BEFORE THE HEARING PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of proposed Plan Change 2 for the One Plan

JOINT WITNESS STATEMENT OF EXPERTS
WATER QUALITY

28 July 2020

INTRODUCTION

1. This joint witness statement relates to expert conferencing on the topic of Water Quality.

2. This joint witness statement relates to proposed Plan Change 2 (**PC2**) of the One Plan by examining environment nitrogen load modelling and environment water quality impacts of proposed PC2.

3. The expert conferencing was held on 28 July 2020 at Palmerston North.

4. Attendees at the conference were:

   (a) Siobhan Karaitiana;

   (b) Rosemary Miller;

   (c) Phil Teal;

   (d) Nic Conland;

   (e) Craig Depree;

   (f) Tim Baker;

   (g) Claire Conwell;

   (h) Peter Wilson;

   (i) Ton Snelder;

   (j) Tim Cox; and

   (k) Abby Matthews.

CODE OF CONDUCT

5. We confirm that we have read the Environment Court Practice Note 2014, and in particular Appendix 3 – Protocol for Expert Witness Conferences, and agree to abide by it.

PURPOSE AND SCOPE OF CONFERENCING

6. The purpose of conferencing was to identify, discuss and highlight points of agreement and disagreement on water quality issues arising from PC2, and the submissions received on the proposed plan change.

7. In addition, questions arising from pre-hearing meetings between submitters and Horizons have been circulated for our consideration as part of conferencing. We have addressed those relevant to our areas of expertise.

8. The scope of the issues covered at this conference included:

   (a) State and Trends in water quality; and

   (b) Modelling approach and assumptions;

9. The experts have agreed that a second conferencing session will be held on 13th August to discuss the outcomes of the water quality modelling, and any residual issues arising from this first conferencing session between them.

KEY FACTS AND ASSUMPTIONS.

10. Water quality state has been assessed relative to One Plan Targets.

METHODOLOGIES AND STANDARDS

11. Methodologies are set out in State and Trends of Water Quality in the Manawatu-Whanganui Region and Scenario Modelling of Nitrogen Management in Manawatu-Whanganui Region. Statements, agreement and disagreement is detailed in Annexure A; Manawatu-Whanganui Region Catchment Nitrogen Model reports.

AGREED ISSUES

12. Refer to Annexure A.

DISAGREEMENT AND REASONS

13. Refer to Annexure A.

PRIMARY DATA

14. 2008 Land Use Data; Horizons Water Quality Data Set; MPI modelling as set out in the Bright et al, 2018, Water Allocation Economics Analysis Land/Water Use Modelling; Bloomer et al, 2020 N Loss from Vegetable Growing Scenarios In Horowhenua.

RESERVATIONS

Preliminary data on lake water quality has not been read by all parties. It has been requested to be added as Methodology by RM. RM has requested the SOE

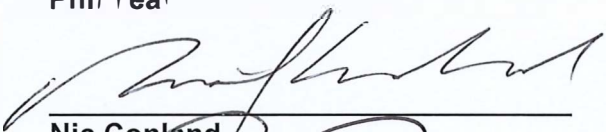
information is circulated to all parties, for consideration oprior to Day 2 of caucusing to enable discussion about Q.1 (Annexure A) in relation to lake water quality state.

Date: 28 July 2020

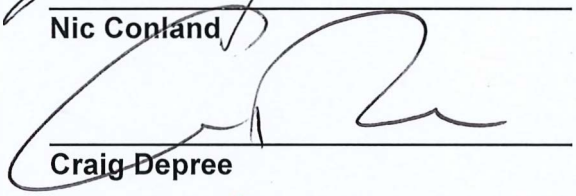
Siobhan Kevaitiana

Rosemary Miller

Phil Tea



Nic Conland



Craig Depree

Tim Baker

Claire Conwell

Peter Wilson

Jon Snelder

Tim Cox

Abby Matthews

ANNEXURE A

In the matter of Proposed Plan Change 2

Expert conferencing – Water Quality (Day 1 – 28 July 2020)

Issue	Statements	Agreed Position	Disagreements, with reasons
State and Trends in Water Quality – Methodology **Appendix 1: Report by T Snelder**	TS: The State and Trends work is contained in two LWP reports (in more detail than today's presentation). Available data to show whether water management subzones are achieving targets in One Plan. Available data is used to make spatial models, with as little bias as possible. Proportion of rivers that are passing or failing is identified. For the purposes of caucusing we have focused on nitrogen and discussed more broadly, other water quality indicators. Table 7 of TS presentation is a fair representation of state analysis. There has been general improvement in Nitrogen levels over the past ten years. Nitrogen concentrations have decreased at more than half of the sites. Of the information available, lakes are degraded. See Appendix 2.	NC: Agree with the methodology. I would like the scenario reporting to be clear about the links between the state and trend analysis and the scenario analysis. CD: Agree with the methodology used but have reservations as follows; Section 6 comparison of state and trends, the conclusions are potentially confounded by the fact that the two populations being compared have very different states. If focus is on nitrogen; CD, PW: There is concern that the state of SIN as assessed relative to One Plan targets, in my opinion, cannot be used to infer nitrogen overallocation in that catchment. CD, NC, PW: There is concern that the state of MCI as assessed relative to One Plan water quality targets, in our opinions, does not reflect the influence of suspended and deposited sediment, i.e. by the way that it is measured in the One Plan by visual clarity.	SK: Does not agree as the methodology is not satisfactory from a Maori perspective. I can't understand the trend in cultural health and mauri over time from the information provided. I was guided by policy 5.8, which includes faecal contamination and sediment.

		PW: Agrees with the methodology in regards to the things that have been monitored. He notes that there are other things that haven't been monitored, and particularly sediment. The question of sediment loads and sediment deposition at sites is missing from statistical data. All others agree with the methodology.	
1. Looking at all four diffuse contaminants from IFLUs and indicators/attributes potentially affected by those contaminants, what is the state of water quality, and the trend in water quality, within the targeted water management sub-zones?	The answer is contained in the State and Trends of River Water Quality in the Manawatu-Whanganui Region.	All agreed.	CD: My concern that the state of contaminants as assessed relative to One Plan targets cannot be used to infer overallocation in that catchment. CD, NC: The methodology used for visual clarity is not adequate (monthly) to determine outcomes for suspended sediment as measured by visual clarity.
2. What is the state and trend of cultural health and mauri within each of the Targeted Management Subzones? What method did Horizons apply (and what assumptions were made) to predict an increase in te mana o te wai as a result of PC2?	AM - Horizons has done a very limited assessment of the cultural health and mauri within the targeted management subzones. More work could be done and the definition of that work is to be determined during the caucusing session with Iwi and hapu. Cawthron are currently undertaking a survey of lakes throughout NZ, looking back through time and drawing out stories, this work may be useful. As this work is being undertaken now, it may not be available in time for this process. Can the caucusing session with Iwi and hapu identify whether there is further information, from a water quality perspective, that we should consider at the next session and are	SK agrees All other experts agree that this is outside their field of expertise.	

	any parameters that are currently gathered through western approach, that are relevant to mauri. (e.g. Is E coli data useful in identifying effects to mauri) SK: Mauri is an intangible concept but may be and has been measured. I have not been provided with evidence that PC2 will result in the increase in mauri. In my opinion, PC2 will does not seek to provide for cultural, traditional, historical or spiritual relationship of iwi with water. NC – Iwi and hapu caucusing session: Does health and mauri vary between the different iwi and hapu within the region?		
Modelling Approach and Assumptions – methodology and modelling 3. What land use assumptions were adopted by Horizons for its catchment nitrogen (N) modelling and are they appropriate?	Approach and assumptions information was pre-circulated. Tim Cox spoke to his report and discussed the methodology and modelling as discussed in the report: Scenario Modelling of Nitrogen Management in Manawatu-Whanganui Region. 2008 land use data, combined with 2012 water quality data and estimated MPI export coefficients were used to calibrate the model. Refer to Catchment Model Report (2.2) for justification of the input data used. Discharges from wastewater plants are explicitly described in the model based on 2012 discharge information and are attenuated	Not in field of expertise for Rosemary Miller, Siobhan Karaitiana or Phil Teal. Methodology was accepted by other experts. NC: Model could be validated using the 2018 land use map and comparing the model predictions to a 2013-2018 water quality data set. TB: If 'zero' has been used as a coefficient for urban areas, what effect does this have on the modelling?	CD: Concerned that the references to Appendix B2 of the Catchment Nitrogen Model Report (Tim Cox), the differences between N losses from MPI report vs modelled losses from baseline OVERSEER files. NC: It is important to undertake sensitivity analysis using alternative export coefficients from the GMP /BMP caucus group.
4. How many intensive farming land uses (IFLUs) are there estimated to be within each of the targeted water management sub-zones?	Dairy farming – 2018 - Parminter report breaks down consented and unconsented 384 – total 217 – consented	All agreed	

How many of those have obtained consent? How many unconsented IFLUs are there estimated to be in each of the targeted water management sub-zones?	167 - non-consented There are gaps in information. Horizons can answer question on land area and the number of consented farms but need assistance from Beef+Lamb, FAR, DairyNZ, Horticulture NZ and others to provide more detailed information on unconsented farms. Refer to Dave Horne's work.		
5. How are the impacts of other non-IFLU land uses accounted for in the modelling and are they appropriately characterised?	They are directly imported into the model using a nitrogen export coefficient using MPI database and the 2008 landuse, with some adjustments made. The model can apportion the load for IFLU and non-IFLU, but this has not been done yet.	All agreed	
6. What is the load from the following activities and has it changed over the past 10 years: (i) New conversions to IFLUs (ii) Intensification of non-IFLUs (iii) Point source discharges	(i) and (ii) To answer this question, further scenarios are required: (iii) We have a scenario to cover this in the report.	All agreed	
7. What assumptions were made about attenuation of nitrogen (N) through soil, in the catchment N modelling and are they appropriate?	Refer to Tim's MW Catchment Nitrogen model report (July 2020) Also refer to MPI Bright report.	All agreed	
8. To what extent can surface water quality (including changes to N load and concentration, as well as consequential effects on biological and ecosystem health attributes) be	Clarification is required on what information is being sought form this question.	All agreed	

identified and attributed to on-farm N loss from individual IFLUs?			

Appendix 1

Water Quality Summary
State and trends in:

Soluble inorganic nitrogen (SIN),

Escherichia coli (E.coli),

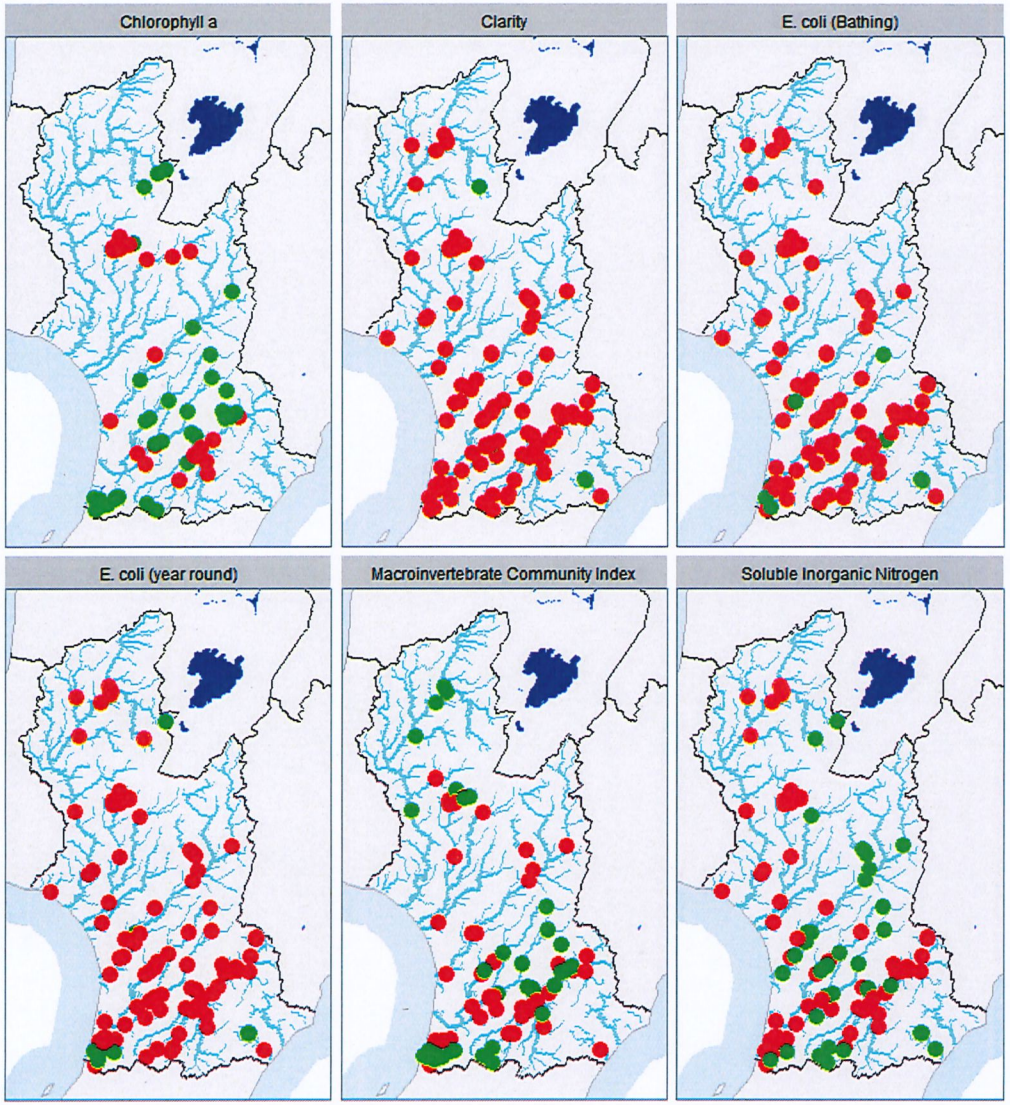
Visual clarity (Clarity),

Periphyton biomass (Chla),

Macroinvertebrate community index (MCI)

State – Compared to One Plan Targets

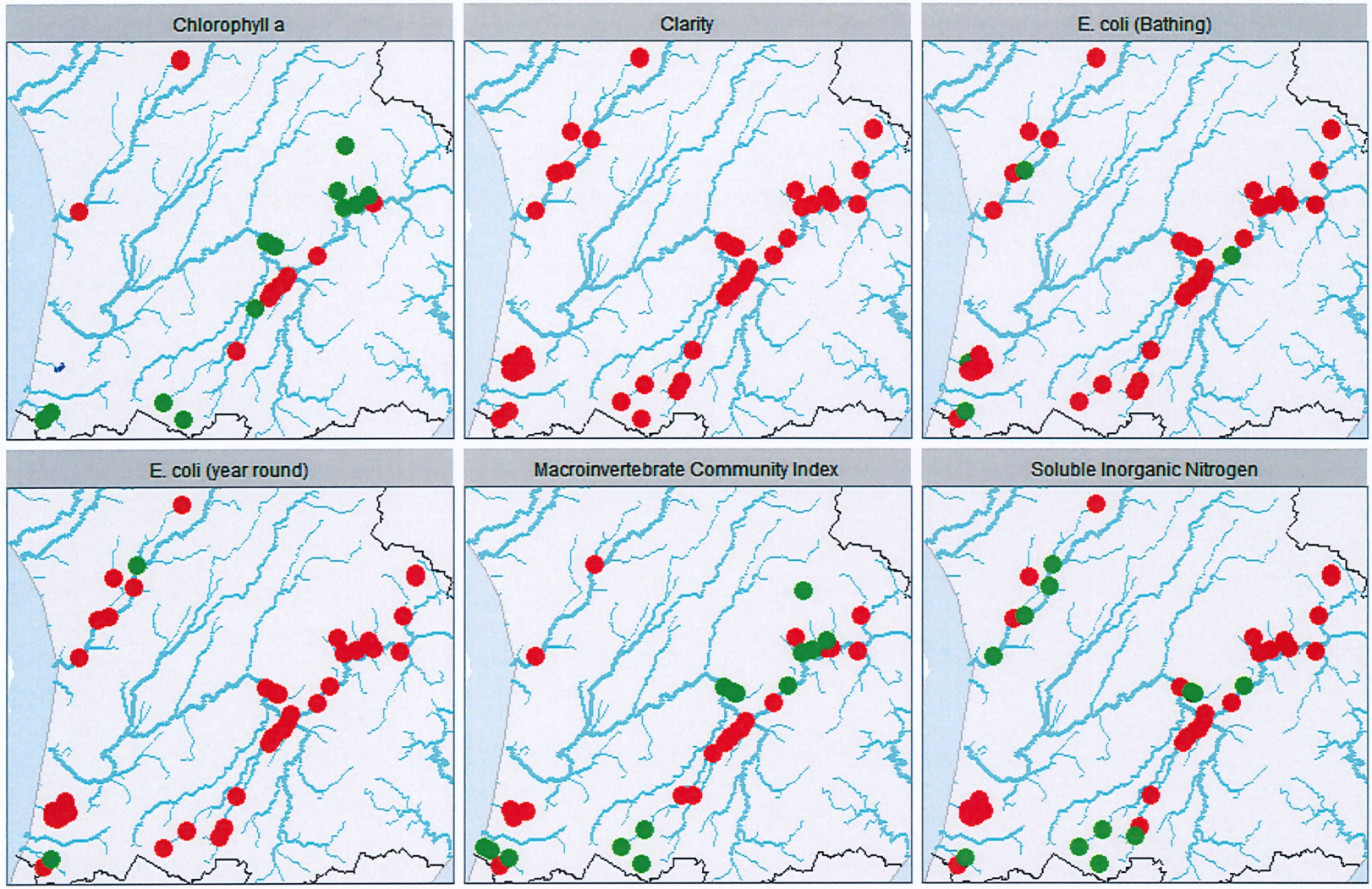
State for 5-year period to end of June 2017



State – c.f. One Plan Targets

Variable	Fail (% sites)	Pass (% sites)
Chlorophyll a	47	53
Clarity	96	4
E. coli (Bathing)	92	8
E. coli (Year Round)	93	7
Macroinvertebrate Community Index	59	41
Soluble Inorganic Nitrogen	68	32

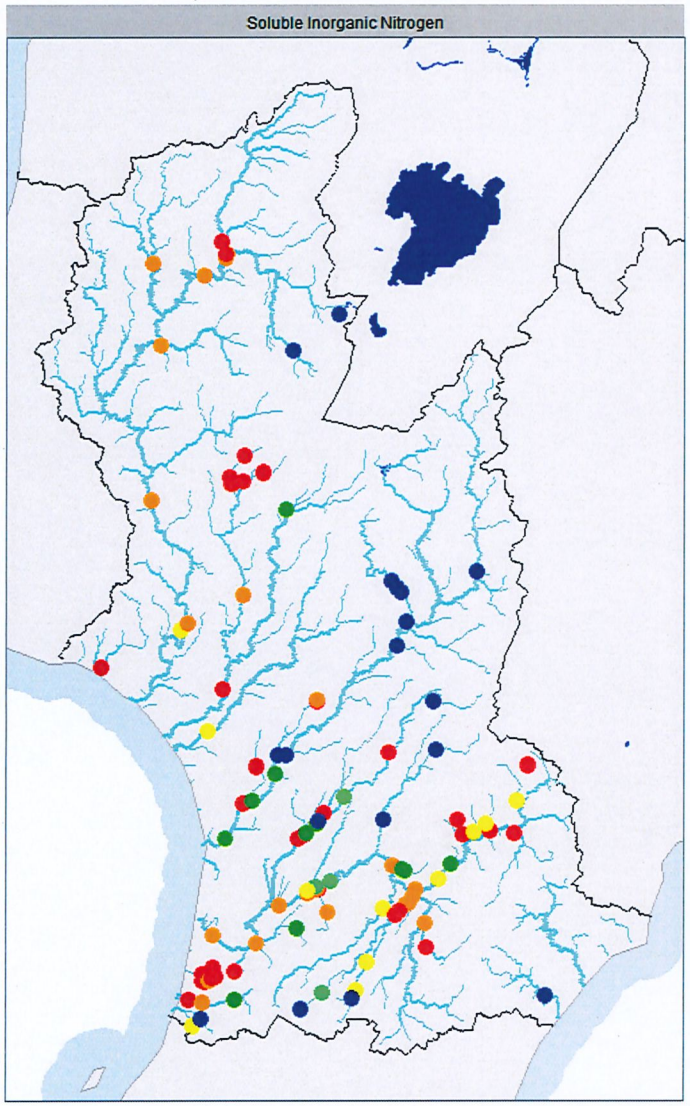
State for 5-year period to end of June 2017 - Target Catchments



State in target catchments – cf One Plan Targets

Variable	Fail (% sites)	Pass (% sites)
Chlorophyll a	52	48
Clarity	100	0
E. coli (Bathing)	89	11
E. coli (Year Round)	96	4
Macroinvertebrate Community Index	61	39
Soluble Inorganic Nitrogen	75	25

Current state relative to target (%)

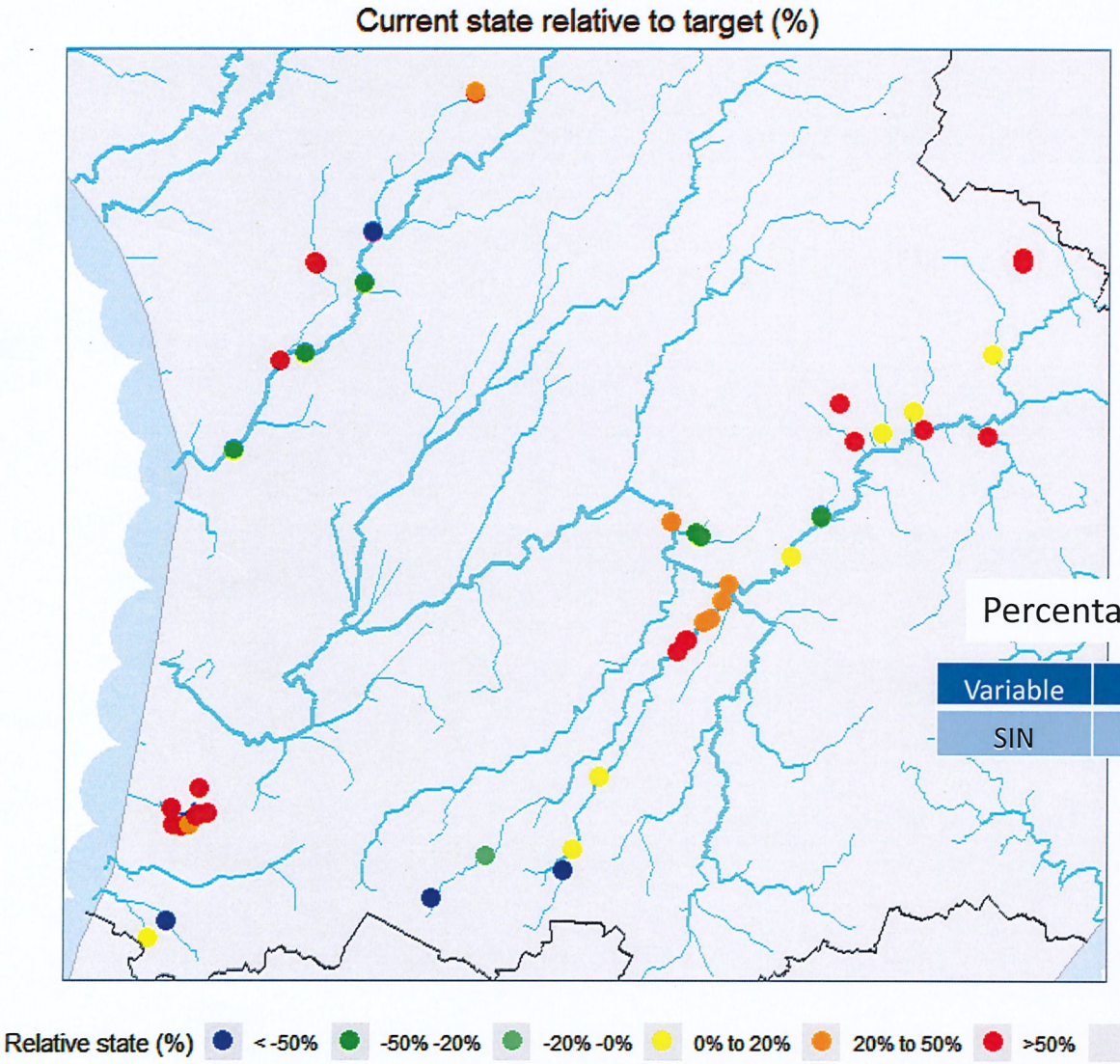


Relative state (%) < -50% -50% -20% -20% -0% 0% to 20% 20% to 50% >50% NA

Percentage of sites in relative state categories

Variable	< -50%	-0.7	-0.2	0% to 20%	20% to 50%	>50%
SIN	16	10	4	11	23	36

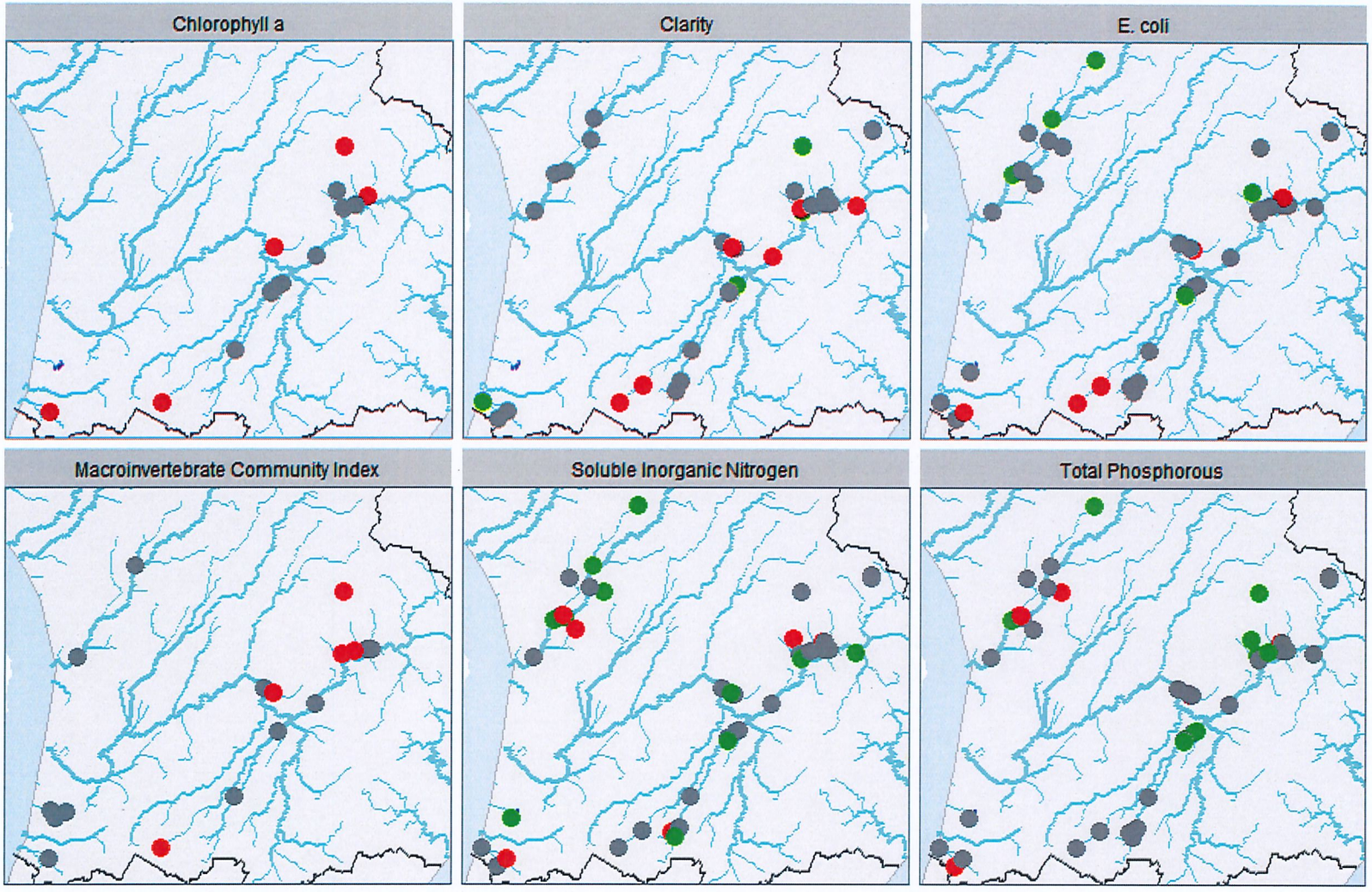
Trends



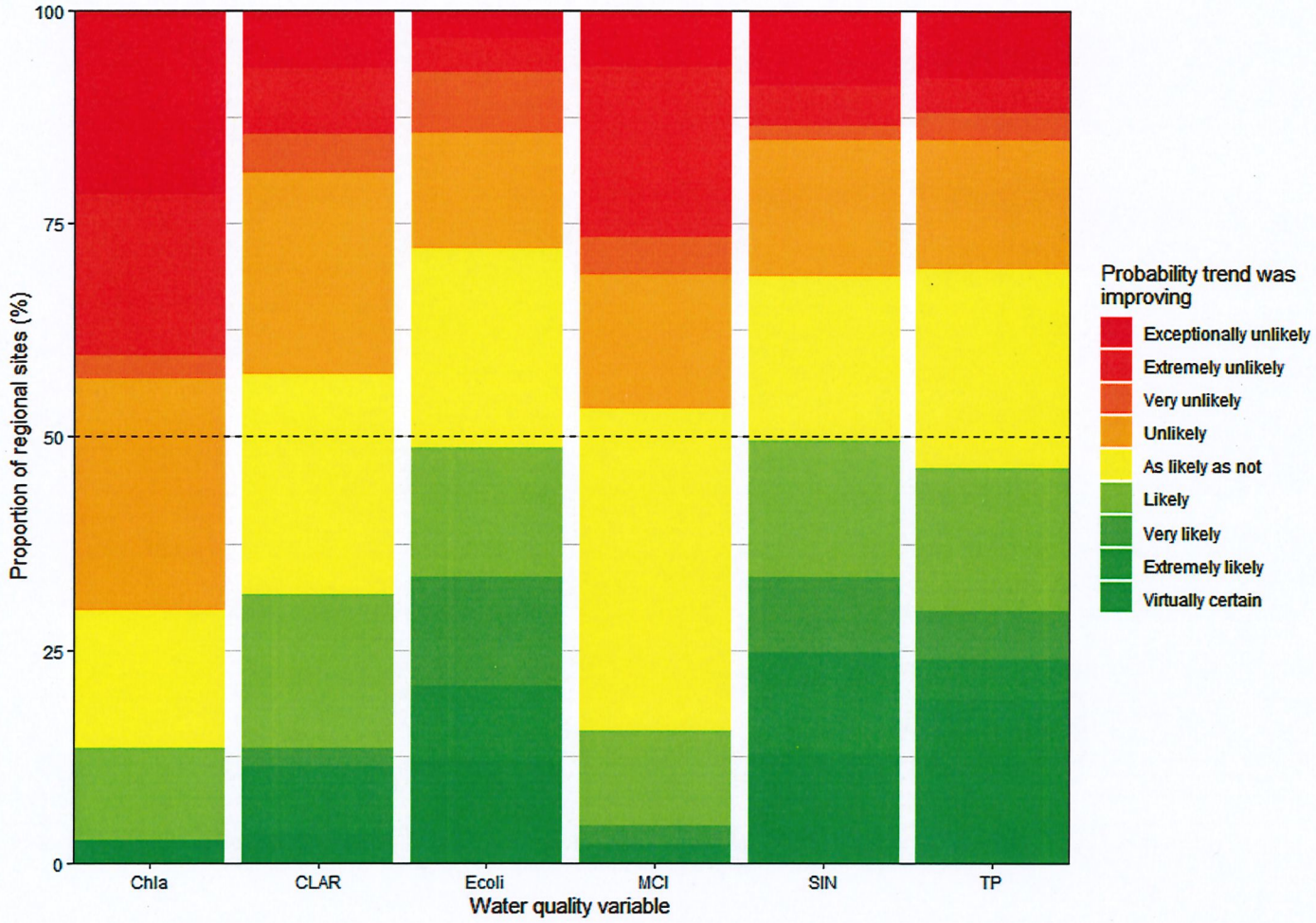
Percentage of target catchment sites in relative state categories

Variable	< -50%	-0.7	-0.2	0% to 20%	20% to 50%	>50%
SIN	9	13	2	17	17	43

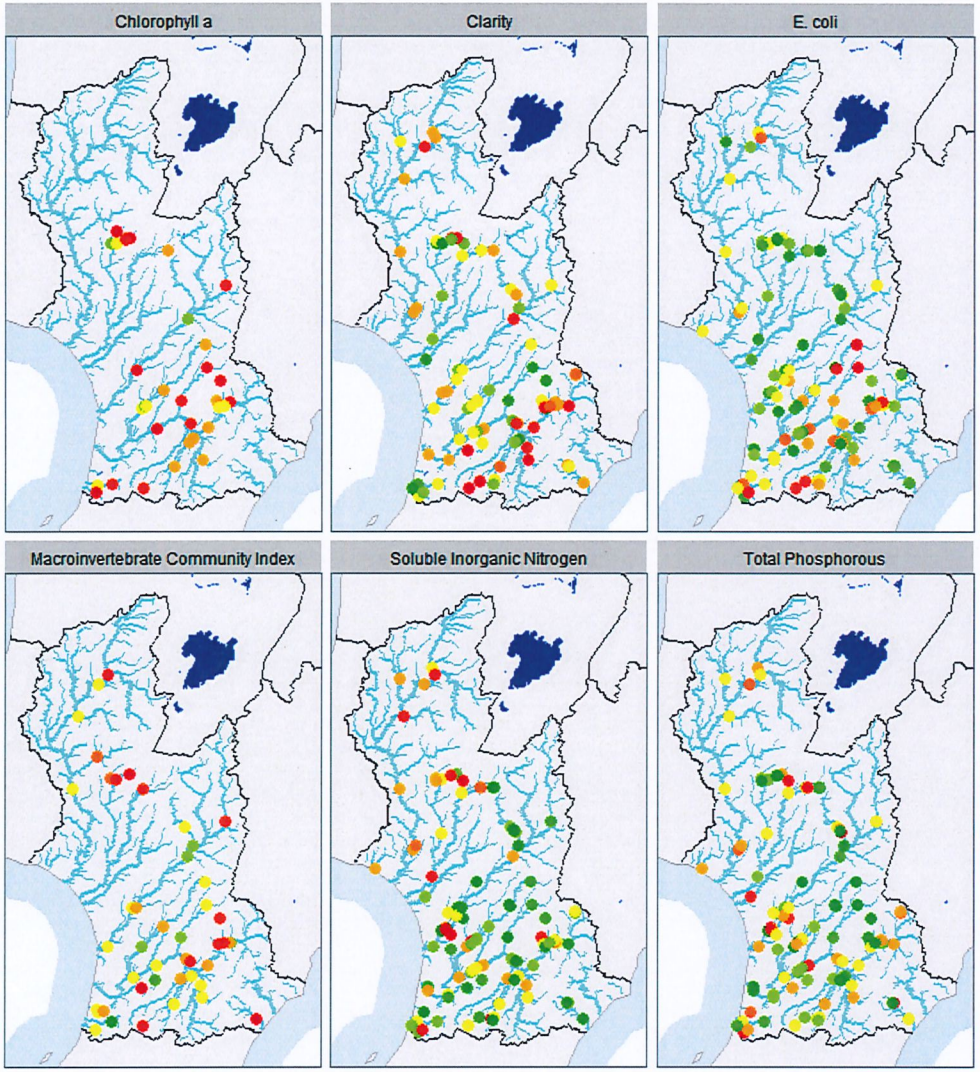
10 year raw trends ending June 2017 - Target Catchments



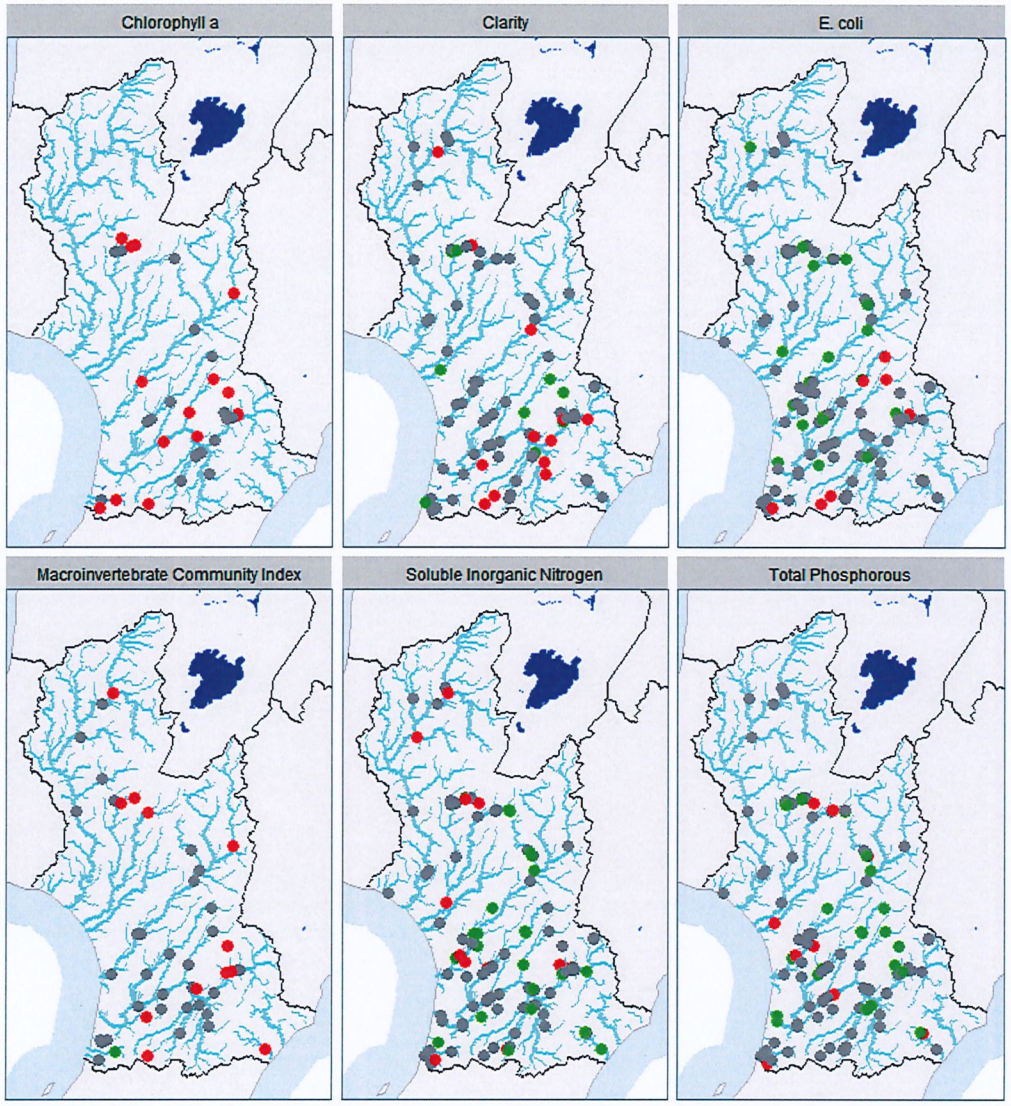
Summary of regional 10-year trends



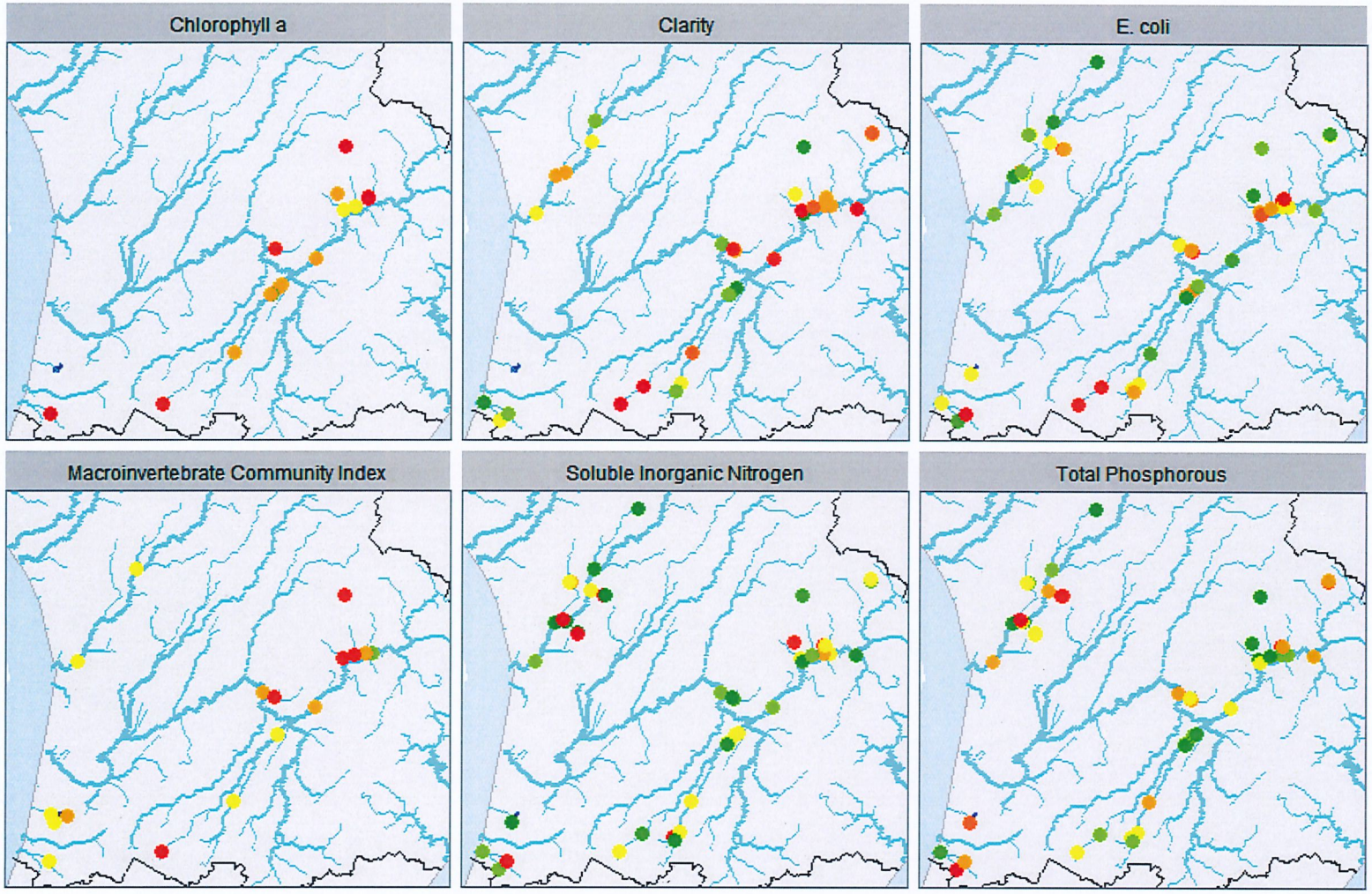
10 year raw trends ending June 2017



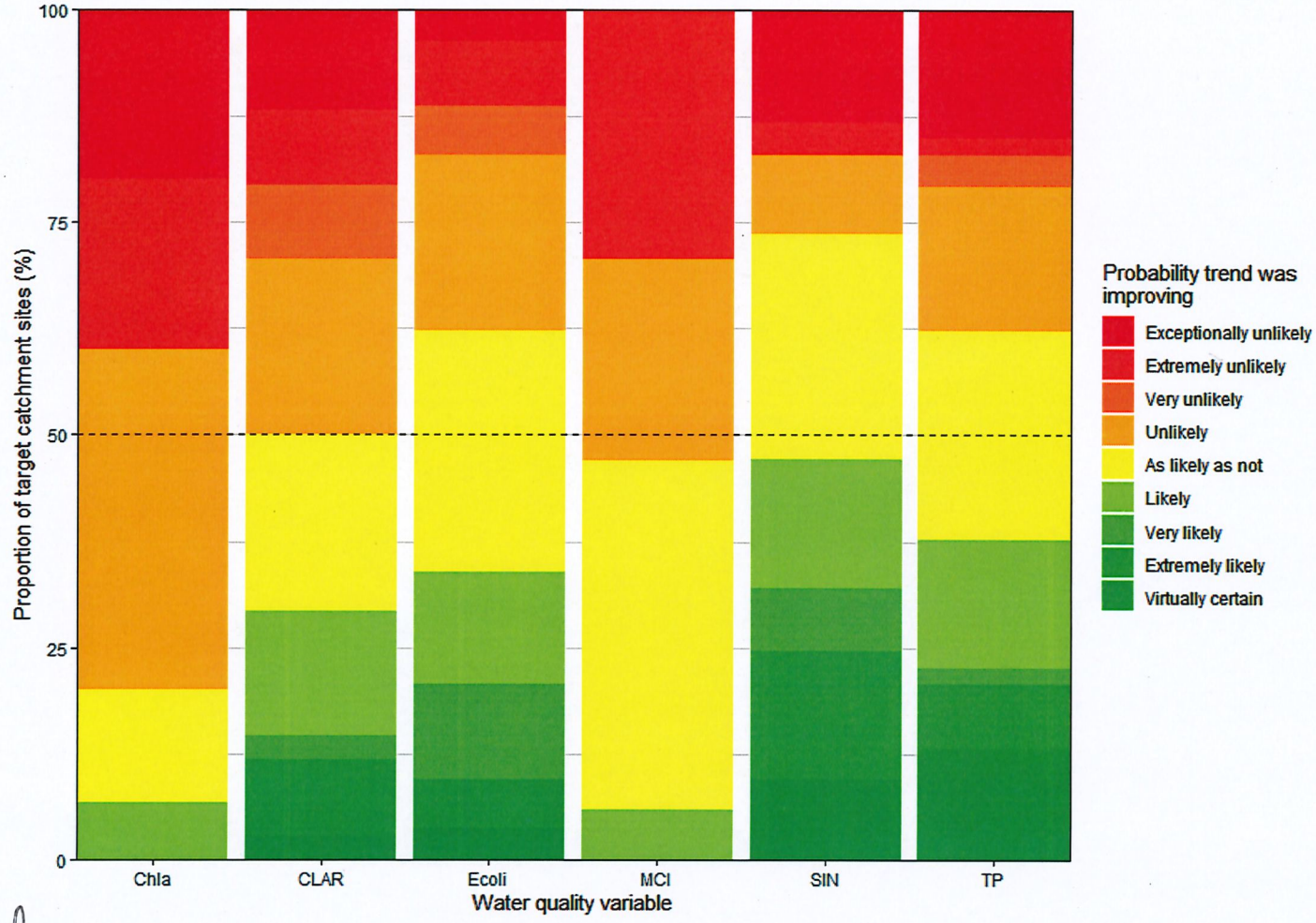
10 year raw trends ending June 2017



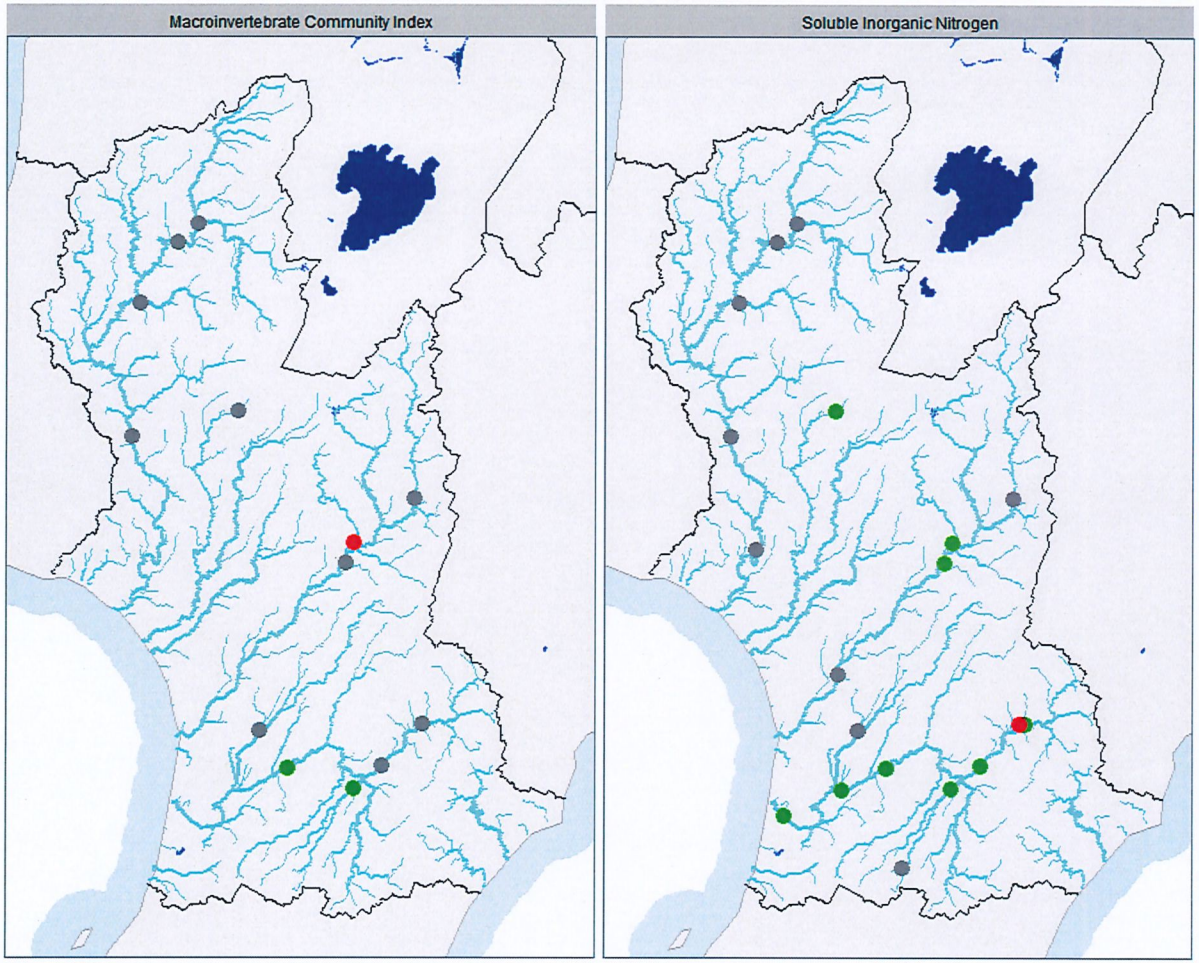
10 year raw trends ending June 2017



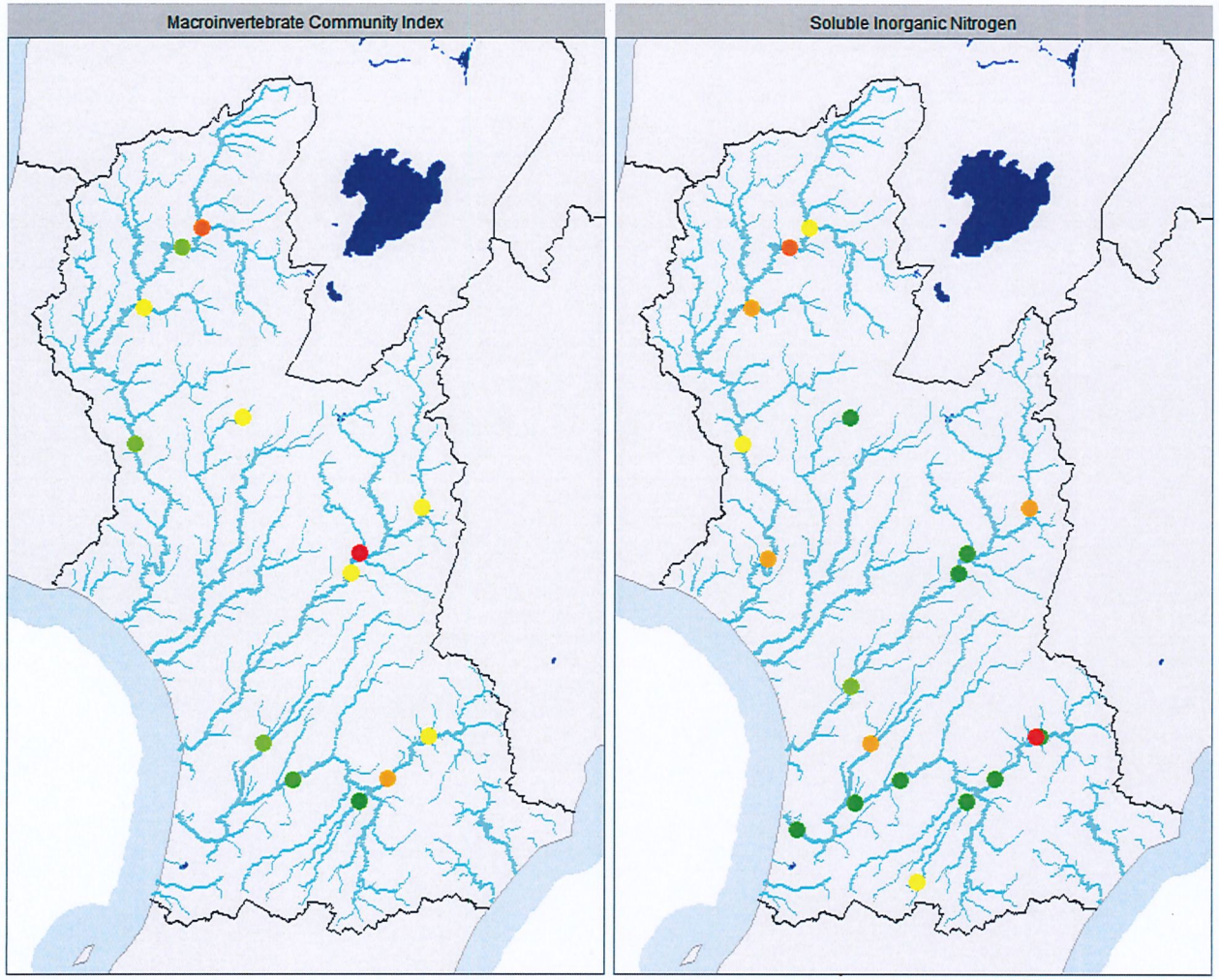
Summary of target catchment 10-year trends



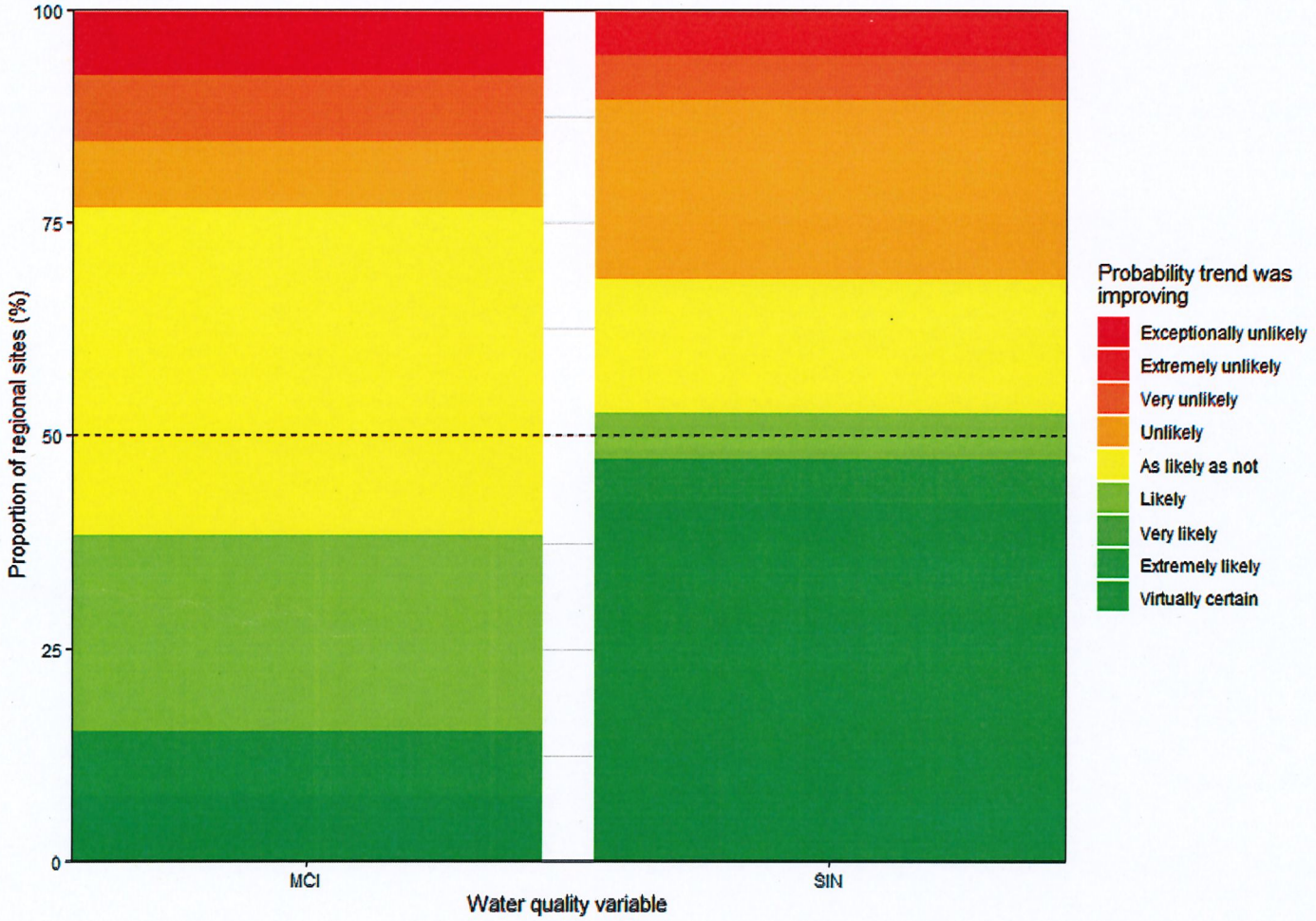
20 year raw trends ending June 2017

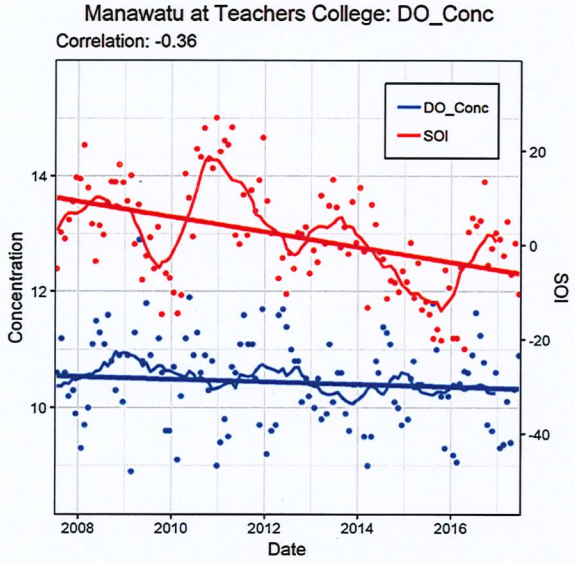


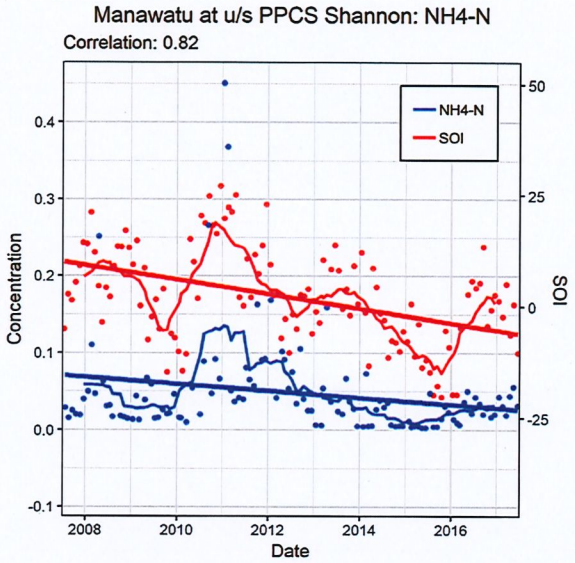
20 year raw trends ending June 2017

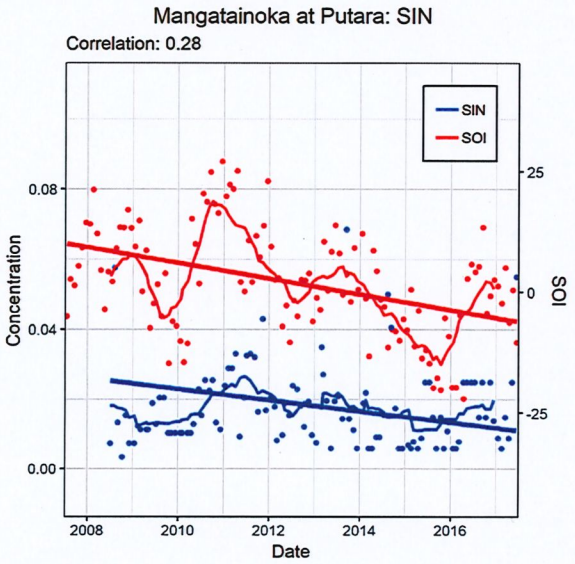


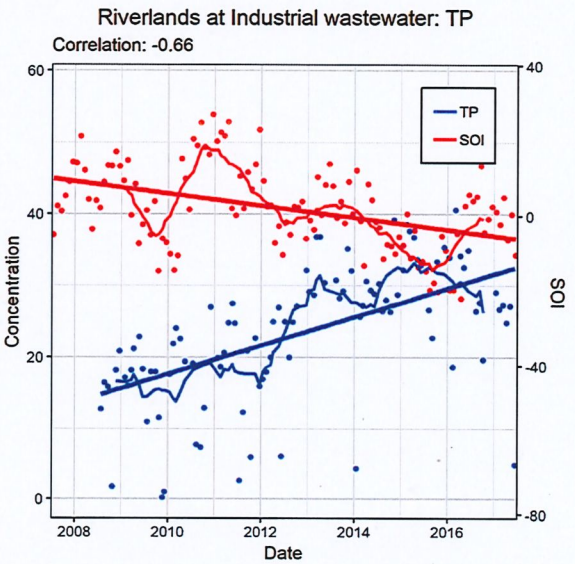
Summary of regional 20-year trends

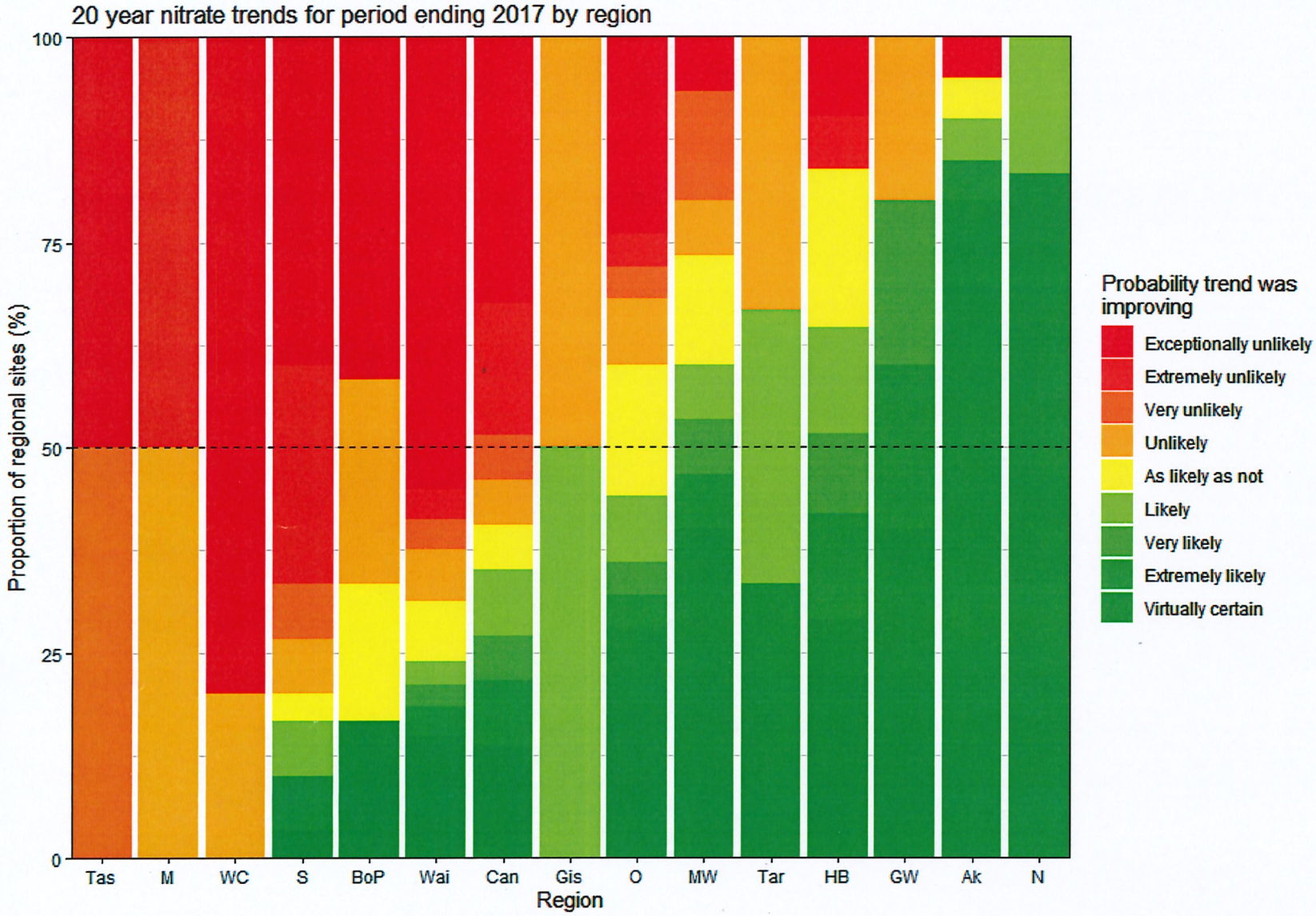



Manawatu at Teachers College: DO_Conc
Correlation: -0.36
DO_Conc
SOI
Concentration
SOI
Date
2008
2010
2012
2014
2016


Manawatu at u/s PPCS Shannon: NH4-N
Correlation: 0.82
NH4-N
SOI
Concentration
SOI
Date
2008
2010
2012
2014
2016


Mangatainoka at Putara: SIN
Correlation: 0.28
SIN
SOI
Concentration
SOI
Date
2008
2010
2012
2014
2016


Riverlands at Industrial wastewater: TP
Correlation: -0.66
TP
SOI
Concentration
SOI
Date
2008
2010
2012
2014
2016


20 year nitrate trends for period ending 2017 by region
Proportion of regional sites (%)
100
75
50
25
0
Tas
M
WC
S
BoP
Wai
Can
Gis
O
MW
Tar
HB
GW
Ak
N
Region
Probability trend was improving
Exceptionally unlikely
Extremely unlikely
Very unlikely
Unlikely
As likely as not
Likely
Very likely
Extremely likely
Virtually certain

Lake water quality monitoring reporting as presented in the State of Environment 2019 report

Site Name	NOF: Lake phytoplankton (median)	NOF: Lake phytoplankton (maximum)	NOF: Lake total nitrogen	One Plan total phosphorus
Lake Alice	B	D	D	D
Lake Dudding	C	C	D	D
Lake Heaton	D	D	D	D
Lake Herbert	C	C	D	D
Lake Horowhenua	D	D	D	D
Lake Kohata	C	D	D	C
Lake Koitiata	A	A	D	C
Lake Koputara	D	D	D	D
Lake Pauri	B	C	D	D
Lake Waipu	B	C	D	D
Lake Westmere	C	C	D	D
Lake William	C	D	D	D
Lake Wiritoa	D	D	D	D
Omanuka Lagoon	C	D	D	D
Pukepuke Lagoon	B	C	D	D

Table 3: Lake water quality compared to One Plan targets (composite samples). Results are indicative only and should be interpreted with caution