is more favourable than for the region or nationally, with the exception of clarity. However, there are sites that are exceeding bottom line grades for MCI, *E.coli* and Clarity (red, or yellow for nitrate or ammonia)

Figure 9 shows the distribution of median water quality state for the Hurunui District, the Canterbury region and all of New Zealand. For the pasture land cover class, the Hurunui District sites, on aggregate, are performing better than those of the Canterbury region and nationally. The exception is for Clarity, which has a lower (worse) median than the entire Canterbury region, and the worst site for Clarity in the Canterbury region is in the Hurunui District (Conway River u/s Inland road). For Ammonia (NH_4N), *E. coli* and DRP, the worst state sites (extent of upper whisker) are better than the median state nationally. The distribution of median Nitrate concentrations is similar to that observed regionally and nationally. We note that in this comparison, with the exception of MCI, there is only one site in the "Natural" land cover class, hence why the box and whisker is only shown as a single horizontal line.

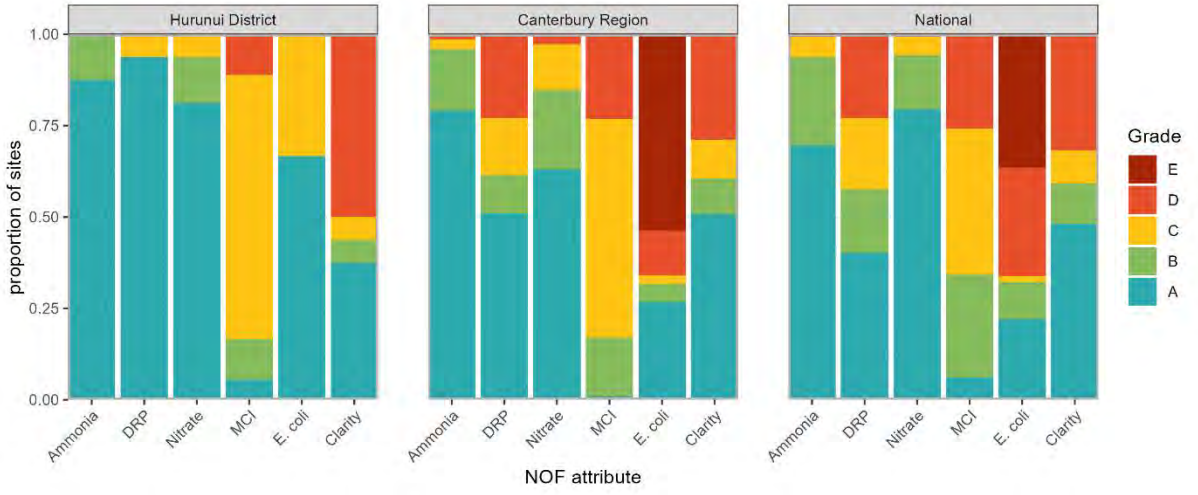

Figure 8: Summary plots showing the proportion of sites assigned to each NOF grade for SoE sites in the Hurunui District, Canterbury Region and New Zealand.

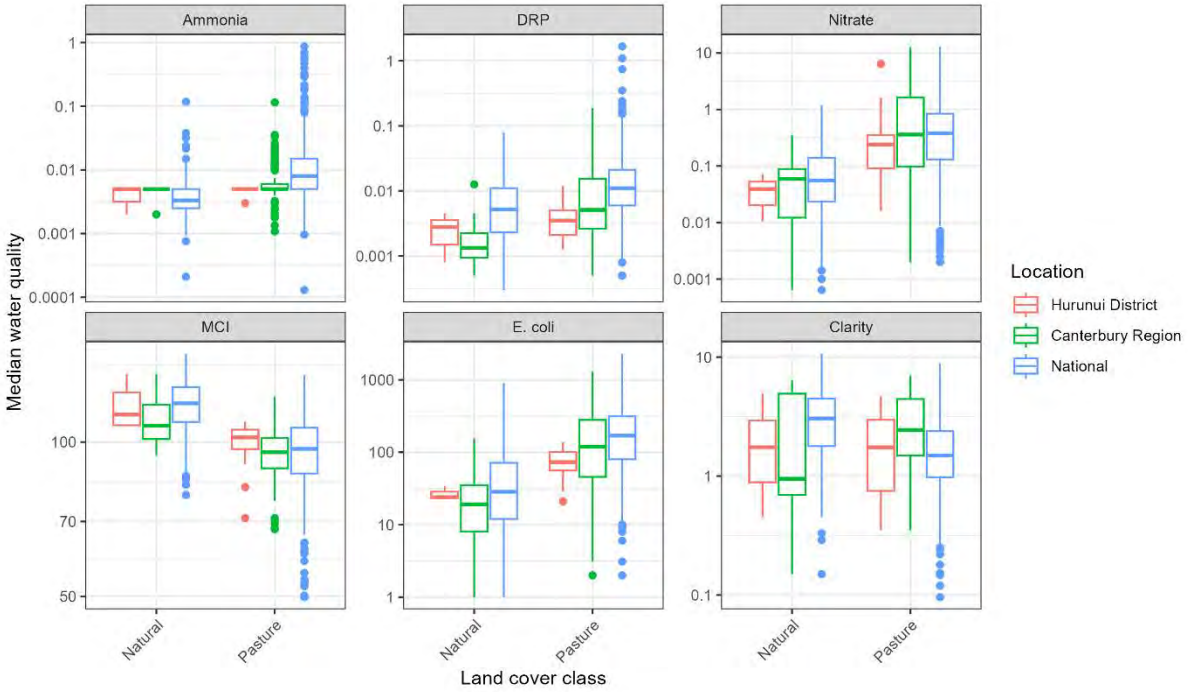

*Figure 9: Box and whisker plots of median water quality state for SoE sites in the Hurunui District, Canterbury Region and New Zealand. Horizontal line in each box indicates the median of site median states and the box indicates the inter-quartile range (IQR). Whiskers extend from the box to the largest (or smallest) values no more than 1.5*IQR from the box. Data beyond the whiskers are shown as and coloured circles*

4.2 Trends

4.2.1 Hurunui District trends

Figure 10 shows a colour coded bar chart representing the proportions of sites with improving and degrading water quality trends based on the categories defined in Table 5 for the 10-year trend period. Blue colours indicate sites with improving trends, and red-orange colours indicate sites with degrading trends. The LAWA categorical description for the trends by site for the 10-year trend period are shown in Figure 11. The distribution of the trend rate values are show in box and whisker plots in Figure 12. Additionally, maps of the 10-year LAWA trend categories are provided in Figure 13.

Plots for each site and variable combination showing all observations and the evaluated trends are provided in the supplementary materials described in Appendix C.

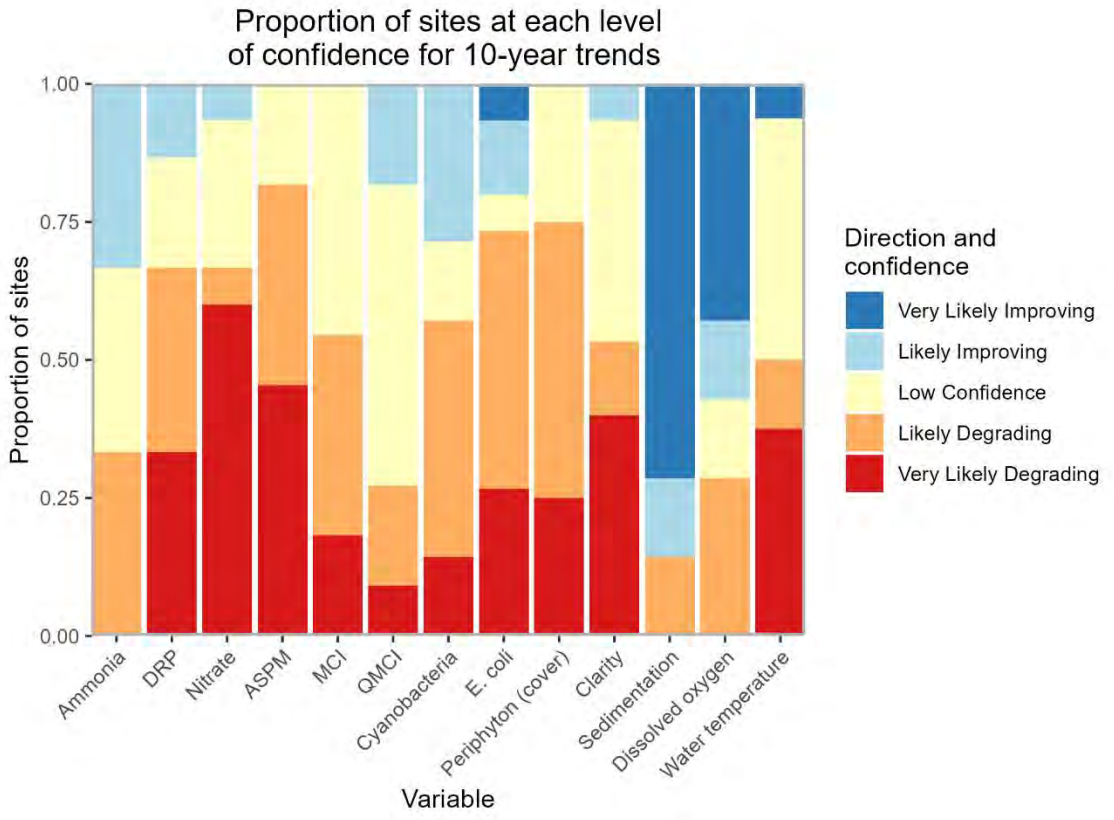

Figure 10. Summary plot representing the proportion of river sites with improving 10-year time period trends at each categorical level of confidence and direction. The plot shows the proportion of sites in each of the trend direction and confidence categories defined in Table 5.

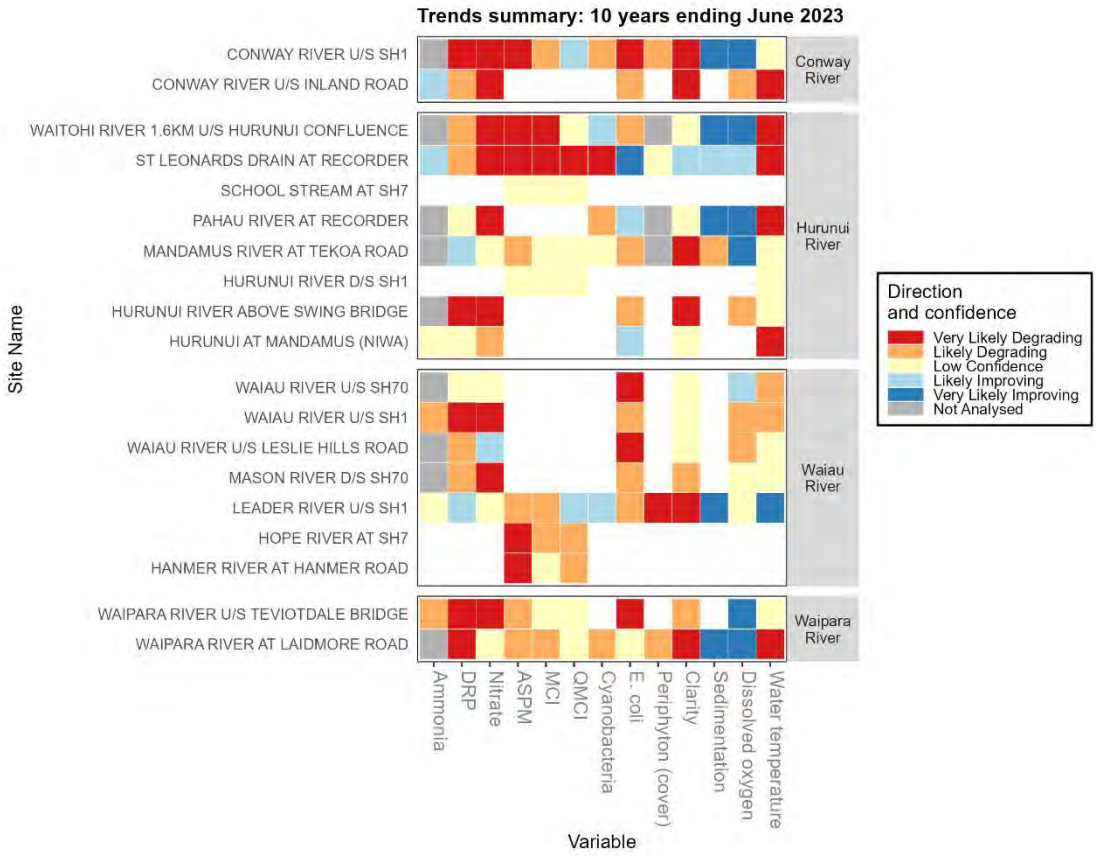

Figure 11: Assessed 10-year trends at river sites classified by trend confidence and direction

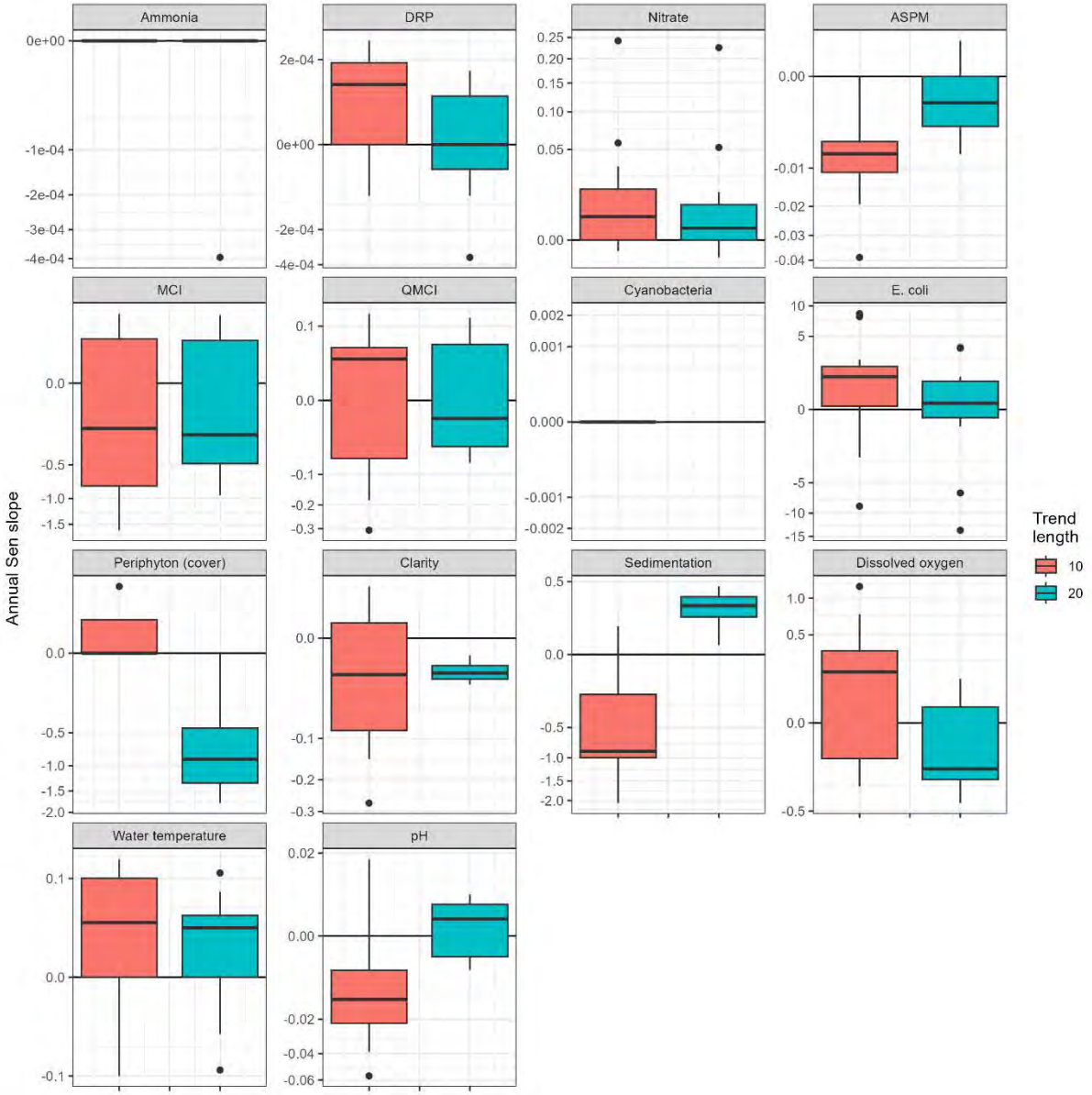

*Figure 12: Box and whisker plots of trend rates (Annual Sen Slope) for 1- and 20-year trends. Horizontal line in each box indicates the median of site trend rates and the box indicates the inter-quartile range (IQR). Whiskers extend from the box to the largest (or smallest) values no more than 1.5*IQR from the box. Data beyond the whiskers are shown as and coloured circles*

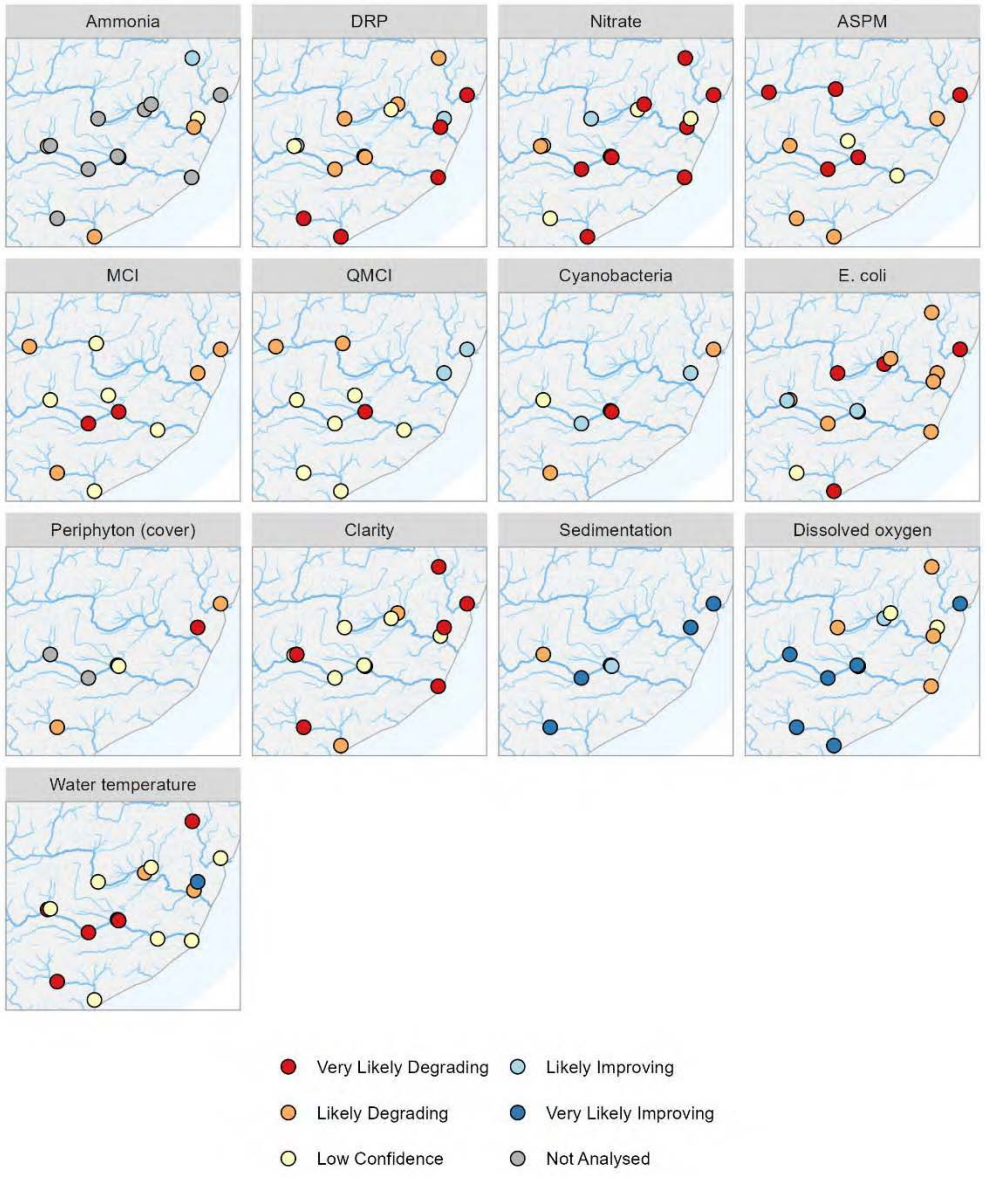

Figure 13: Map of trend confidence and direction of 10-year trends

4.2.2 Comparison of Hurunui trends against regional and national performance

Figure 10 shows a colour coded bar chart representing the proportions of sites with improving and degrading water quality trends based within the Hurunui District, Canterbury region and New Zealand. Note, trends in clarity were unavailable at many sites, and so Turbidity results are shown as a proxy. Overall, given the relatively small number of sites sampled within the Hurunui District, the summary suggests that the distribution of trends within the Hurunui District is slightly better, compared to the region or nationally for Ammonia and DRP, and slightly worse for nitrate and *E. coli*.

Figure 15 shows the distribution of water quality trend rates for the Hurunui District, the Canterbury Region and all of New Zealand. For the pasture land cover class, the Hurunui district sites, on aggregate, are performing better than those of the Canterbury region and nationally. The distribution of Nitrate trend rates is generally worse to that observed regionally

and nationally, with no large improving (negative) trend rates, and the largest degrading trend rate (St Leonard's drain) is the largest within the country.

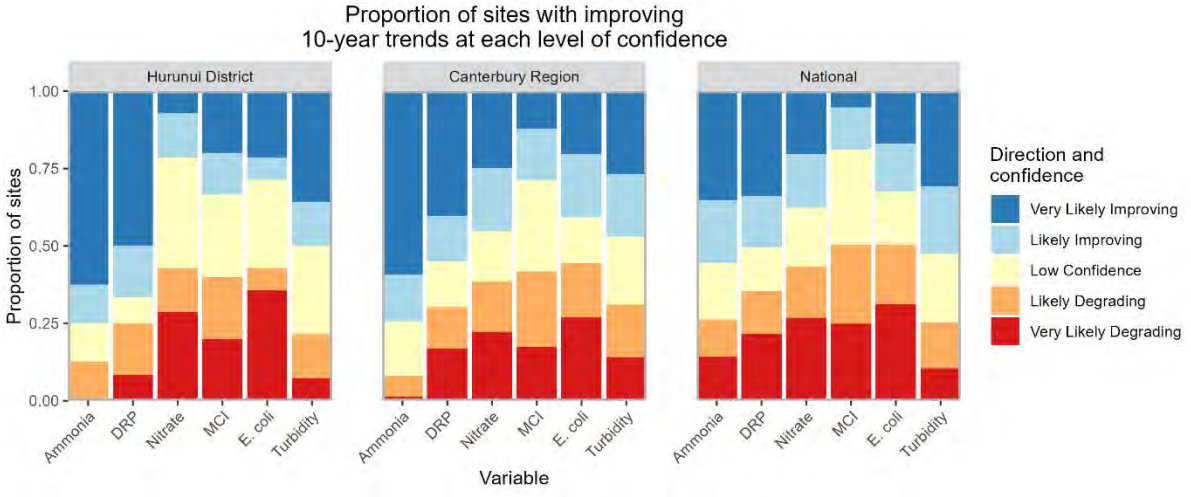

Figure 14. Summary plot representing the proportion of river sites with improving 10-year time period trends at each categorical level of confidence and direction for SoE sites in the Hurunui District, Canterbury Region and New Zealand. The plot shows the proportion of sites in each of the trend direction and confidence categories defined in Table 5.

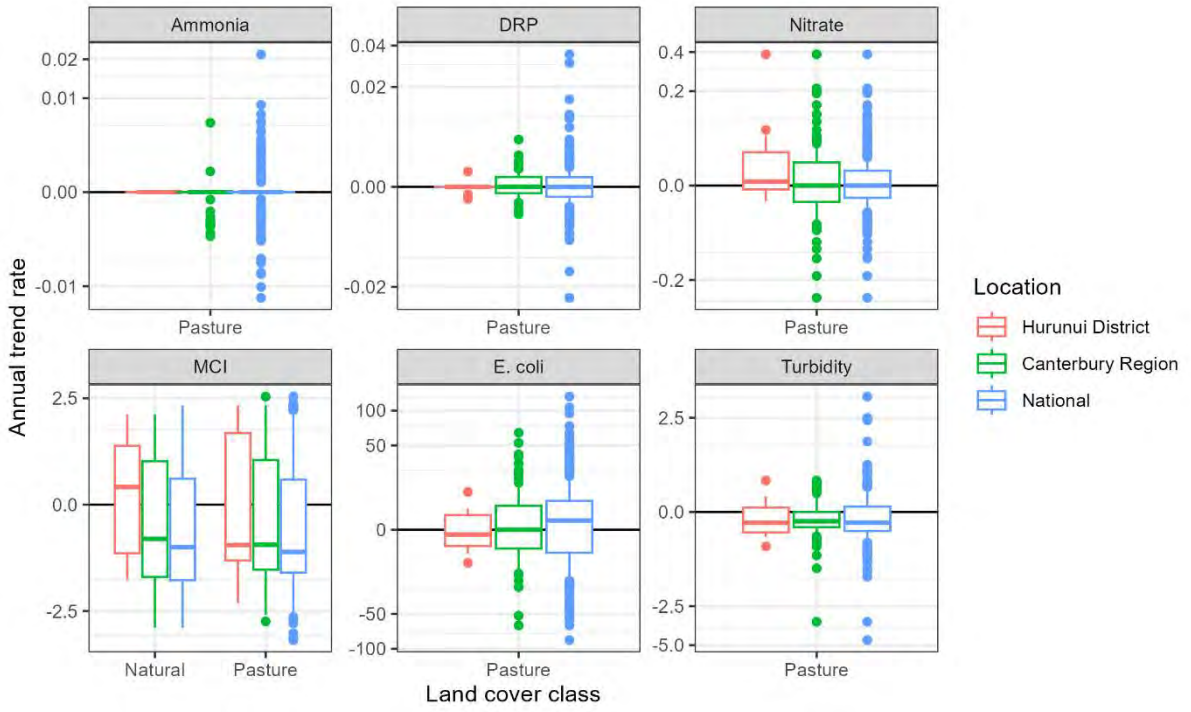

*Figure 15: Box and whisker plots of trend rates (Annual Sen Slope) for SoE sites in the Hurunui District, Canterbury Region and New Zealand. Horizontal line in each box indicates the median of site trend rates and the box indicates the inter-quartile range (IQR). Whiskers extend from the box to the largest (or smallest) values no more than 1.5*IQR from the box. Data beyond the whiskers are shown as and coloured circles*

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Appendix A HWRRP water quality criteria

Hurunui River

Policy 5.3 To manage water quality in the Hurunui River and its tributaries by setting water quality limits as follows:

(a) The 95th percentile of monthly periphyton biomass measurements in the mainstem of the Hurunui River shall not exceed 120 mg/m2 chlorophyll-a or 20% cover of filamentous algae more than 2 centimetres long;

(b) The 95th percentile of monthly periphyton biomass measurements in the Pahau and Waitohi Rivers shall not exceed 200 mg/m2 chlorophyll-a or 30% cover of filamentous algae more than 2 centimetres long;

(c) The average annual dissolved reactive phosphorus concentrations in the mainstem of the Hurunui River shall not exceed 0.0044 mg DRP/L;

(d) The annual median and 95th percentile nitrate nitrogen concentrations in the mainstem of the Hurunui River and its tributaries above the Mandamus flow recorder site shall not exceed 1.1 and 2.0 mg NO3-N/L respectively, these being the chronic nitrate-nitrogen toxicity thresholds for maintaining a 99% level of species protection; and

(e) The annual median and 95th percentile nitrate nitrogen concentrations in the mainstem of the Hurunui River, and in its tributaries at their confluence with the mainstem, below the Mandamus flow recorder site shall not exceed 2.3 and 3.6 mg NO3-N/L respectively, these being the chronic nitrate-nitrogen toxicity thresholds for maintaining a 95% level of species protection.

Waiau River

Policy 5.3A To manage water quality in the Waiau River and its tributaries by setting water quality limits as follows:

(a) The 95th percentile of monthly periphyton biomass measurements in the mainstem of the Waiau River shall not exceed 120 mg/m2 chlorophyll-a or 20% cover of filamentous algae more than 2 centimetres long;

(b) The annual median and 95th percentile nitrate nitrogen concentrations in the mainstem of the Waiau River and its tributaries above the Marble Point flow recorder site shall not exceed 1.1 and 2.0 mg NO3-N/L respectively, these being the chronic nitrate-nitrogen toxicity thresholds for maintaining a 99% level of species protection; and

(c) The annual median and 95th percentile nitrate nitrogen concentrations in the mainstem of the Waiau River, and in its tributaries at their confluence with the mainstem, below the Marble Point flow recorder site shall not exceed 2.3 and 3.6 mg NO3-N/L respectively, these being the chronic nitrate-nitrogen toxicity thresholds for maintaining a 95% level of species protection.

Appendix B CWLRP water quality criteria

Table 1a Freshwater Outcomes for Canterbury Rivers

Management Unit	Sub-unit	Ecological Health Attributes			Macrophyte attributes		Periphyton attributes[1]			Situation attribute[1]	Human Health attributes			Cultural Attribute
		QMCI* [min score]	Dissolved oxygen [min saturation] (%)	Temperature [max] (°C)	Emergent macrophytes [max cover of bed] (%)	Total macrophytes [max cover of bed] (%)	Chlorophyll a [max biomass] (mg/m²)	Filamentous algae >20mm [max cover of bed] (%)	Cyano bacteria mat cover [max cover of bed] (%)	Fine sediment <2mm diameter [max % cover of bed] (%)	Suitability for contact recreation [SFRG*]	*E. coli*[3] [median] (*E. coli*/100ml)	*E. coli*[3] [95th percentile] (*E. coli*/100ml)	
Natural State[4]	Rivers are maintained in their natural state													Freshwater mahinga kai species sufficiently abundant for customary gathering, water quality is suitable for their safe harvesting, and they are safe to eat.
Alpine – Upland		6			No value set	No value set	50	10	20	10	Good	≤130	≤540	
Alpine-lower							120	20	30		Good to Fair	≤130	≤1000	
Hill-fed upland							50	10	20	15	Good	≤130	≤540	
Hill-fed lower							200	30	50		Good to Fair	≤130	≤1000	
	Urban	4.5	90	20						20	No value set	≤130	≤1000	
Lake-fed		6					200	30	50	10	Good	≤130	≤540	
Banks Peninsula		5					120	20	30	20	No value set	≤130	≤1000	
Spring-fed upland		6			20	30	50	10	20	10	Good	≤130	≤540	
Spring-fed lower basins		5			30	30	200	30	50		Fair	≤130	≤1200	
Spring-fed plains		5	70		30	50	200	30	50	20	No value set	≤130	≤1200	
	Urban	4.5			30	60	200	30	50	30	No value set	≤130	≤1000	

1 These attributes only apply to wadeable areas of wetted riverbed. For the purposes of this table, wadeable areas are derined as reaches of the river up to 600mm in depth.

2 Outcome shall be exceeded in no more than 8% of samples for rivers classified as default class in the National Policy Statement for Freshwater Management 2014 (amended 2017), and in no more than 16% samples for rivers classified as productive class. A minimum of 3 years of monthly data is required to determine compliance with the outcomes.

3 Determined from a minimum of 60 samples collected on a monthly basis over 5 years.

4 Rivers within land that is administered for conservation purposes by the Department of Conservation.

*Key: QMCI = quantitative macroinvertebrate community index

SFRG = Suitability for Recreation Grade from Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas, Ministry for the Environment, June

Note: yellow highlighted row indicates the only management unit relevant in the Hurunui District (for catchments other than Waiau and Hurunui).

Appendix C Description of supplementary files

All analysis outputs are tabulated in the spreadsheet:

"HurunuiDistrict_StateandTrends_240627.xlsx"

The spreadsheet contains 5 tabs:

- Summary: The summary spreadsheet provides a high-level summary combining together 2023 state and 10-year trend outputs for all sites.
- Trends: Full results for the trend assessment are presented in the tab "Trends". Many of the columns relate to intermediate outputs from the statistical analysis. For more details about the statistical methods refer to Whitehead et al. (2021).
- AllState: Full state assessment with various percentiles and other statistics provided to describe the state for all 5-year state windows.
- AllStateGrades: Numeric attributes states and grades for all NPS-FM, HWRRP and CLWRP attributes, for all 5-year state windows.
- Metadata: Metadata about each the monitoring sites providing information about location and catchment characteristics.

Descriptions of the column names in each tab are provided below.

Table 6: Column descriptions for "Summary" tab of supplementary material

Column Name	Description
SITE_NAME	Site name
Attribute	Name of attribute
CATCHMENT	Catchment
GradeStatus	Relates to inclusion rules associated with minimum data requirements described in section xxx.
ECan Numeric	The numeric value of the numeric attribute state used in the HWRRP or CLWRP. Where the attribute is an overall attribute (i.e., combination of 95th and median scores) this cell is blank.
ECan Grade	Grade assigned based on CLWRP or HWRRP
NPS-FM Numeric	The numeric value of the numeric attribute state used in the NPS-FM. Where the attribute is an overall attribute (i.e., combination of 95th and median scores) this cell is blank.
NPS-FM Grade	Grade assigned based on NPS-FM
CompareStateCAN_2020	Performance of the NPS-FM attribute against the distribution of NPS-FM numeric attribute states in Canterbury. Only applies to SoE sites and relates to the national 2020 SoE state assessment
CompareStateNAT_2020	Performance of the NPS-FM attribute against the distribution of NPS-FM numeric attribute states in New Zealand. Only applies to SoE sites and relates to the national 2020 SoE state assessment
AnnualSenSlope	Trend rate (attribute units/year)
ImprovementConfLAWA	LAWA Direction and confidence category
CompareTrendCAN_2020	Performance of the trend rate against the distribution of trend rates in Canterbury. Only applies to SoE sites and relates to the national 2020 SoE trend assessment
CompareTrendNAT_2020	Performance of the trend rate against the distribution of trend rates in New Zealand. Only applies to SoE sites and relates to the national 2020 SoE trend assessment

Table 7: Column descriptions for "Trends" tab of supplementary material

Column Name	Description
SITE_NAME	Site name
sID	Site code
CATCHMENT	Catchment
npID	Variable name
nObs	Number of observations
S	S-statistic
VarS	Variance
D	n * (n - 1)/2
tau	Kendall's tau
Z	Z-statistic
p	p-value for Mann-Kendall or Seasonal Kendall test
C	Confidence that trend direction is correct
Cd	Confidence that trend direction is decreasing
prop.censored	proportion of observations that are censored
prop.unique	proportion of observations that are unique
no.censorlevels	number of censor levels
Median	Median value for the time period
AnnualSenSlope	Annual Sen Slope (attribute units/year)
Sen_Lci	Lower confidence interval for annual sen slope
Sen_Uci	Upper confidence interval for annual sen slope
AnalysisNote	Relevant notes about the analysis
Percent.annual.change	Percent annual change in Sen slope
TrendDirection	The trend direction
Seasonal	TRUE if data is seasonal and Seasonal Kendall test performed
Freq	The sampling frequency used as seasons in the analysis (either monthly, bi-monthly, quarterly or yearly)
Period	The time period of the trend assessment
EndYEar	The end year of the trend assessment
ImprovementConfLAWA	Categorical description of confidence of improving trend

Table 8: Column descriptions for "AllState" tab of supplementary material

Column Name	Description
npID	Variable name
sID	Site Code
SITE_NAME	Site Name
CATCHMENT	Catchment
DomLandCover	Dominant land cover code
N.values	Number of observations
N.years	Number of years with at least one observation
N.Qtr	Number of quarters with at least one observation
N.Leftcensored	Number of left censored values (below detection limit)
N.Rightcensored	Number of right censored values (above reporting limit)
DL	The detection limit
AL	The reporting limit
Q5	5th percentile
Q20	20th percentile
Q25	25th percentile
Median	Median
Q75	75th percentile
Q80	80th percentile
Q83	83rd percentile
Q92	92nd percentile
Q95	95th percentile
G540	Proportion of observations greater than 540
G260	Proportion of observations greater than 260
AnnMax	Annual maximum
AnnMin	Annual minimum
Mean	Mean
ImputedLower	Indicates whether imputation was performed on values below the detection limit
ImputedUpper	Indicates whether imputation was performed on values above the reporting limit
EndYear	End year for the 5-year state assessment (30-June-YYYY)

Table 9: Column descriptions for "AllStateGrades" tab of supplementary material

Column Name	Description
sID	Site Code
SITE_NAME	Site Name
CATCHMENT	Catchment
DomLandCover	Dominant land cover code
npID	Variable name
N.totvalues	Number of observations
N.Qtr	Number of years with at least one observation
N.years	Number of quarters with at least one observation
State Numeric	The value of the numeric attribute state
State Statistic Grade	State grade assigned for the attribute
GradeStatus	Relates to inclusion rules described in section xxx.
EndYear	End year for the 5-year state assessment (30-June-YYYY)
Standard	Name of the guideline and description of the numeric attribute
Authority	Guideline name
Overall	Indicates whether the grades are the "overall" attribute grade (TRUE), or one of two numeric attribute states that contribute to an overall grade (FALSE)

Table 10: Column descriptions for "AllStateGrades" tab of supplementary material

Column Name	Description
nzsegment	Digital drainage network (REC2) segment identifier
sID	Site code
SITE_NAME	Site Name
SOURCE	Sub-catchment name
CATCHMENT	Sea draining catchment name
NZTMX	Coordinates (X)
NZTMY	Coordinates (Y)
catAreaKM2	Catchment area (km2)
Peri_class	Periphyton class (required for NPS-FM periphyton attribute)
Sed_Class	Sediment class (required for NPS-FM clarity attribute)
DomLandCover	Dominant landcover code

Time series plots of trends for individual sites and water quality variables are provided in:

- 10YearTrends_Rivers_hiCen240621A.pdf
- 20YearTrends_Rivers_hiCen240621A.pdf

Figure 16 provides an example of the type of plots provided in these supplementary files. The x-axis shows the full trend period (in this case, 10 years, ending June 2023). The y-axis shows the water quality observations (in this case, concentration of DRP, mg l^{-1}). Solid points are the values used in the trend assessment. Red dots are observations that were censored. In the evaluation of the Sen Slope (trend rate), half of the censored value is used (note the open red circles with closed red circles at half of their value). Open black circles are related to occasions where there is more than one sample in the sampling period (in this case, it is monthly sampling). In order to reduce bias associated with changes in sampling frequency, higher frequency sampling is downsampled to provide a consistent sampling frequency over the entire trend period (by taking the sample closest to the middle of the sampling period). The solid blue line indicates the trend rate. The middle point of the solid blue line sits on the median observed water quality for the trend period. The dashed blue lines show the 90% confidence intervals of the trend rate. The grey box in the upper left corner provides a summary of the evaluated trend, both as a percentage (relative to the 10-year median) and in absolute terms (in this case, mg l^{-1} yr^{-1}). The confidence in trend is reported as confidence trend is DECREASING – we note that this differs from the body of the report where the confidence is expressed as confidence the trend was improving. For QMCI, MCI, ASPM and Clarity, the confidence that the trend was improving is the complement of the confidence that the trend was decreasing, as for these variables increasing values indicate improvement.

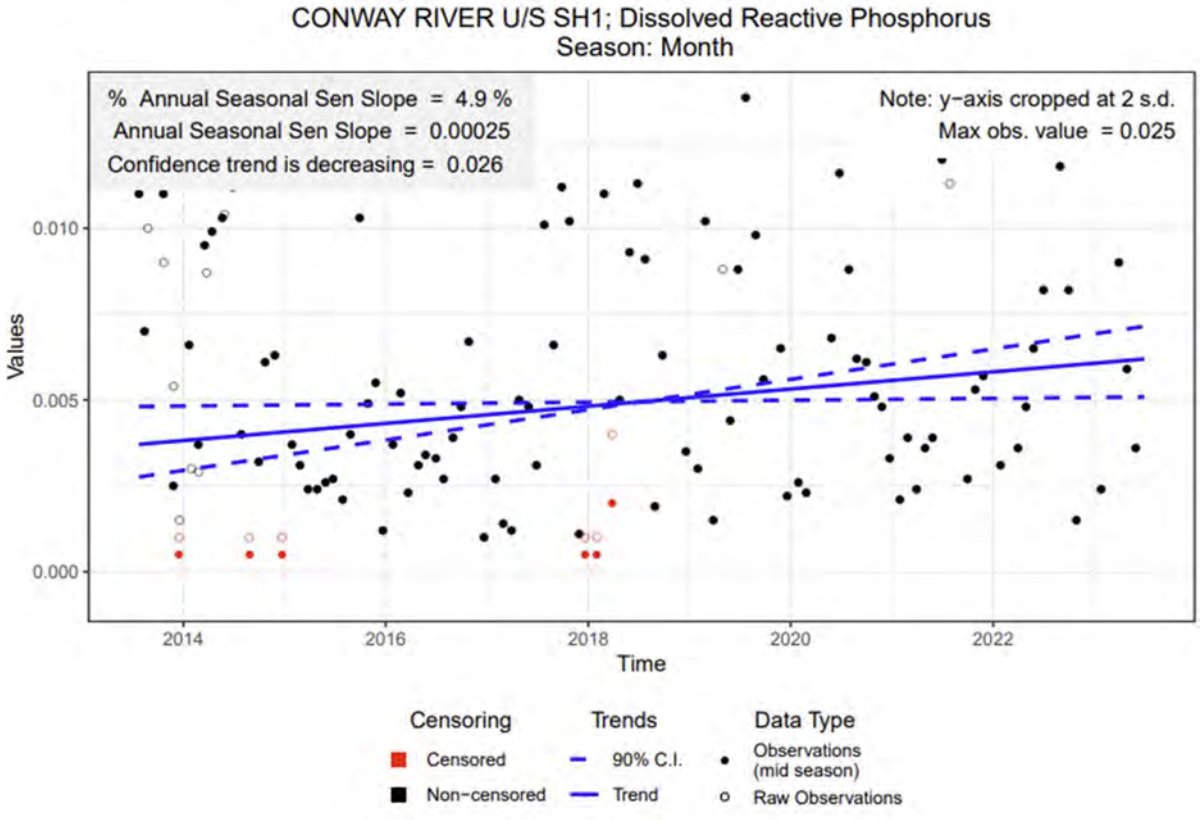
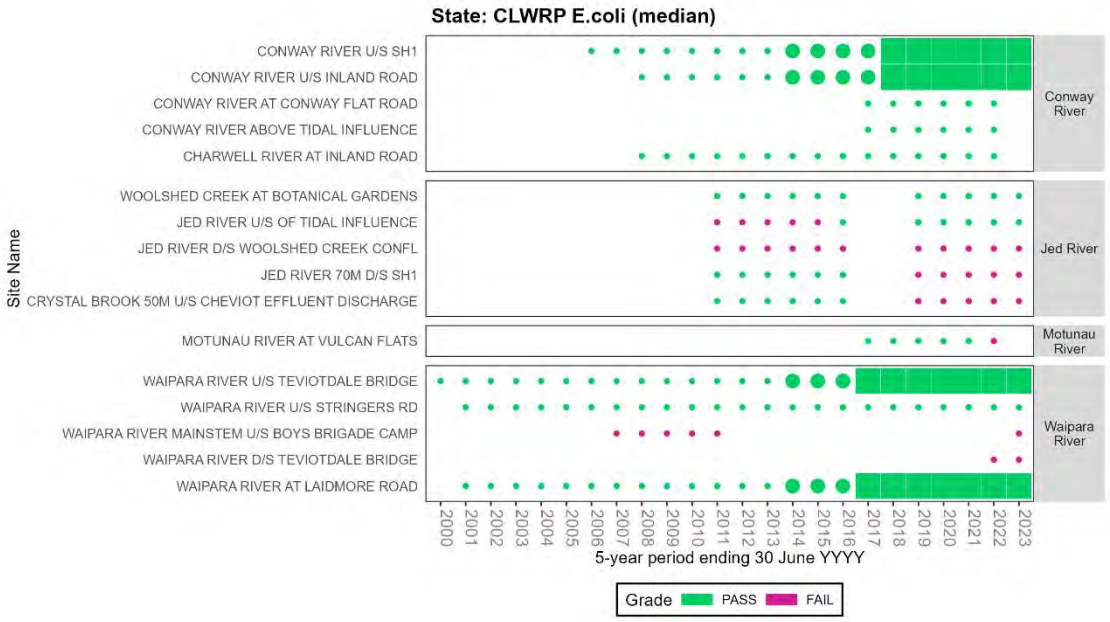
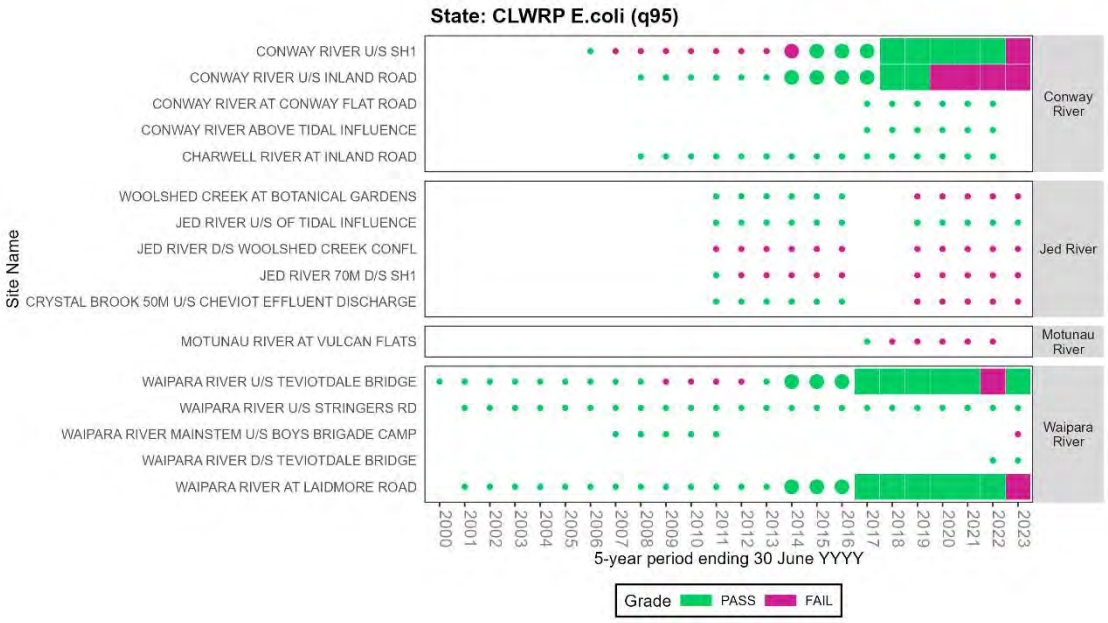


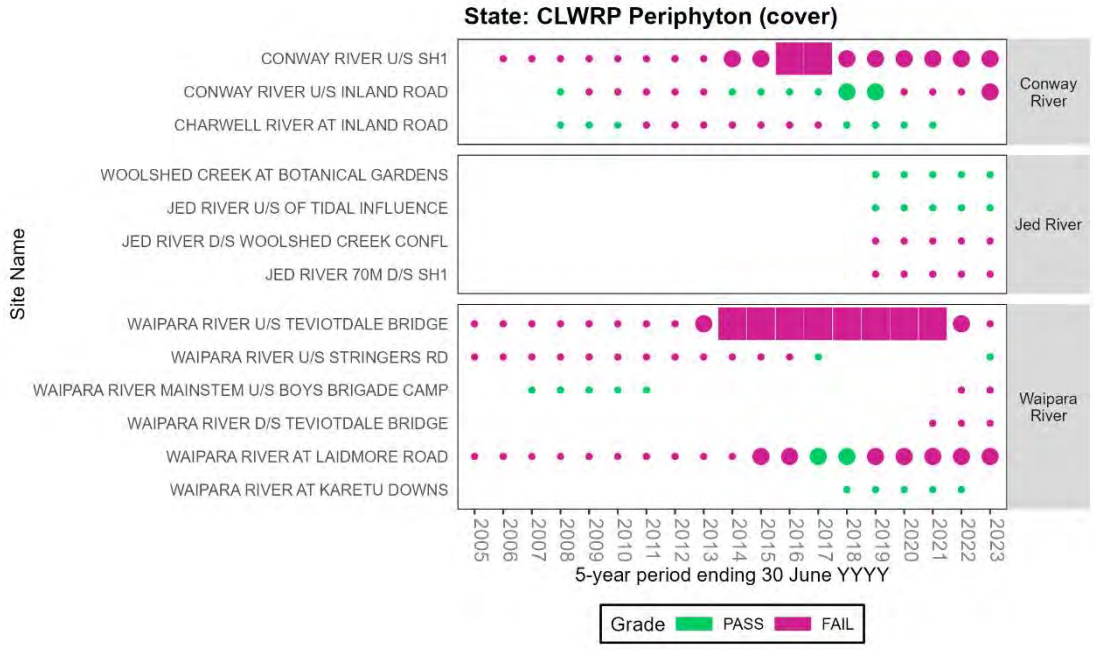
Figure 16: Example timeseries plot with trend

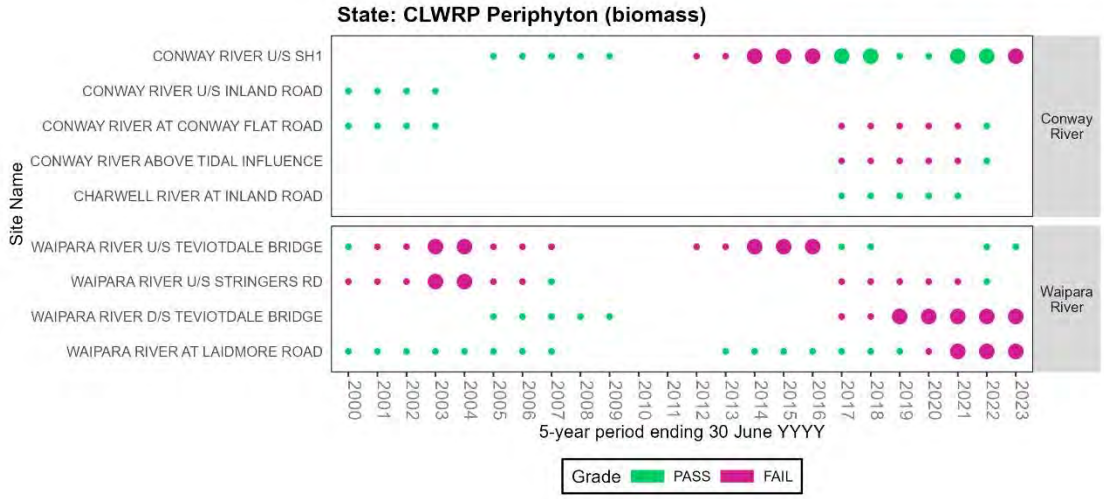
Appendix D State with time

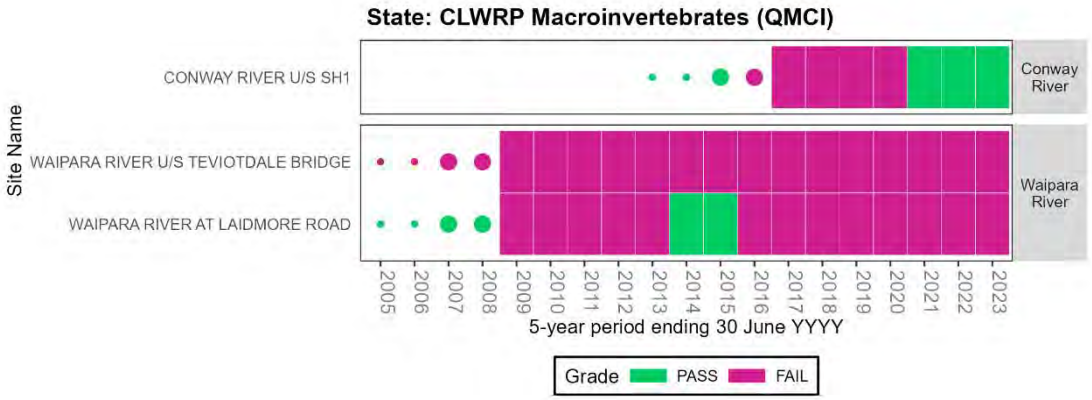
Plots included in this appendix show water quality grades, by site, for rolling state assessment periods. There is one plot per numeric attribute state. The x-axis provides the end year of the 5-year state assessment (ending on 30 June). Colours indicate state grade for each site and attribute. Coloured squares indicate the state grade where there are sufficient observations to meet the formal requirement for grading. Large, coloured circles indicate interim grades for sites. Small, coloured circles indicate sites with fewer observations than the requirement to define interim grades. No colour indicates no data was available for the state assessment window.

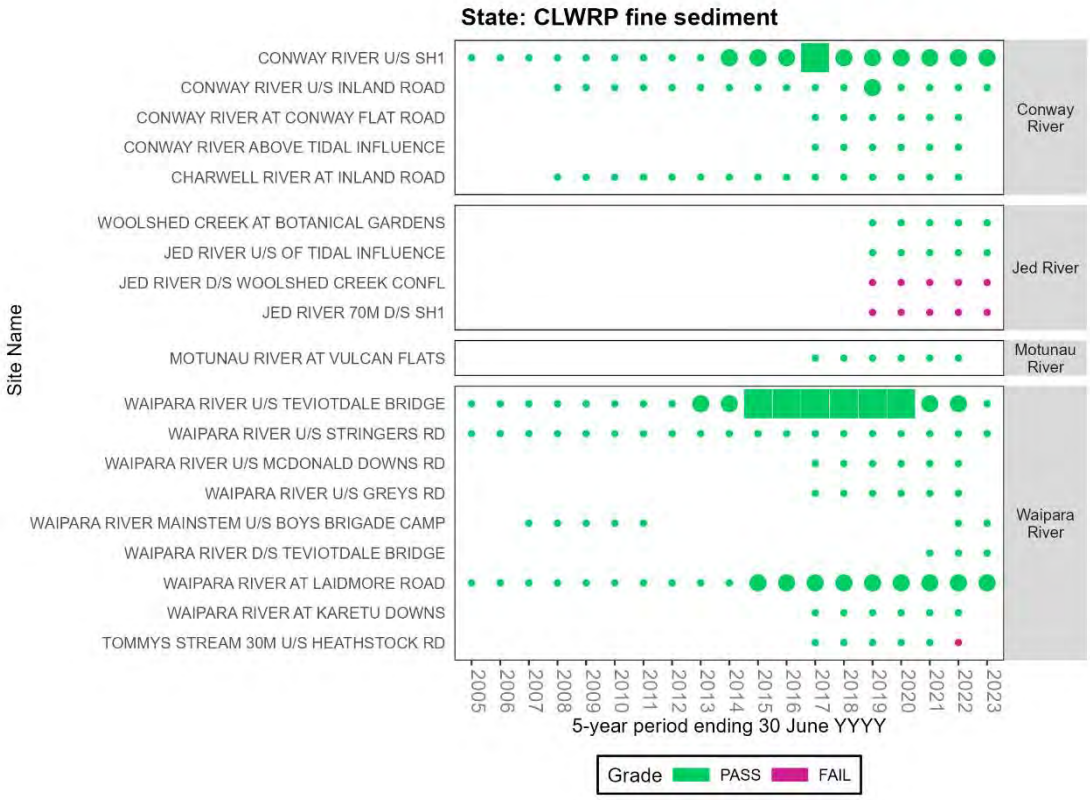



State: CLWRP E.coli (q95)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
MOTUNAU RIVER AT VULCAN FLATS
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Site Name
Conway River
Jed River
Motunau River
Waipara River
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: CLWRP Periphyton (cover)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CHARWELL RIVER AT INLAND ROAD
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
Site Name
Conway River
Jed River
Waipara River
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: CLWRP Periphyton (biomass)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Site Name
Conway River
Waipara River
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: CLWRP Macroinvertebrates (QMCI)
CONWAY RIVER U/S SH1
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Site Name
Conway River
Waipara River
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: CLWRP fine sediment
Site Name
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
MOTUNAU RIVER AT VULCAN FLATS
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Conway River
Jed River
Motunau River
Waipara River
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
5-year period ending 30 June YYYY
Grade
PASS
FAIL


State: HWRRP Nitrate (median)
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
Site Name
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
5-year period ending 30 June YYYY
Grade
PASS
FAIL


State: HWRRP Nitrate (q95)
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
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5-year period ending 30 June YYYY
Grade
PASS
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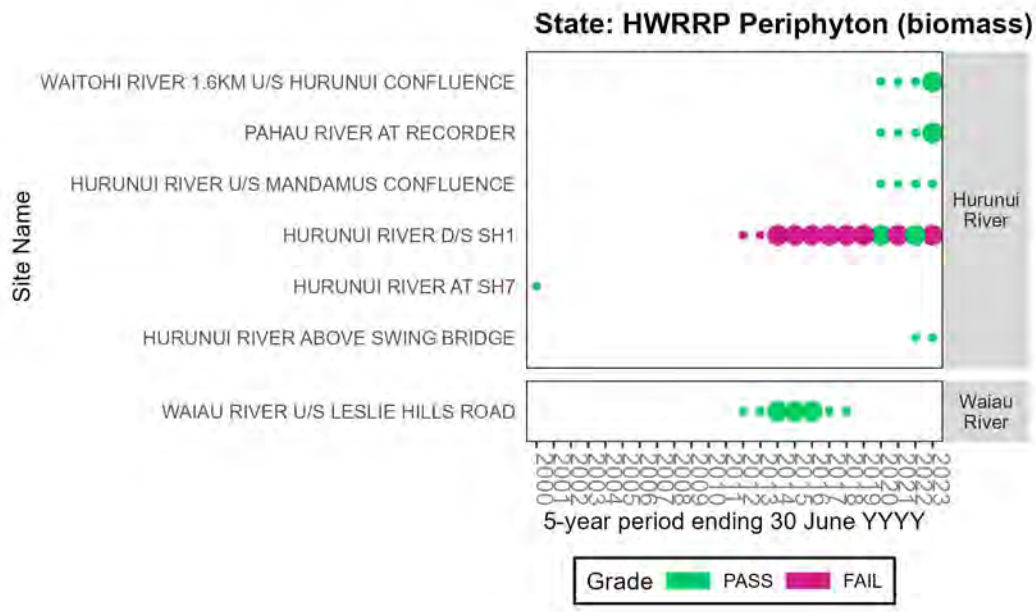
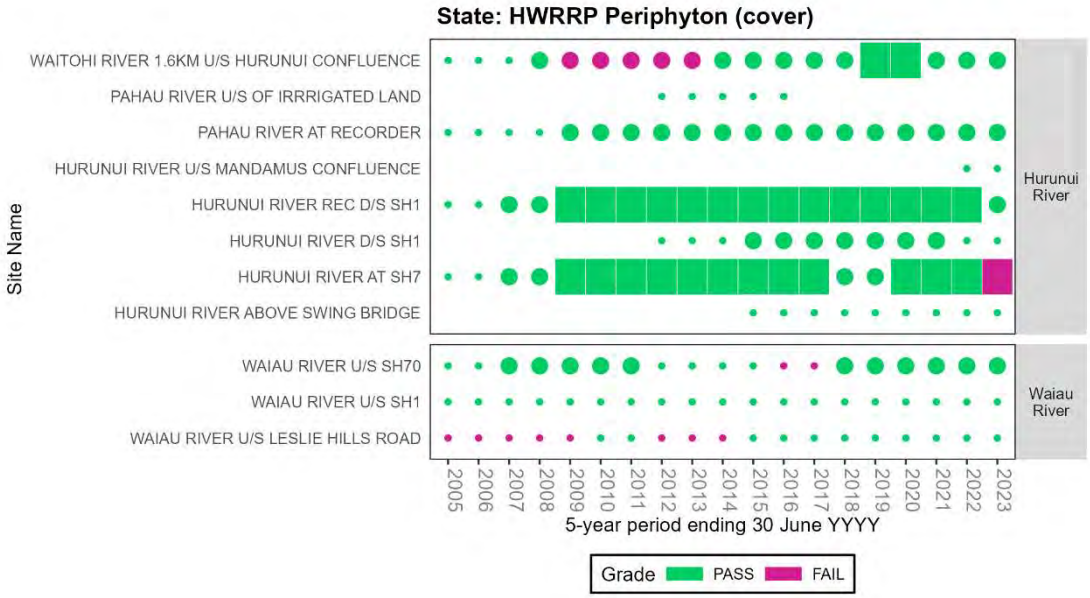
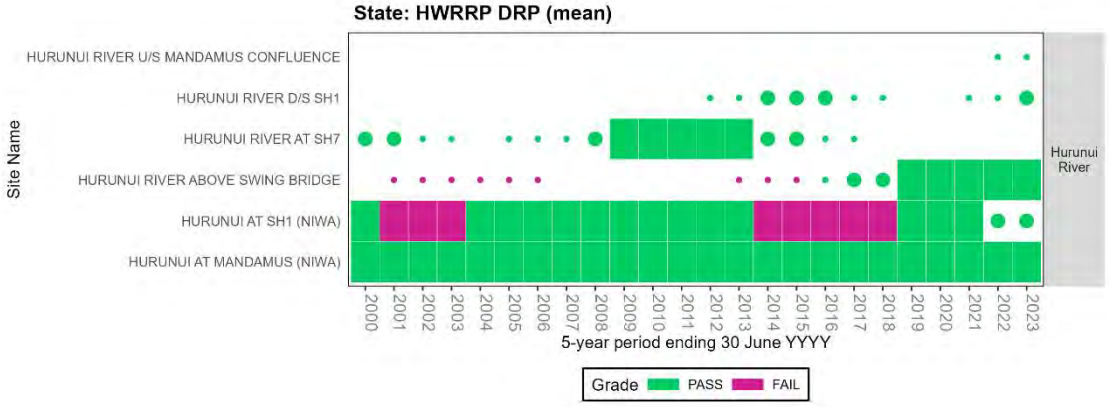
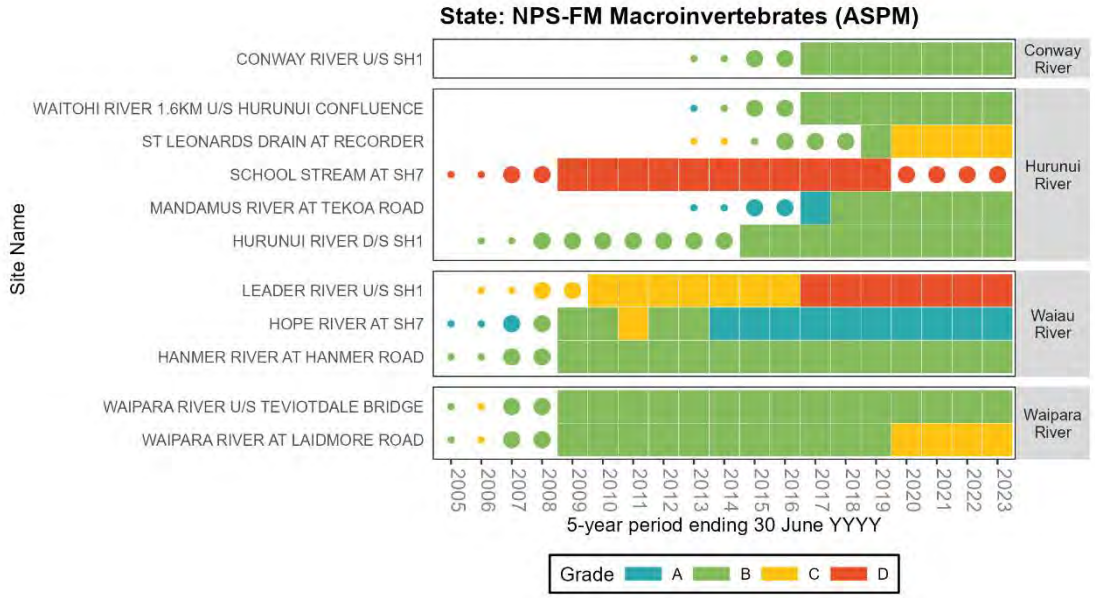
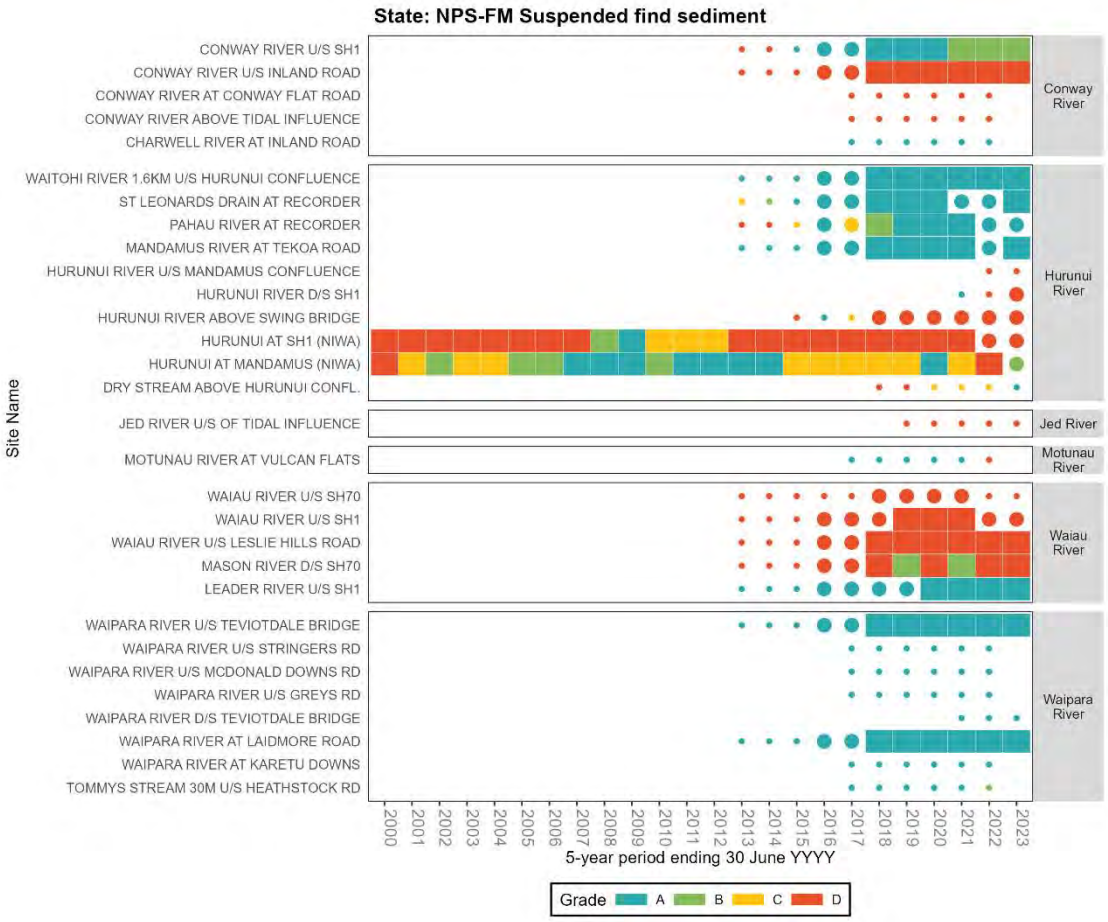

State: HWRRP Periphyton (biomass)
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
PAHAU RIVER AT RECORDER
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
WAIAU RIVER U/S LESLIE HILLS ROAD
Site Name
Hurunui River
Waiau River
5-year period ending 30 June YYYY
Grade PASS FAIL


State: HWRRP Periphyton (cover)
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER REC D/S SH1
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
Site Name
Hurunui River
Waiau River
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: HWRRP DRP (mean)
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
Site Name
Hurunui River
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade PASS FAIL


State: NPS-FM Macroinvertebrates (ASPM)
CONWAY RIVER U/S SH1
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
SCHOOL STREAM AT SH7
MANDAMUS RIVER AT TEKOA ROAD
HURUNUI RIVER D/S SH1
LEADER RIVER U/S SH1
HOPE RIVER AT SH7
HANMER RIVER AT HANMER ROAD
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Site Name
Conway River
Hurunui River
Waiau River
Waipara River
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Suspended find sediment
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
JED RIVER U/S OF TIDAL INFLUENCE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
MASON RIVER D/S SH70
LEADER RIVER U/S SH1
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM DRP (median)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
Site Name
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM DRP (q95)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
Site Name
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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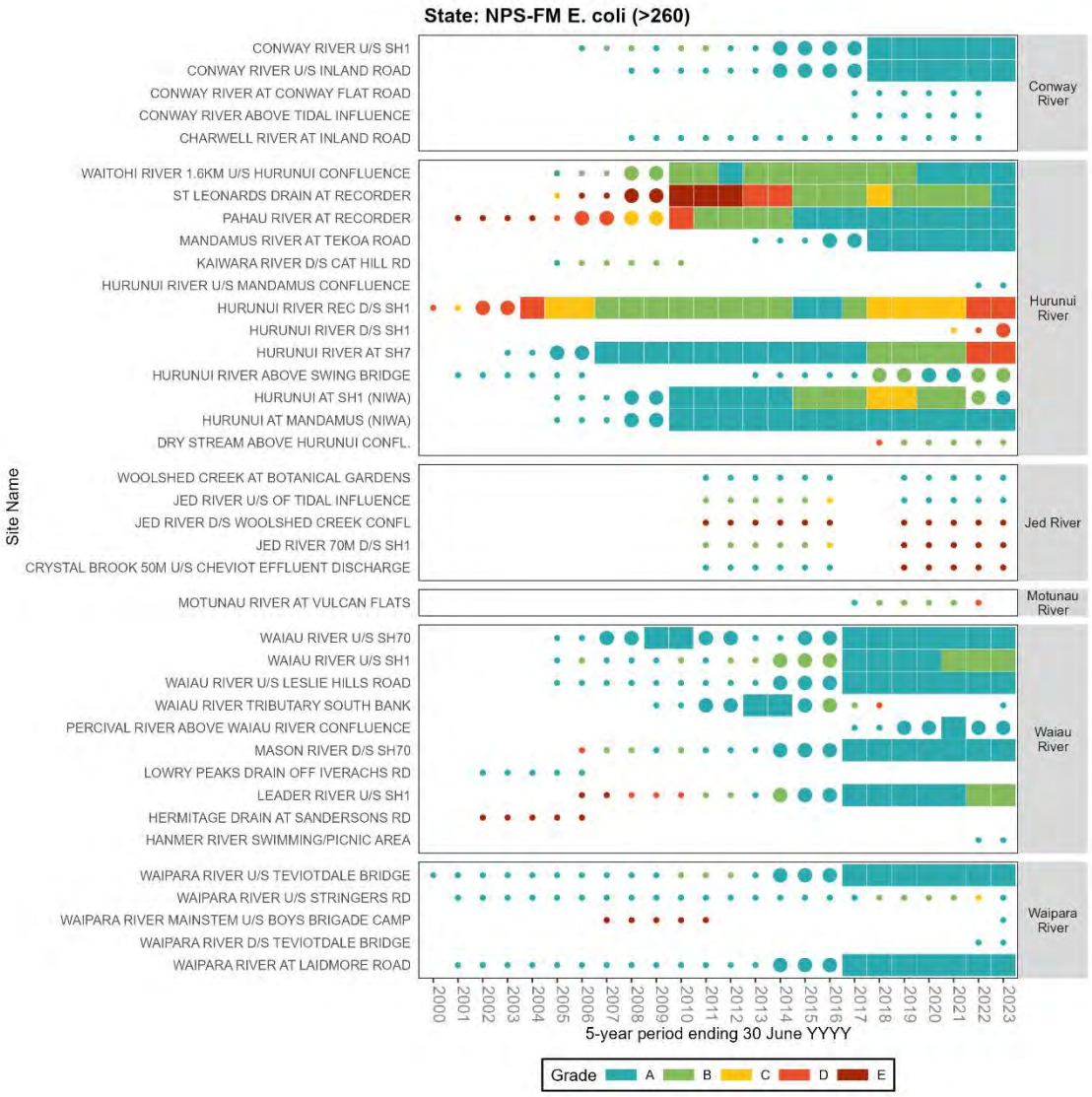
5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM E. coli (>260)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER REC D/S SH1
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER TRIBUTARY SOUTH BANK
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HERMITAGE DRAIN AT SANDERSONS RD
HANMER RIVER SWIMMING/PICNIC AREA
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Waipara River
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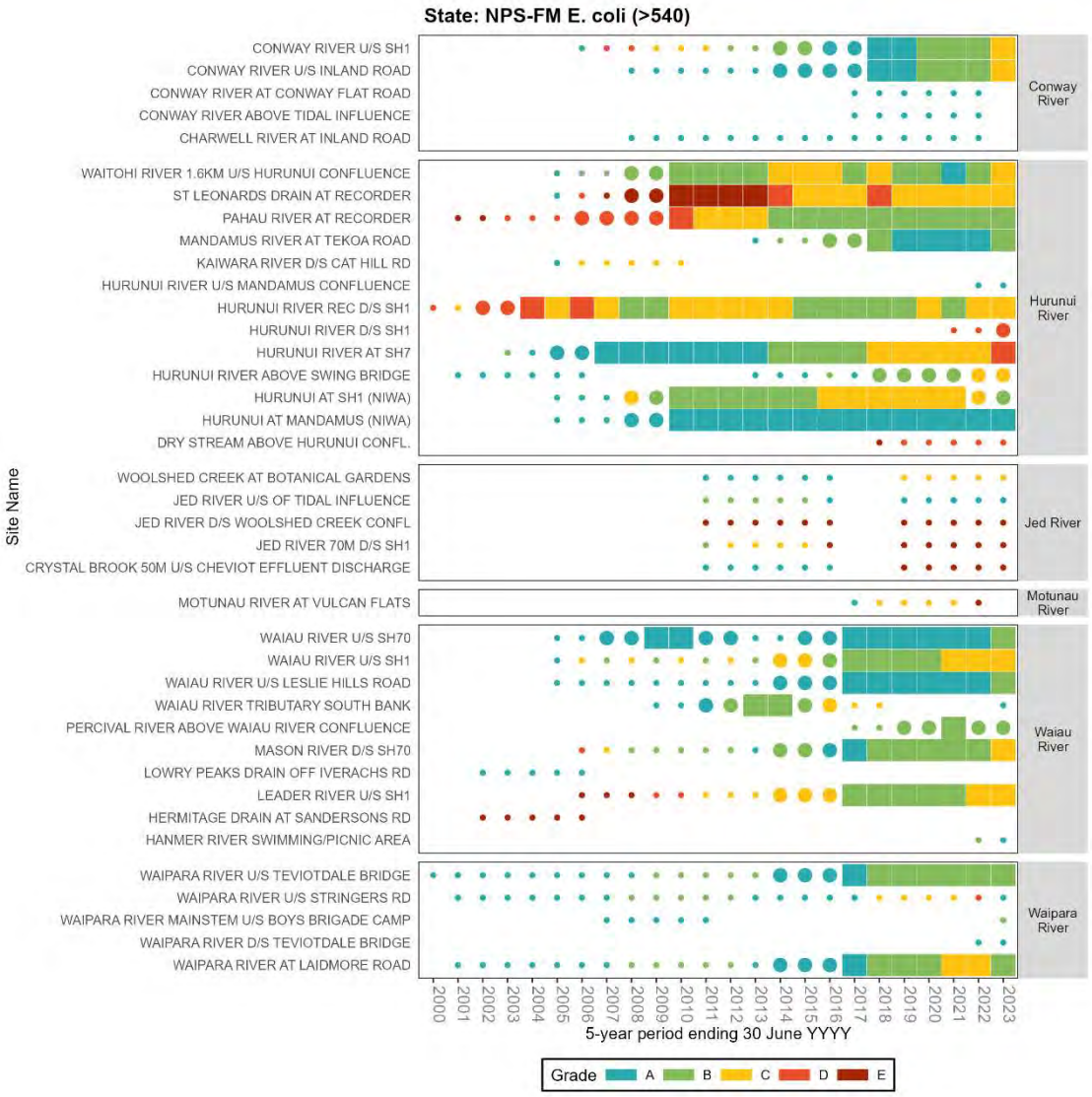
5-year period ending 30 June YYYY
Grade A B C D E


State: NPS-FM E. coli (>540)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER REC D/S SH1
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER TRIBUTARY SOUTH BANK
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HERMITAGE DRAIN AT SANDERSONS RD
HANMER RIVER SWIMMING/PICNIC AREA
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Waipara River
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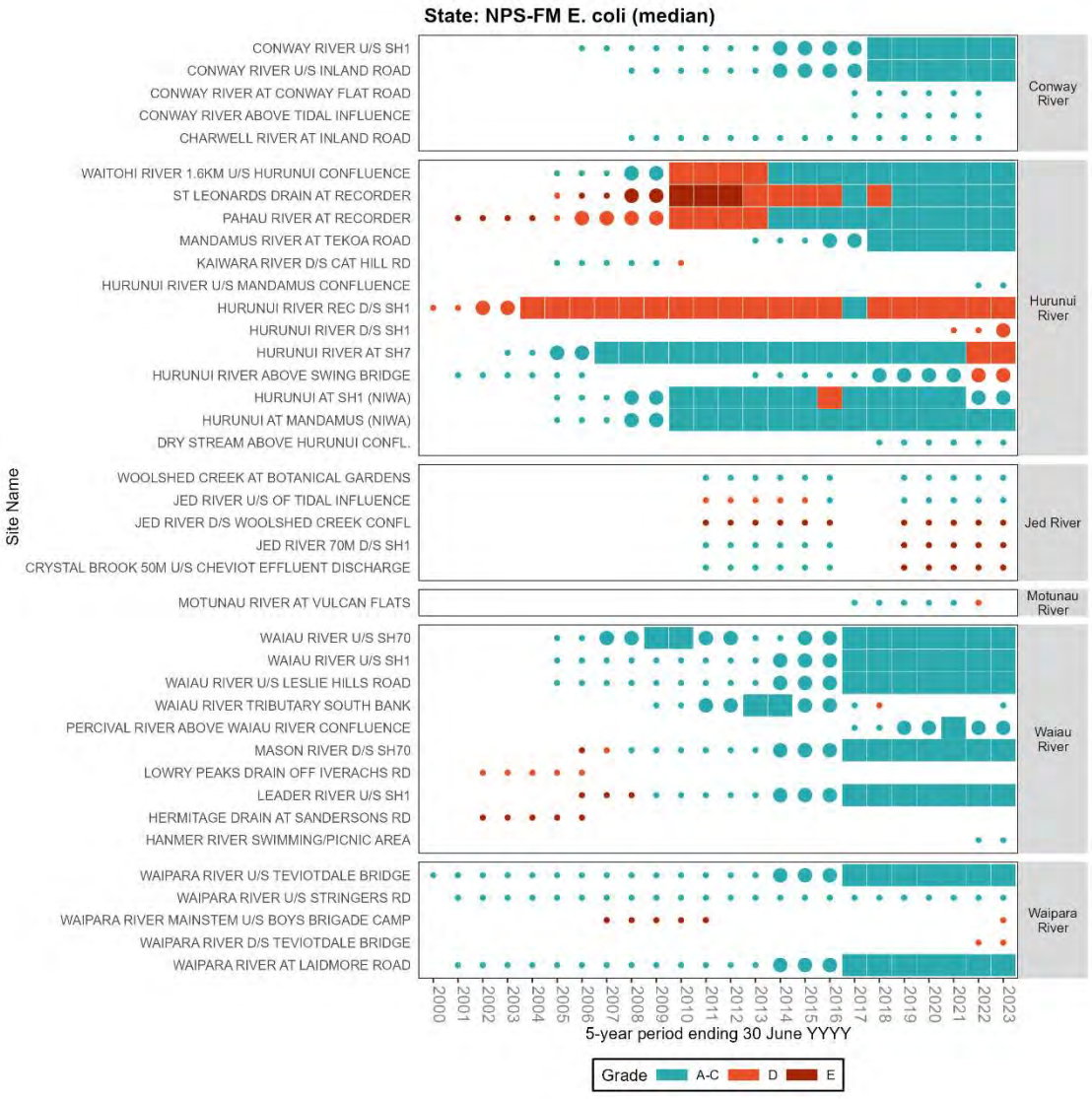
5-year period ending 30 June YYYY
Grade A B C D E


State: NPS-FM E. coli (median)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER REC D/S SH1
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER TRIBUTARY SOUTH BANK
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HERMITAGE DRAIN AT SANDERSONS RD
HANMER RIVER SWIMMING/PICNIC AREA
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Waipara River
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5-year period ending 30 June YYYY
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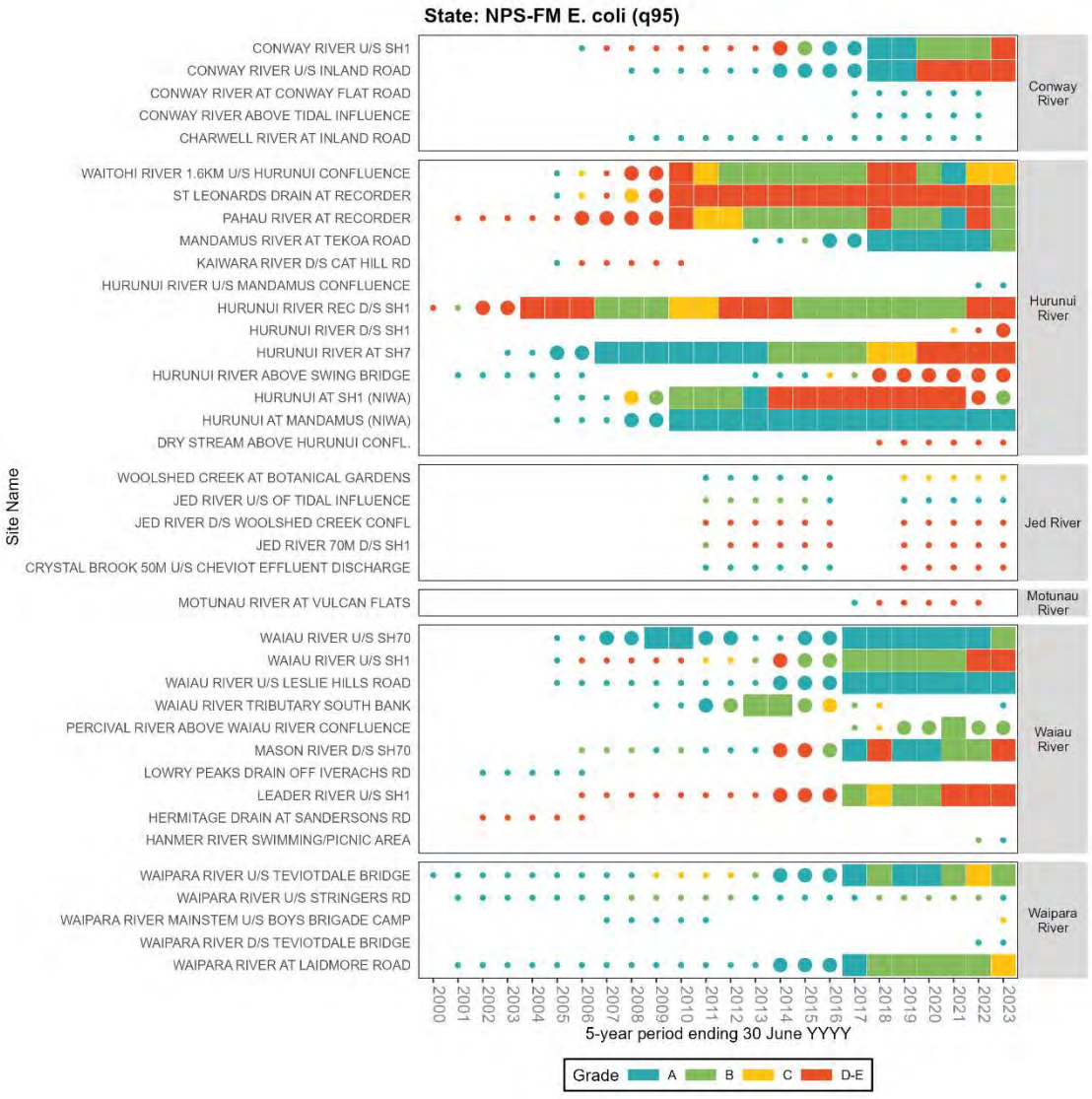
State: NPS-FM E. coli (q95)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER REC D/S SH1
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER TRIBUTARY SOUTH BANK
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HERMITAGE DRAIN AT SANDERSONS RD
HANMER RIVER SWIMMING/PICNIC AREA
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER MAINSTEM U/S BOYS BRIGADE CAMP
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Waipara River
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2023
5-year period ending 30 June YYYY
Grade
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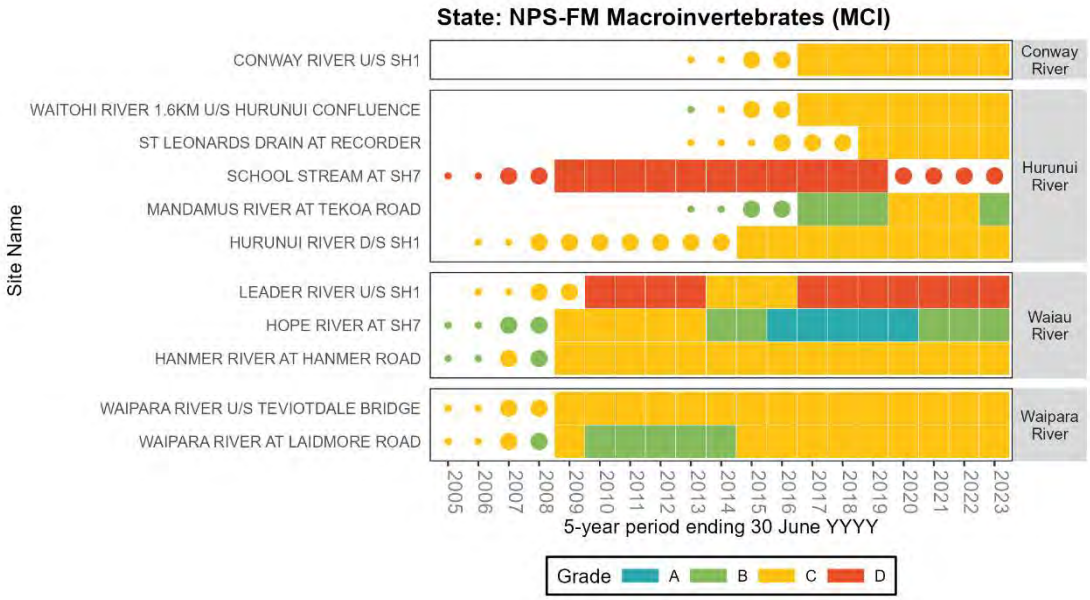
D-E


State: NPS-FM Macroinvertebrates (MCI)
CONWAY RIVER U/S SH1
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
SCHOOL STREAM AT SH7
MANDAMUS RIVER AT TEKOA ROAD
HURUNUI RIVER D/S SH1
LEADER RIVER U/S SH1
HOPE RIVER AT SH7
HANMER RIVER AT HANMER ROAD
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Site Name
Conway River
Hurunui River
Waiau River
Waipara River
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5-year period ending 30 June YYYY
Grade
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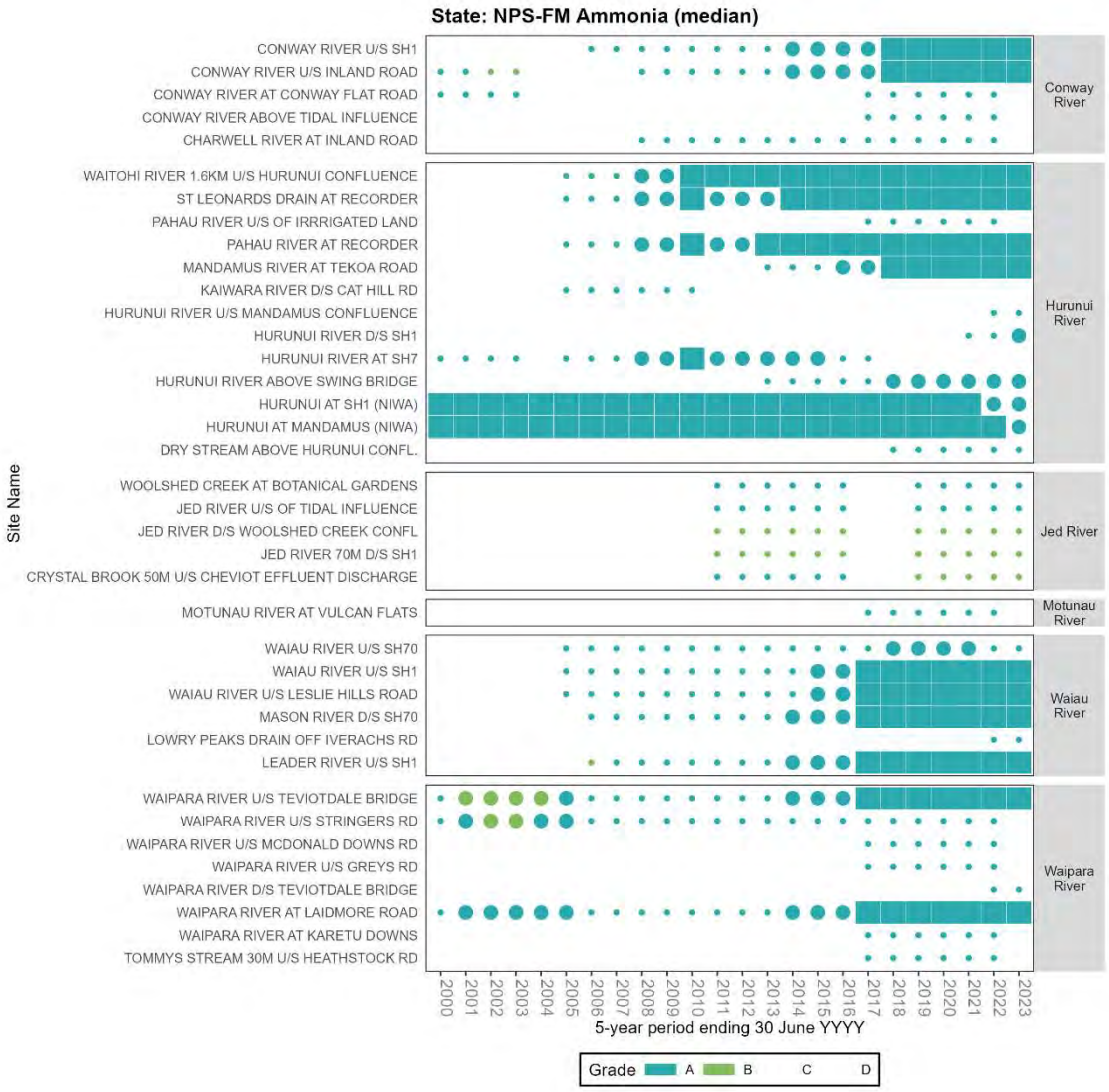
State: NPS-FM Ammonia (median)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Ammonia (q95)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
Site Name
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Nitrate (median)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
Site Name
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Nitrate (q95)
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
Conway River
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
WAIKARI RIVER ABOVE HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
PAHAU RIVER U/S OF IRRRIGATED LAND
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
LEADER RIVER U/S CONNEMARA ROAD
KAIWARA RIVER D/S CAT HILL RD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
HURUNUI AT SH1 (NIWA)
HURUNUI AT MANDAMUS (NIWA)
GRETA RIVER US HURUNUI CONFLUENCE
DRY STREAM ABOVE HURUNUI CONFL.
Hurunui River
WOOLSHED CREEK AT BOTANICAL GARDENS
JED RIVER U/S OF TIDAL INFLUENCE
JED RIVER D/S WOOLSHED CREEK CONFL
JED RIVER 70M D/S SH1
CRYSTAL BROOK 50M U/S CHEVIOT EFFLUENT DISCHARGE
Jed River
MOTUNAU RIVER AT VULCAN FLATS
Motunau River
Site Name
WAIAU RIVER U/S SH70
WAIAU RIVER U/S SH1
WAIAU RIVER U/S LESLIE HILLS ROAD
WAIAU RIVER AT MARBLE POINT
WAIAU RIVER AT LOWER RECORDER
STANTON RIVER U/S WAIAU CONFLUENCE
ROTHERHAM STREAM BELOW FISH FARM
PERCIVAL RIVER ABOVE WAIAU RIVER CONFLUENCE
PASS STREAM AT PASS STREAM RD
MASON RIVER U/S WAIAU CONFL.
MASON RIVER D/S SH70
LOWRY PEAKS DRAIN OFF IVERACHS RD
LEADER RIVER U/S SH1
HOPE RIVER D/S GLYNN WYE RECORDER
HOME STREAM U/S RIVER ROAD
HERMITAGE DRAIN AT SANDERSONS RD
GRANTHAM RIVER U/S WOODBANK ROAD
COUNTESS STREAM U/S OF WAIAU RIVER CONFLUENCE
Waiau River
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER U/S MCDONALD DOWNS RD
WAIPARA RIVER U/S GREYS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
WAIPARA RIVER AT KARETU DOWNS
TOMMYS STREAM 30M U/S HEATHSTOCK RD
Waipara River
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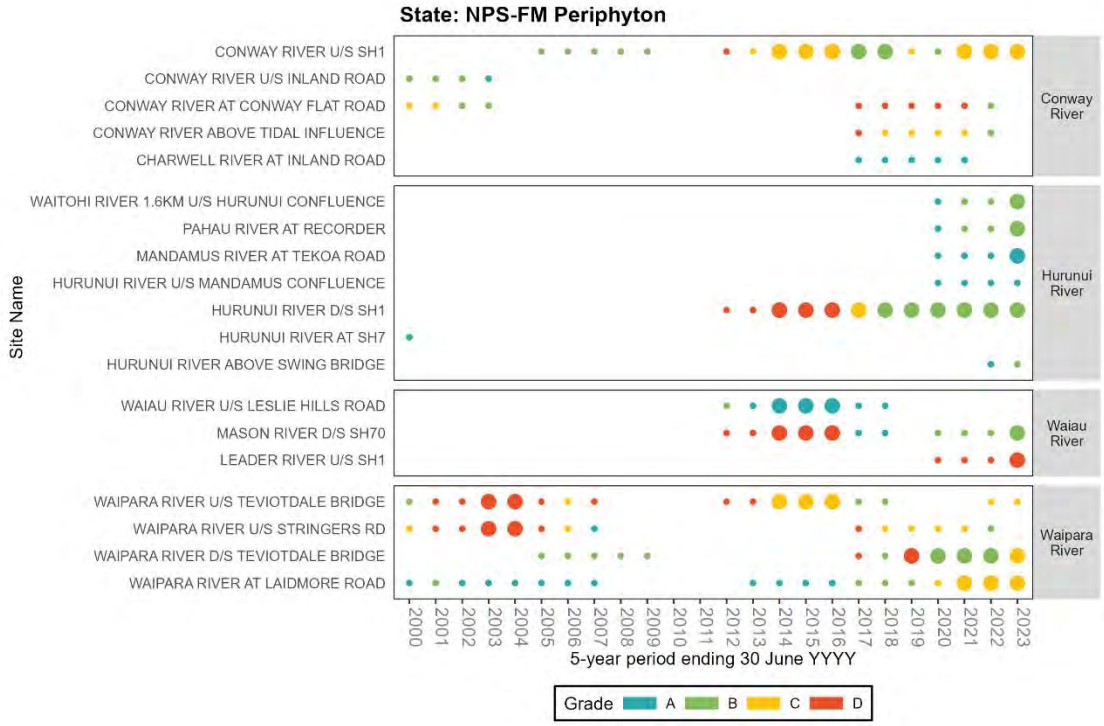
5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Periphyton
CONWAY RIVER U/S SH1
CONWAY RIVER U/S INLAND ROAD
CONWAY RIVER AT CONWAY FLAT ROAD
CONWAY RIVER ABOVE TIDAL INFLUENCE
CHARWELL RIVER AT INLAND ROAD
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
PAHAU RIVER AT RECORDER
MANDAMUS RIVER AT TEKOA ROAD
HURUNUI RIVER U/S MANDAMUS CONFLUENCE
HURUNUI RIVER D/S SH1
HURUNUI RIVER AT SH7
HURUNUI RIVER ABOVE SWING BRIDGE
WAIAU RIVER U/S LESLIE HILLS ROAD
MASON RIVER D/S SH70
LEADER RIVER U/S SH1
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER U/S STRINGERS RD
WAIPARA RIVER D/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Conway River
Hurunui River
Waiau River
Waipara River
Site Name
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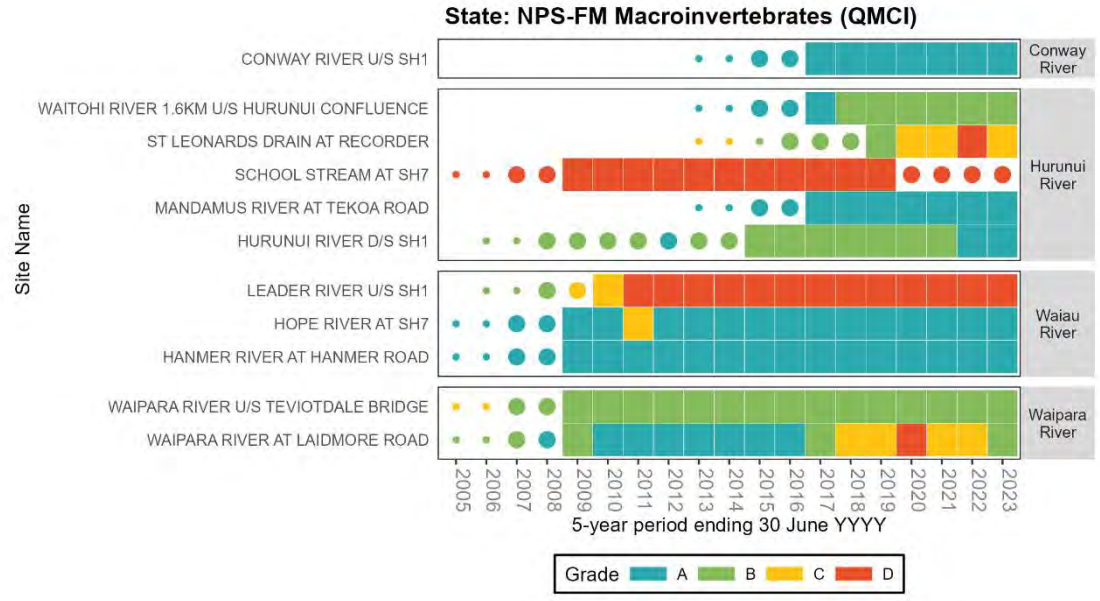
5-year period ending 30 June YYYY
Grade A B C D


State: NPS-FM Macroinvertebrates (QMCI)
CONWAY RIVER U/S SH1
WAITOHI RIVER 1.6KM U/S HURUNUI CONFLUENCE
ST LEONARDS DRAIN AT RECORDER
SCHOOL STREAM AT SH7
MANDAMUS RIVER AT TEKOA ROAD
HURUNUI RIVER D/S SH1
LEADER RIVER U/S SH1
HOPE RIVER AT SH7
HANMER RIVER AT HANMER ROAD
WAIPARA RIVER U/S TEVIOTDALE BRIDGE
WAIPARA RIVER AT LAIDMORE ROAD
Conway River
Hurunui River
Waiau River
Waipara River
Site Name
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5-year period ending 30 June YYYY
Grade A B C D