Greater Heretaunga and Ahuriri Land and Water Management Collaborative Stakeholder (TANK) Group

TANK

Meeting 33:
10 October 2017

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REGIONAL COUNCIL

Karakia

Karakia

Ko te tumanako

Kia pai tenei rā

Kia tutuki i ngā wawata

Kia tau te rangimarie

I runga i a tatou katoa

Mauriora kia tatou katoa

Āmine

Water is a taonga and the purpose of our meeting is to…….

Agenda

9:30am	Notices, meeting record (Robyn)
10.00am	Adaptive Management and Limit Setting
10.30am	Low-risk water guidelines for estuary and coastal environments (Anna) ▪ Decide on objectives for loads to the estuary
11:30am	Recommendations for attribute state objectives (Sandy)
12:30pm	**LUNCH**
1.00pm	Decide on objectives for attributes states (Sandy)
2.30pm	Learning from the Tukituki experience (Nathan)
3:00pm	**COFFEE BREAK**
3:15pm	Options and next steps
3.45pm	Field Trip
4:00pm	**CLOSE MEETING**

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Meeting objectives

1. Agree on objectives for contaminant loads to the estuaries
2. Agree on desired attribute states
3. Discuss nutrient management approach(s) and agree next steps

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Engagement etiquette

- Be an active and respectful participant / listener
- Share air time – have your say and allow others to have theirs
- One conversation at a time
- Ensure your important points are captured
- Please let us know if you need to leave the meeting early

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Ground rules for observers

- RPC members are active observers by right (as per ToR)
- Pre-approval for other observers to attend should be sought from Robyn Wynne-Lewis (prior to the day of the meeting)
- TANK members are responsible for introducing observers and should remain together at break out sessions
- Observer's speaking rights are at the discretion of the facilitator and the observer should defer to the TANK member whenever possible.

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Notices

- WCO update
- RPC paper on need to extend target notification date from Dec 2017 to August 2018 (see Handout)
- Proposed meeting dates for 2018
  - Thus 22 Feb
  - Thus 22 March
  - Thus 19 April
  - Tues 15 May
  - ???
- Any from the floor?

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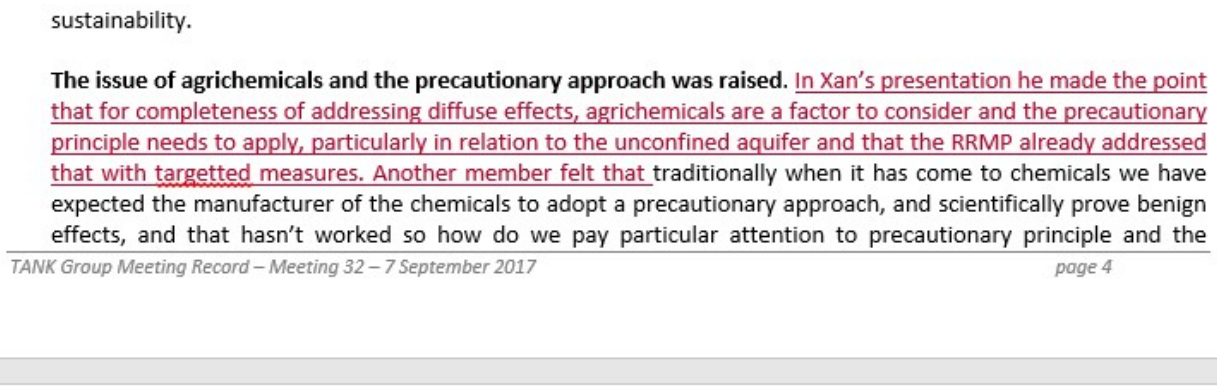
Meeting Record – TANK Group 32

- Matters arising
  - Correction DMP to GMP on p3
  - More context on agrichemicals discussion



sustainability.

The issue of agrichemicals and the precautionary approach was raised. In Xan's presentation he made the point that for completeness of addressing diffuse effects, agrichemicals are a factor to consider and the precautionary principle needs to apply, particularly in relation to the unconfined aquifer and that the RRMP already addressed that with targetted measures. Another member felt that traditionally when it has come to chemicals we have expected the manufacturer of the chemicals to adopt a precautionary approach, and scientifically prove benign effects, and that hasn't worked so how do we pay particular attention to precautionary principle and the

application of chemicals that have been produced by somebody else that have different measurement standards? *This issue is governed by the EPA and the way that they regulate chemicals including what can be brought into the country and what can be applied.*

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Action points

		Person	Status
32.1	Check with Thomas Wilding on what information there is on flows and native fish/birds.	Thomas	On agenda at 18 Oct

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Presentation

1. An overview of plan preparation and review processes
2. Recommendations for reducing contaminant loads into the estuaries
3. Recommendations for freshwater quality state relevant to values
4. Some summary results for modelled nutrient losses
5. A recommendation for further assessment of nutrient loss objectives and options for management

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Setting objectives and limits for water quality

Your decisions today about water quality attribute states will be informed by;

- The impact of contaminants in the Ahuriri and Waitangi Estuaries
- The required freshwater quality state to meet values

NPS-FM requires objectives and limits to be set for freshwater bodies

- ‘Maintain’ or ‘improve’ is the bottom line…

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The Issues:

- Limit setting for surface water quality and estuarine water quality is governed by complex interactions;
  - Relationships are complex;
    - river water quality and estuary water/sediment
    - within freshwater systems
- Impacts on Ahuriri/Waitangi estuaries' ecosystems from nutrients/sediment are not modelled
- Limits can be set for estuary, but how does that relate to land-use in catchment?
- Significant 'lag' in systems, because sediment and nutrients are stored in rivers/estuaries

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Issues

- The interactions between land use activities, mitigation measures and water quality can be;
  - complex
  - location specific and sometimes uncertain
  - not yet completely understood or
  - not accurately quantifiable.

- It is seldom possible to predict the exact outcome of mitigation measures, including timeframes, on attribute states.

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macroinvertebrates, ecosystem health

Dissolved Oxygen

Flow

Temperature

Habitat

Macrophytes

Contaminants

Algae

Nutrients

Sediment

Metabolism

Riparian vegetation

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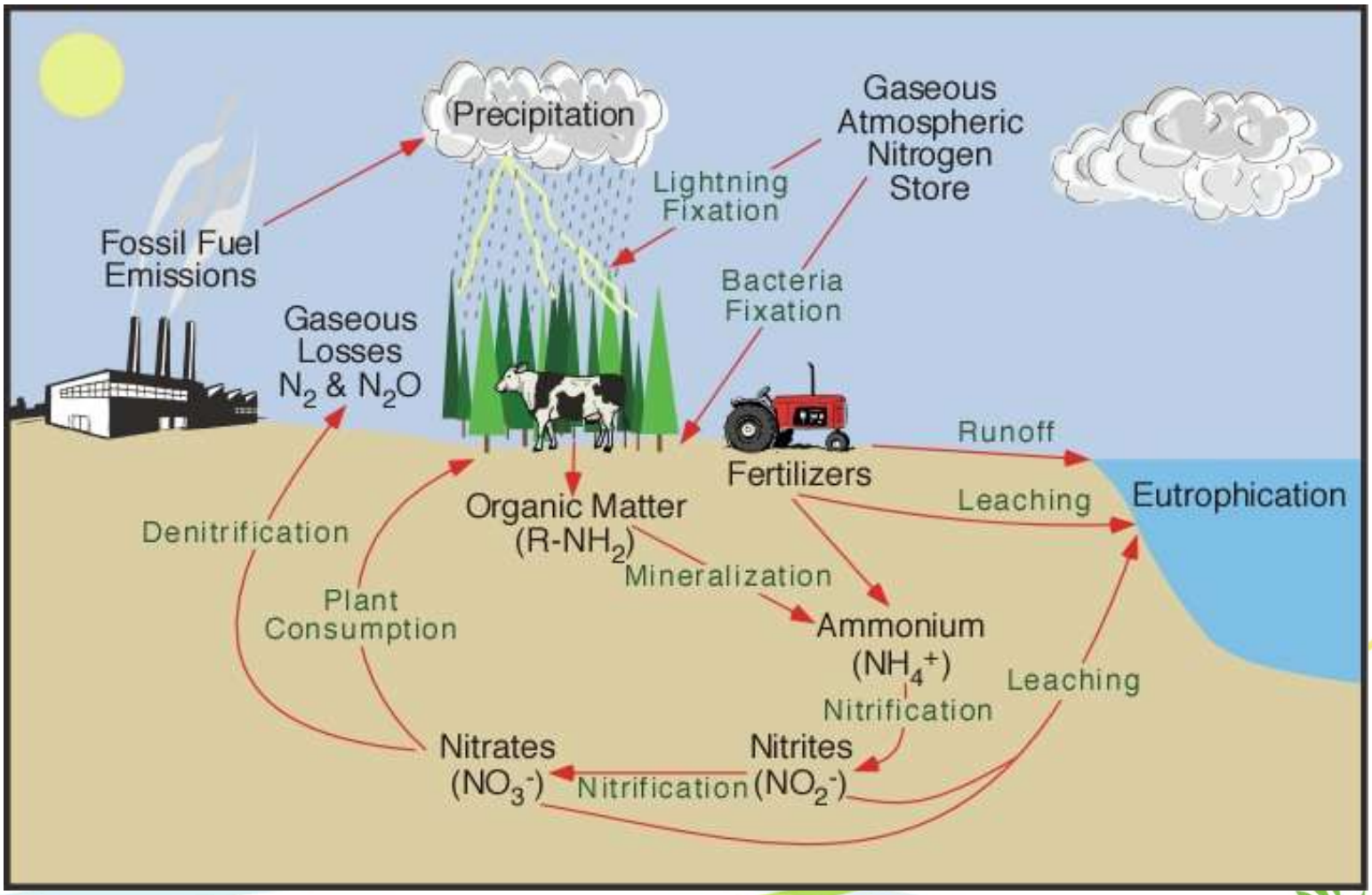

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What we know

The Relationships

Soil conservation and erosion control ➔ reduces soil loss

- improves water clarity & turbidity
- reduces deposited sediment
- improves MCI

Stock exclusion - ➔ riparian vegetation

- reduces bank erosion
- shading reduces macrophyte growth
- reduced macrophyte growth increases oxygen levels
- reduces some contaminants (esp E. coli, sediment, phosphorous

Nutrients - ➔ make plants grow

- too much increases aquatic plant growth (algae/macrophytes)

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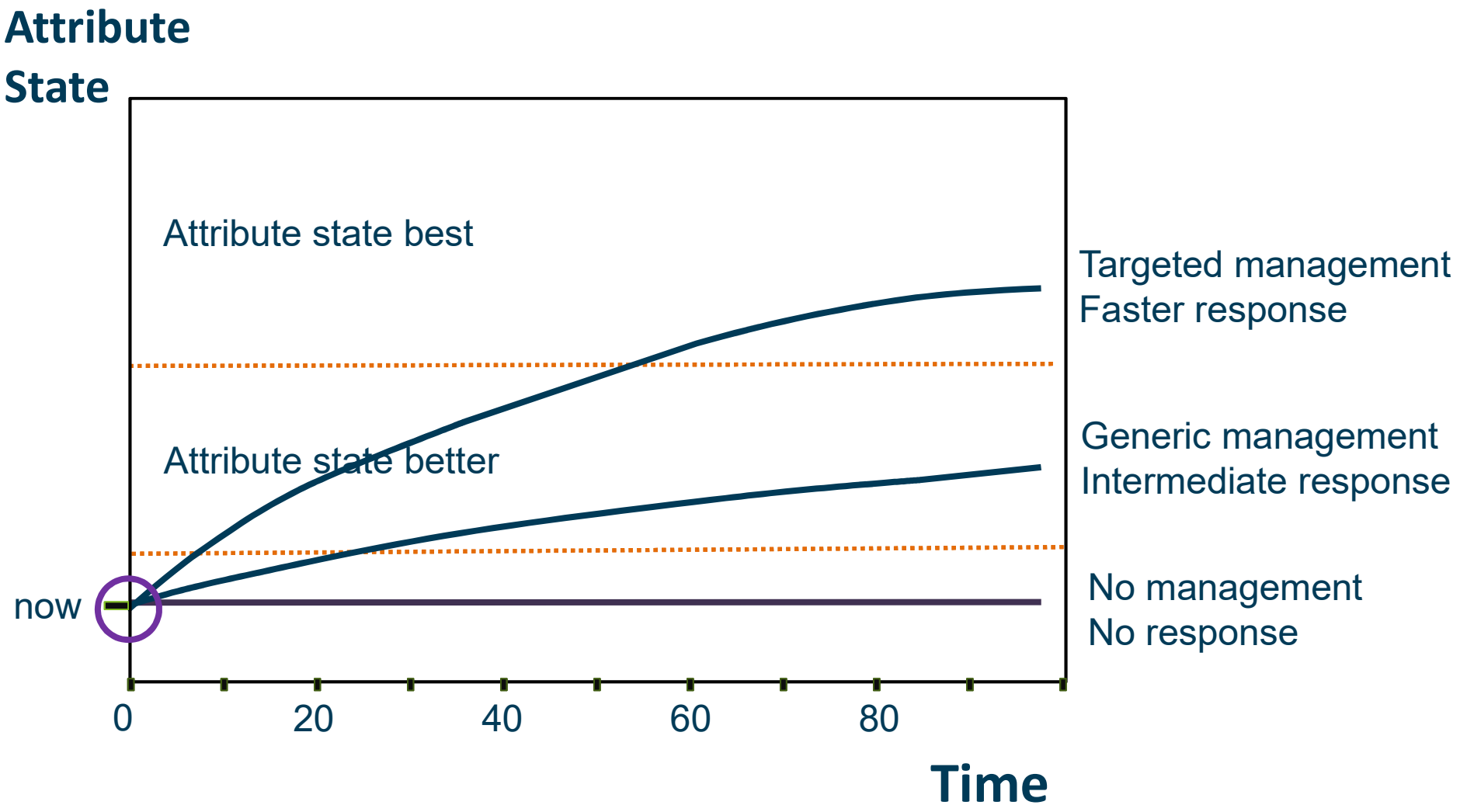
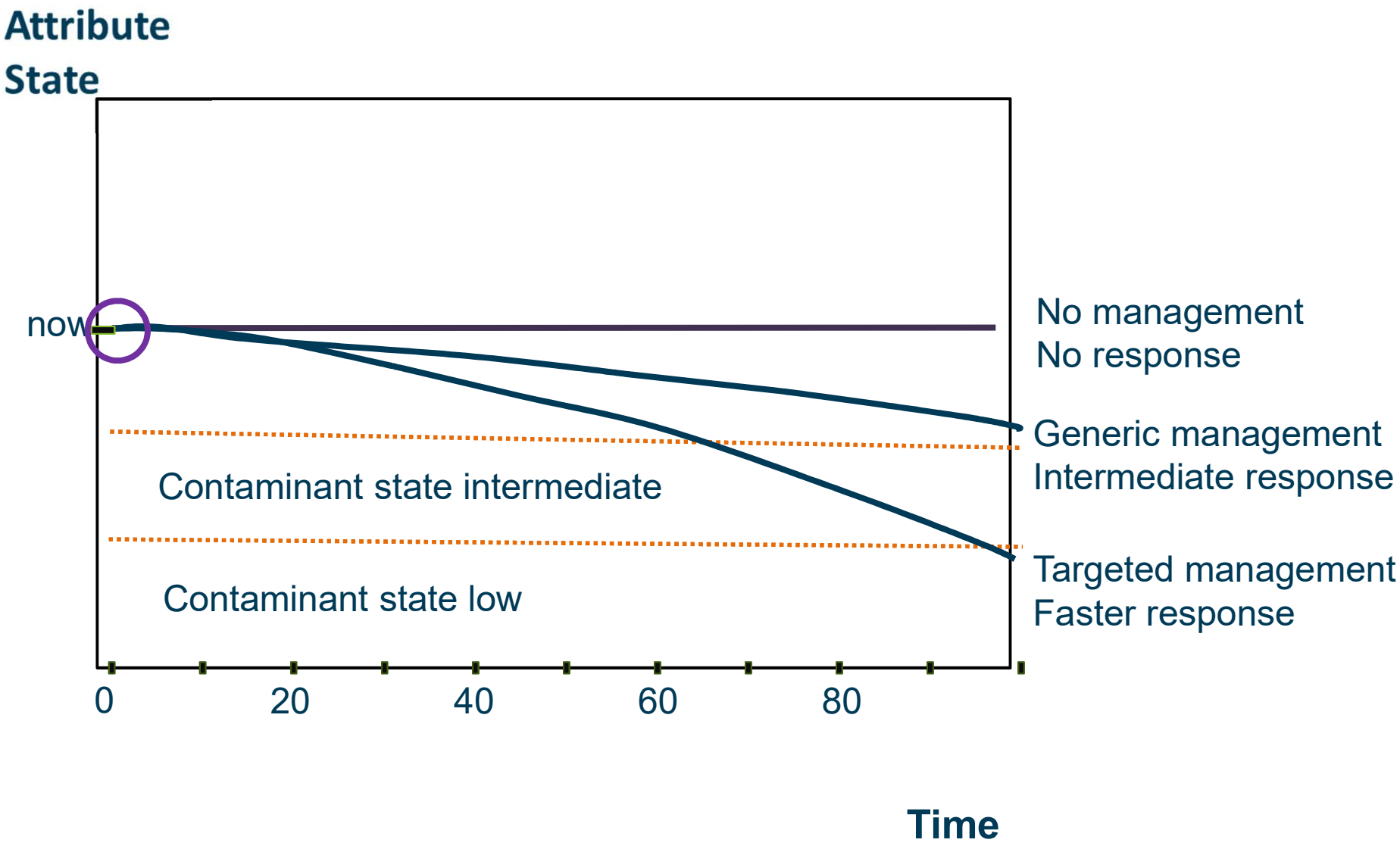
Responses to management



Responses to management



Maintain or Improve

- This means being the same as, or getting better than, previously
- We only know this is happening (and why) when we monitor …
  - Water quality and flows in rivers and the estuaries
  - What land-use activities are occurring
- And understand…(or model)
  - Sediment/nutrient loss from the land
  - How land-use is linked to sediment/nutrient loss rates

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Dealing With Uncertainties

- There are uncertainties in planning for nutrient/ water management:
  - Complex linkages outlined before
  - Targets set for ecosystems may not be achievable technically, but this may not be obvious until later
  - The cost of achieving ecosystem targets may be too high for a community, and this may not be apparent at first

- Adaptive management can help cope with these uncertainties

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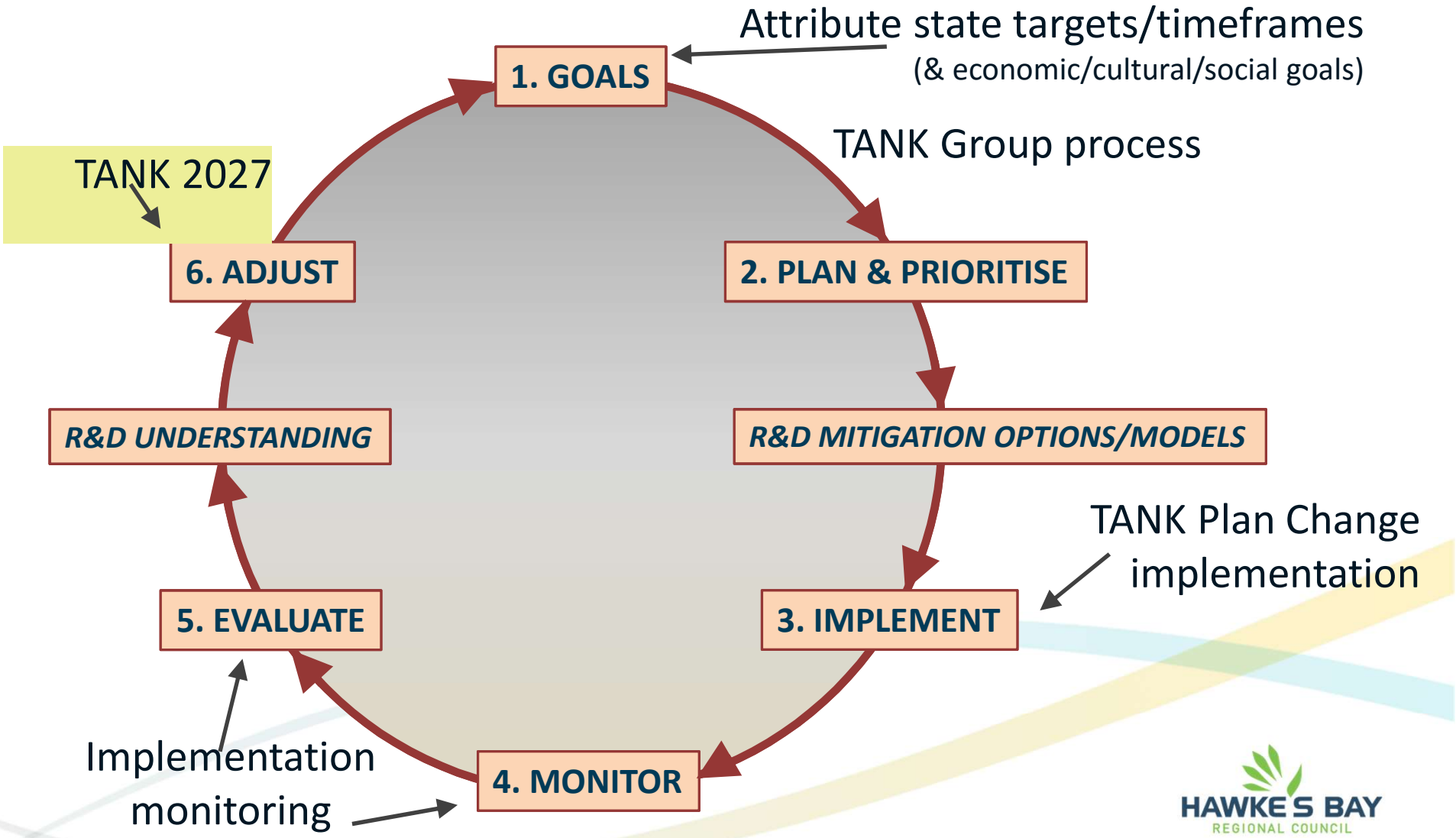
Adaptive Management



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Adaptive Management – Processes

- NPS-FM attribute state targets set
  - Management prioritised by TANK
  - Methodology to be determined by TANK

- Timeframes will take into account economic, cultural, social matters
  - Target or objectives for attribute states could be either proportional changes and/or absolute targets

- Likely focus will be required on significant known relationships and pathways;
    - Stock exclusion
    - Sediment (phosphorus) - Ngaruroro and Tutaekuri
    - Nutrients in Karamu catchment
    - Shading for macrophytes and temperature
    - Stormwater

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Adaptive Management – Processes

- Implement Plan Change – Evaluation of the Plan
  - Implementation monitoring shows if trends as expected after 10 years (life of the Plan)

- Plan review can then decide:
  - Whether existing implementation is meeting/exceeding/falling short of targets (are expected trajectories for improvement being met?)
  - Whether to understand/model linkages in more detail
  - Whether to set different limits

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Decisions required from today

- That contaminant inputs into the estuary be reduced by % for further modelling and assessment
- That freshwater quality objectives be adopted
- That timeframes for reducing nutrient losses and sediment to estuaries be adopted following economic assessment outputs;
  - Further assessment and modelling of mitigations necessary to meet nutrient reduction targets
  - Sediment mitigation/stock exclusion costs are being modelled

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Low risk trigger values for the TANK estuaries

Anna Madarasz-Smith

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Challenge 1 - Nutrient Management

Issues:

1. The total amount of nutrients and sediment (load) entering the Ahuriri and Waitangi Estuaries is in excess of that required for good ecological health.

2. There are currently no water quality guidelines for NZ marine or estuarine waters.

3. We need to focus on reduction in the freshwater inputs to achieve a healthy estuary.
   - Developing estuarine WQ triggers to see how we're performing;
   - Comparing freshwater inputs to ANZECC guidelines;
   - Propose reductions for nutrient input concentrations.

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Challenge 1 - Proposal

Recommendation;

Reduce freshwater contamination inputs to estuary by %

- Adopt proposed estuarine WQ triggers
- Determine reductions based on freshwater inputs compared to ANZECC guidelines;

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Te Whanganui ā Orotu, Ahuriri Estuary

"The most significant wetland along the entire length of the eastern coastline of North Island between East Cape and Wellington" DoC and Ramsar 1996.

Issues are -

- **Too much sediment**
- **Too many nutrients**
- **70% of Napier stormwater**
- **Invasive pests, incl. marine**
- **Declined state**

Pressures stem from the catchment.

Waitangi Estuary

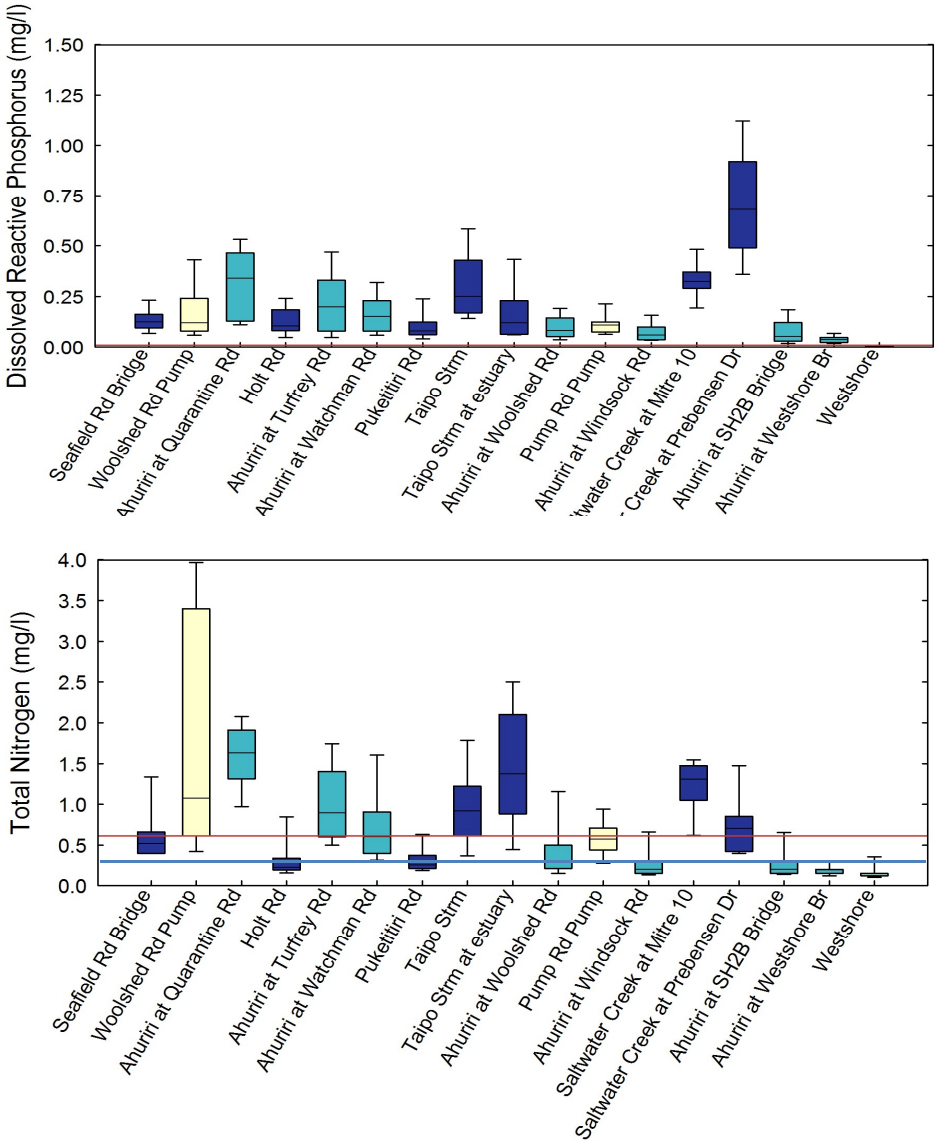
Nationally significant fisheries habitat, recommended area for protection (RAP) within Heretaunga.

Issues are -

- **Too much sediment**
- **Too many nutrients**
- **HDC stormwater**

Pressures stem from the catchment.

What is the evidence of a ‘problem’? - Nutrients



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What level of ecosystem protection should we be looking at?

What is the appropriate level of ecosystem protection?

Condition 1:
High ecological conservation value. Typically unmodified.

Condition 2:
Slightly to moderately disturbed ecosystems

Condition 3:
Highly disturbed ecosystems

RECOMMENDED:
Condition 2.

What are the choices for guideline development?

Biological and ecological effects based	Reference or control site based	Statistical distribution
Known concentrations of contaminants cause known effects	An unimpacted system is used to determine what the 'reference' state should look like.	Where few data are available derive trigger values using 80% percentile values*

*ANZECC 2000 – 3.3.2.4 Preferred approaches to deriving low-risk guideline trigger values

What do we need to make guidelines for?

Causative factor	Response variable
Total nitrogen	Algal growth Eutrophication Oxygen depletion Clarity reduction
Total phosphorus	Algal growth Eutrophication Oxygen depletion Clarity reduction
Sediment load	Increased mudiness Deposition Increased turbidity
Total suspended solids	Increased mudiness Deposition Increased turbidity

Nutrient Management – Proposed Estuarine Guidelines

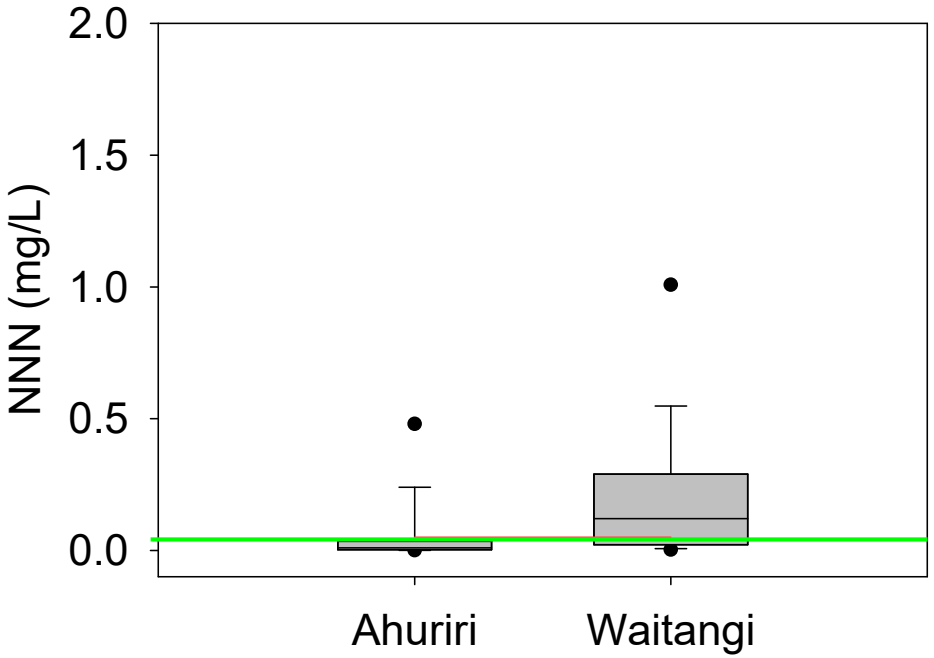
Guideline approach used = 'Best of what's left' *sensu* USEPA

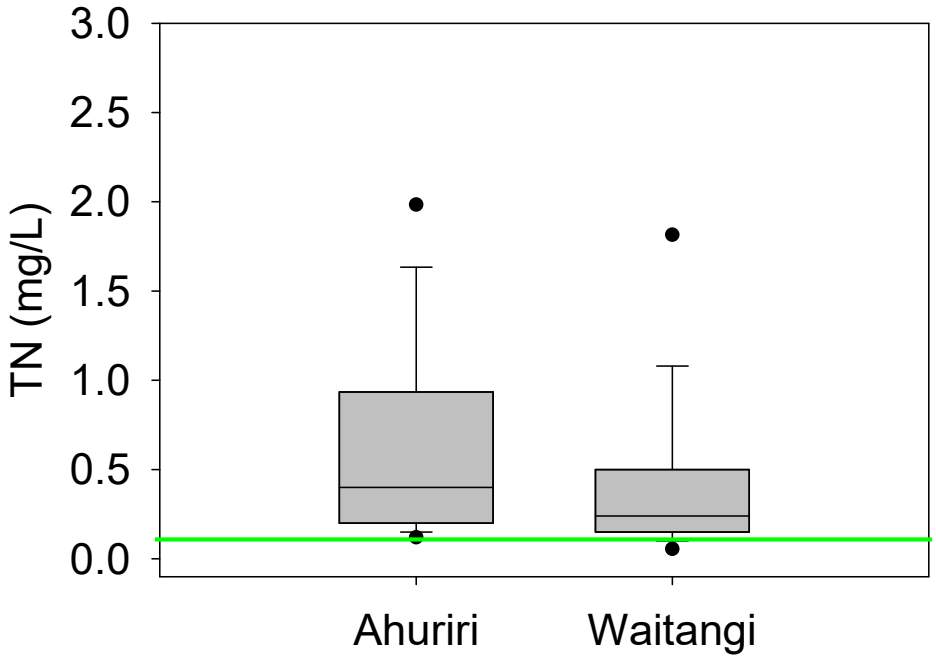
Parameter	Best Site	Proposed G/L	Unit
Total Suspended Solids	Tukituki Est	27	g/m^3
Nitrate + Nitrite Nitrogen	Ahuriri Est	0.05	mg/L
Total Nitrogen	Maungawhio Lgn	0.11	mg/L
Dissolved Reactive Phosphorus	Mohaka Est	0.015	mg/L
Total Phosphorus	Tukituki Est	0.05	mg/L

How does this compare?

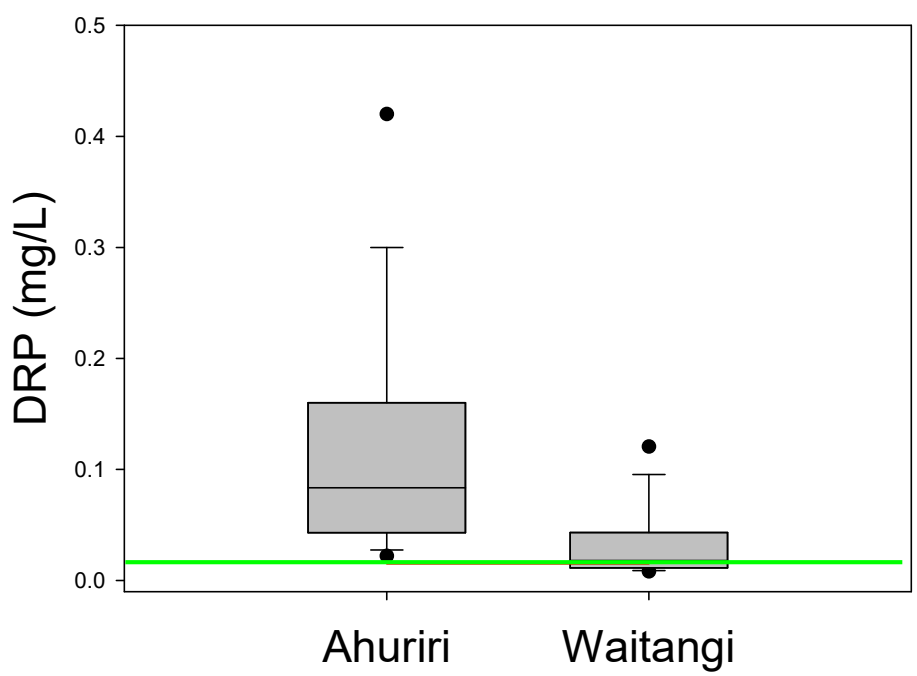
Parameter	TANK Proposed	Northland	OnePlan Horizons
Nitrate + Nitrite Nitrogen (mg/L)	**0.05**	0.048	N/A
Total Nitrogen (mg/L)	**0.11**	0.190	N/A
Dissolved Reactive Phosphorus (mg/L)	**0.015**	0.017	0.015
Total Phosphorus (mg/L)	**0.05**	0.03	N/A

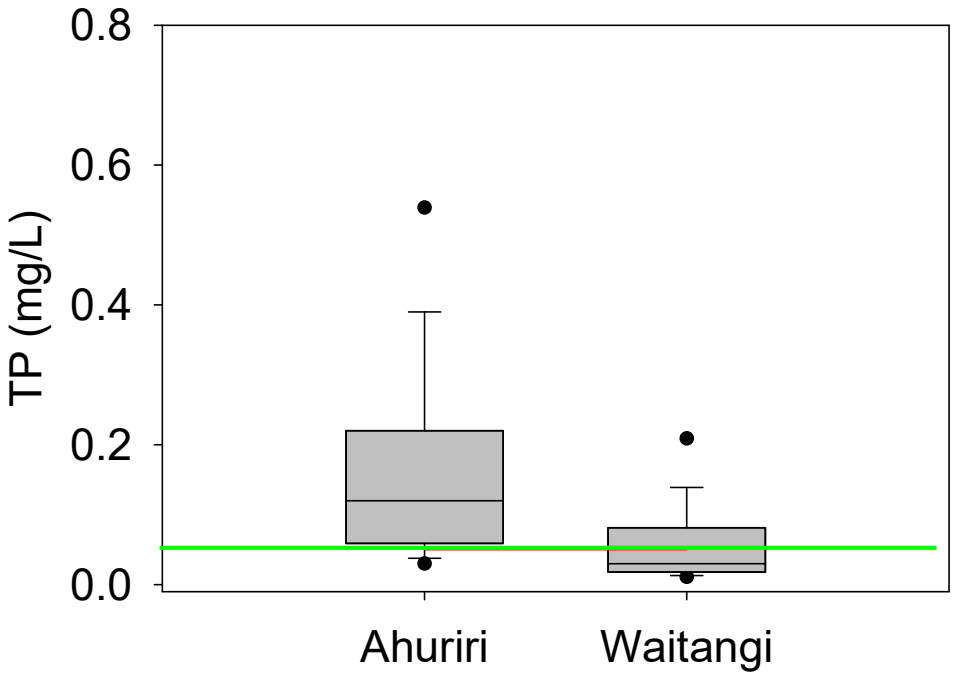
What does this mean for nitrogen?





What does this mean for phosphorus?



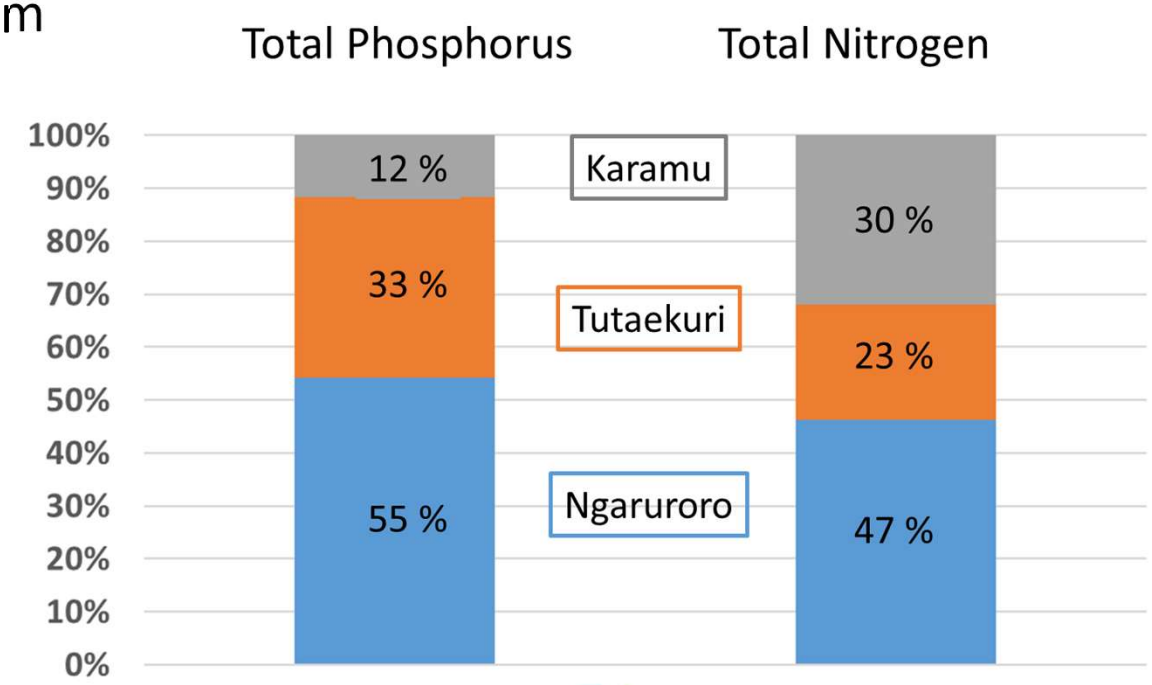


Where are the nutrients coming from? Waitangi

Mean annual average load from Source model:

Total N = 814 tonnes per year
Total P = 101 tonnes per year

Other contaminants? Via stormwater management



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Issues to consider:

- New Zealand has no marine or estuarine guidelines;
- The relationship between freshwater input concentrations and estuarine in-water concentrations is not 1:1;
- The relationship between freshwater nutrient concentration reductions (as a %) and land based mitigations (as a %) are not 1:1.

- This means adaptive management and implementation monitoring are required to determine how we are progressing to our GOAL.

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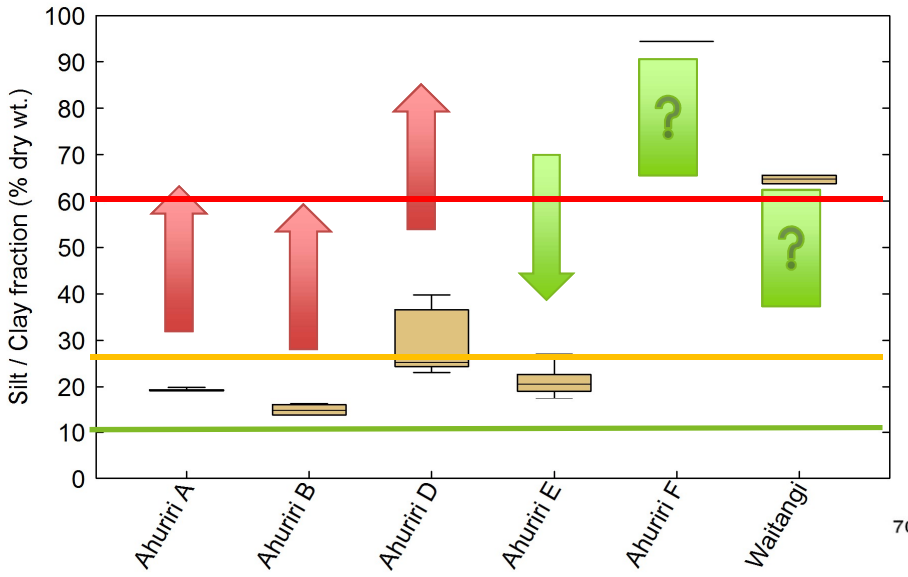
What should we be aiming for upstream nutrient concentrations?

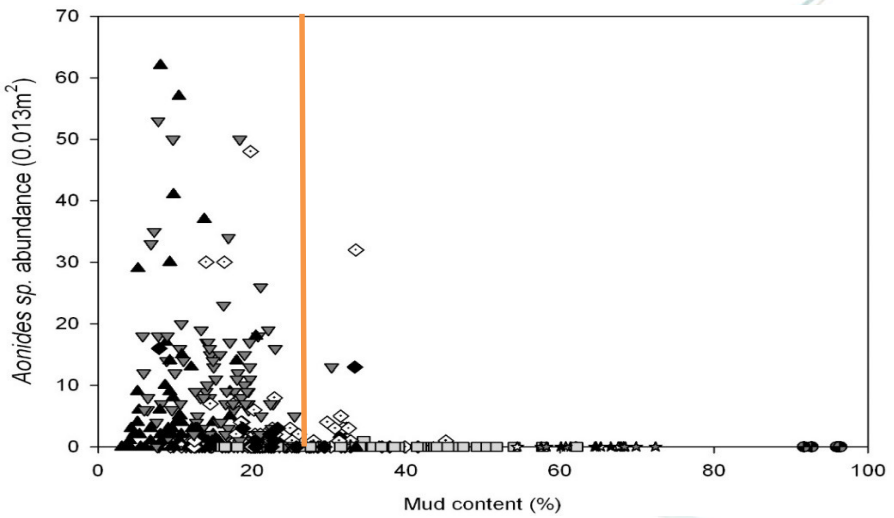
Estuary Freshwaters	Parameter	State (Median)	Guideline (ANZECC Lowland)	% Reduction required to achieve ANZECC	% Reduction recommended
Ahuriri	**NNN**	0.076	0.444	None	
	Total N	0.71	0.614	14%	**14%**
	DRP	0.196	0.01	95%	**30%**
	TP	0.23	0.033	86%	**30%**

What should we be aiming for upstream nutrient concentrations?

Estuary Freshwaters	Parameter	State (Median)	Guideline (ANZECC Lowland)	% Reduction required to achieve ANZECC	% Reduction recommended
Waitangi	**NNN**	0.129	0.444	None but… (>50%)	**30%**
	Total N	0.28	0.614	None but… (46%)	**30%**
	DRP	0.021	0.01	53%	**30%**
	TP	0.035	0.033	6%	**6%**

What is the evidence of a ‘problem’? - Sediments





Sediment Management

Land/Freshwater

- Reduce land erosion by 30%.

Estuarine outcomes

- Mud content at single sites <25% or reducing (<63um);
- No more than 2mm sediment accumulation per year (annual average)

Challenge 1 - Nutrient Management

Issues:

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   - Developing estuarine WQ triggers to see how we're performing;
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Challenge 1 - Proposal

Recommendation;

Reduce freshwater contamination inputs to estuary by recommended %

- Adopt proposed estuarine WQ triggers
- % reductions based on freshwater inputs compared to ANZECC guidelines

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TANK plenary discussion

Decide on objectives for nutrient load reduction to estuaries

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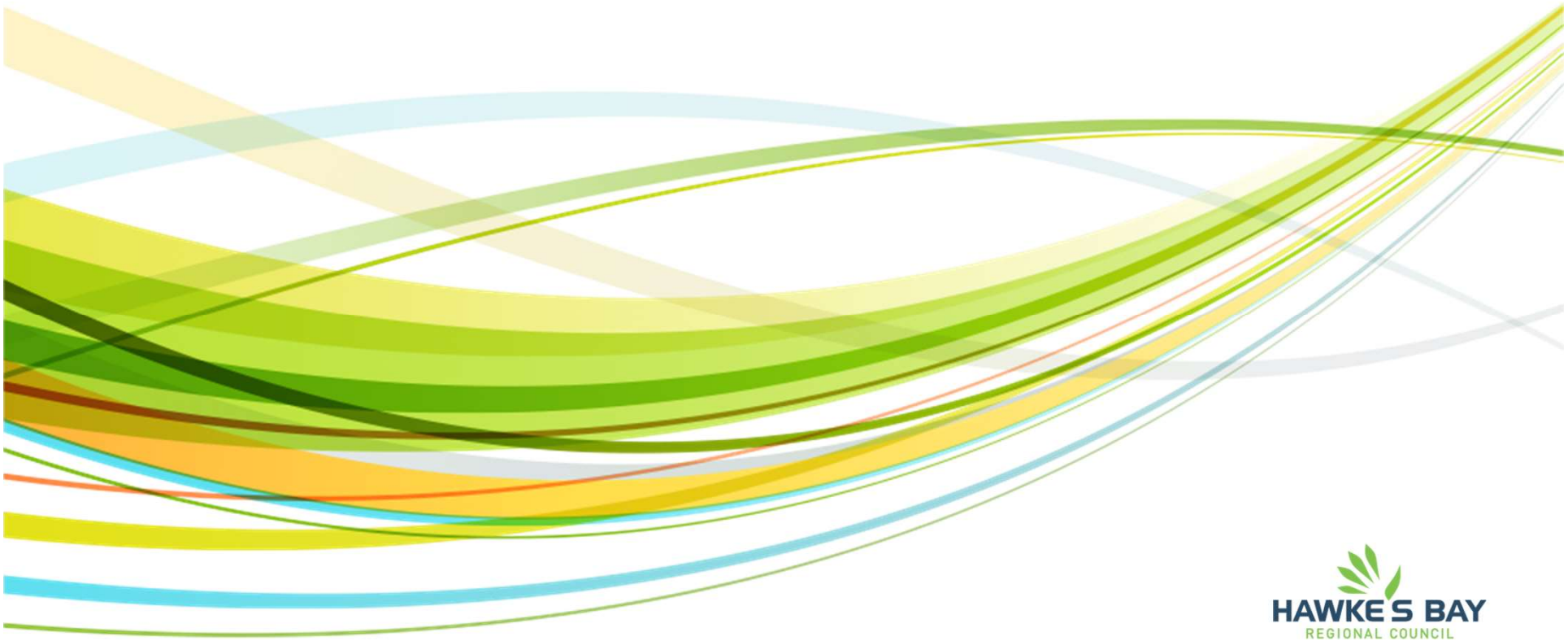
Desired Attribute States



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Challenge 2 Agree Objectives for Water Quality

Issue

We need to decide on the attribute states for water quality.

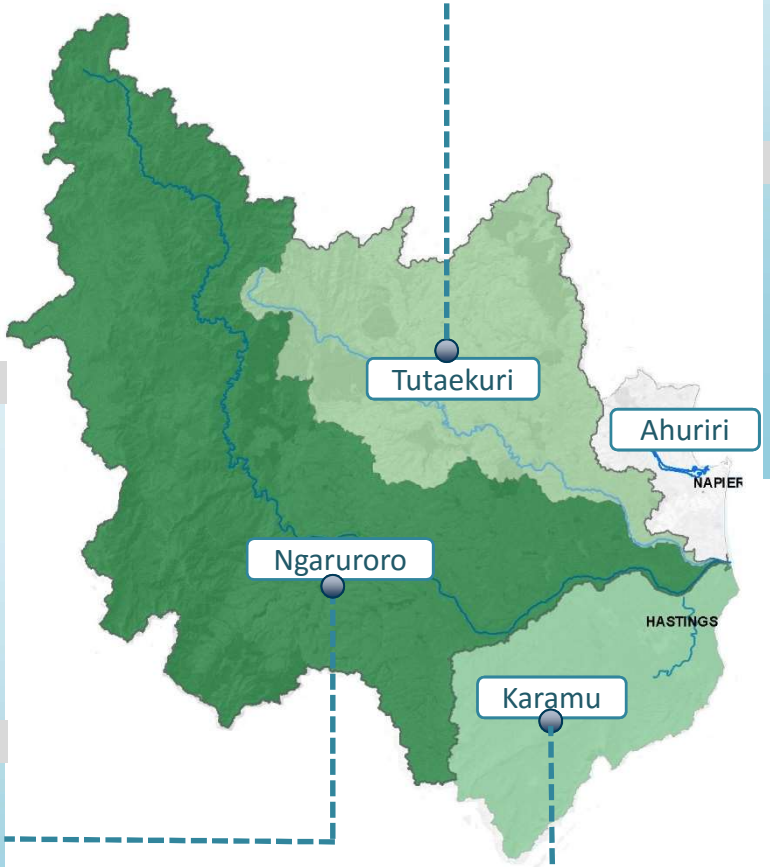
Proposal

We will use water management zones to establish the desired attribute state for similar river types that reflect the identified values.

Principals used in making recommendations for attribute states;

- (It is assumed that) similar management responses will be required for similar river ecosystem types and catchment characteristics
- The recommendations are in relation to meeting specified guideline values where relevant or available.
- Current state is to be maintained unless ….
  - Improvement is required where guidelines show specified values are not being met.
  - Where improvements are necessary, the recommendation is for improvement to the next band – actual timeframes still dependent on economic assessment

The TANK catchments



Tributaries

Medium priority

Med / high priority

Main stem

Medium priority

High priority

Tributaries

Medium priority

Low / med priority

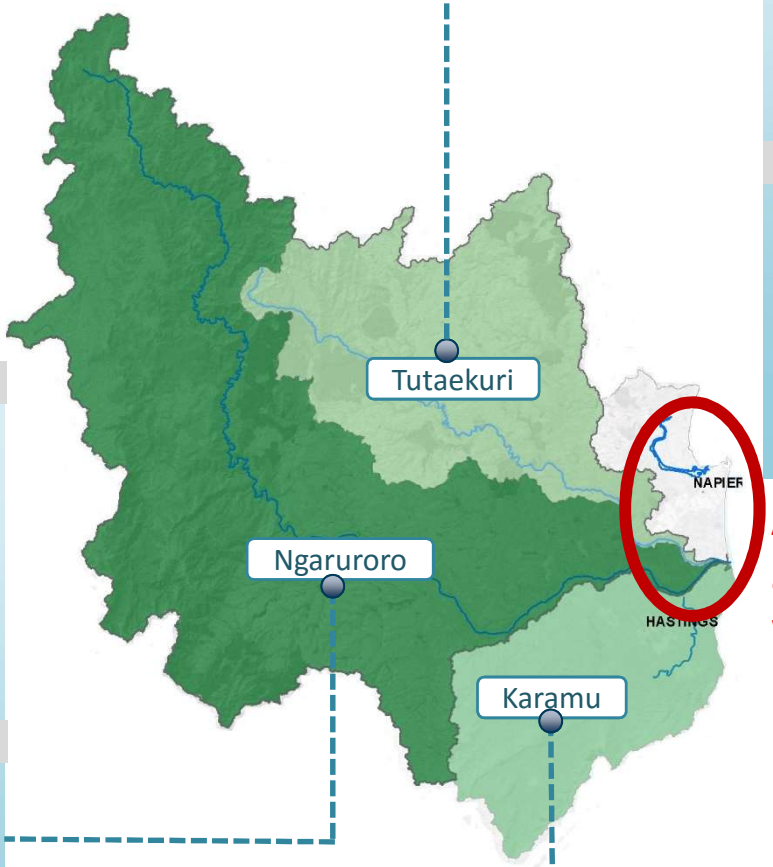
Main stem

Low priority

High priority

Other management for ecosystem health:
High priority

The TANK catchments



Tributaries

Medium priority

Med / high priority

Main stem

Medium priority

High priority

Ahuriri and Waitangi Estuary

!

Tributaries

Medium priority

High priority

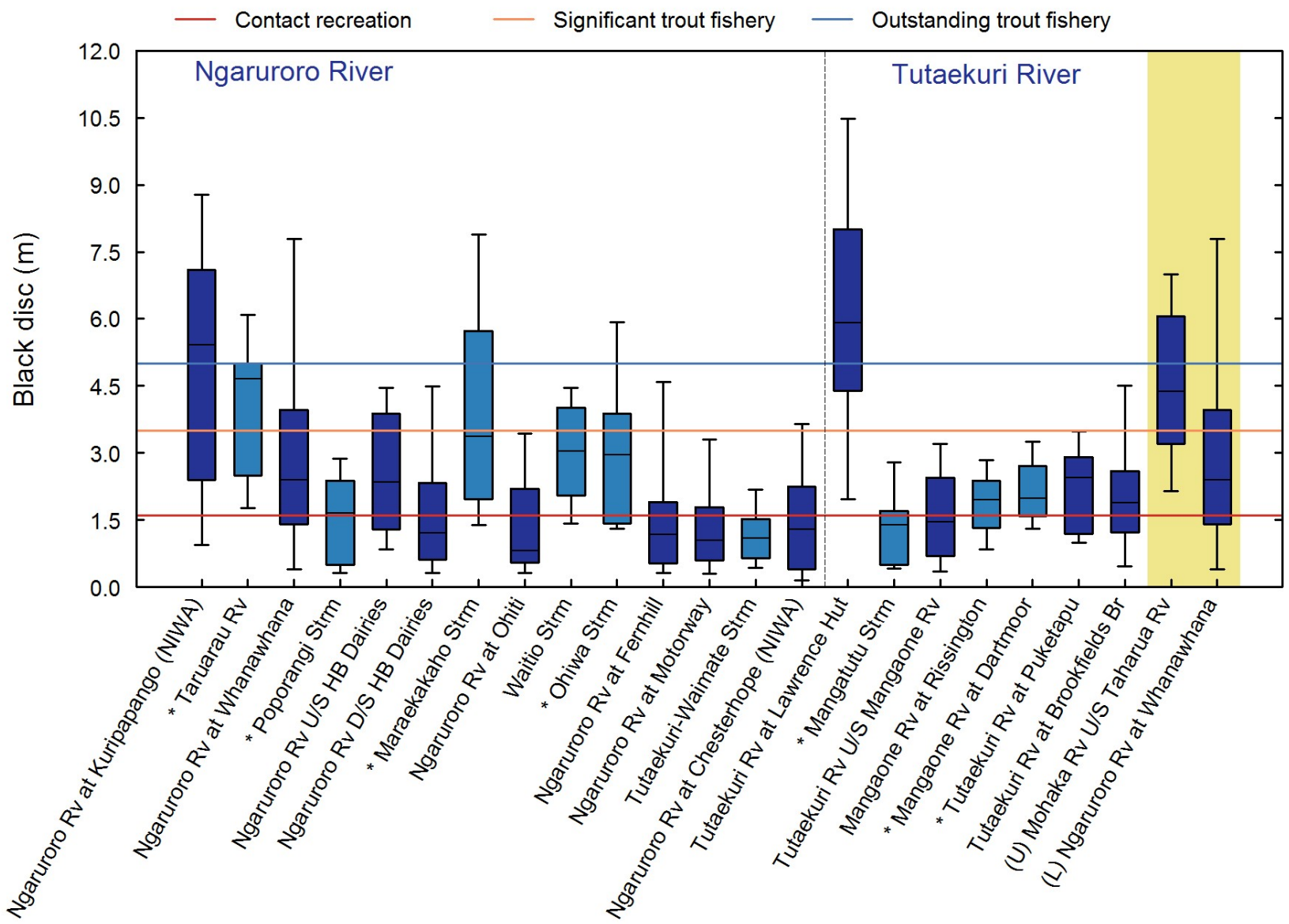
Main stem

Low priority

High priority

Nutrients
High priority

SOE data in relation to guidelines



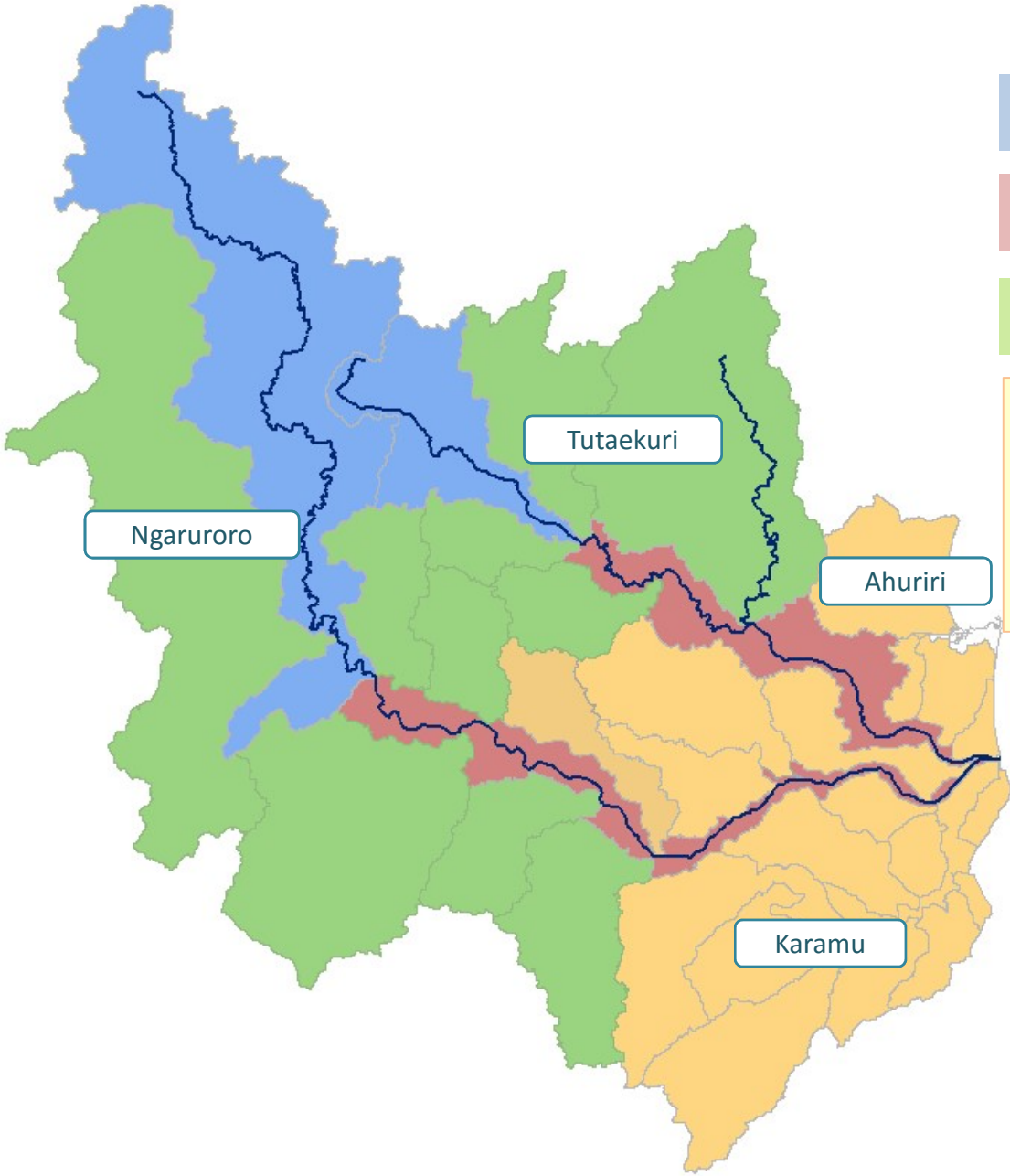
Site name	E.coli	NO_3	Amm-N	Chla	PeriWCC	MPh	DIN	TN	DRP	TP	Bdisk	Turbidity	MCI
Ngaruroro catchment													
Ngaruroro Rv at Kuripapango	A	A	A				A	A	A	A	B	B	excellent
*Taruarau Rv	A	A	A	A	A		A	A	A	A	B	A	excellent
Ngaruroro Rv at Whanawhana	A	A	A	B	B		A	A	A	A	C	B	good
*Poporangi Strm	A	A	A	B	B		D	D	F	C	C	C	good
Ngaruroro Rv U/S HB Dairies	A	A	A	C	A		A	A	A	A	C	B	good
Ngaruroro Rv D/S HB Dairies	A	A	A	B	A		A	A	A	B	D	C	good
*Maraekakaho Strm	A	B	A		F		C	D	F	C	C	B	good
Ngaruroro Rv at Ohiti	A	A	B	B			B	A	A	B	D	D	good
Waitio Strm	B	A	B	B	B		C	C	F	C	C	A	g-f
*Ohiwia Strm	C	A	A				D	D	F	F	C	B	fair
Ngaruroro Rv at Fernhill	A	A	A	B	B		B	B	A	B	D	C	fair
Ngaruroro Rv at Motorway	A	A	A	B	B		B	B	A	B	D	C	g-f
Tutaekuri-Waimate Strm	B	A	A				C	C	F	F	E	C	fair
Ngaruroro Rv at Chesterhope NIWA	A	A	A				B	B		C	D	C	good
Waitangi Estuary Ngaruroro arm				M_algae			B	B	D	C		E	
Tutaekuri catchment													
Tutaekuri Rv at Lawrence Hut	A	A	A	A	A		A	A	A	A	A	A	excellent
*Mangatutu Strm	A	A	A		D		C	C	F	B	D	B	good
Tutaekuri Rv U/S Mangaone Rv	A	A	B	B	A		B	B	D	B	D	B	good
Mangaone Rv at Rissington	A	A	A	B	A		C	C	F	C	C	A	good
*Mangaone Rv at Dartmoor	A	A	A				B	B	F	D	C	A	good
*Tutaekuri Rv at Puketapu	A	A	A	C	A		B	B	E	B	C	A	fair
Tutaekuri Rv at Brookfields Br	A	A	A	D	A		B	B	E	B	C	B	fair
Waitangi Estuary Tuaekuri arm				M_algae			B	B	E	D		D	
Karamu catchment													
Ruahapia Strm	C	A	B				D	D	F	F	E	C	poor
Karewarewa Strm	C	C	C				E	F	F	F	D	C	poor
Awanui Strm	B	B	B				E	F	F	F	D	B	poor
Poukawa Strm	A	A	A				C	F	F	F	D	A	poor
Herehere Strm	D	B	A				C	D	F	F	C	C	poor
Mangarau Strm at Keirunga Rd	B	A	A	D			B	C	F	F	E	C	fair
Mangarau Strm at Te Aute Rd	B	B	A	C			F	F	F	F	E	B	poor
Clive Rv	B	B	A				D	D	F	F	D	B	poor
Waitangi Estuary Clive arm				M_algae			C	C	F	F		C	

Decisions the group has made on priorities

Ngaruroro	Toxicity Ammonia	Toxicity Nitrate	E.coli	Sediment	Algae / MPh	MCI
upper Ngaruroro	✓	✓	✓	✓	✓	✓
mid Ngaruroro	✓	✓	✓	medium	✓	✓
Lower Ngaruroro	✓*	✓	✓	medium/ high	✓	medium
Hill tributaries	✓	✓*	✓	medium/ high	medium/ high	✓
Lowland tributaries	✓*	✓	high	medium/ high	N/A	medium/ high
Waitangi estuary	N/A	N/A		high		N/A
	*investigate significance of B Band (low priority)					

Tutaekuri	Toxicity Ammonia	Toxicity Nitrate	E.coli	Sediment	Algae / MPh	MCI
Upper Tutaekuri	✓	✓	✓	✓	✓	✓
Mid Tutaekuri	✓	✓	✓	medium	✓	✓
Lower Tutaekuri main stem	✓	✓	✓	medium/ high	medium/ high	medium/ high
Tutaekuri tributaries	✓	✓	✓	medium	medium	medium

Water Quality & Ecology Zones



Zone 1. Upper catchments

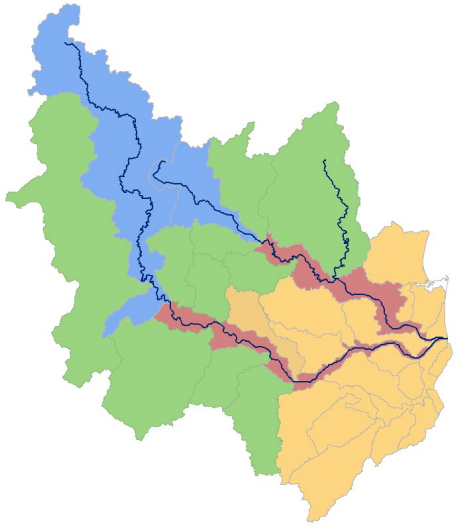
Zone 2. Main stem

Zone 3. Hill country tributaries

Zone 4. Lowland tributaries

- Karamu
- Lower Ngaruroro tributaries
- Ahuriri

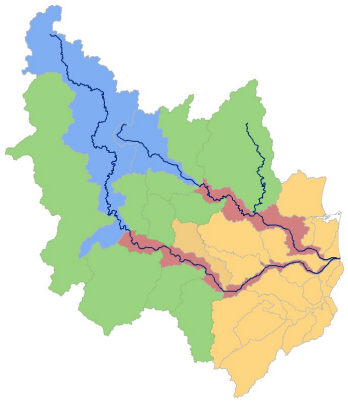
Summary on desired states



Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**
Deposited sediment	Waitangi/Ahuriri estuaries	maintain current	maintain current	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**
Algae - cover	Ecosystem health	maintain current	maintain current	maintain current	maintain current	**improve ≤ 40%**	maintain **≤ 40%**	n/a	n/a	n/a
Algae - cover	Recreation	maintain current	maintain current	**improve < 30%**	**improve < 30%**	**improve < 30%**	**improve < 30%**	n/a	n/a	n/a
Macrophyte volume	Ecosystem health	maintain current	maintain current	n/a	n/a	**improve ≤ 50%**	n/a	**improve ≤ 50%**	**improve ≤ 50%**	**improve ≤ 50%**
MCI	Ecosystem health	maintain current	maintain current	maintain current **>100**	maintain current **>100**	maintain current	maintain current	maintain current >80	**improve ≥80**	**improve ≥80**
DIN	Algal growth/ estuary	maintain current	maintain current	maintain current	maintain current	**improve <0.295** mg/L	**improve <0.295** mg/L	**improve <0.444** mg/L	**improve <0.444** mg/L	**improve <0.444** mg/L
DRP	Algal growth/ estuary	maintain current	maintain current	maintain current	maintain current	maintain current	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L

Attributes: State and Objective

Turbidity: trout fishery, ANZECC GL



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	turbidity (NTU) (median; at flow < median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	≤ 0.5									
Significant trout fishery	> 0.5 to ≤ 0.7									
upland (ANZECC)	> 0.7 to ≤ 4.1									
lowland (ANZECC)	> 4.1 to ≤ 5.6									
	> 5.6									
maintain / improve?										

clear

turbid

Below guidelines

✓ Maintain

↑ Improve

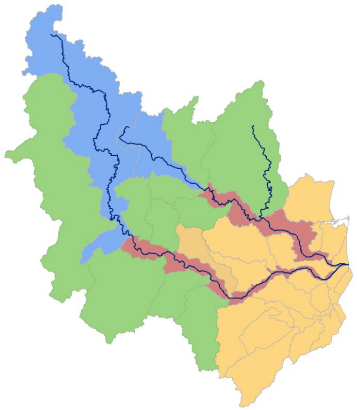
Applicable guideline for defined value

Applicable guideline not met

Value not identified for management unit

Attributes: State and Objective

Turbidity: trout fishery, ANZECC GL



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	turbidity (NTU) (median; at flow < median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	≤ 0.5	0.5								
Significant trout fishery	> 0.5 to ≤ 0.7		0.6							
upland (ANZECC)	> 0.7 to ≤ 4.1									
lowland (ANZECC)	> 4.1 to ≤ 5.6									
	> 5.6									
recommended	maintain / improve?	✓	✓							

clear

turbid

Below guidelines

✓ Maintain

↑ Improve

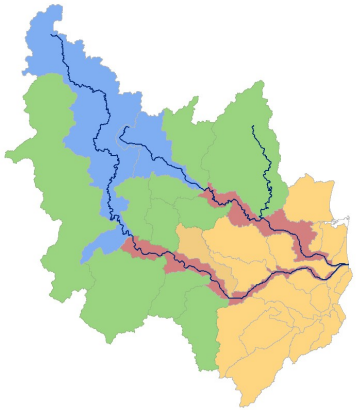
Applicable guideline for defined value → check

Applicable guideline not met

Value not identified for management unit

Attributes: State and Objective

Turbidity: trout fishery, ANZECC GL



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	turbidity (NTU) (median; at flow < median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	≤ 0.5	0.5								
Significant trout fishery	> 0.5 to ≤ 0.7		0.6							
upland (ANZECC)	> 0.7 to ≤ 4.1			2.1	2.2					
lowland (ANZECC)	> 4.1 to ≤ 5.6			5.2	2.7					
	> 5.6									
maintain / improve?		✓	✓	✓						

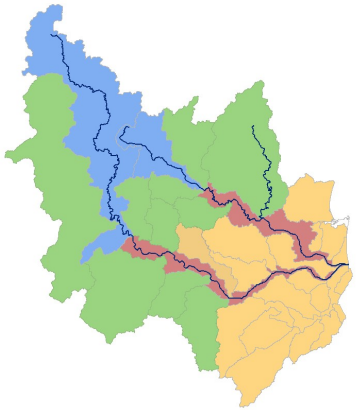
clear

turbid

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Turbidity: trout fishery, ANZECC GL



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	turbidity (NTU) (median; at flow < median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	≤ 0.5	0.5								
Significant trout fishery	> 0.5 to ≤ 0.7		0.6			0.6				
upland (ANZECC)	> 0.7 to ≤ 4.1			2.1	2.2	2.1	2			
lowland (ANZECC)	> 4.1 to ≤ 5.6			5.2	2.7		2.8			
	> 5.6									
maintain / improve?		✓	✓	✓		✓				

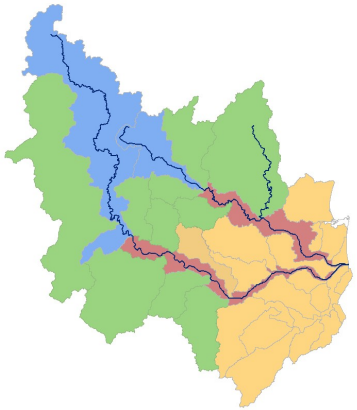
clear

turbid

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Turbidity: trout fishery, ANZECC GL



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	turbidity (NTU) (median; at flow < median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	≤ 0.5	0.5								
Significant trout fishery	> 0.5 to ≤ 0.7		0.6			0.6				
upland (ANZECC)	> 0.7 to ≤ 4.1			2.1	2.2	2.1	2	1.2	1.5	
lowland (ANZECC)	> 4.1 to ≤ 5.6			5.2	2.7		2.8	5.1	4	
	> 5.6									5.8
recommended	maintain / improve?	✓	✓	✓		✓		✓		↑

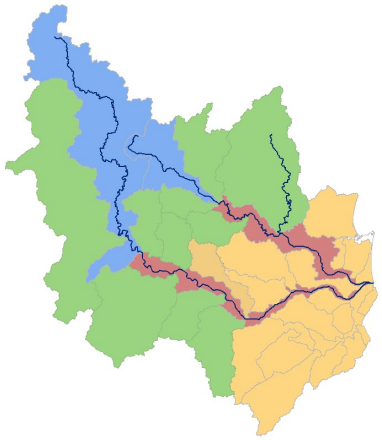
clear

turbid

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Clarity: trout fishery, recreation



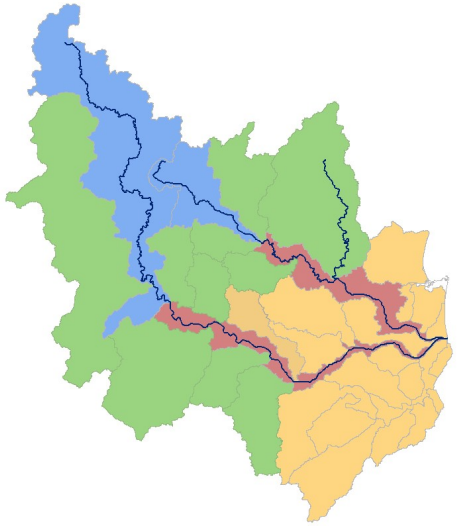
	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	Clarity Black Disc (m)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Outstanding trout fishery	> 5	7.6	6.3			5.7				
Significant trout fishery	> 3.5 to 5			4.2 2.2						
RRMP recreation	> 1.6 to 3.5				2.7	2.1	2.3	3.5	2.5	
	< 1.6							1.5	1.3	0.6
	maintain / improve?	✓	✓	✓		✓		↑		

clear

turbid

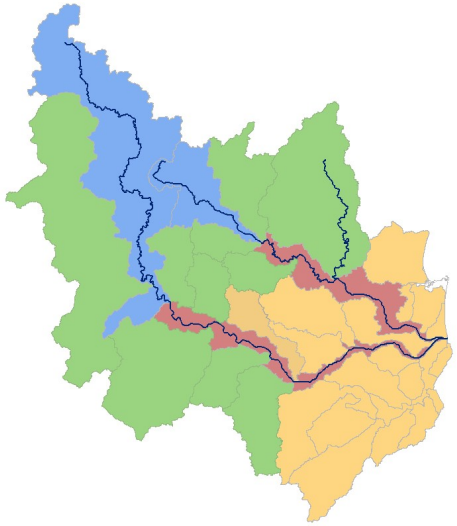
- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Summary on desired states



Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**

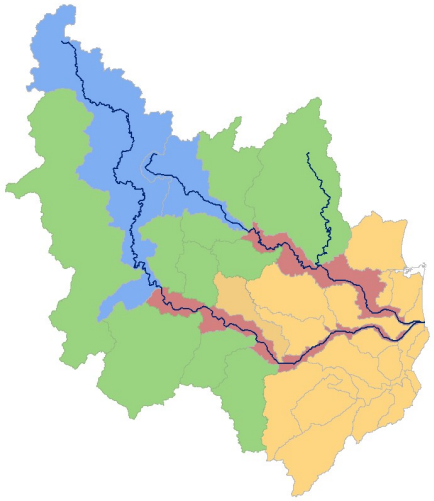
Summary on desired states



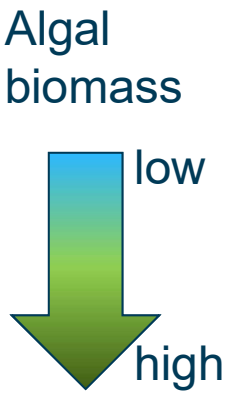
Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**
Deposited sediment	Waitangi/Ahuriri estuaries	maintain current	maintain current	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**

Attributes: State and Objective

NPS NOF algal biomass



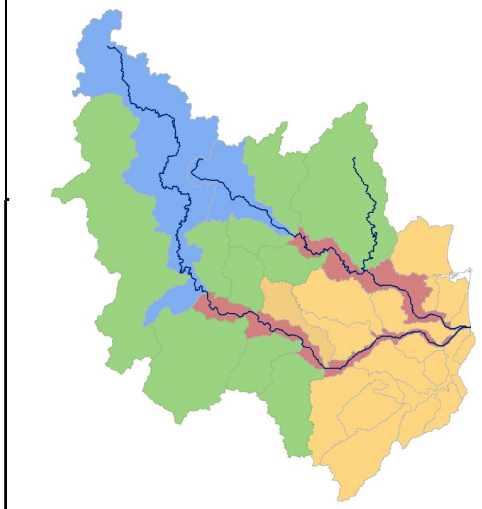
	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem	
	Bloom magnitude and frequency*	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low
Excellent	≤ 50			*	
Good	> 50 and ≤120				
Fair	> 120 and ≤200				
Poor	>200				
	maintain / improve?	✓	✓	✓	



- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Algal cover: Ecosystem health



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries	
	Periphyton Cover (%PeriWCC)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri
Excellent	≤ 20						
Good	> 20 and ≤ 40						
Fair	> 40 and ≤ 55						
Poor	>55						
maintain / improve?		✓	✓	✓		↑	

Algal cover

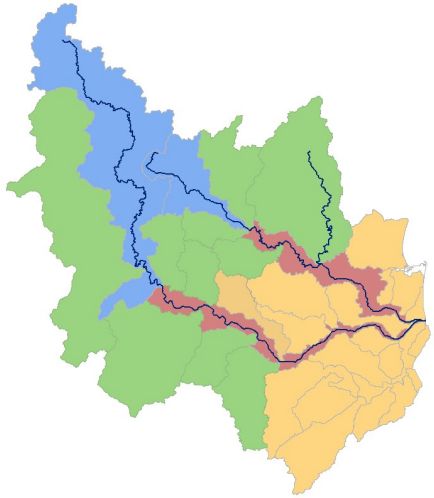
low

high

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Algal cover: Recreation



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries	
	Periphyton Cover (%PeriWCC)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri
below algal cover threshold	≤ 30						
above algal cover threshold	> 30						
maintain / improve?		✓	✓	↑		↑	

Algal cover

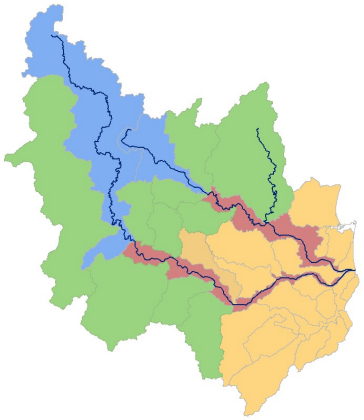
low

high

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Attributes: State and Objective

Macrophyte volume: Ecosystem health



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	Macrophyte CAV (% cross-section area/volume)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Trout fishery values	≤ 30 %									
Ecological condition	30 to ≤ 50 %									
Poor	> 50%									
maintain / improve?		N/A	N/A	N/A	N/A	↑	N/A	↑		

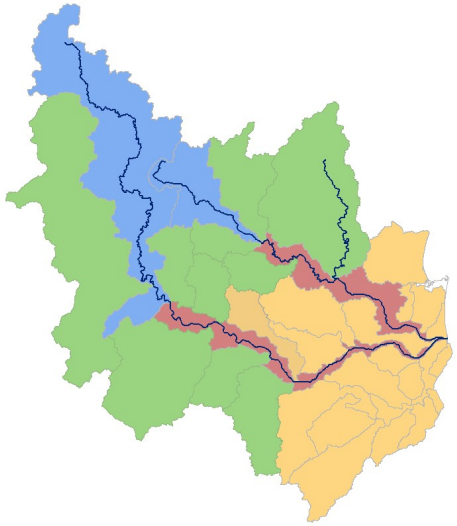
MPh volume

low

high

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

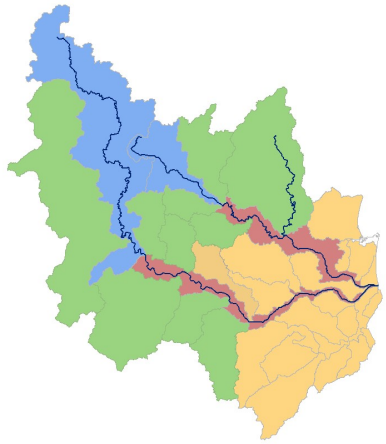
Summary on desired states



Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**
Deposited sediment	Waitangi/Ahuriri estuaries	maintain current	maintain current	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**
Algae - cover	Ecosystem health	maintain current	maintain current	maintain current	maintain current	**improve ≤ 40%**	maintain **≤ 40%**	n/a	n/a	n/a
Algae - cover	Recreation	maintain current	maintain current	**improve < 30%**	**improve < 30%**	**improve < 30%**	**improve < 30%**	n/a	n/a	n/a
Macrophyte volume	Ecosystem health	maintain current	maintain current	n/a	n/a	**improve ≤ 50%**	n/a	**improve ≤ 50%**	**improve ≤ 50%**	**improve ≤ 50%**

Attributes: State and Objective

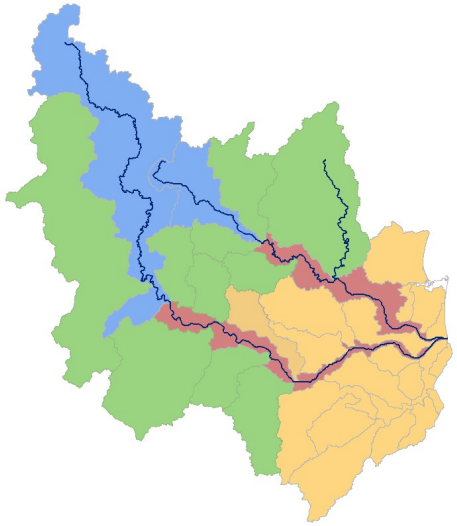
MCI: Ecosystem health



Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
MCI	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Excellent ≥120	130	128							
Good ≥ 100 and < 120			116	107	108	116			
Fair ≥ 80 and < 100			97	87			99	87	
Poor < 80								68	67
maintain / improve?	✓	✓	✓↑		✓			↑	↑

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Summary on desired states



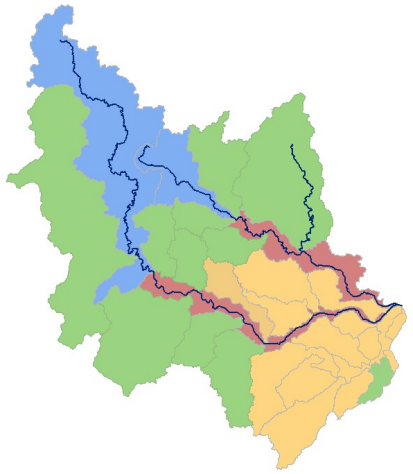
Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**
Deposited sediment	Waitangi/Ahuriri estuaries	maintain current	maintain current	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**
Algae - cover	Ecosystem health	maintain current	maintain current	maintain current	maintain current	**improve ≤ 40%**	maintain **≤ 40%**	n/a	n/a	n/a
Algae - cover	Recreation	maintain current	maintain current	**improve < 30%**	**improve < 30%**	**improve < 30%**	**improve < 30%**	n/a	n/a	n/a
Macrophyte volume	Ecosystem health	maintain current	maintain current	n/a	n/a	**improve ≤ 50%**	n/a	**improve ≤ 50%**	**improve ≤ 50%**	**improve ≤ 50%**
MCI	Ecosystem health	maintain current	maintain current	maintain current **>100**	maintain current **>100**	maintain current	maintain current	maintain current >80	**improve ≥80**	**improve ≥80**

Management variables: DIN (algal growth)

	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	DIN concentration (mg/L) (median)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Periphyton 30 day accrual	< 0.075			0.044						
ANZECC upland trigger	< 0.167			0.044	0.155-		0.6*			
Periphyton 20 day accrual	< 0.295			0.134				0.247		
ANZECC lowland trigger	< 0.444									
	> 0.444									
maintain / improve?		✓	✓	✓		↑		↑		

- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit

Management variables: DRP (algal growth)



	Numeric attribute state	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
	DRP concentration (mg/L)	Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Periphyton 20 day accrual	< 0.0026									
ANZECC upland trigger	< 0.009									
ANZECC lowland trigger	< 0.01									
RRMP	< 0.015									
	> 0.015				●	●	●	●	●	●
maintain / improve?		✓	✓		↑	↑		↑		

● Below guidelines

✓ Maintain

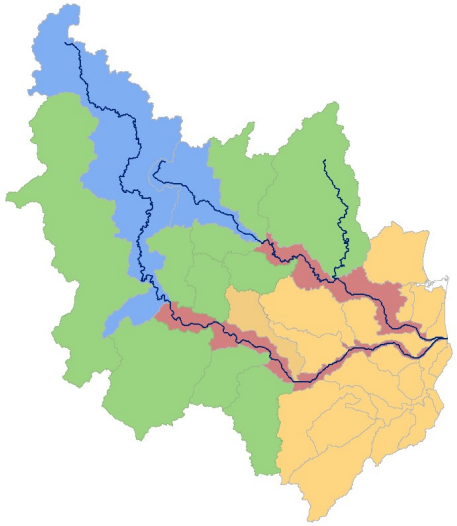
↑ Improve

Applicable guideline for defined value

Applicable guideline not met

Value not identified for management unit

Summary on desired states



Attribute	Value/guideline	Zone 1 Upper catchments		Zone 2 Mid-low main stem		Zone 3 Hill country tributaries		Zone 4 Lowland tributaries		
		Ngaruroro	Tutaekuri	Ngaruroro mid - low	Tutaekuri mid - low	Ngaruroro	Tutaekuri	Ngaruroro	Karamu	Ahuriri
Sediment - turbidity	Trout fishery ANZECC	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve ≤ 5.6 NTU**
Sediment - clarity	Trout fishery recreation	maintain current	maintain current	maintain current	maintain current	maintain current	maintain current	**improve >1.6 m**	**improve >1.6 m**	**improve >1.6 m**
Deposited sediment	Waitangi/Ahuriri estuaries	maintain current	maintain current	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**	**improve**
Algae - cover	Ecosystem health	maintain current	maintain current	maintain current	maintain current	**improve ≤ 40%**	maintain **≤ 40%**	n/a	n/a	n/a
Algae - cover	Recreation	maintain current	maintain current	**improve < 30%**	**improve < 30%**	**improve < 30%**	**improve < 30%**	n/a	n/a	n/a
Macrophyte volume	Ecosystem health	maintain current	maintain current	n/a	n/a	**improve ≤ 50%**	n/a	**improve ≤ 50%**	**improve ≤ 50%**	**improve ≤ 50%**
MCI	Ecosystem health	maintain current	maintain current	maintain current **>100**	maintain current **>100**	maintain current	maintain current	maintain current >80	**improve ≥80**	**improve ≥80**
DIN	Algal growth/ estuary	maintain current	maintain current	maintain current	maintain current	**improve <0.295** mg/L	**improve <0.295** mg/L	**improve <0.444** mg/L	**improve <0.444** mg/L	**improve <0.444** mg/L
DRP	Algal growth/ estuary	maintain current	maintain current	maintain current	maintain current	maintain current	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L	**improve <0.0.15** mg/L

TANK Discussion

Do you agree with the proposed objectives for attribute states?

If not, what else do you propose and why?

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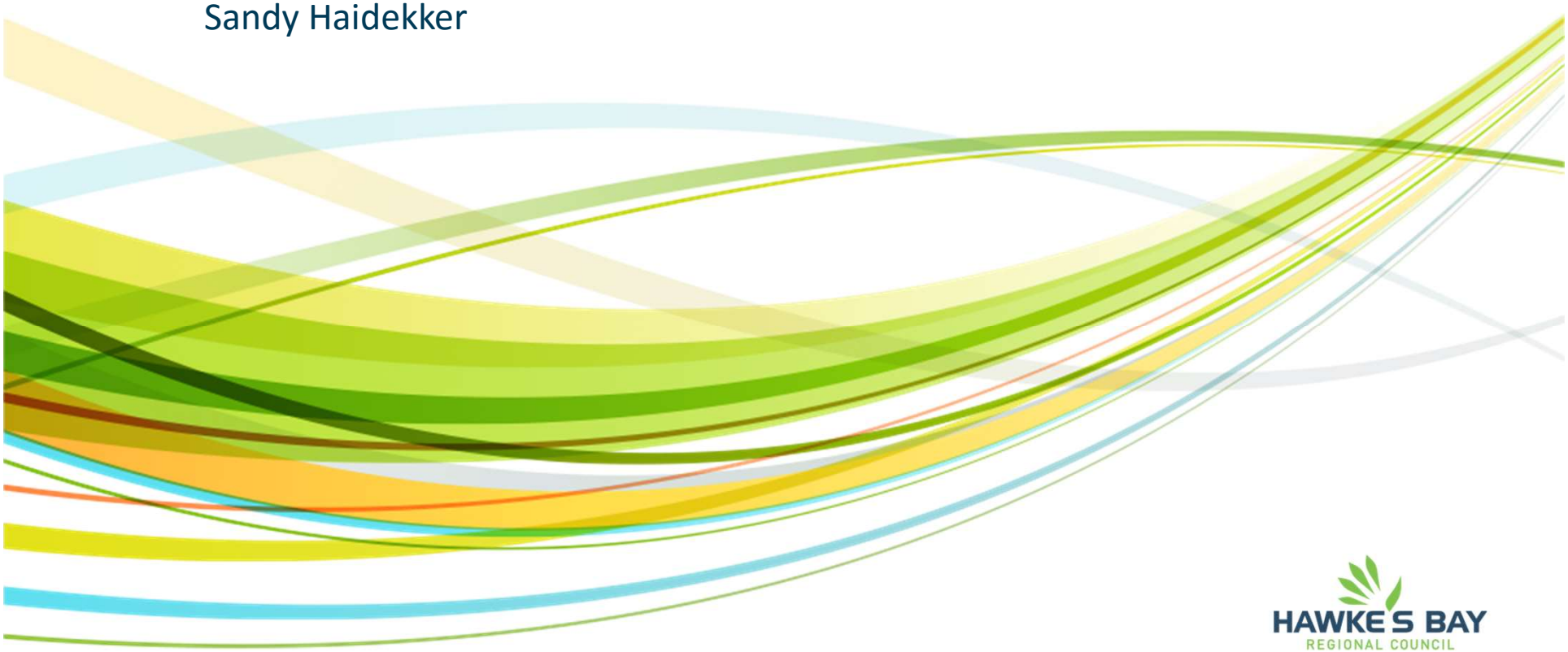
Understanding nutrient SOURCES

Presentation of modelling results showing nutrient and sediment sources

Sandy Haidekker



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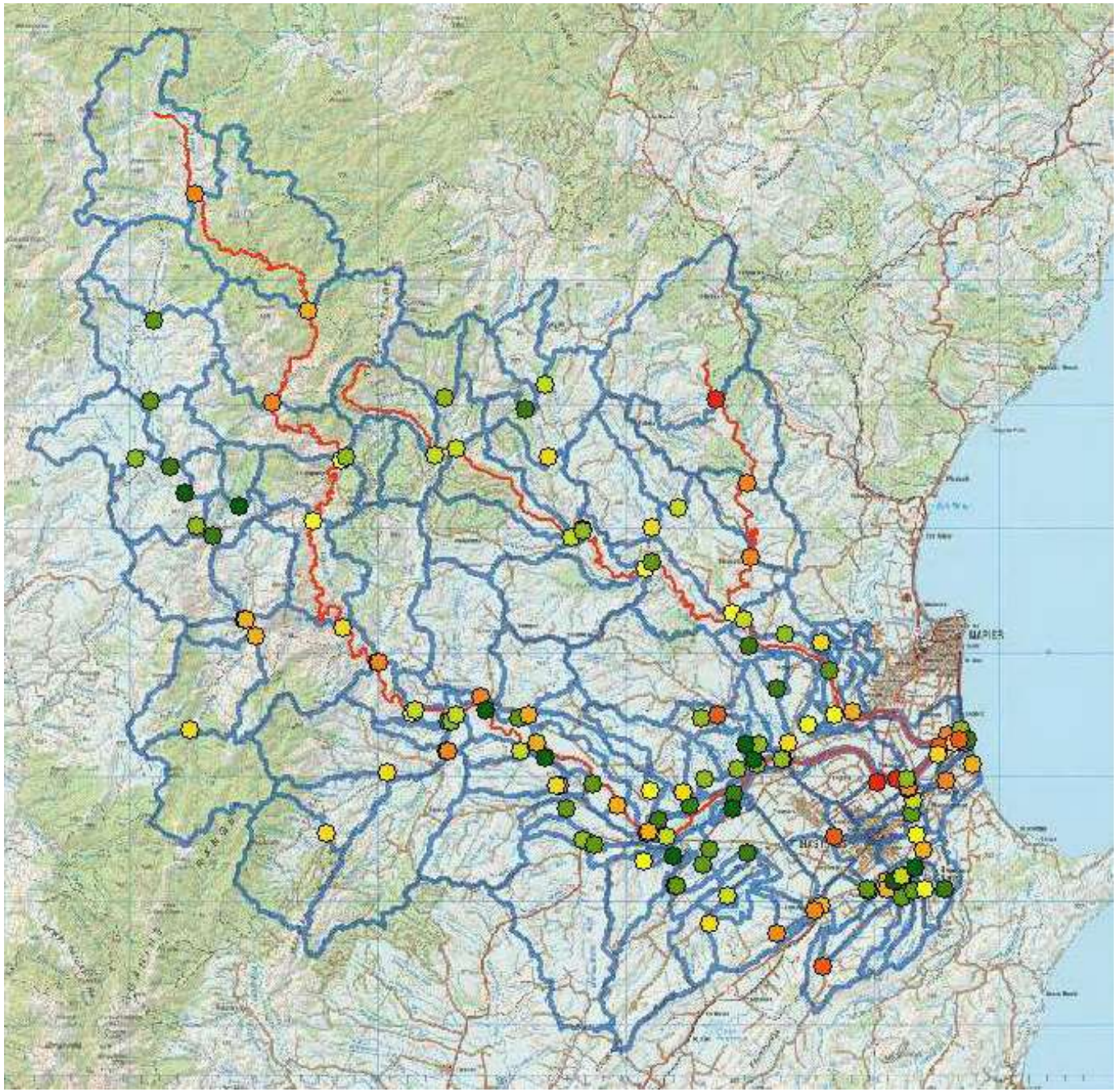
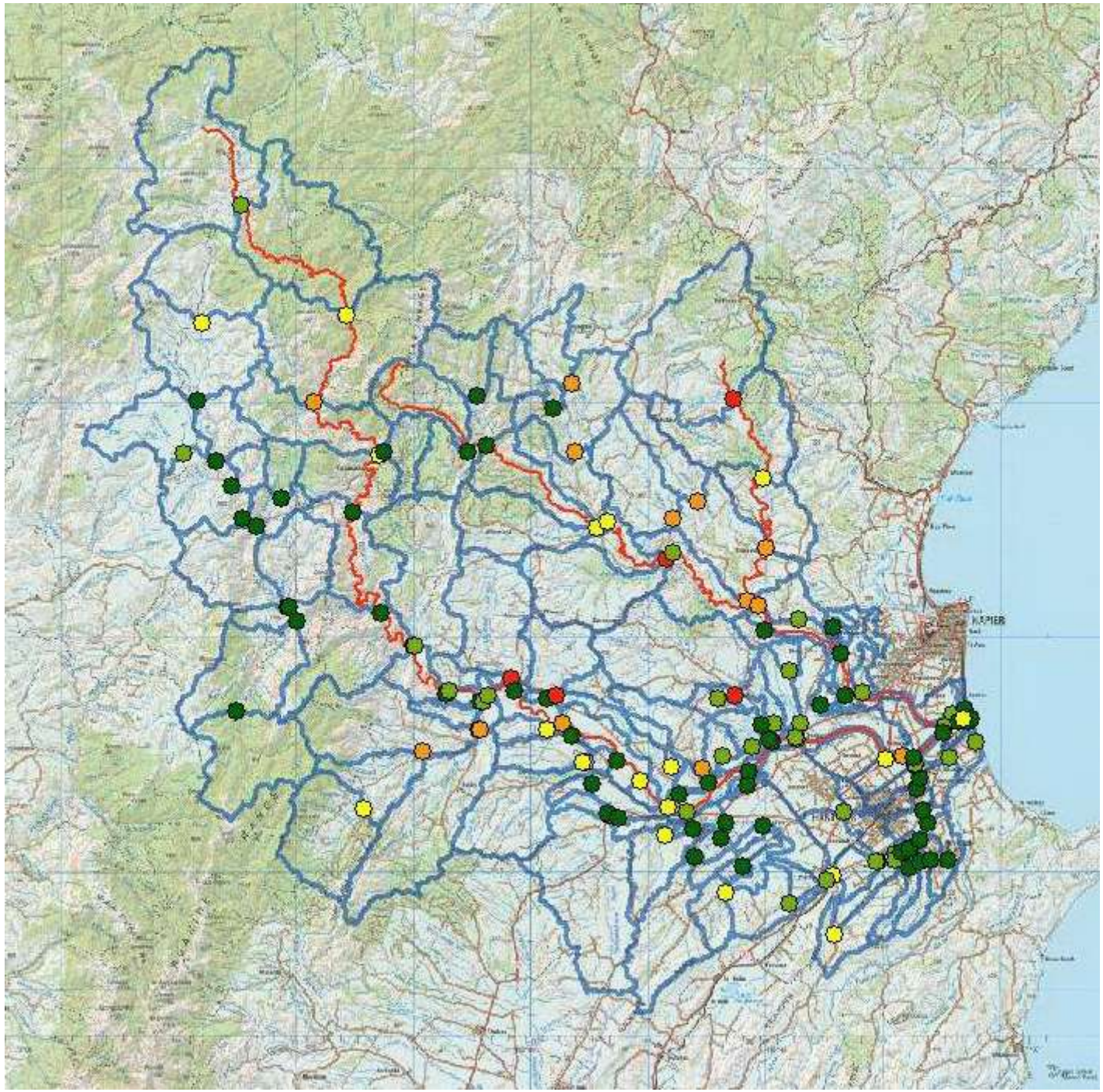
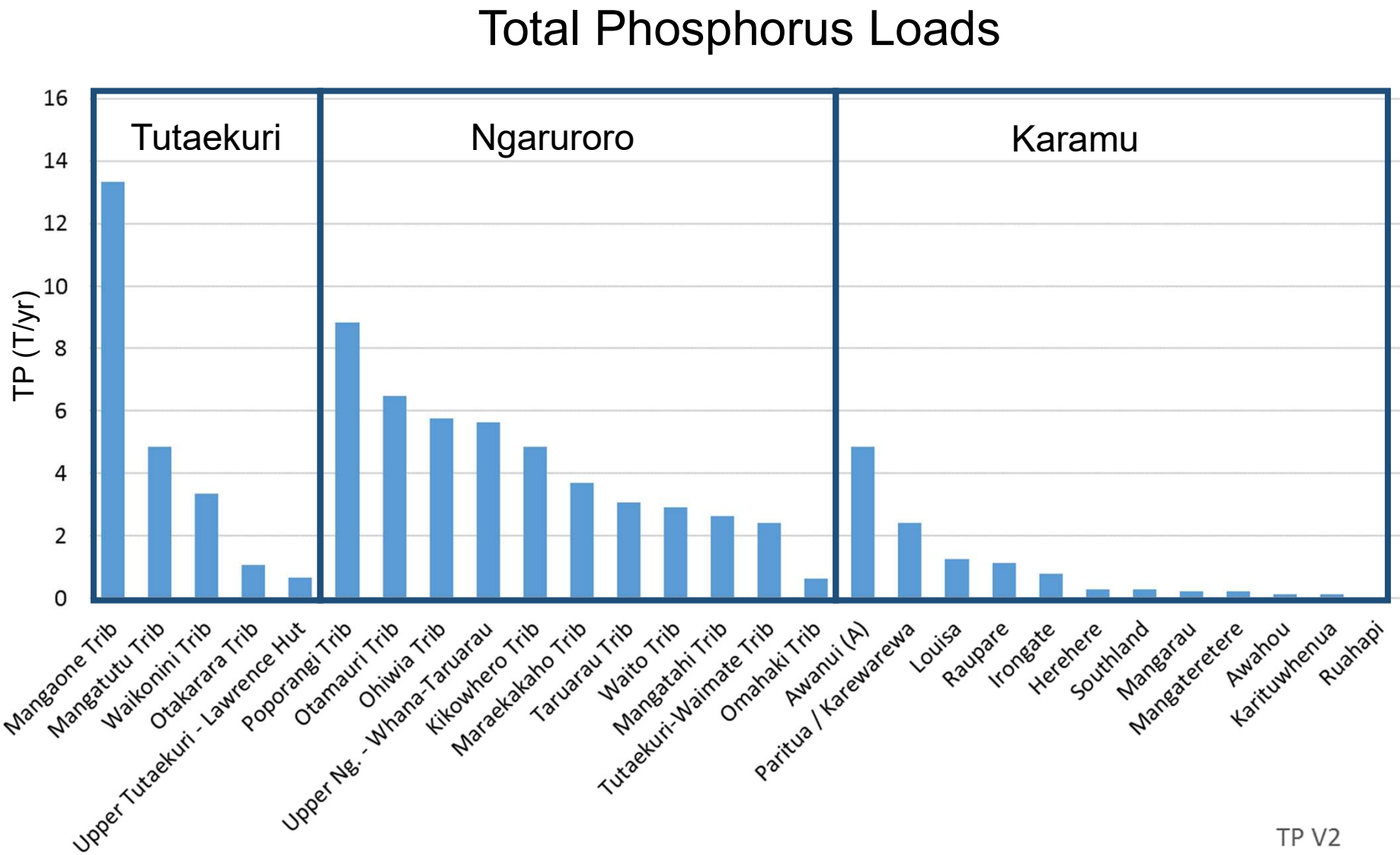
TN load



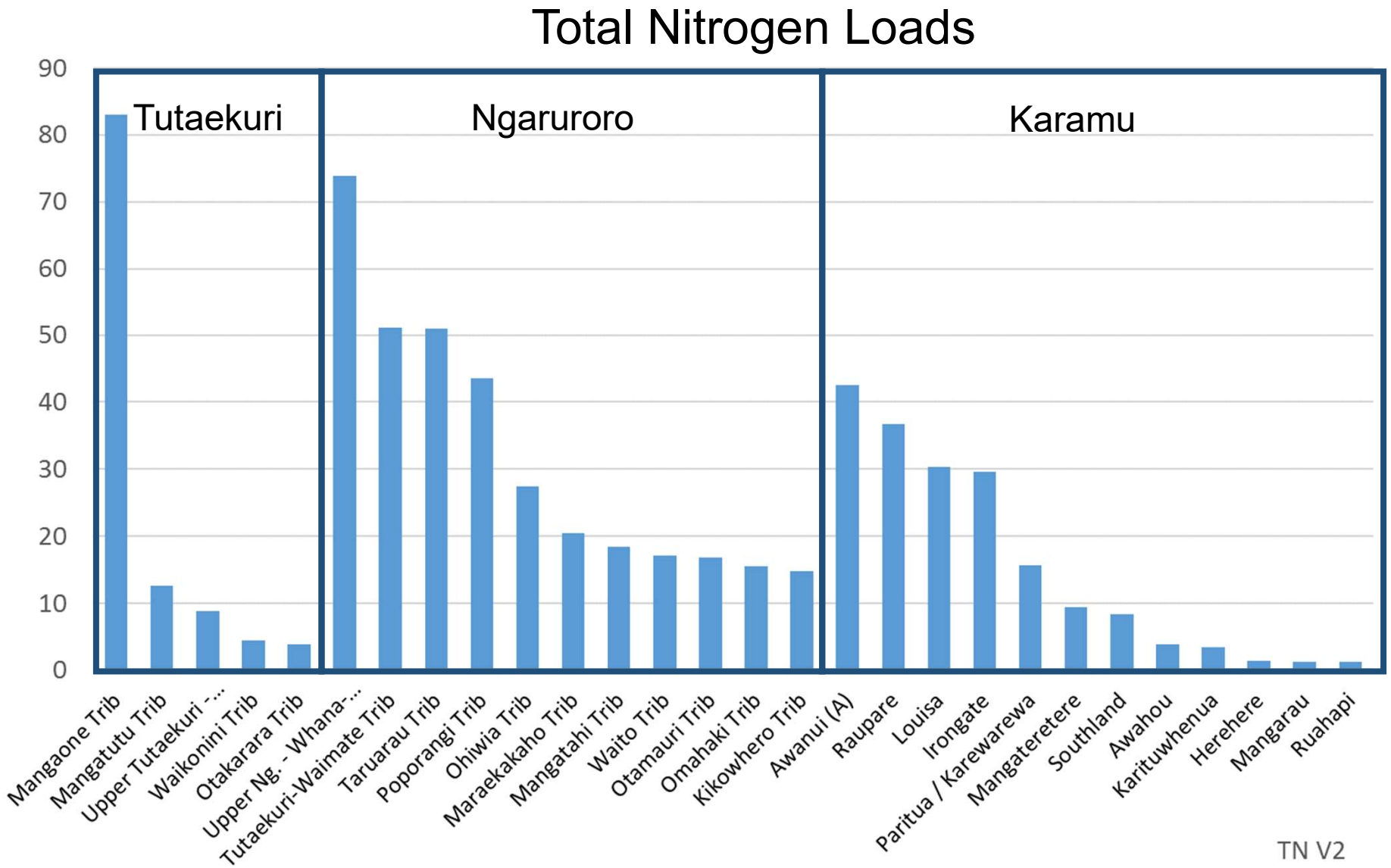
TP load



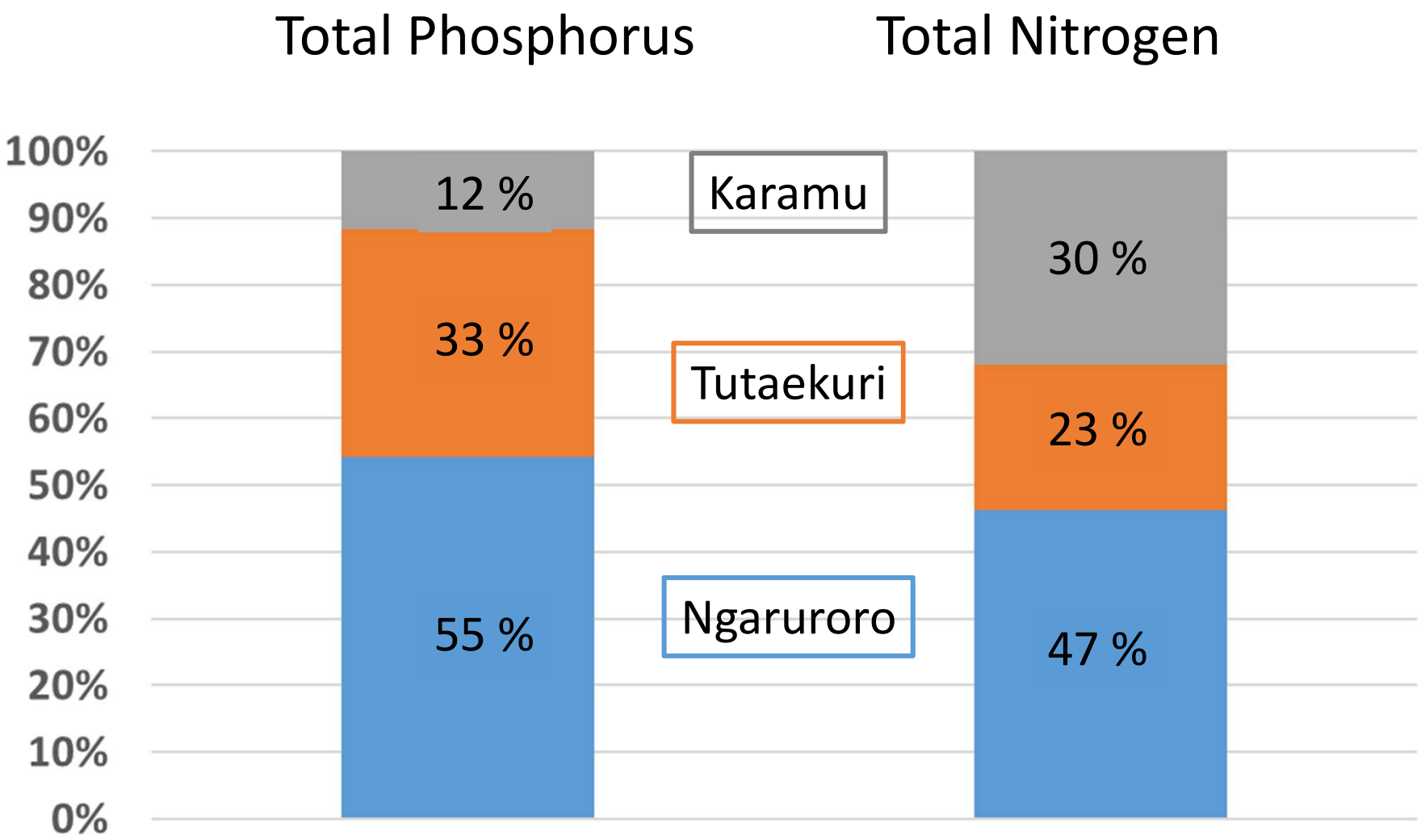
Ranked nutrient loads from sub catchments



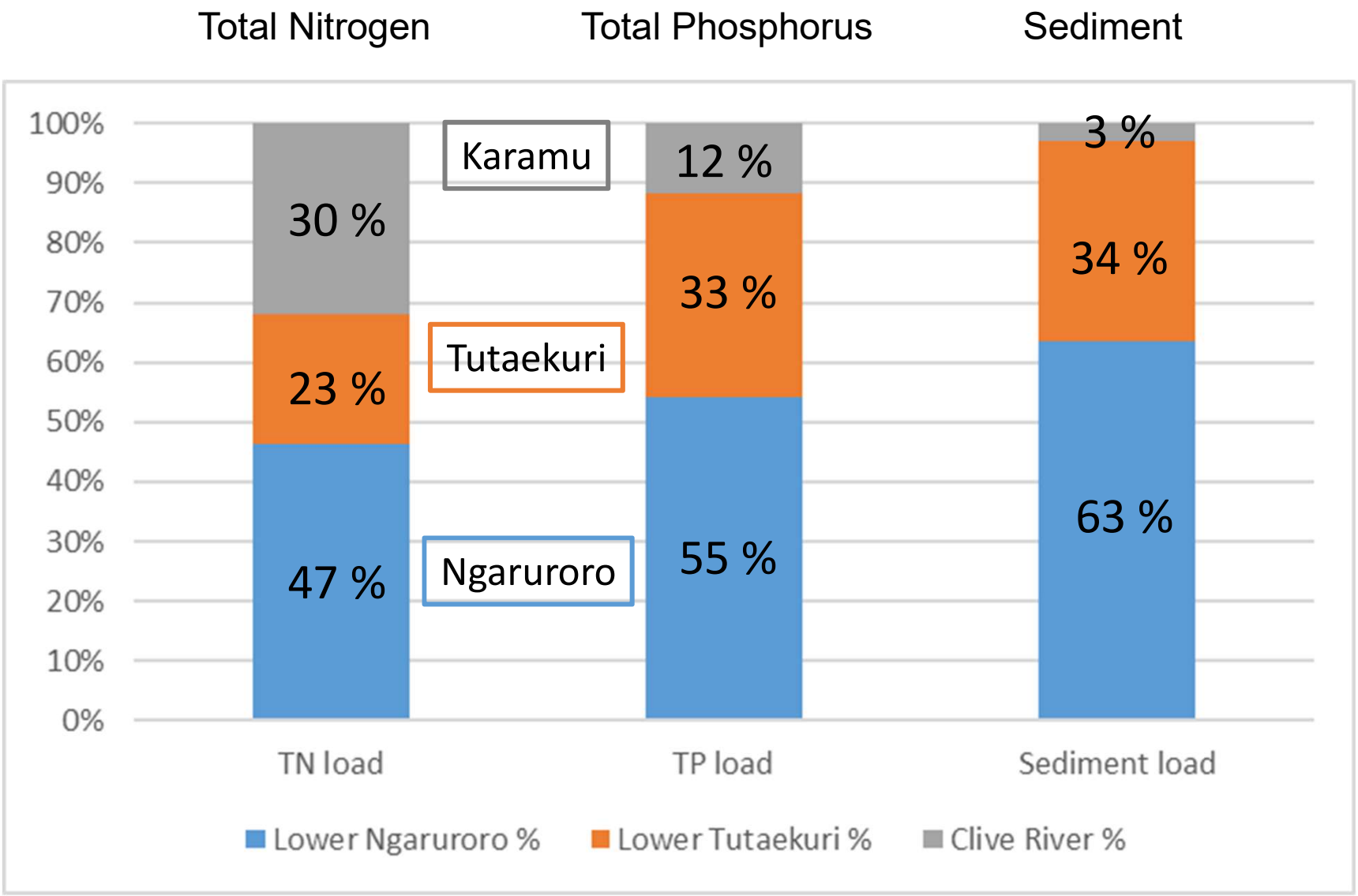
Ranked nutrient loads from sub catchments



Proportional load of nutrients to the Waitangi estuary

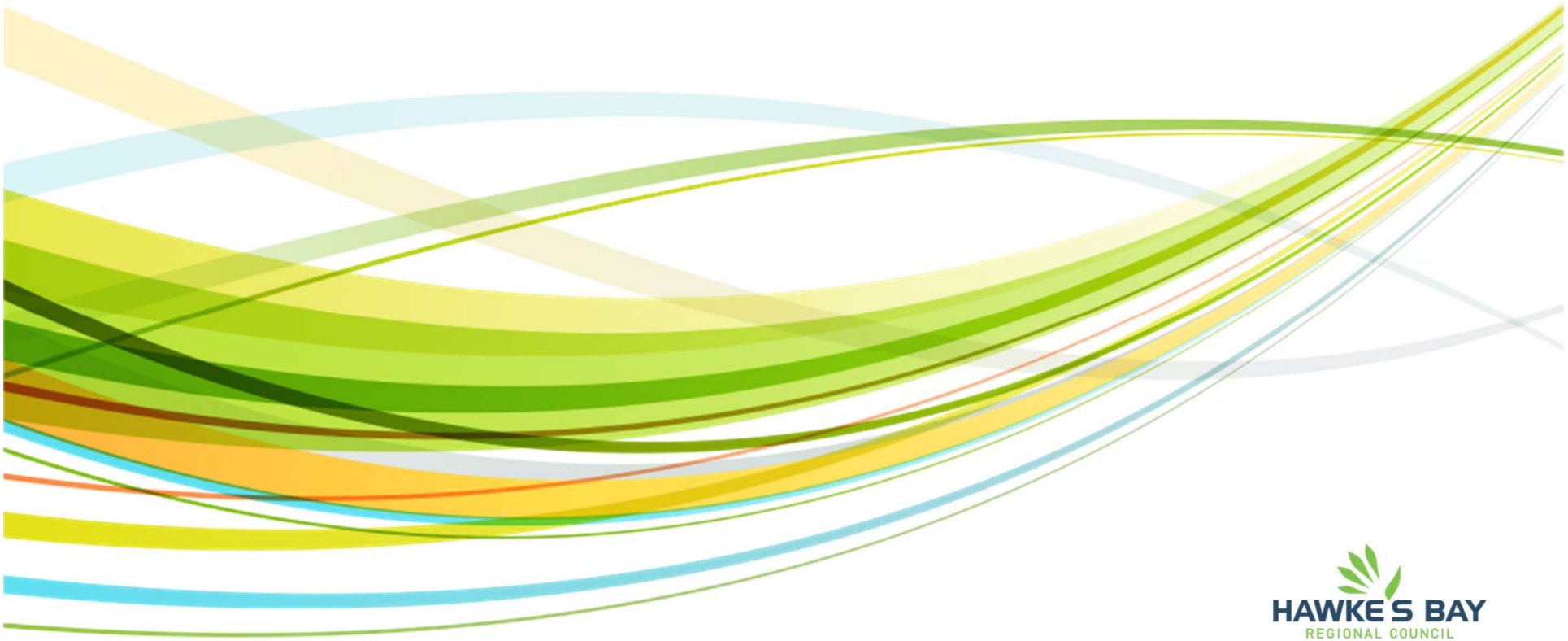


Proportional loads to the Waitangi estuary



Learning from PC6 – process and the plan

Nathan's presentation



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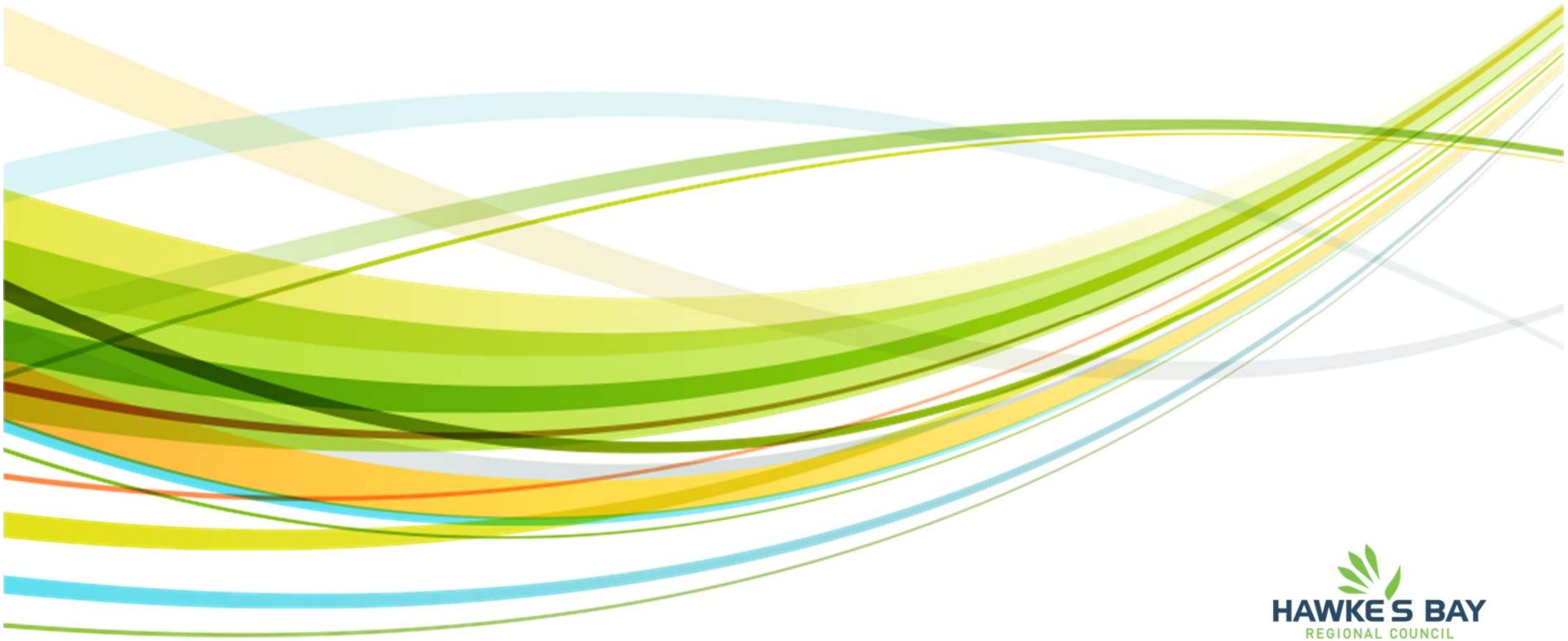
Managing Nutrients



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Questions remaining

1. Where are the nutrients coming from?
   - Modelled representative nutrient discharges
     - SPASMO and Overseer
   - Land uses and soils contributions
     - Effects of tile drains
2. Mitigation measures to reduce nutrient losses
     - Understanding what they are for each land use – costs and effectiveness
3. Menu of management options
   - Property nutrient discharge allowances
   - Multi-pronged approach including adaptive management
   - Nutrient budgeting
4. Recommended next step
   - Industry solutions for reducing nutrients and meeting objectives

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Proposal

That the EAWG and industry bodies be asked to consider the menu of management options for reducing nutrient losses to the estuary and make recommendations to the TANK group for their preferred approach

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Nutrient Management

Plenary discussion

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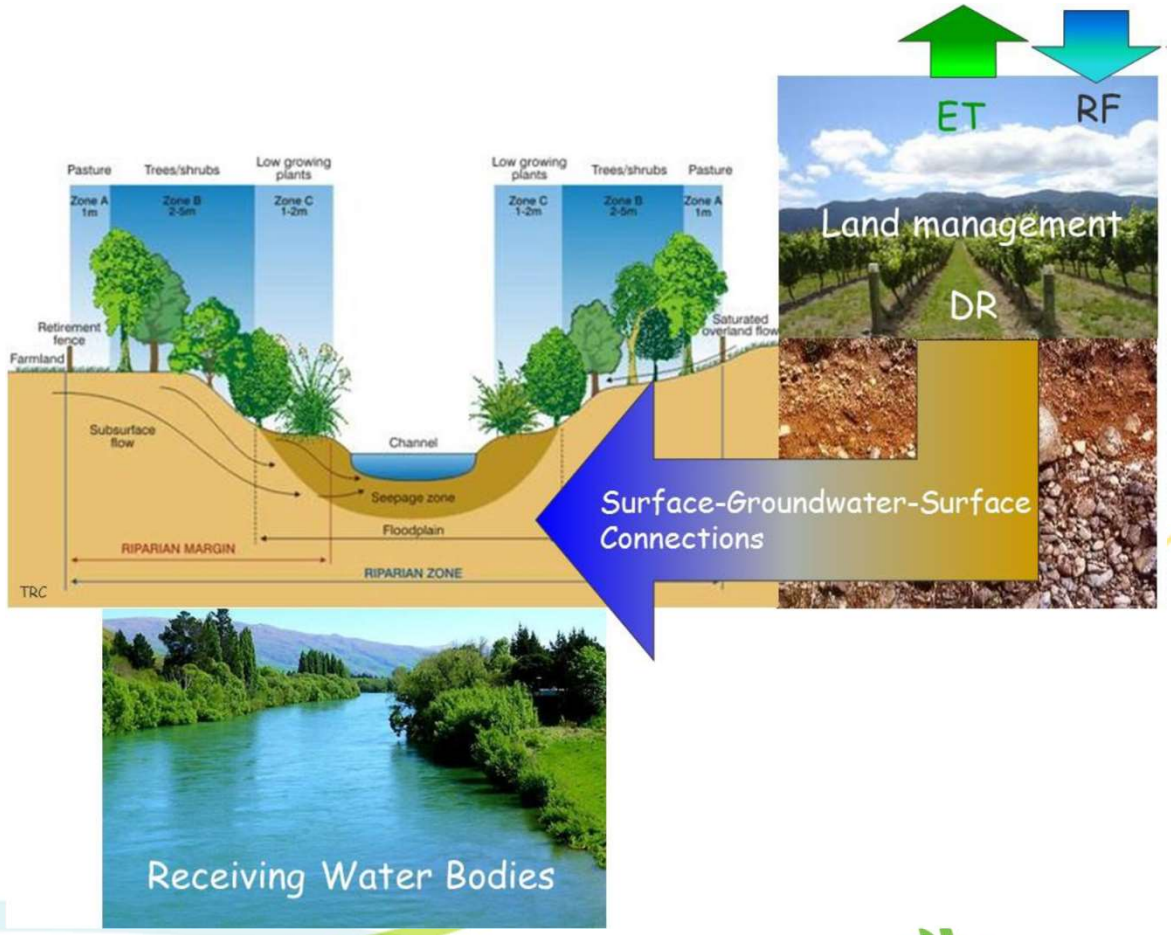
Management Options



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Nutrient Management Options (1)

Option 1: Adaptive Management – Outcomes focus

Industry focussed mitigation and adaptive management approach in collaboration with industry groups aimed at reducing Nitrogen load to the estuary

- Losses in the Ngaruroro and Tutaekuri to be managed indirectly by reducing sediment loss and farm plans?

Option 2: Allocation to properties based on natural capital

Assigning Nitrogen losses on a per property NDA according to LUC

Table 5.9.1D: Tukituki LUC Natural Capital; Nitrogen Leaching Rates[24]

LUC Class	I	II	III	IV	V	VI	VII	VIII
Rate (KgN/ha/year)	30.1	27.1	24.8	20.7	20	17	11.6	3

Nutrient Management Options (2)

Option 3: Proportional reduction
Calculate existing land use nutrient loss and impose proportional reduction

Option 4: Catchment Average
Allocate the same nutrient loss allowance per hectare – adjusted to meet load target.

Option 5: Land Cover or Sector Average
Specific land uses are allocated the same nutrient allowance – proportionally reduced to meet target load reduction

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Nutrient Management Options (3)

Option 6: Nutrient Vulnerability
A property allowance is calculated based on nutrient leaching /retention capacity. More allowance to land with a low risk of leaching (this may result in opposite outcome than allocation to option 2).

Option 7: Property Boundary Limits
No NDA – but focus on water quality at the property boundary

Option 8: Cap and Trade
Establish total allowable load for catchments, determine acceptable NDAs to meet target load (as in options 2-7), provide management regime that enables trade between land owners to allow low leaching activities to transfer to higher leaching activities

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Costs/benefits

Separate summary

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Verbal updates from Working Groups

- Engagement
- Economic Assessment
- Stormwater
- Wetlands/Lakes
- Mana whenua

Next meeting – 18 October 2017

- Recap from previous meetings and context setting (Jeff Smith)
  - Impact of stream depleting groundwater
- Impact of different flows on fish) (Joe Hay Cawthron)
  - Levels of protection using MALF
- Impact of different flows on native birds (Matt Brady, John Cheyne)
- Scenario results from SOURCE model (Rob Waldron)
  - Security of supply at various flows (2400 L/s; 3.6L/s 4.2 L/s)
- Agree flow regimes for Ngaruroro and Tuatekuri for socio-economic assessment (Mary-Anne)

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Future topics

- Report back on further modelling (flows/quality)
- Agree on water allocation regime
- Drinking Water Group reporting
- FMU boundaries
- Monitoring plan
- Economic assessment outputs
- Plan drafting

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Closing Karakia

Nau mai rā

Te mutu ngā o tatou hui

Kei te tumanako

I runga te rangimarie

I a tatou katoa

Kia pai to koutou haere

Mauriora kia tatou katoa

Āmine