

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



Meeting 22: 9 August 2016

Karakia

Agenda

- 10:00am Welcome, karakia, notices, meeting record
- 10:15am Tutaekuri – locality of values
- 10:30am Ngaruroro and Tutaekuri attributes states
- 12:30pm LUNCH**
- 1:15pmContinued....
- 2:30pm Waitangi Estuary – freshwater influences
- 3:00pm COFFEE BREAK**
- 3:15pm Updates on: Working Groups, Water Conservation Order,
Bayesian Belief Network (BBN) work and RPC meeting
- 3:45pm TANK Information Portal
- 3:50pm Agenda setting for next meeting
- ~4:00pm FINISH**

Meeting objectives

1. Continue to make choices for attribute states in:
 - the Ngaruroro River
 - Ngaruroro River tributaries
2. Confirm values for the Tutaekuri catchment
3. Understand current state and make choices for attribute states for the Tutaekuri River
4. Understand estuary state in relation to freshwater inputs

Action points


ID	Action item	Person responsible	Status
21.1	Provide a link on the portal to the Next Steps for Freshwater summary of submissions. http://www.mfe.govt.nz/sites/default/files/media/Fresh%20water/summary-of-submissions-next-steps-for-freshwater-final-3.pdf	Desiree	Completed
21.2	Provide feedback on the “TANK Plan Change – Engagement Plan” to Drew as the convenor of the Engagement Working Group.	TANK members	
21.3	Bring back a firmer set of guidelines for working group membership including matters such as who gets to decide who joins the working groups and the roles of TANK plenary members, observers and other supporting experts.	HBRC project team	Completed See Briefs on portal
21.4	Discuss the process around a spokesperson(s) further and report back with further clarification, including working with the mana whenua group.	Drew/ Engagement WG	To be considered by WG
21.5	Provide the plenary group with a gap analysis that compares all the previous work that has been carried out for stormwater in the TANK catchment and identification of what work needs to be done	Rina/ Stormwater WG	In progress
21.6	Compose and provide to the plenary group a reading list to read to come up to speed on information available.	Rina	In progress
21.7	HBRC to clarify the locations of the Poporangi and Ohara Streams.	Mary-Anne	Completed. See GIS map
21.8	HBRC to check whether swimability is a compulsory value in the RPS everywhere all of the time.	Mary-Anne	Refer Meeting record

Tūtaekuri Values

Tutaekuri Catchment Values

Location	Values	Comments
All water - surface and groundwater	Mauri Life-supporting capacity Habitat and biodiversity - native fish, eels, plants and birds Trout fishery Household water supply Stock drinking water	Household water supply may need treatment because of natural water quality. This especially includes surface water, as there are animals and birds in the catchment.
All surface water	Swimming/immersion Mahinga kai, Nohoanga Taonga raranga, taonga rongoa. Natural character and Amenity – (including wild and scenic value) as there is a high level of natural character Fishing - whitebait, eels, trout	Provision of access not part of this water quality management consideration Swimming not at flood flows or for urban streams High natural character values above Mangatutu R confluence.
Surface - main stem and tributaries - and groundwater	Food and fibre production/ processing (and employment) Industrial and commercial use (and employment)	
Main stem	Tourism, Kayaking Rafting	
Main stem (specific lower reaches)	Gravel extraction	
Main stem and Mangaone R	Trout fishing	
Shallow lakes and wetlands	Commercial eeling ?	
Surface waters - tributaries	Small scale hydro-electric power generation	
Surface and groundwater	Direct discharges (including stormwater) and non-point source discharges	More details (consent data) about direct discharges are required before making a decision about the use of surface waters for discharge of contaminants
Groundwater	Contribution to surface flows and water body values	

- Amendments - include “amenity value”
- Other suggestion; land cover as value

An aerial photograph of a wide, braided river system. The river consists of numerous interconnected channels of light-colored, silty water flowing over a vast, flat, light-colored gravel and sand bar. The surrounding landscape is a mix of green grassy fields, patches of dark green forest, and rocky outcrops. In the background, rolling hills and mountains are visible under a blue sky with scattered white and grey clouds.

Meeting 22

Ngaruroro and Tutaekuri catchments

Water Quality

An aerial photograph of a wide river valley. The river is light-colored, likely due to sediment, and winds through a valley with green hills and some rocky outcrops. In the background, there are blue mountains under a blue sky with scattered white clouds.

Meeting 22

Ngaruroro and Tutaekuri catchments

Water Quality

- General considerations and recap from last meeting

Tutaekuri catchment:

- NOF attributes for toxicity (ecosystem health) and *E.coli* (contact recreation)

Ngaruroro and Tutaekuri catchments:

- Algae and nutrients
- Macroinvertebrates
- Water clarity, sediment

Take home points from last meeting

- Progress too slow
- 'Happy/ unhappy' rating for current state not suitable
- Unknown uncertainty behind data
- Sometimes confusing

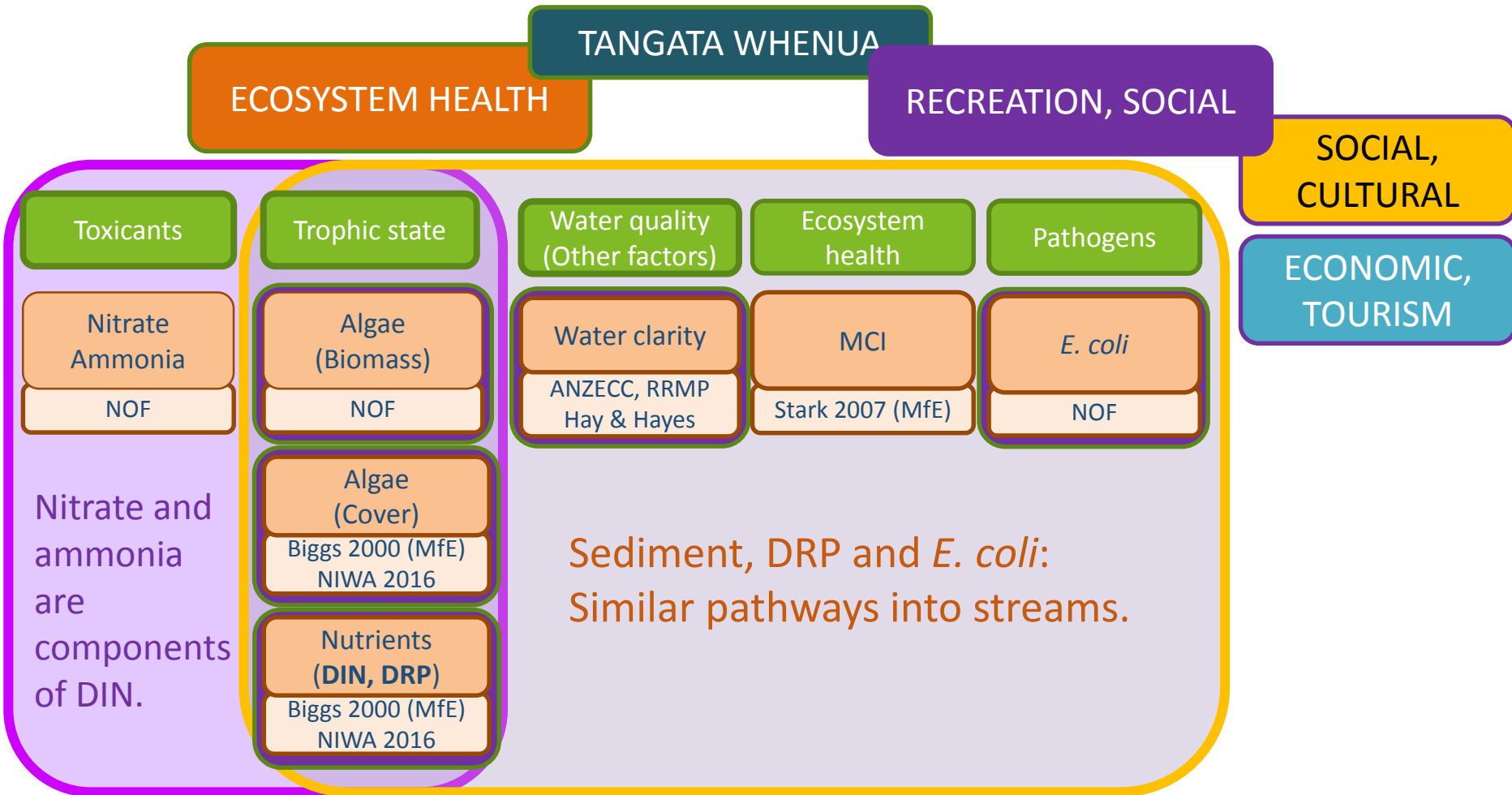
Changes to this presentation:

- Discussing attributes for Tutaekuri and Ngaruroro together
- Replacement of rating happy/ unhappy with current state by prioritising responses instead
- Tables now sorted separately for main stem and tributaries (management zones?)
- Background information on the data
- Ngaruroro macrophyte dominated lowland sites taken out of algae section

RESPONSE RATING (PRIORITY)	NARRATIVE
High	<p>Water quality and/or quantity needs of the values are not being met or There is a high risk that values will be significantly adversely affected without management intervention</p>
Medium	<p>Water quality and quantity needs of the values are not being fully met or There is a risk that values will be adversely affected without management intervention</p>
Low	<p>Water quality and quantity needs of the values are being mostly met or There is a low risk that values will be adversely affected or Management response required for other priority areas may manage this aspect at higher level of protection</p>
No	<p>Water quality and quantity needs of the values are being fully met and There is a very low risk that values will be adversely affected</p>

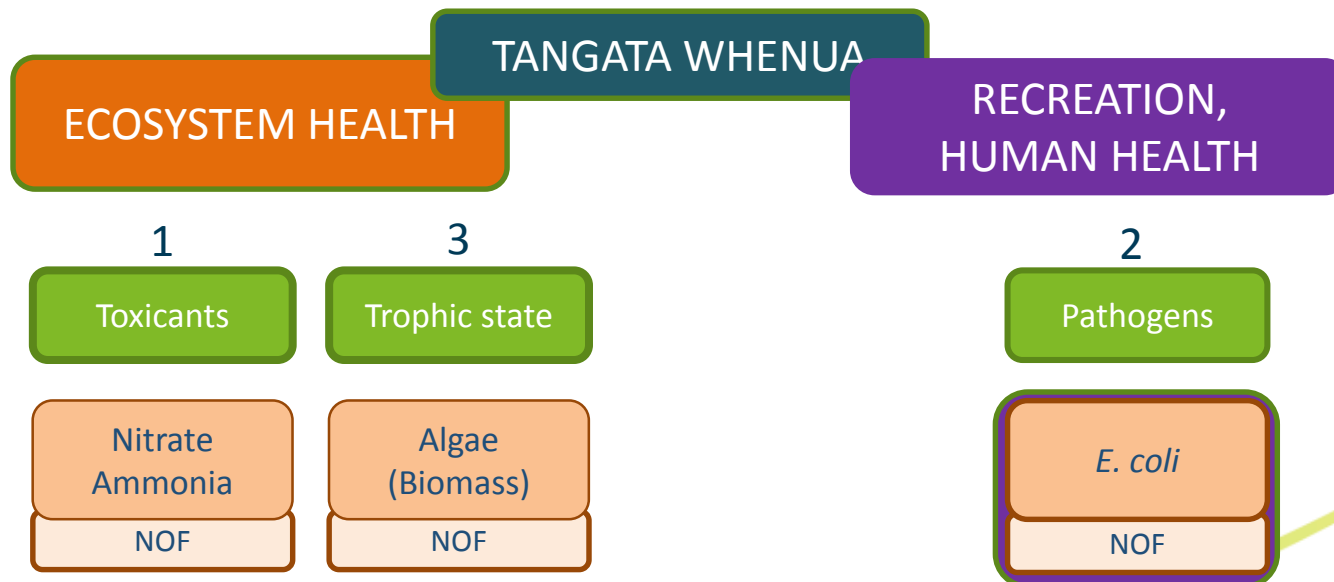
Site name	E.coli	NO ₃	Amm-N	Chla	PeriWCC	MPh	DIN	TN	DRP	TP	Bdisk	Turbidity	MCI
Ngaruroro catchment													
Ngaruroro Rv at Kuripapango	A	A	A				A	A	A	A	B	B	E
*Taruarau Rv	A	A	A	A	A		A	A	A	A	B	A	E
Ngaruroro Rv at Whanawhana	A	A	A	B	B		A	A	A	A	C	B	G
*Poporangi Strm	A	A	A	B	B		D	D	F	C	C	C	G
Ngaruroro Rv U/S HB Dairies	A	A	A	C	A		A	A	A	A	C	B	G
Ngaruroro Rv D/S HB Dairies	A	A	A	B	A		A	A	A	B	D	C	G
*Maraekakaho Strm	A	B	A		P		C	D	F	C	C	B	G
Ngaruroro Rv at Ohiti	A	A	B	B			B	A	A	B	D	D	G
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	F
Ngaruroro Rv at Fernhill	A	A	A	B	B		B	B	A	B	D	C	F
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	F
Ngaruroro Rv at Chesterhope NIWA	A	A	A				B	B		C	D	C	G
Tutaekuri catchment													
Tutaekuri Rv at Lawrence Hut	A	A	A	A	A		A	A	A	A	A	A	E
*Mangatutu Strm	A	A	A		D		C	C	F	B	D	B	G
Tutaekuri Rv U/S Mangaone Rv	A	A	B	B	A		B	B	D	B	D	B	G
Mangaone Rv at Rissington	A	A	A	B	A		C	C	F	C	C	A	G
*Mangaone Rv at Dartmoor	A	A	A				B	B	F	D	C	A	G
*Tutaekuri Rv at Puketapu	A	A	A	C	A		B	B	E	B	C	A	F
Tutaekuri Rv at Brookfields Br	A	A	A	D	A		B	B	E	B	C	B	F
Karamu and Ahuriri catchments													
Ruahapia Strm	C	A	B				D	D	F	F	E	C	P
Karewarewa Strm	C	C	C				E	F	F	F	D	C	P
Awanui Strm	B	B	B				E	F	F	F	D	B	P
Poukawa Strm	A	A	A				C	F	F	F	D	A	P
Herehere Strm	D	B	A				C	D	F	F	C	C	P
Mangarau Strm at Keirunga Rd	B	A	A	D			B	C	F	F	E	C	F
Mangarau Strm at Te Aute Rd	B	B	A	C			F	F	F	F	E	B	P
Clive Rv	B	B	A				D	D	F	F	D	B	P
Taipu Strm	C	A	C				D	E	F	F	F	D	P

Attribute groups of similar response to management



NOF attributes: aims in NOF bands

Compulsory attributes for ecosystem health and human health (recreation)- **Tutaekuri catchment**



Nitrate toxicity on aquatic organisms, Tutaekuri catchment

Guideline source:	NOF band	
Attribute/Indicator:	Nitrate NO3-N (mg /L)	
Value:	Ecosystem Health Toxicity	Ecosystem Health Toxicity
Statistic:	Annual median	Annual 95th %ile
Tutaekuri Rv at Lawrence Hut	A	A
*Mangatutu Strm	(A)	(A)
Tutaekuri Rv U/S Mangaone Rv	A	A
Mangaone Rv at Rissington	A	A
*Mangaone Rv at Dartmoor	(A)	(A)
*Tutaekuri Rv at Puketapu	(A)	(A)
Tutaekuri Rv at Brookfields Br	A	A

NOF narrative state

High conservation value system.

Unlikely to be effects even on sensitive species.

Ammonia toxicity on aquatic organisms, Tutaekuri catchment

Guideline source:	NOF band	
Attribute/Indicator:	Ammonia NH4-N (mg/L)	
Value:	Ecosystem Health Toxicity	Ecosystem Health Toxicity
Statistic:	Median	Maximum
Tutaekuri Rv at Lawrence Hut	A	B
*Mangatutu Strm	(A)	(A)
Tutaekuri Rv U/S Mangaone Rv	A	B
Mangaone Rv at Rissington	A	A
*Mangaone Rv at Dartmoor	(A)	(A)
*Tutaekuri Rv at Puketapu	(A)	(A)
Tutaekuri Rv at Brookfields Br	A	A

NOF narrative state

99% species protection level:
No observed effect on any species tested.

95% species protection level:
Starts impacting occasionally on the 5% most sensitive species.

Sites in B band only marginally over threshold A-B: 0.05 mg/L

- Tutaekuri at Lawrence Hut: 1 sample in 5 years 0.055 mg/L
- Tutaekuri U/S Mangaone : 1 sample in 5 years 0.053 mg/L

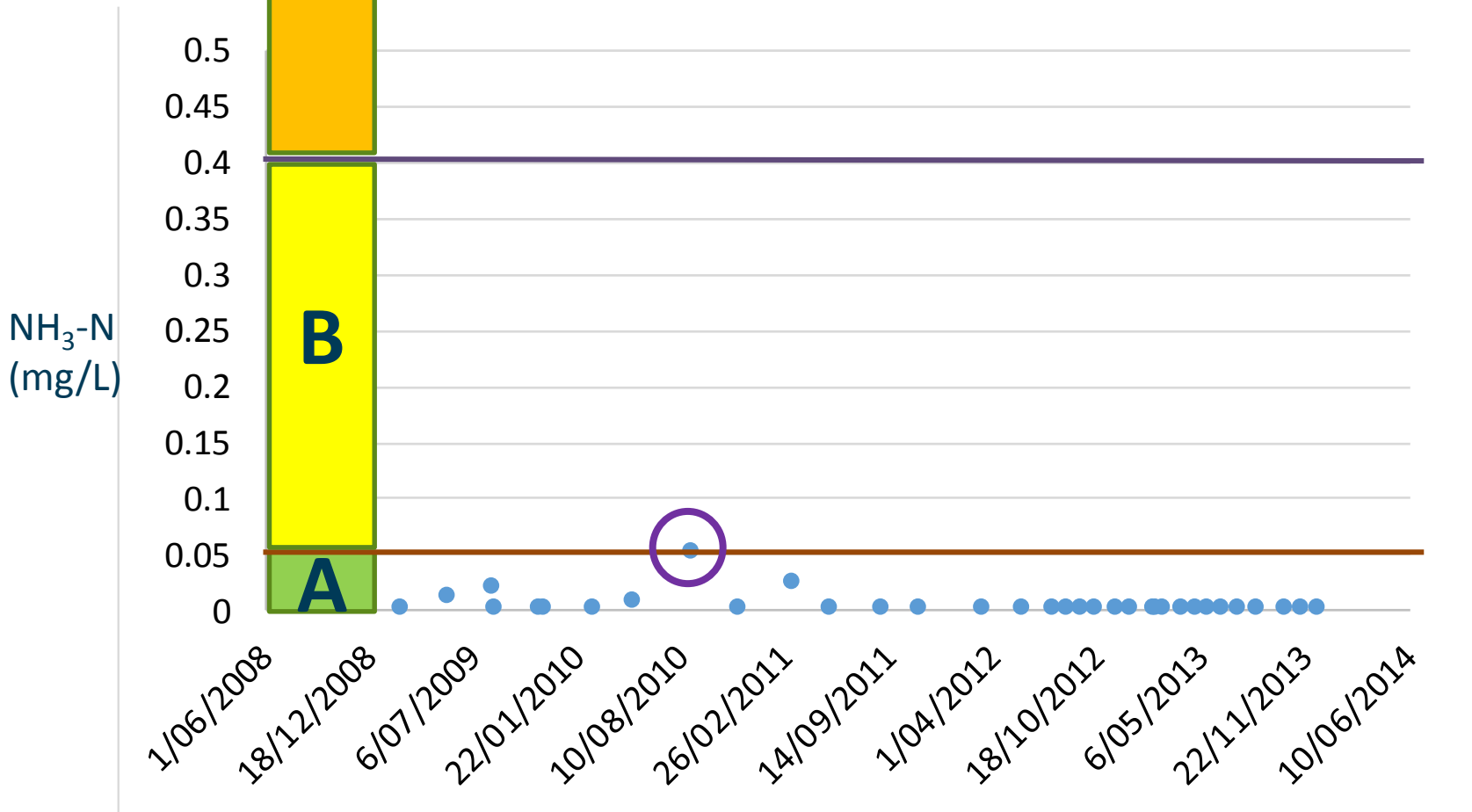
Ammonia toxicity on aquatic organisms, Tutaekuri catchment

Data within NOF A-band,
2 sites with maximum ammonia
concentration *marginally* in B band

Attribute State	Annual Maximum*	Ngaruroro	Narrative State
A	≤ 0.05	All sites except:	99% species protection level: No observed effect on any species tested.
B	> 0.05 and ≤ 0.4	Tutaekuri Lawrence Hut Tutaekuri U/S Mangaone	95% species protection level: Starts impacting occasionally on the 5% most sensitive species.
C	> 0.40 and ≤ 2.20	-	80% species protection level: Starts impacting regularly on the 20% most sensitive species (reduced survival of most sensitive species)
D	> 2.2	-	Starts approaching acute impact level (ie risk of death) for sensitive species

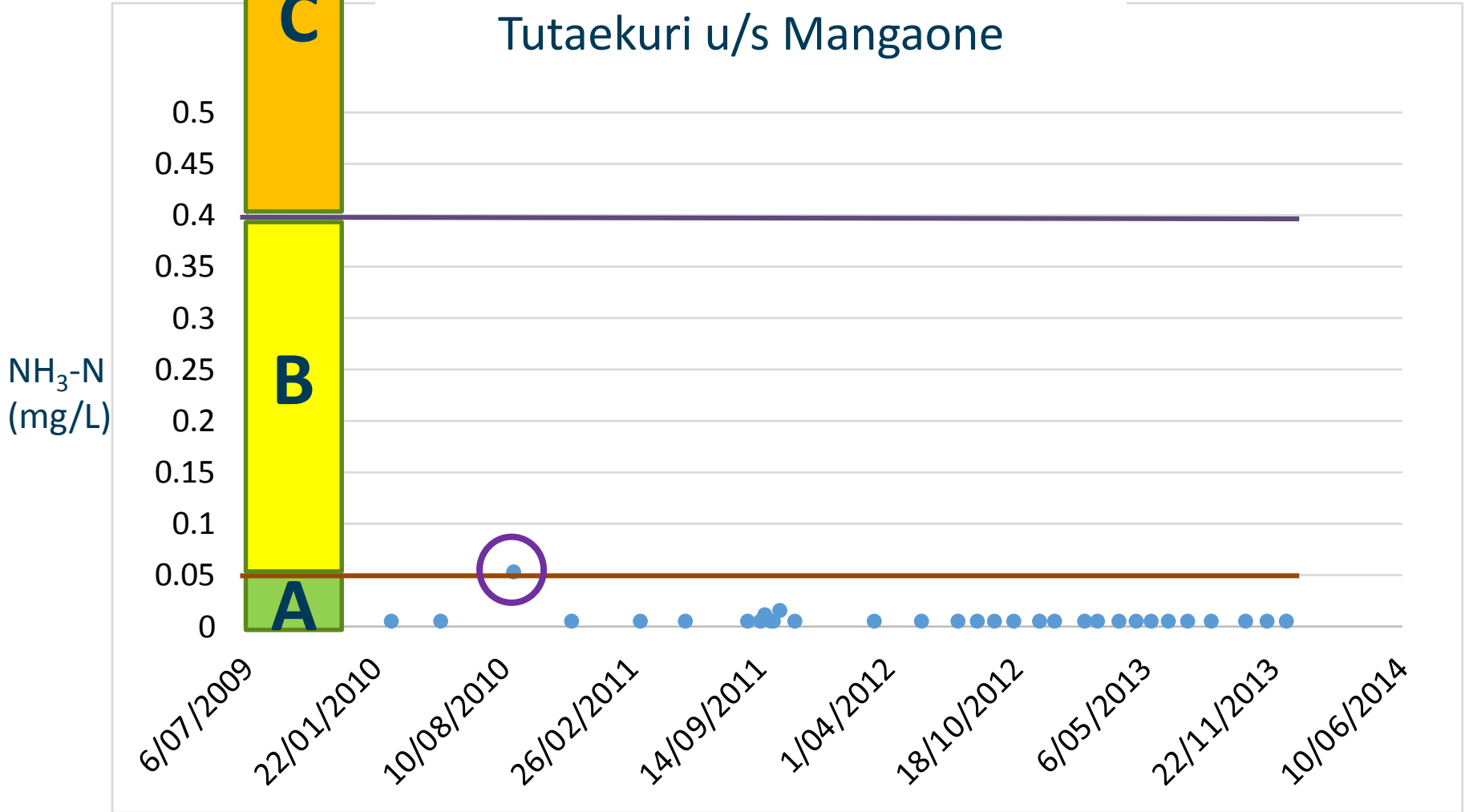
Ammonia

Tutaekuri at Lawrence Hut



Ammonia

Tutaekuri u/s Mangaone



Overview nitrate and ammonia NOF bands Tutaekuri catchment

Guideline source:	NOF band		NOF band			
Attribute/Indicator:	Nitrate NO3-N (mg /L)		Ammonia NH4-N (mg/L)		Priority level	Priority level
Value:	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Tutaekuri main stem	Tributaries
Statistic:	Annual median	Annual 95th %ile	Median	Maximum		
Tutaekuri Rv at Lawrence Hut	A	A	A	B	No priority	
Tutaekuri Rv U/S Mangaone Rv	A	A	A	B		
*Tutaekuri Rv at Puketapu	(A)	(A)	(A)	(A)		
Tutaekuri Rv at Brookfields Br	A	A	A	A		
*Mangatutu Strm	(A)	(A)	(A)	(A)		No priority
Mangaone Rv at Rissington	A	A	A	A		
*Mangaone Rv at Dartmoor	(A)	(A)	(A)	(A)		

Guideline source:	NOF band		NOF band	
Attribute/Indicator:	Nitrate (mg/L)		Ammonia (mg/L)	
Value:	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity
Statistic:	Annual median	Annual 95th %ile	Median	Maximum
Ngaruroro Rv at Kuripapango NIWA	A	A	A	A
*Taruarau Rv	A	(A)	A	(A)
Ngaruroro Rv at Whanawhana	A	A	A	A
Ngaruroro Rv U/S HB Dairies	A	A	A	A
Ngaruroro Rv D/S HB Dairies	A	A	A	A
Ngaruroro Rv at Ohiti	A	A	A	B
Ngaruroro Rv at Fernhill	A	A	A	B
Ngaruroro Rv at Motorway	A	A	A	A
Ngaruroro Rv at Chesterhope NIWA	A	A	A	A
*Poporangi Strm	A	(A)	A	(A)
*Maraekakaho Strm	A	(B)	A	(A)
Waitio Strm	A	A	A	B
*Ohiwa Strm	A	(A)	A	(A)
Tutaekuri-Waimate Strm	A	A	A	B

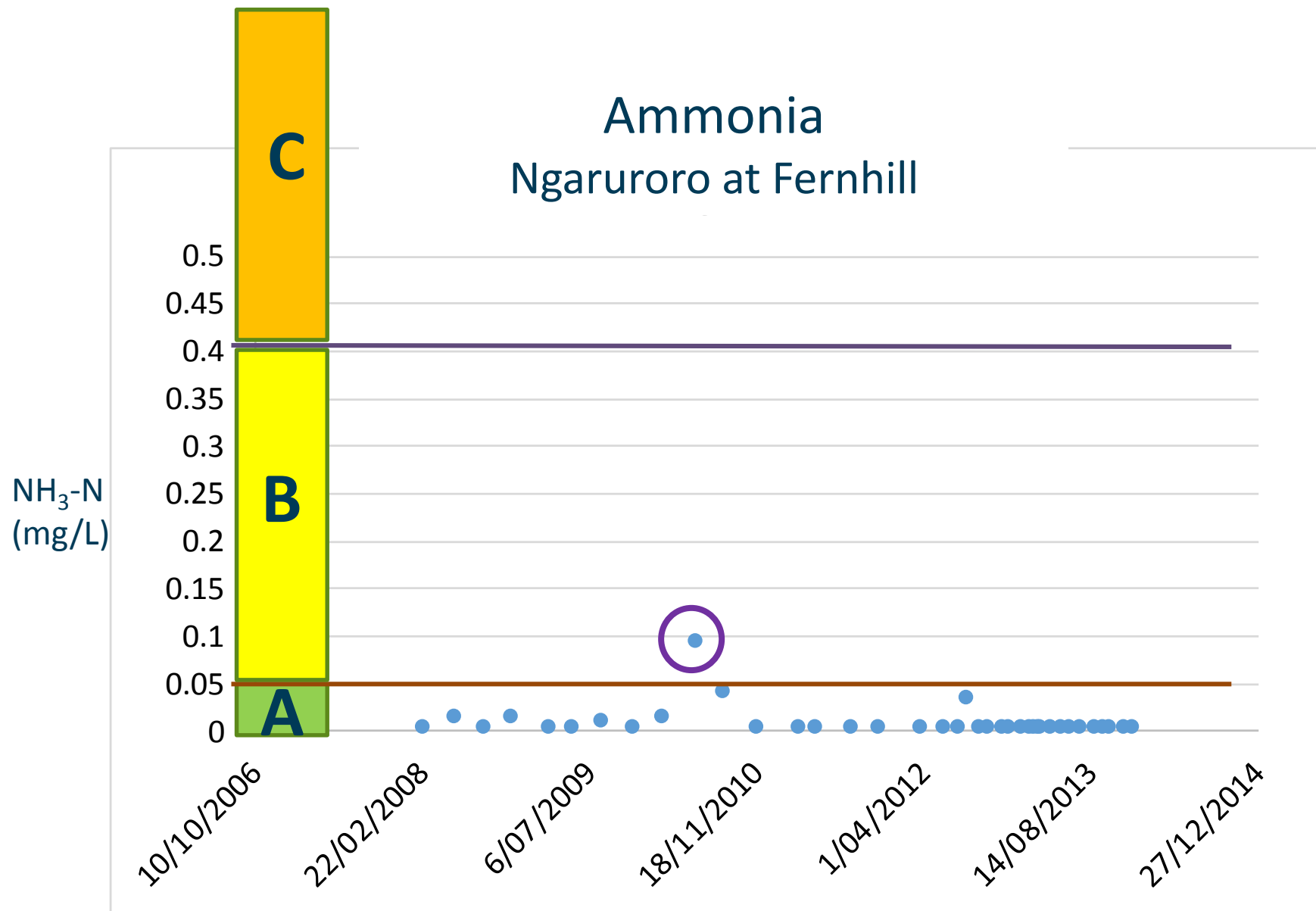
Red triangles: sites discontinued in 2012

Ammonia toxicity on aquatic organisms, Ngaruroro catchment

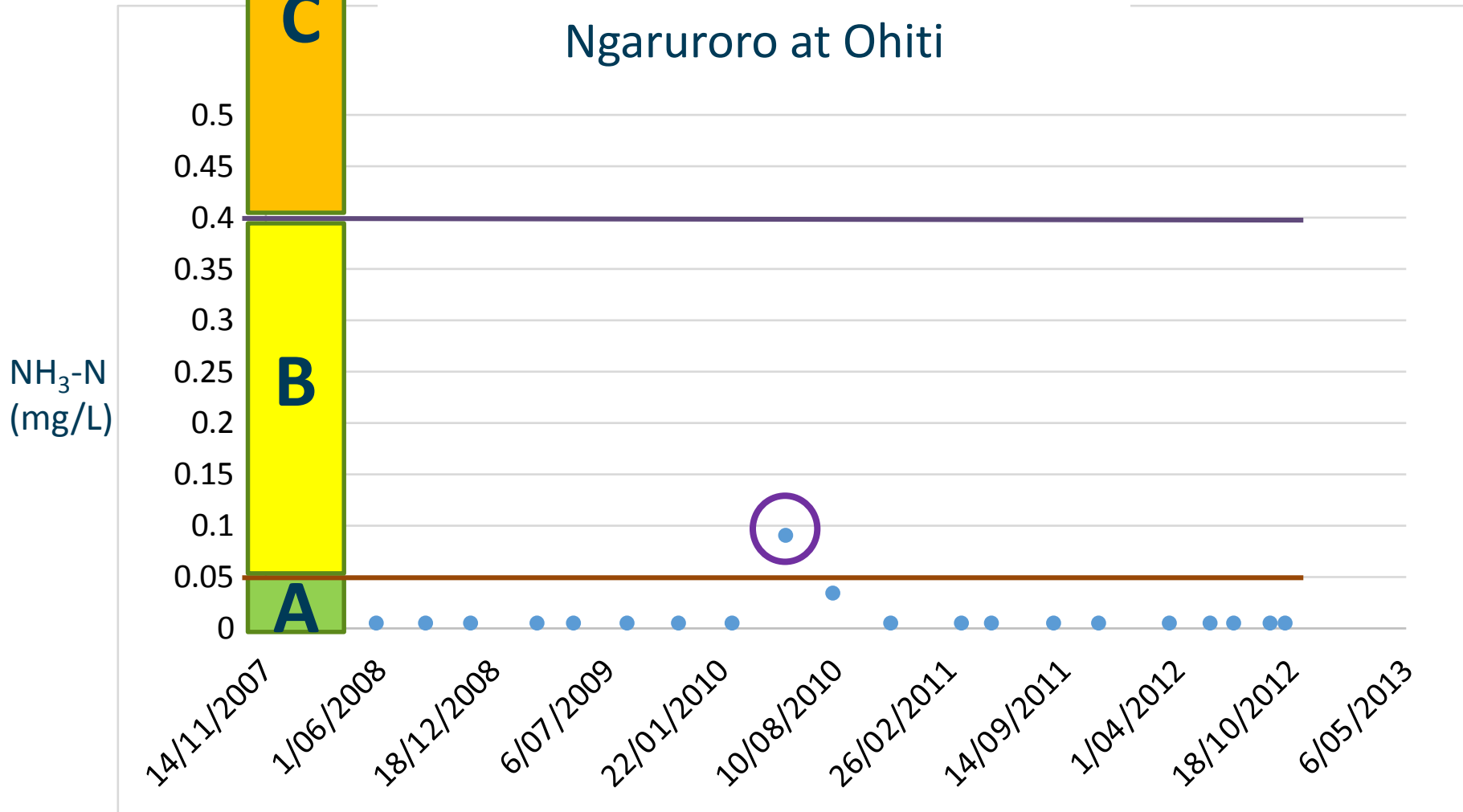
Data within NOF A-band,
4 sites with maximum ammonia
concentration *marginally* in B band

Attribute State	Annual Maximum*	Ngaruroro	Narrative State
A	≤ 0.05	All sites except:	99% species protection level: No observed effect on any species tested.
B	> 0.05 and ≤ 0.4 max 0.096	Ngaruroro at Ohiti Waitio Strm Ngaruroro at Fernhill Tutaekuri-Waimate	95% species protection level: Starts impacting occasionally on the 5% most sensitive species.
C	> 0.40 and ≤ 2.20	-	80% species protection level: Starts impacting regularly on the 20% most sensitive species (reduced survival of most sensitive species)
D	> 2.2	-	Starts approaching acute impact level (ie risk of death) for sensitive species

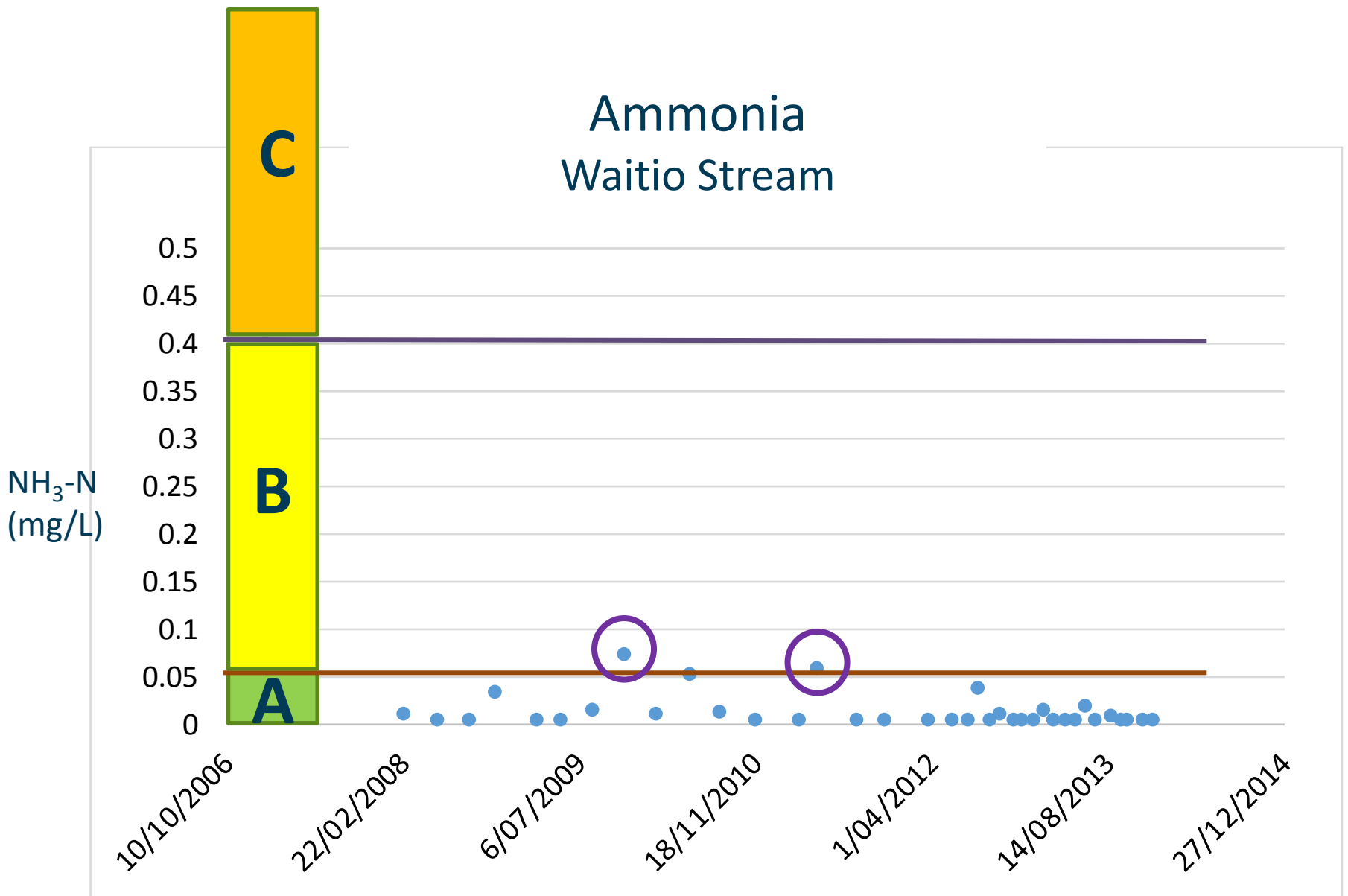
Ammonia Ngaruroro at Fernhill



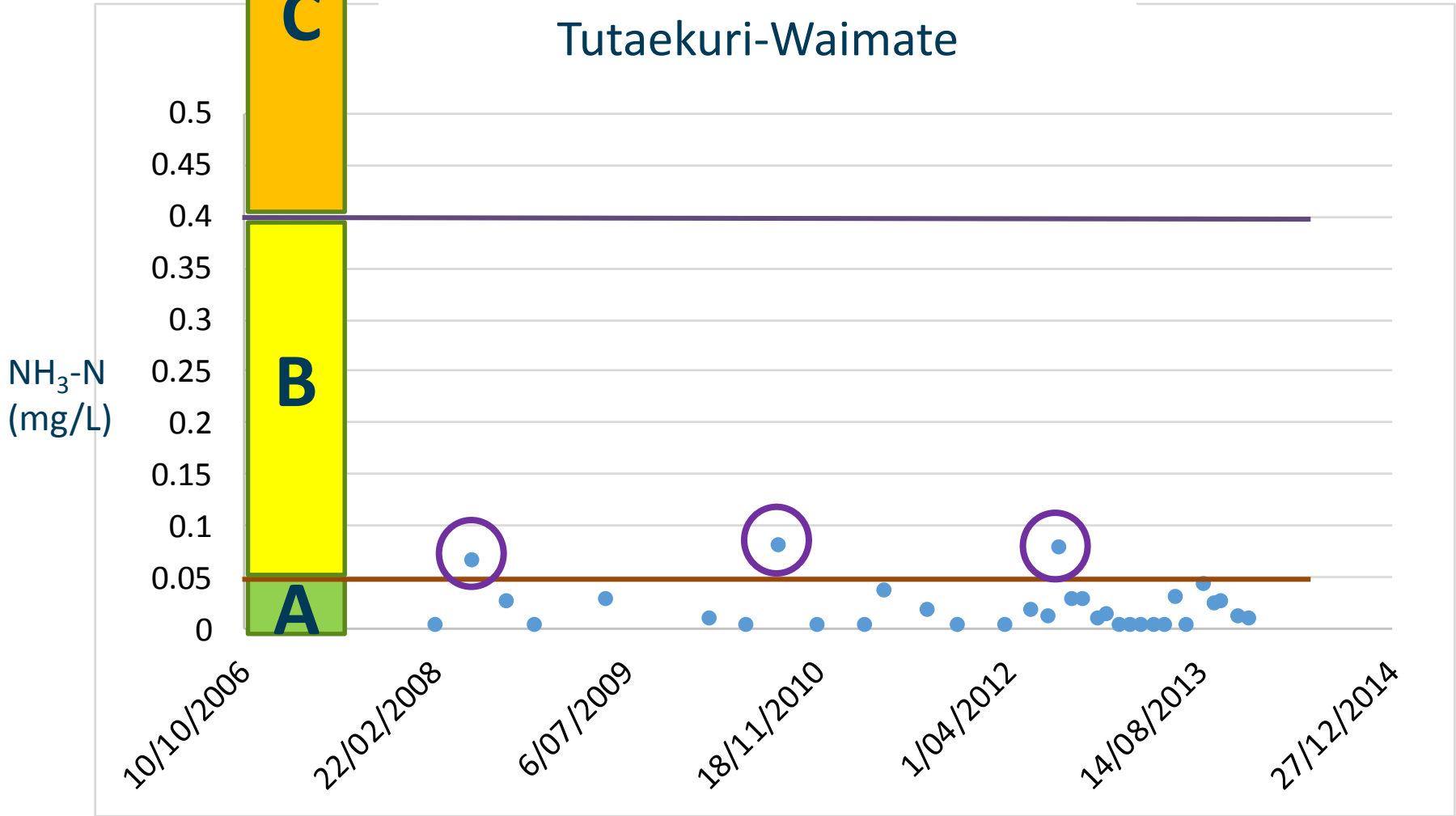
Ammonia Ngaruroro at Ohiti



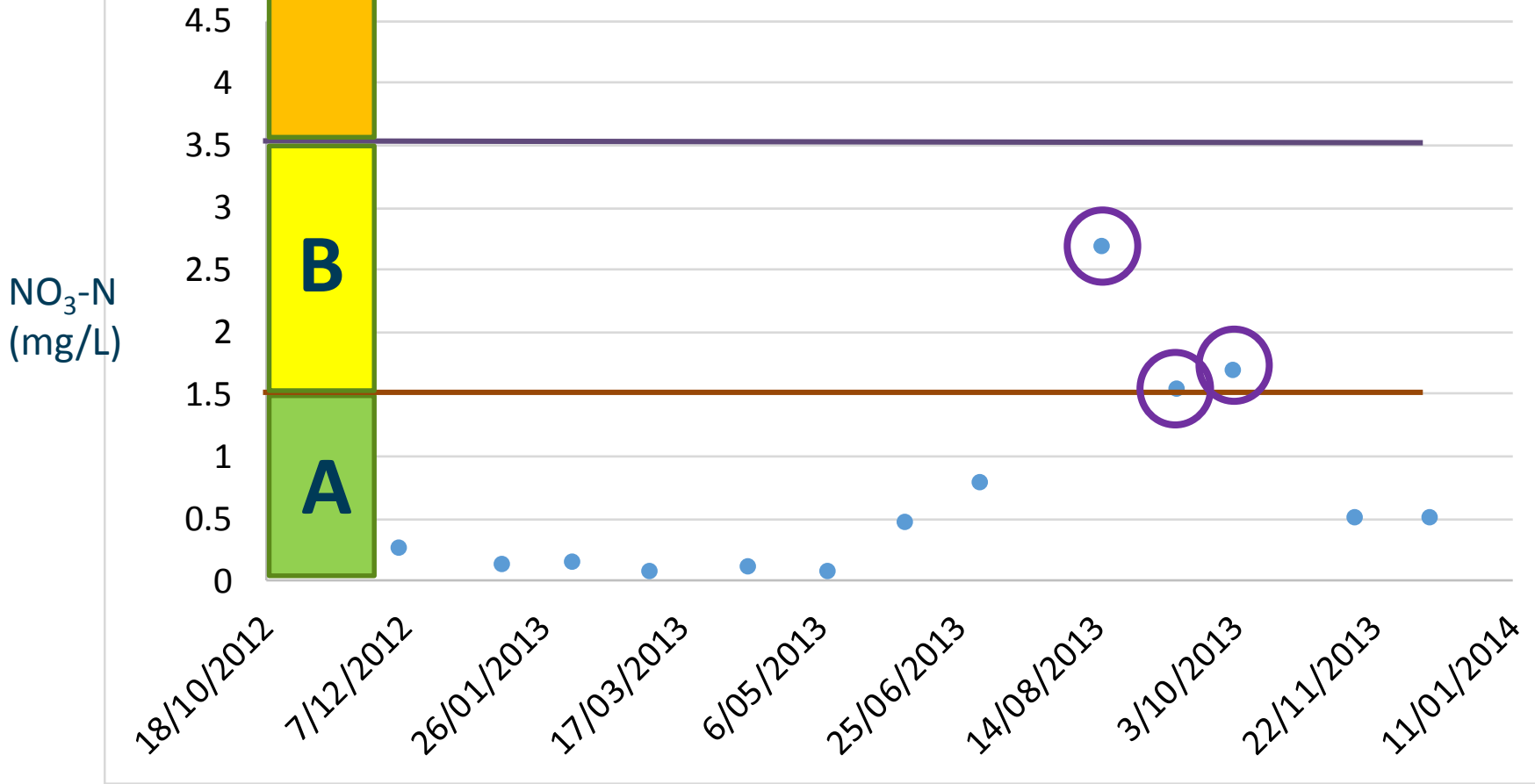
Ammonia Waitio Stream



Ammonia Tutaekuri-Waimate



Nitrate Maraekakaho Stream



Overview nitrate and ammonia NOF bands

Ngaruroro catchment

Guideline source:	NOF band		NOF band			
Attribute/Indicator:	Nitrate (mg/L)		Ammonia (mg/L)		Priority level	Priority level
Value:	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity	Ecosystem Health Toxicity	upper Ngaruroro & main stem	Tributaries
Statistic:	Annual median	Annual 95th %ile	Median	Maximum		
Ngaruroro Rv at Kuripapango NIWA	A	A	A	A	No priority	
*Taruarau Rv	A	(A)	A	(A)		
Ngaruroro Rv at Whanawhana	A	A	A	A		
Ngaruroro Rv U/S HB Dairies	A	A	A	A		
Ngaruroro Rv D/S HB Dairies	A	A	A	A		
Ngaruroro Rv at Ohiti	A	A	A	B		
Ngaruroro Rv at Fernhill	A	A	A	B		
Ngaruroro Rv at Motorway	A	A	A	A		
Ngaruroro Rv at Chesterhope NIWA	A	A	A	A		
*Poporangi Strm	A	(A)	A	(A)		No
*Maraekakaho Strm	A	(B)	A	(A)		Low
Waitio Strm	A	A	A	B		Low
*Ohiwa Strm	A	(A)	A	(A)		No
Tutaekuri-Waimate Strm	A	A	A	B		Low

Red triangles: sites discontinued in 2012

Contact recreation/ human health: *E. coli* in the Tutaekuri catchment

Guideline source:	NOF band			
Attribute/Indicator:	<i>E. coli</i> (CFU/100ml)		Priority level	Priority level
Value:	Recreation e.g. boating: Occasional immersion	Recreation e.g. swimming: Full immersion	Tutaekuri main stem	Tributaries
Statistic:	Annual median	Annual 95th %ile		
Tutaekuri Rv at Lawrence Hut	A	A	No priority	
Tutaekuri Rv U/S Mangaone Rv	A	A		
*Tutaekuri Rv at Puketapu	(A)	(A)		
Tutaekuri Rv at Brookfields Br	A	A		
*Mangatutu Strm	(A)	(A)		No priority
Mangaone Rv at Rissington	A	A		
*Mangaone Rv at Dartmoor	(A)	(A)		

NOF narrative state

People are exposed to a **very low risk** of infection (less than 0.1% risk).

People are exposed to a **low risk** of infection (up to 1% risk).

Contact recreation/ human health: *E. coli* in the Ngaruroro catchment

Guideline source:	NOF	
Attribute/Indicator:	<i>E. coli</i> (CFU/100ml)	
Value:	Recreation e.g. boating: Occasional immersion	Recreation e.g. swimming: Full immersion
Statistic:	Annual median	Annual 95th %ile*
Ngaruroro Rv at Kuripapango NIWA	A	
*Taruarau Rv	A	(A)
Ngaruroro Rv at Whanawhana	A	A
*Poporangi Strm	A	(A)
Ngaruroro Rv U/S HB Dairies	A	
Ngaruroro Rv D/S HB Dairies	A	A
*Maraekakaho Strm	A	(A)
Ngaruroro Rv at Ohiti	A	
Waitio Strm	A	A
*Ohiwia Strm	A	(D)
Ngaruroro Rv at Fernhill	A	A
Ngaruroro Rv at Motorway	A	
Tutaekuri-Waimate Strm	A	D
Ngaruroro Rv at Chesterhope NIWA	A	

To calculate bands for primary contact recreation:

- 95th percentile
- Calculated for swimming season Nov-April
- Flood flows excluded (<median flow)
- → This reduces the dataset!
- Needs >10 samples, ideally 30
- 95th percentile can be higher with less data
- Tried with two datasets but both return D band.

NOF narrative state

People are exposed to a **moderate to high risk of infection** (greater than 5% risk).

NOF narrative state

People are exposed to a **very low risk of infection** (less than 0.1% risk).

People are exposed to a **low risk of infection** (up to 1% risk).

*2011 to 2015 data

Red triangles: sites discontinued in 2012

Contact recreation/ human health: *E. coli* in the Ngaruroro catchment

Guideline source:	NOF band			
Attribute/Indicator:	<i>E. coli</i> (CFU/100ml)		Priority level	Priority level
Value:	Recreation e.g. boating: Occasional immersion	Recreation e.g. swimming: Full immersion	upper Ngaruroro & main stem	Tributaries
Statistic:	Annual median	Annual 95th %ile*		
Ngaruroro Rv at Kuripapango NIWA	A		No priority	
*Taruarau Rv	A	(A)		
Ngaruroro Rv at Whanawhana	A	A		
Ngaruroro Rv U/S HB Dairies	A			
Ngaruroro Rv D/S HB Dairies	A	A		
Ngaruroro Rv at Ohiti	A			
Ngaruroro Rv at Fernhill	A	A		
Ngaruroro Rv at Motorway	A			
Ngaruroro Rv at Chesterhope NIWA	A			
*Poporangi Strm	A	(A)		
*Maraekakaho Strm	A	(A)		No
Waitio Strm	A	A		No
*Ohiwa Strm	A	(D)		
Tutaekuri-Waimate Strm	A	D		

Red triangles: sites discontinued in 2012

Discussion and Feedback

- Do you agree with the response rating (priorities)?
 - for toxicity (ammonia, nitrate)
 - for recreation, human health (*E.coli*)
- Swimming values: does primary contact recreation apply to the tributaries (e.g. Waitio, Tutaekuri-Waimate)?

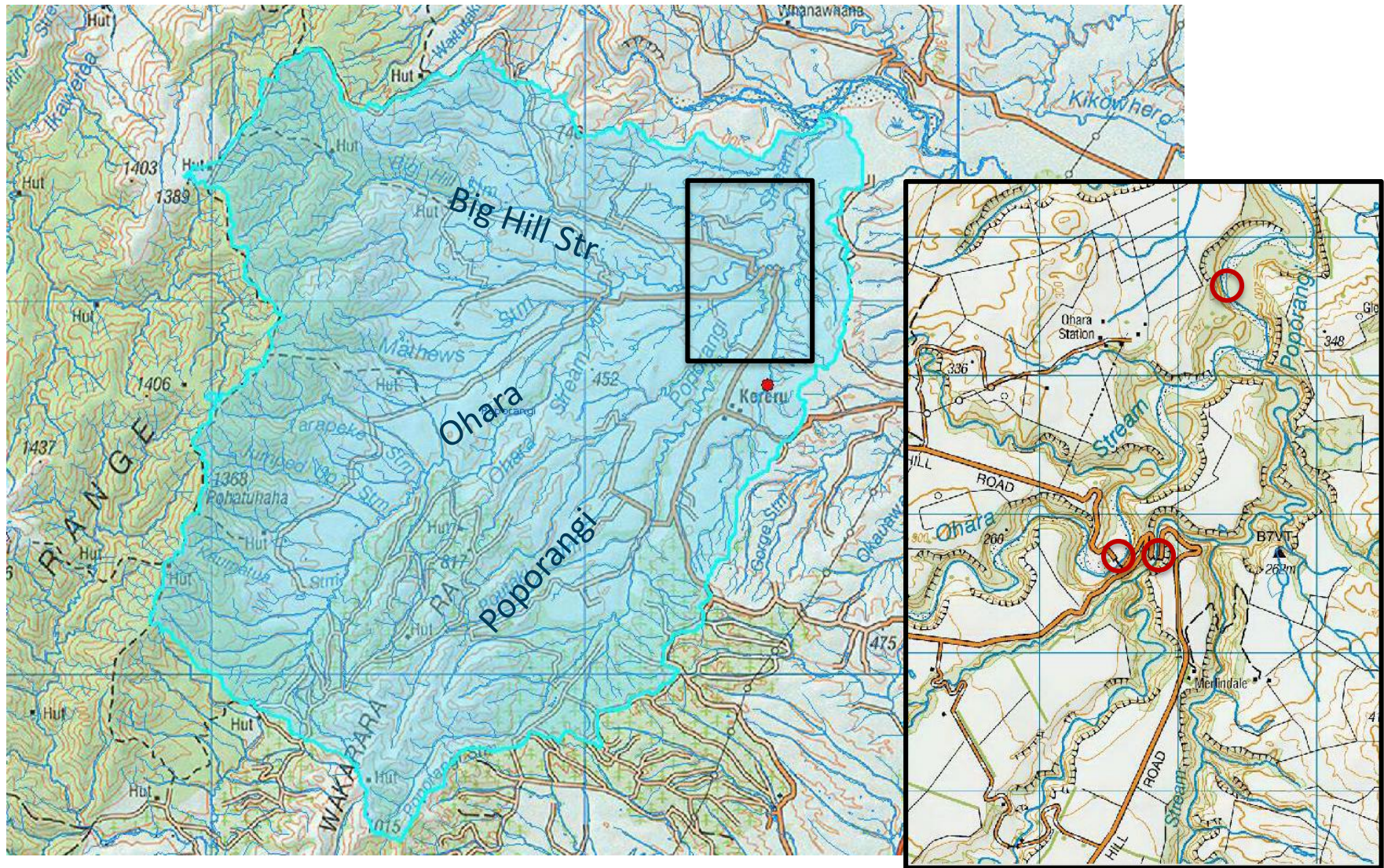
Management of Algae

Objective for this session;

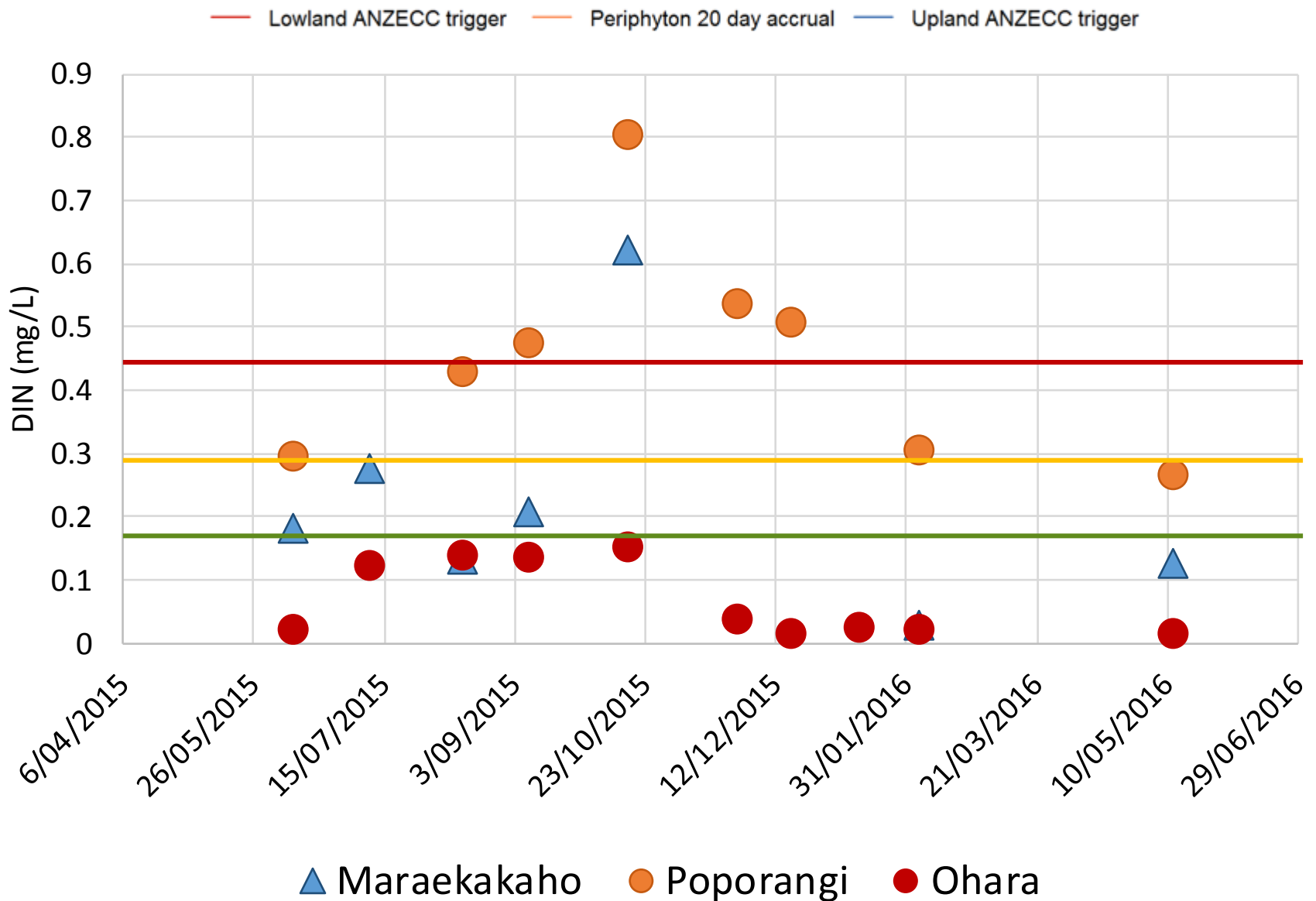
- Response ratings (prioritisation) are agreed on where needs of values are not met

Format of session

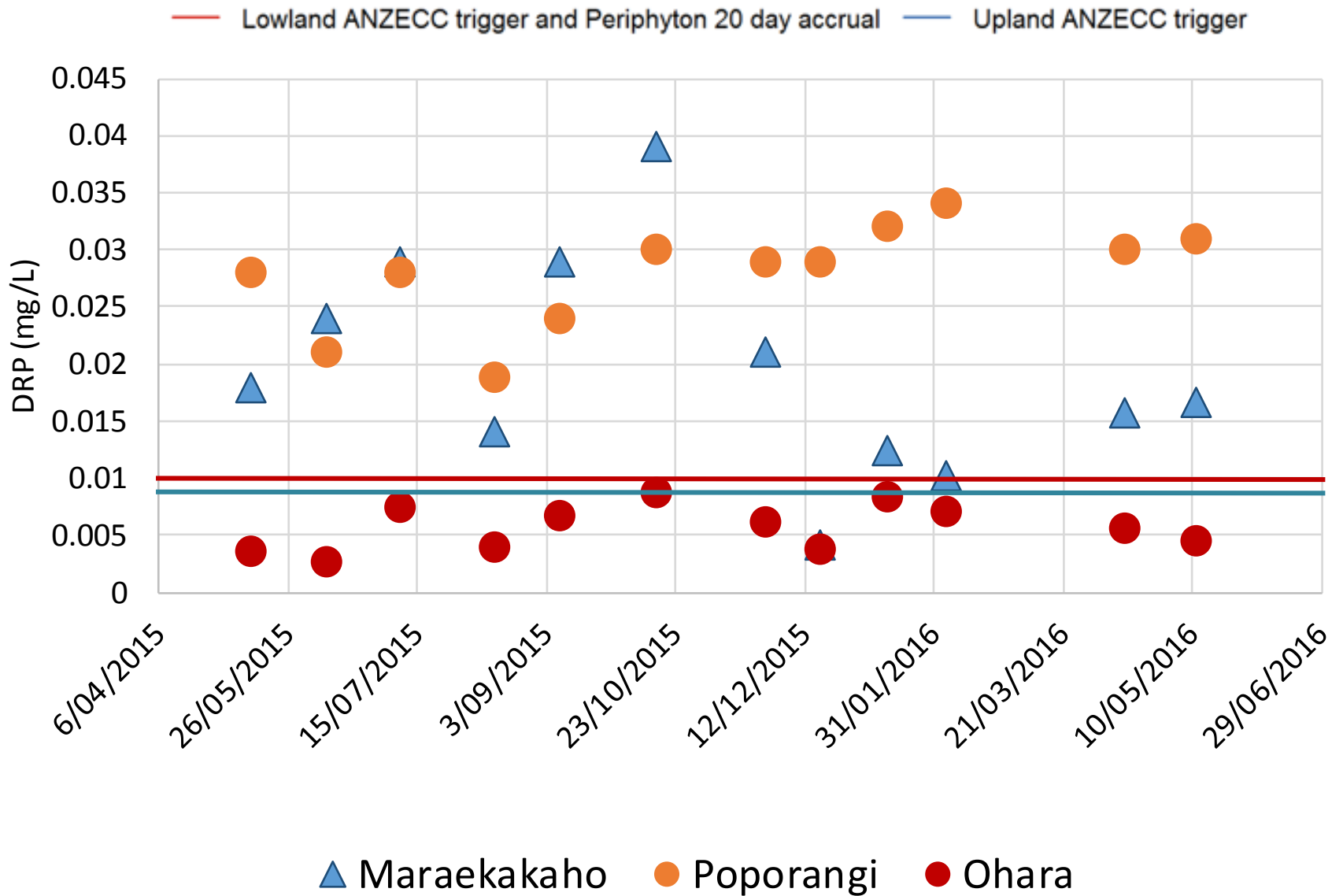
- Presentation of algae (trophic level) states in relation to NOF bands
- Presentation of algae state in relation to other guidelines for values (recreation and other values)
- Phormidium
- Algal biomass in context with nutrients
- TANK group discussion/question session
- Discussion on priorities



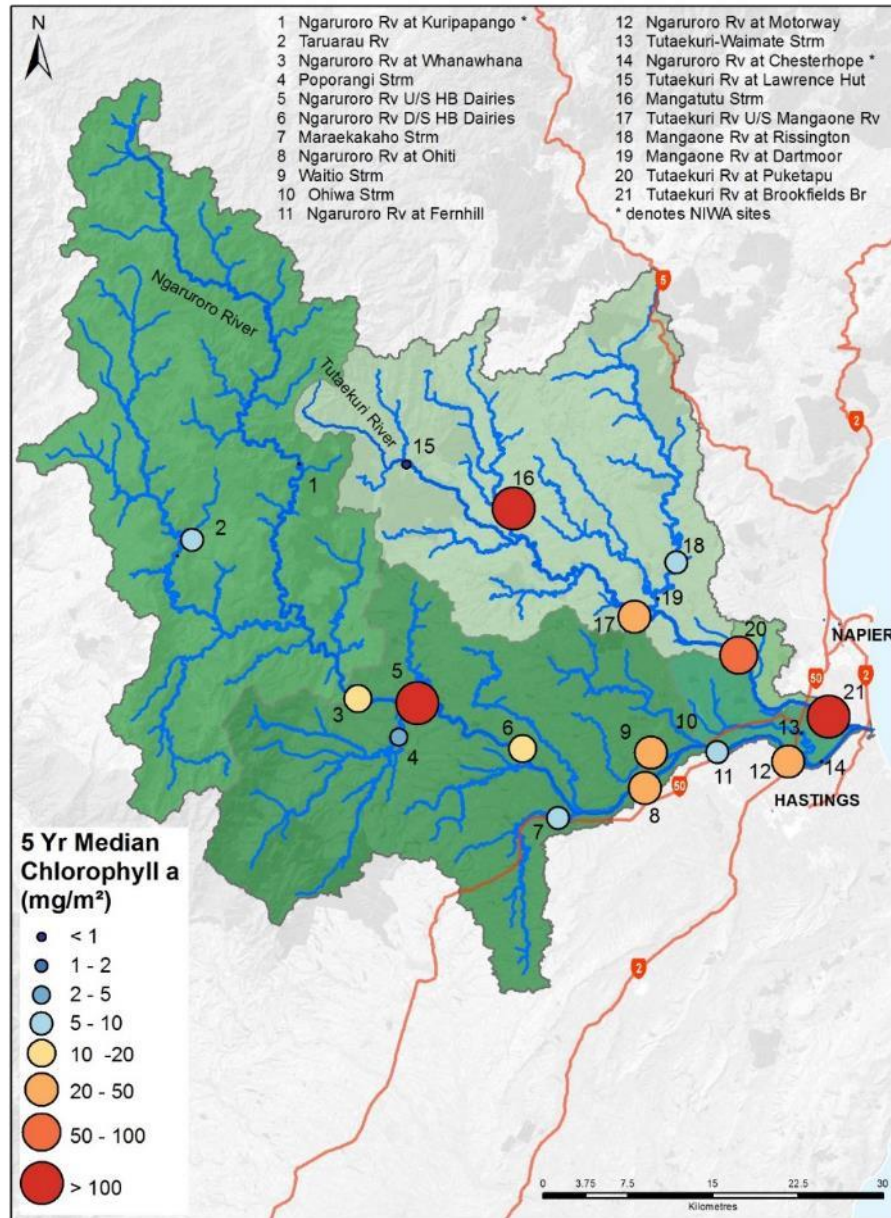
DIN



DRP



Algae biomass at SOE sites Ngaruroro and Tutaekuri



	ATTRIBUTE / PERFORMANCE MEASURE	VALUE
NOF	Algal biomass	<ul style="list-style-type: none"> • Trophic state (ecosystem health)
NIWA	Algal cover index (%PeriWCC)	<ul style="list-style-type: none"> • Ecosystem health • Angling, recreation
MfE	Phormidium cover	<ul style="list-style-type: none"> • Human/ animal health



Filamentous algae

Mats

(may include Phormidium)

- Natural algal community, variability, role
- When do they turn into an impact?

Summary of Algae in the Ngaruroro catchment

Algae dominated sites only

Guideline source:	NOF band
Attribute/Indicator:	Algal biomass (mg Chl- <i>a</i> /m ²)
Value:	Ecosystem health Trophic state
Statistic:	Frequency of exceedance
Ngaruroro Rv at Whanawhana	A
Ngaruroro Rv D/S HB Dairies	A
Ngaruroro Rv at Fernhill	A

Rare blooms reflecting negligible nutrient enrichment and/or alteration of the natural flow regime or habitat.

Dataset: Jan 2013 to Dec 2015
Monthly samples

Algae in the Tutaekuri catchment: biomass (NOF)

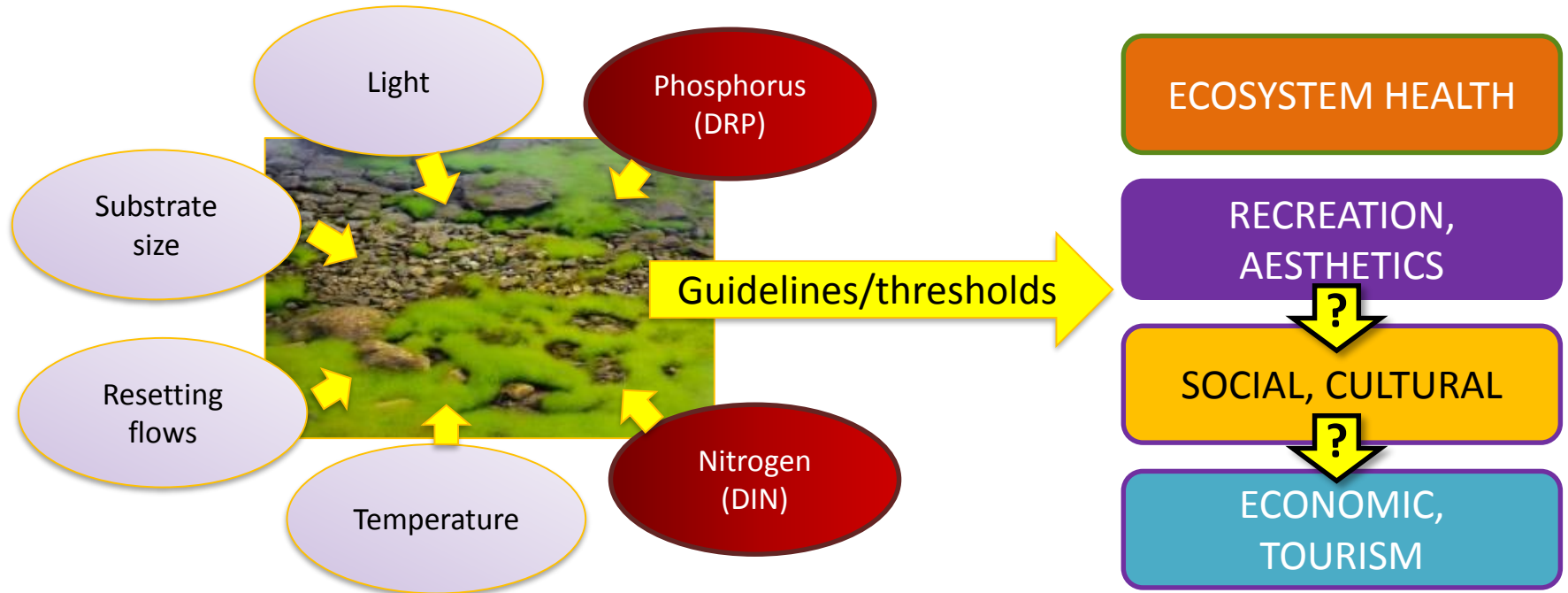
Guideline source:	NOF band
Attribute/Indicator:	Algal biomass (mg Chl- <i>a</i> /m ²)
Value:	Ecosystem health Trophic state
Statistic:	Frequency of exceedance
Tutaekuri Rv at Lawrence Hut	A
Tutaekuri Rv U/S Mangaone Rv	B
Mangaone Rv at Rissington	(B)

Rare blooms reflecting negligible nutrient enrichment and/or alteration of the natural flow regime or habitat.

Occasional blooms reflecting low nutrient enrichment and/or alteration of the natural flow regime or habitat.

Dataset: Jan 2013 to Dec 2015
Monthly samples

Algal and aquatic plant growth



- Algal thresholds link to values
- Nutrients link to algal growth, but not directly to values

➔ Nutrient management DIN and DRP (Ngaruroro co-limited)
2 options: against guidelines or relative to current state of algal growth?

Algal cover on stream bed (%PeriWCC)

Attribute State	Ecological condition (% PeriWCC)	Recreation/ Aesthetics (%PeriWCC)
Excellent	< 20%	< 30% ✓
Good	20 to 39%	
Fair	40 to 55%	
Poor	> 55%	> 30% △


Annual maximum %PeriWCC
Filaments + (mats /2)



Summary of Algae in the Ngaruroro catchment

Algae dominated sites only


Guideline source:	NOF band	NIWA	NIWA	NIWA
Attribute/Indicator:	Algal biomass (mg Chl- <i>a</i> /m ²)	Algal cover (%PeriWCC)	Algal cover (%PeriWCC)	Algal cover (%PeriWCC)
Value:	Ecosystem health Trophic state	Ecological condition	Aesthetics / recreation	
Statistic:	Frequency of exceedance	Average maxima over 3 years	Average maxima 3 years (30%PWCC)	Max 3 years
*Taruarau Rv	N/D	Good	< 30%	25%
Ngaruroro Rv at Whanawhana	A	Good	> 30%	34%
Ngaruroro Rv D/S HB Dairies	A	Good	> 30%	36%
Ngaruroro Rv at Fernhill	A	Good	> 30%	40%
*Poporangi Strm	N/D	Excellent	< 30%	16%
*Maraekakaho Strm	N/D	Poor	> 30%	67%



- Main stem: Moderate increase algal cover from upstream to downstream, maintains good ecosystem condition.
- Sometimes exceeds recreation values
- Poporangi: shaded site.
- Maraekakaho: algae and aquatic plants (macrophytes).
- PeriWCC mats – proportion Phormidium?

Summary of algae in the Tutaekuri catchment

Guideline source:	NOF band	NIWA	NIWA	NIWA
Attribute/Indicator:	Algal biomass (mg Chl- <i>a</i> /m ²)	Algal cover (%PeriWCC)	Algal cover (%PeriWCC)	Algal cover (%PeriWCC)
Value:	Ecosystem health Trophic state	Ecological condition	Aesthetics / recreation	
Statistic:	Frequency of exceedance	Average maxima over 3 years	Average maxima 3 years (30%PWCC)	Average maxima 3 years (30%PWCC)
Tutaekuri Rv at Lawrence Hut	A	Excellent	<30%	8%
Tutaekuri Rv U/S Mangaone Rv	B	Good	>30%	31%
*Tutaekuri Rv at Puketapu		Good	<30%	23%
Tutaekuri Rv at Brookfields Br		Good	>30%	30%
*Mangatutu Strm		Excellent	<30%	17%
Mangaone Rv at Rissington	(B)	Excellent	<30%	1%
*Mangaone Rv at Dartmoor		Excellent	<30%	7%



- Main stem: moderate increase in algae cover, maintains good ecosystem condition.
- Mangaone River: small gravel that does not support large algal biomass
- Mangatutu: Algae are mainly mats, PeriWCC counts ½ cover of mats. 87% total algal cover in 2013; mats include Phormidium: >80% in total algal cover.
- See Phormidium next slide

Algal cover: Filaments and mats



Sometimes mats can be mostly Phormidium,
→ But in PeriWCC counted as ½ the impact

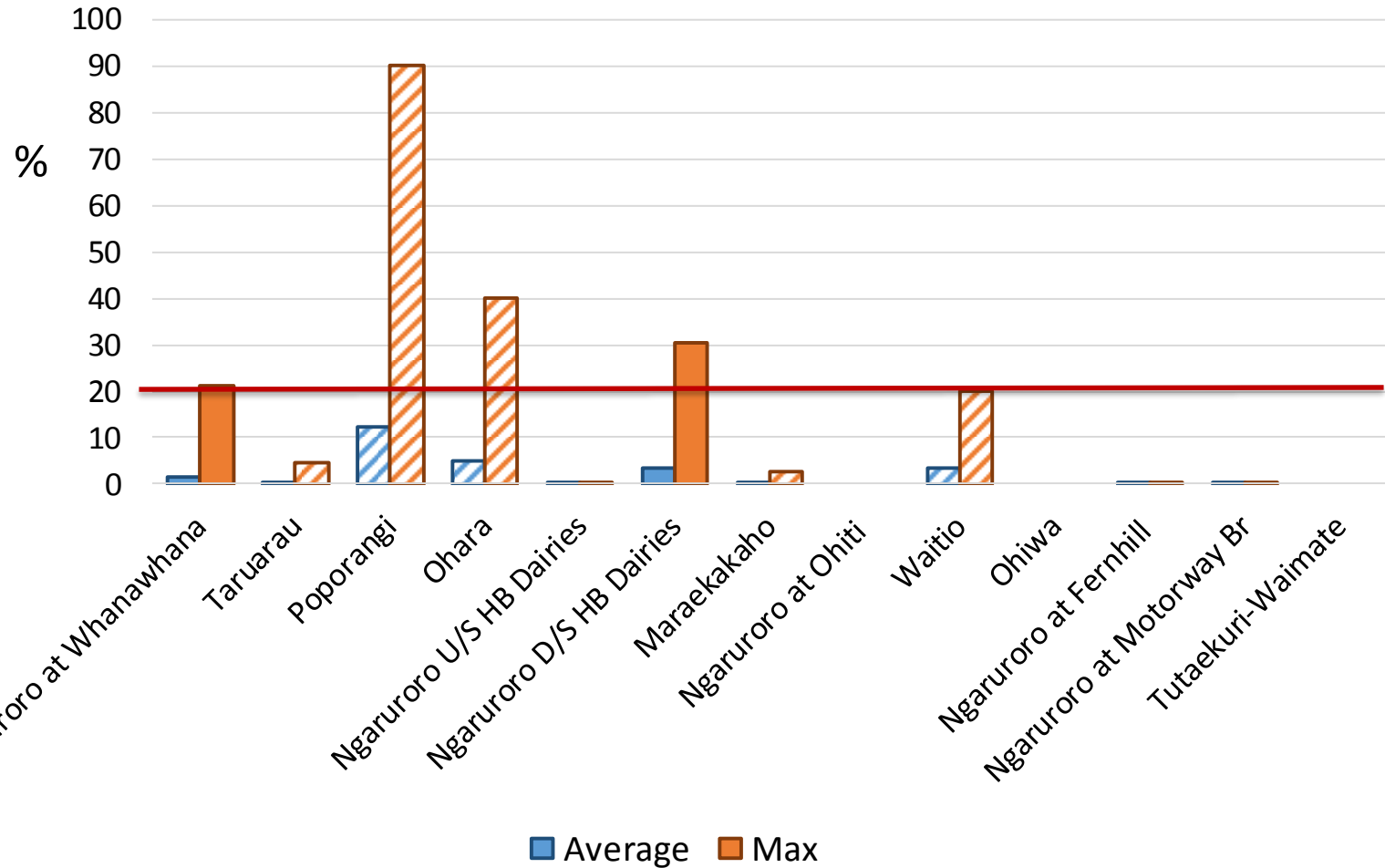
Algal cover: Filaments and mats



Phormidium (cyanobacteria):

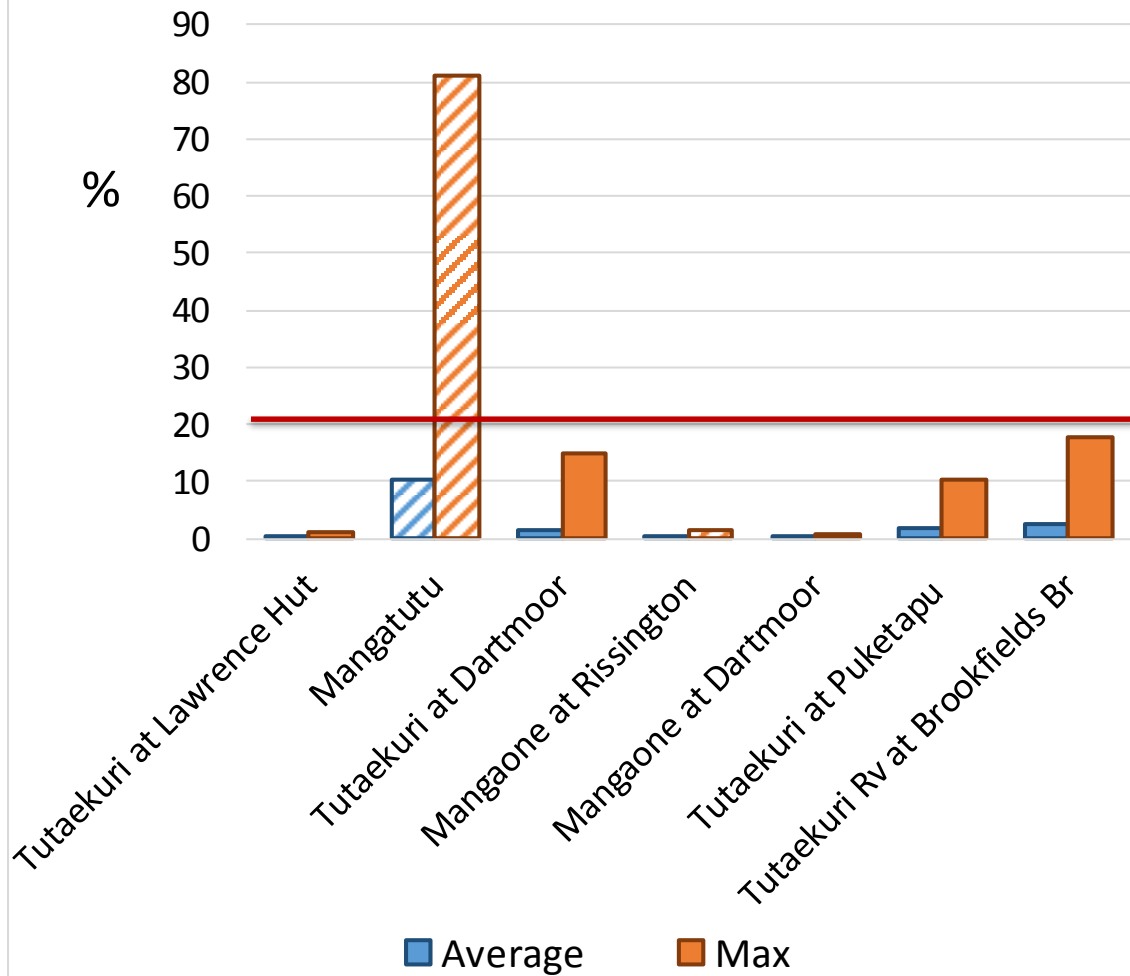
- 20% cover guideline: Risk-based alert trigger for recreation/health (compare *E.coli*). Mats are not always toxic – precautionary approach.
- Response to environmental factors not fully understood yet (current research!). Very variable between years and spatially! (Cover and toxicity)
- Management options not fully known but influencing factors nutrients and flow.
- Needs definition where recreation/health value applies

Phormidium cover Ngaruroro catchment

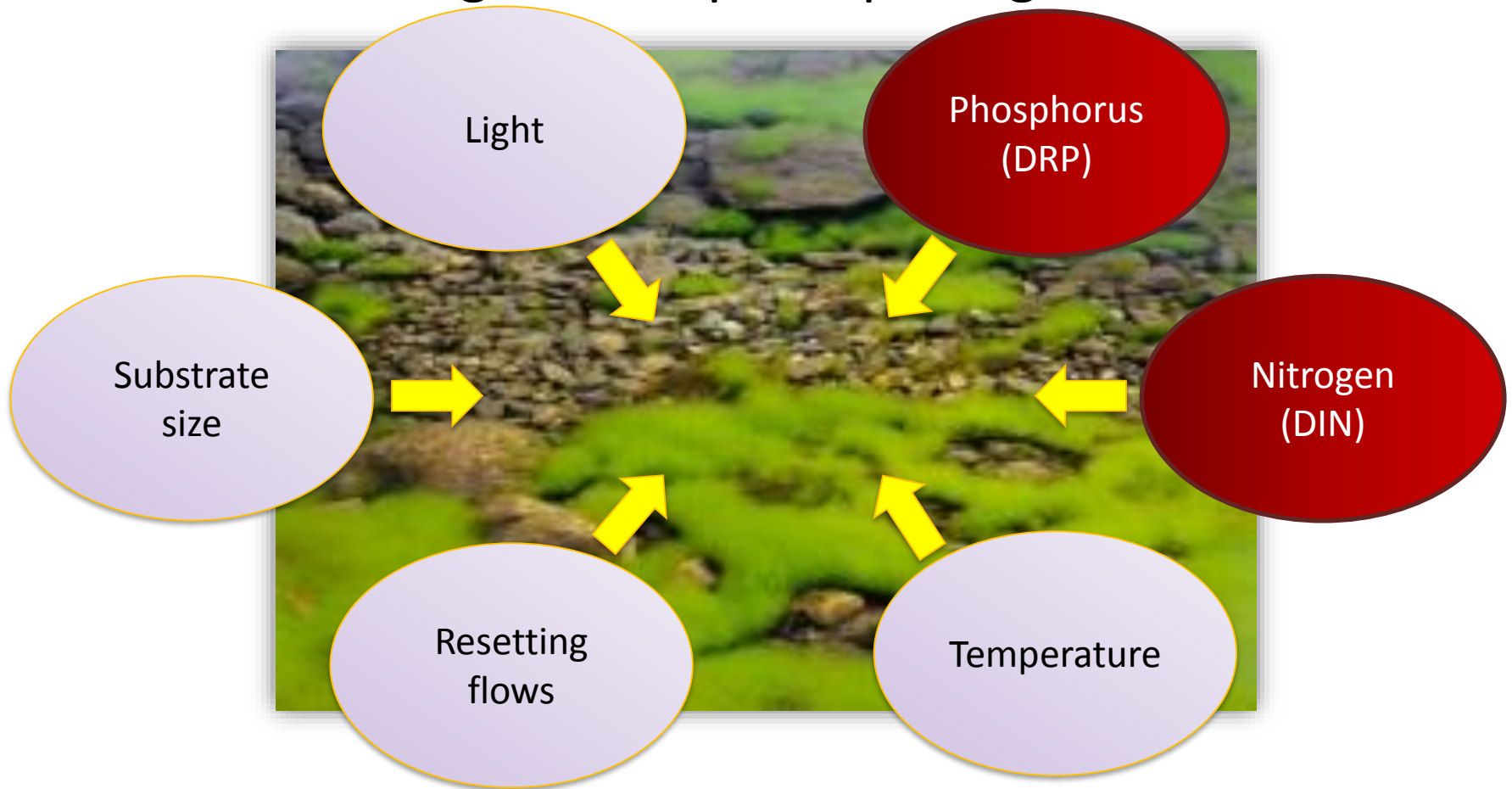


Dataset: same as PeriWCC, filtered for % Phormidium cover

Phormidium cover Tutaekuri catchment



Algal and aquatic plant growth

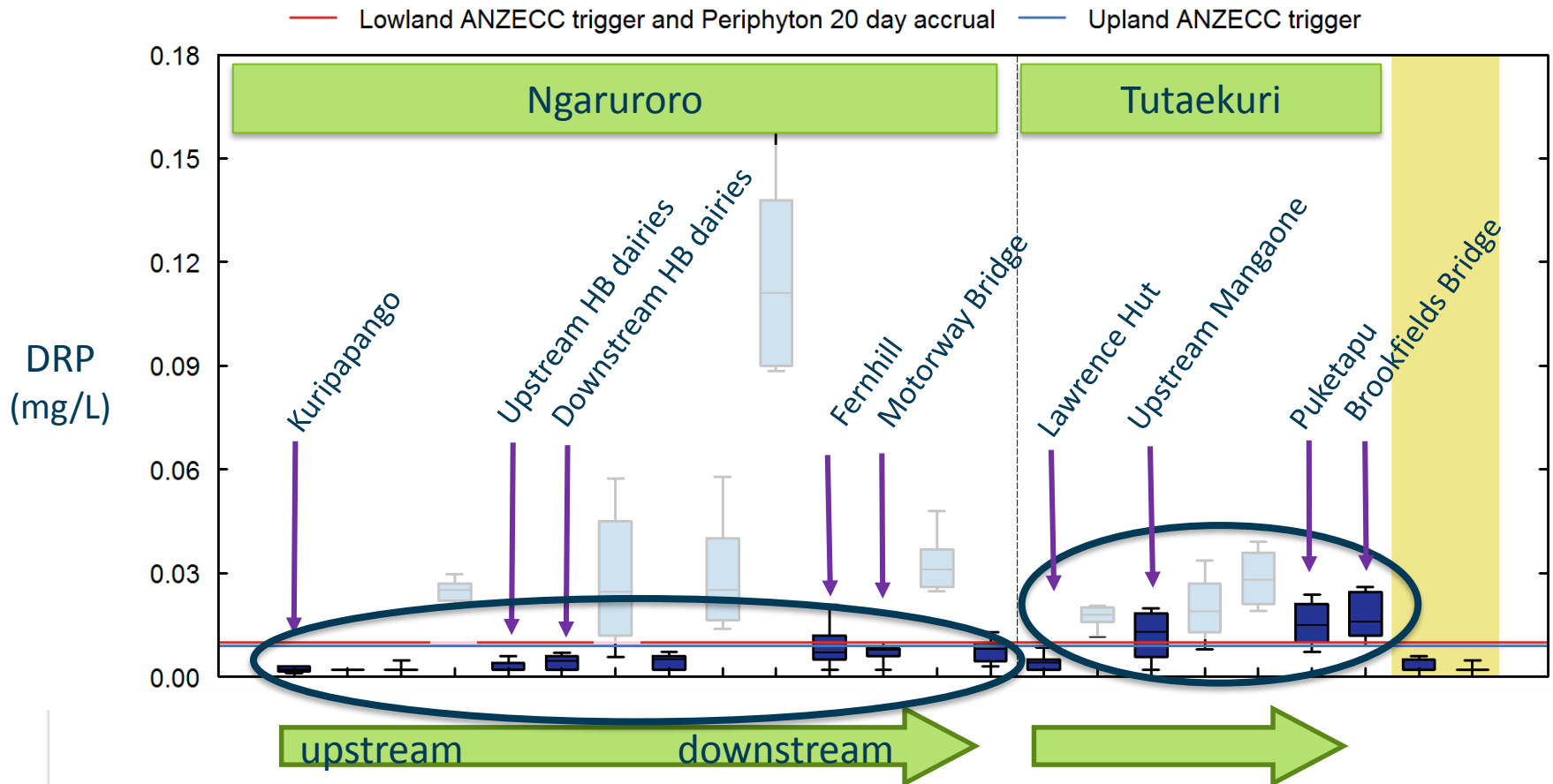


*Sometimes we don't measure high algal growth when nutrients are high
Or low algal growth when nutrients are low:*

Also depends on

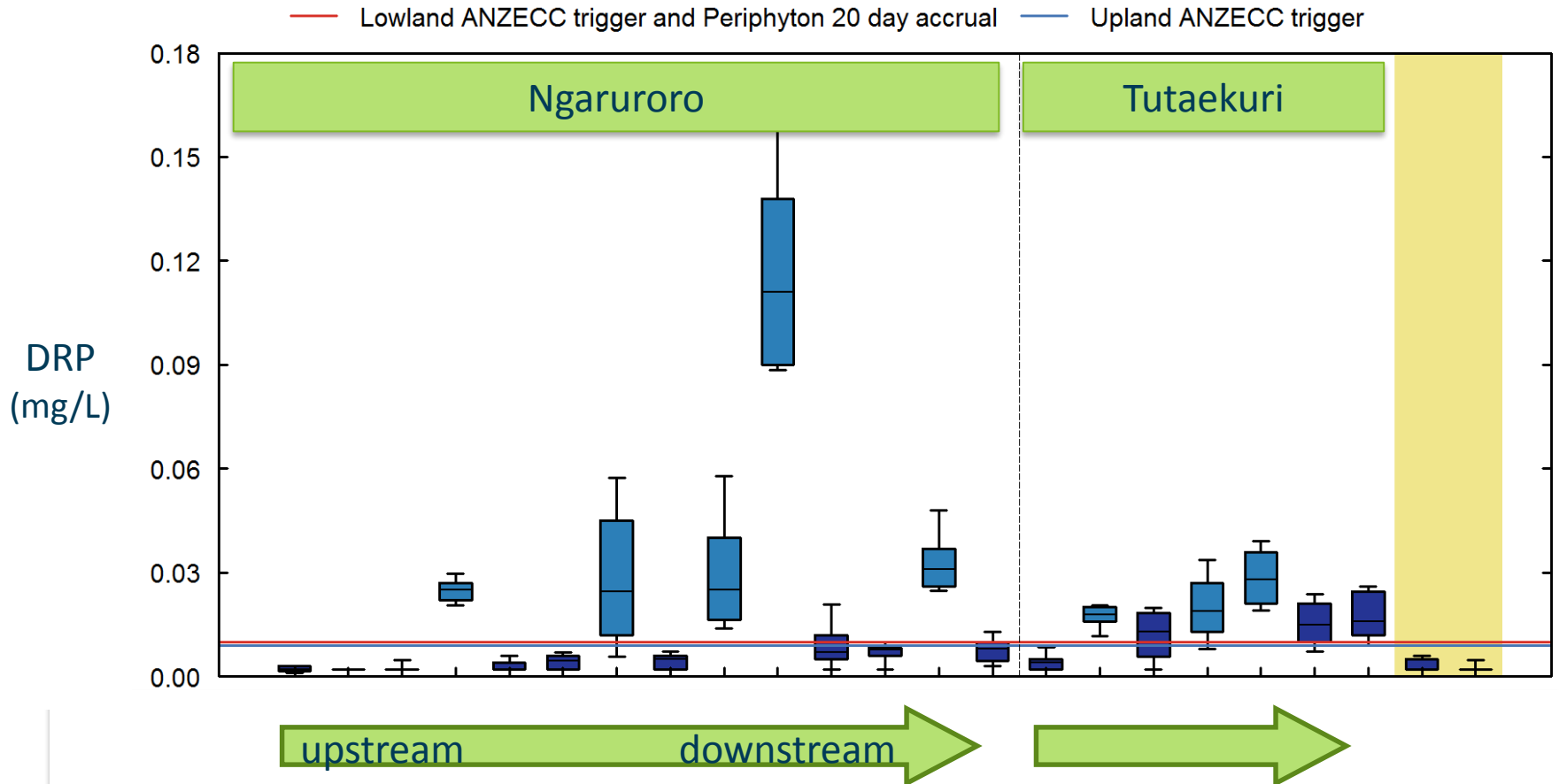
- *Growth stage of algae (fastest growth? mature?)*
- *Flow (shallow water, slow flow: more efficient nutrient uptake)*
- *Substrate (stable?)*

DRP at SOE sites Ngaruroro and Tutaekuri



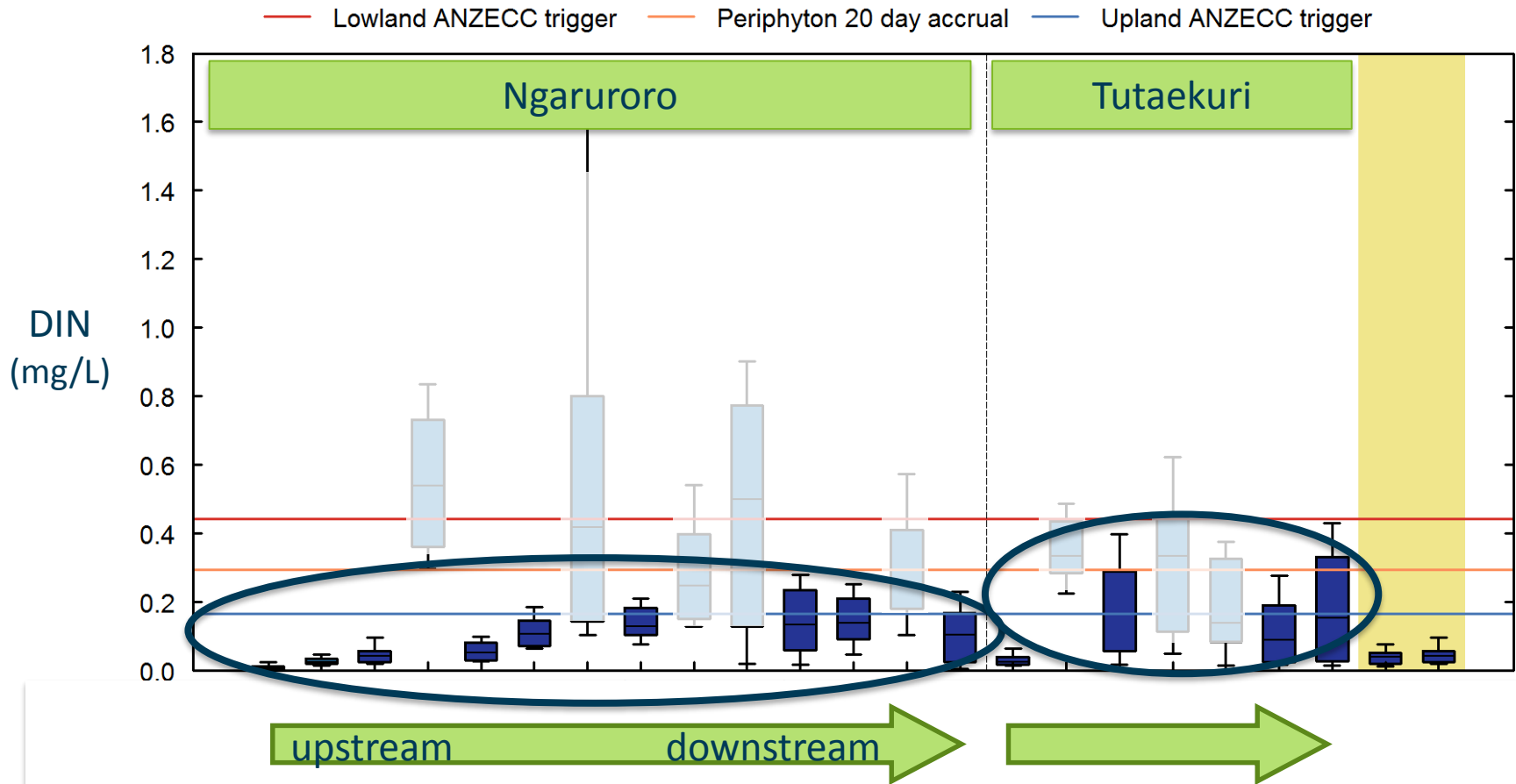
➤ Main stem: DRP higher in Tutaekuri than Ngaruroro

DRP at SOE sites Ngaruroro and Tutaekuri



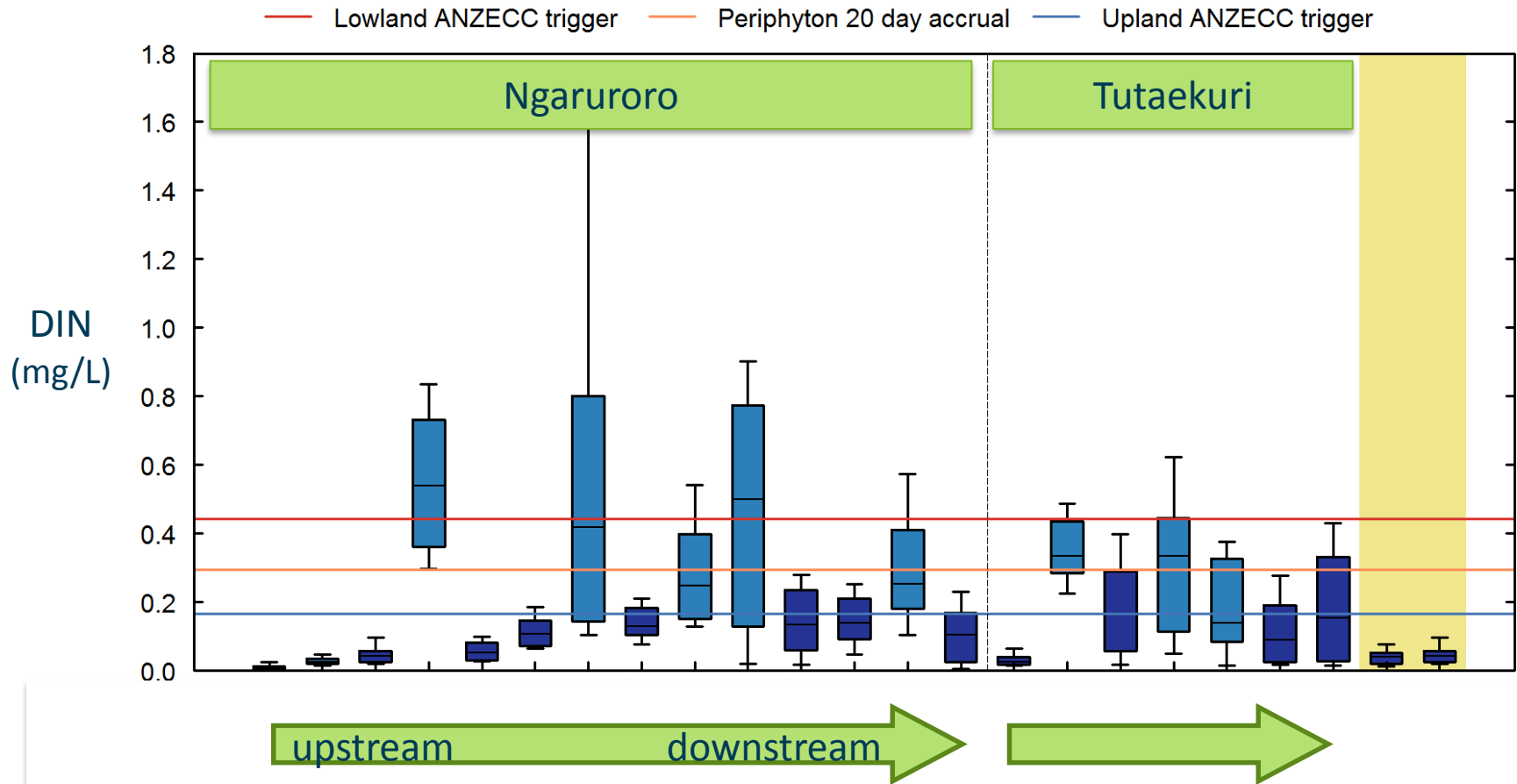
- Main stem: DRP higher in Tutaekuri than Ngaruroro
- Tributaries: always above guideline values in both catchments

DIN at SOE sites Ngaruroro and Tutaekuri



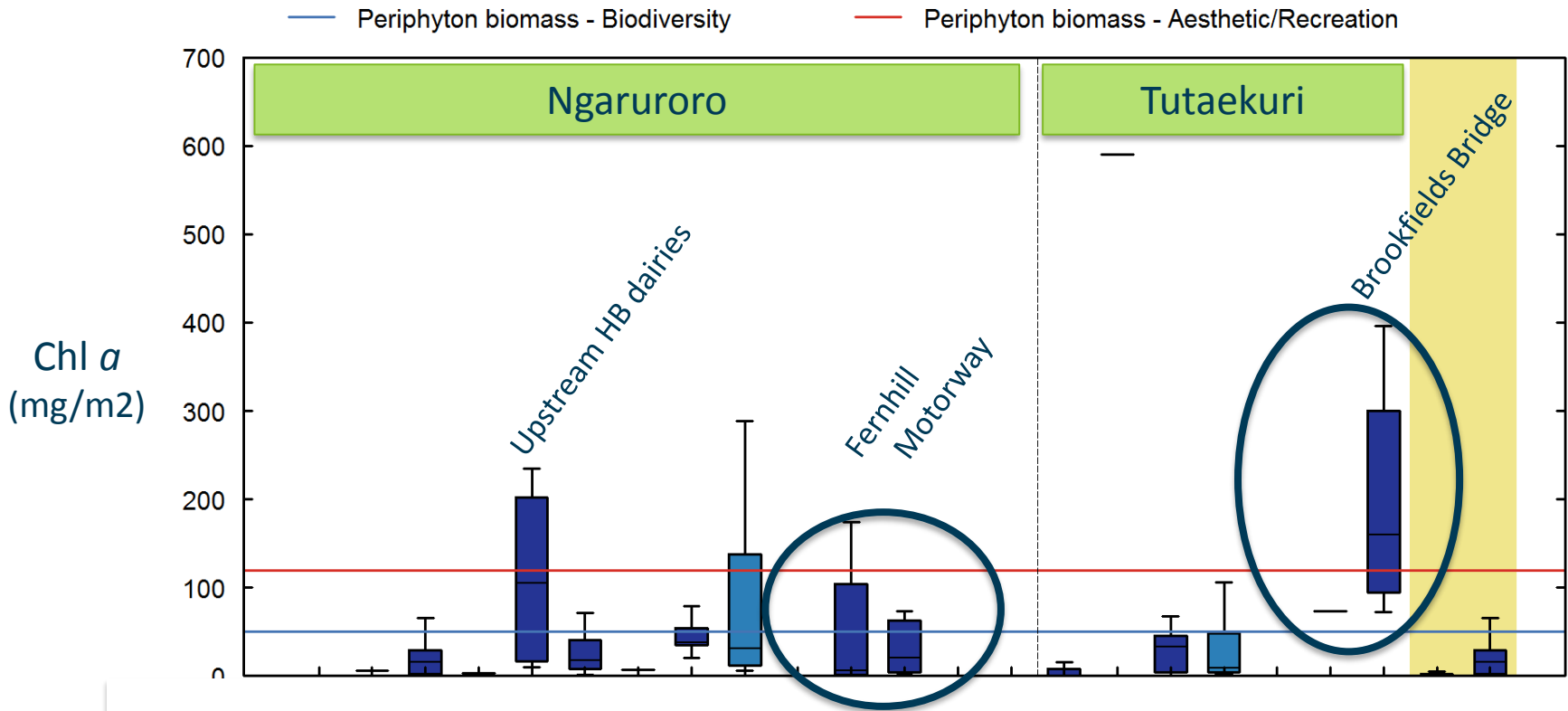
- Main stem: DIN in Tutaekuri slightly higher than in Ngaruroro

DIN at SOE sites Ngaruroro and Tutaekuri



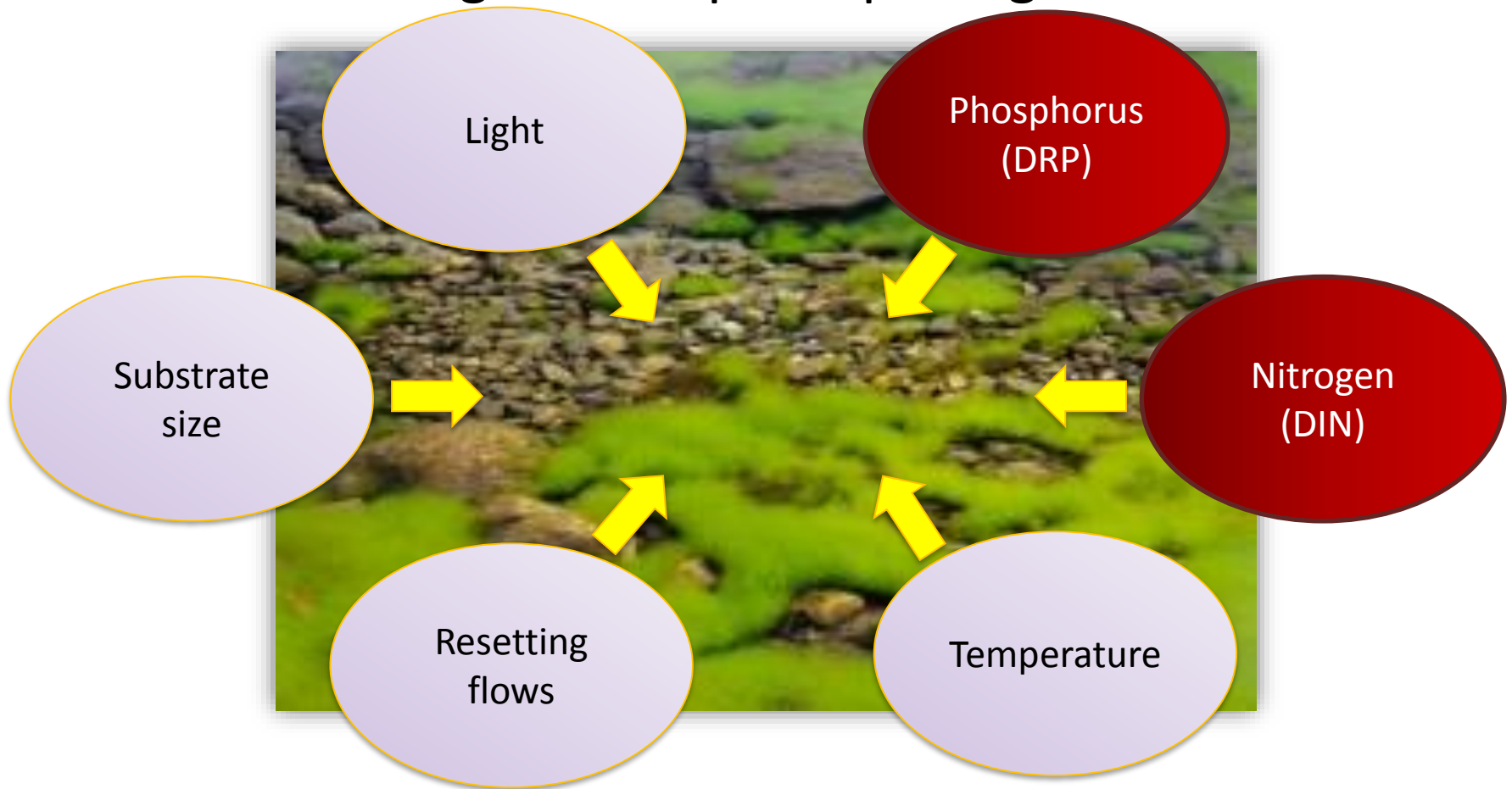
- Main stem: DIN in Tutaekuri slightly higher than in Ngaruroro
- High DIN tributaries: Poporangi, Mangatutu, Mangaone (algae)
- Also high nutrient tributaries: Waitio, Ohiwa, Tutaekuri-Waimate (macrophytes)

Algae biomass at SOE sites Ngaruroro and Tutaekuri



- Less algal biomass in lower Ngaruroro than lower Tutaekuri.
- Upstream HB Dairies, Mangaone, Poporangi: At some sites algal biomass results are different from what would be expected from nutrient concentration.
- Sample size differences= uncertainty in comparison: Whanawhana, d/s HBD and Fernhill true long term sites with monthly samples

Algal and aquatic plant growth



Sometimes we don't measure high algal growth when nutrients are high
Or low algal growth when nutrients are low:

Also depends on

- Growth stage of algae (fastest growth? mature?)
- Flow (shallow water, slow flow: more efficient nutrient uptake)
- Substrate (stable?)

Summary for algae, nutrients (Ngaruroro catchment)

Attribute	Value	State summary, notes
Algae (NOF: biomass) (NIWA: cover)	NOF: ecosystem health NIWA: ecosystem health, recreation, aesthetics	<ul style="list-style-type: none"> NOF A-band (excellent) at 3 key site measured in Ngaruroro main stem: Rare blooms reflecting negligible nutrient enrichment and/or alteration of flow and habitat. <p>NIWA algal cover index:</p> <ul style="list-style-type: none"> Occasional exceedances for contact recreation/aesthetics in mid and low main stem and 1 tributary (long accrual periods) Algal cover indicating good ecological condition in Ngaruroro main stem, excellent in Poporangi (at a shaded site), poor in Maraekakaho Other tributaries not suitable for periphyton assessment, see macrophytes
Aquatic plants (NIWA)	ecosystem health, recreation, trout fishery	<ul style="list-style-type: none"> Exceedances in tributaries
Nutrients DIN and DRP	Indirect effect on values. Direct effect on algal and macrophyte growth.	<ul style="list-style-type: none"> Low nutrient concentration in Ngaruroro main stem High nutrient concentration in tributaries, contribution to main stem Long accrual periods (long algal growth periods) increase risk for blooms even when nutrient concentration low

Summary for algae, nutrients (Tutaekuri catchment)

Attribute	Value	State summary, notes
Algae (NOF: biomass)	NOF: ecosystem health	<ul style="list-style-type: none"> NOF A-band (excellent) at Tutaekuri Lawrence Hut: Rare blooms reflecting negligible nutrient enrichment and/or alteration of flow and habitat. NOF B-band upstream Mangaone confluence and Mangaone at Rissington: Occasional blooms reflecting low nutrient enrichment and/or alteration of the natural flow regime or habitat.
Algae (NIWA: cover)	NIWA: ecosystem health, recreation, aesthetics	<p>NIWA algal cover index:</p> <ul style="list-style-type: none"> Occasional exceedances for contact recreation/aesthetics in mid and low main stem (long accrual periods) Algal cover indicating good ecological condition in Tutaekuri main stem, excellent in the tributaries (Mangaone: fine gravel unsuitable for extensive algal growth)
Nutrients DIN and DRP	<i>Indirect</i> effect on values. Direct effect on algal growth.	<ul style="list-style-type: none"> Low nutrient concentration in the upper Tutaekuri, increasing downstream, exceeding guidelines in lower main stem Higher nutrient concentration in tributaries, contribution to main stem Long accrual periods (long algal growth periods) increase risk for blooms even when nutrient concentration low

Summary of Algae in the Ngaruroro and Tutaekuri catchments

Guideline source:	NOF band		NIWA	NIWA	NIWA		
Attribute/Indicator:	Algal biomass (mg Chl- <i>a</i> /m ²)	% PeriWCC	Algal cover (%PeriWCC)	Algal cover (%PeriWCC)	Phormidium (% cover)	Priority level	Priority level
Value:	Ecosystem health Trophic state		Ecological condition	Aesthetics / recreation	Recreation/ health	upper Ngaruroro & main stem	Tributaries
Statistic:	Frequency of exceedance	Max avge 3 years	Average maxima over 3 years	Average maxima 3 years	Maximum		
*Taruarau Rv		25%	Good	< 30%	5%	Low	
Ngaruroro Rv at Whanawhana	A	34%	Good	> 30%	21%		
Ngaruroro Rv D/S HB Dairies	A	36%	Good	> 30%	31%		
Ngaruroro Rv at Fernhill	A	40%	Good	> 30%	0%		
*Poporangi Strm		16%	Excellent	< 30%	90%		Medium
*Maraekakaho Strm		67%	Poor	> 30%	3%		

Tutaekuri Rv at Lawrence Hut	A	8%	Excellent	<30%	1%	Low	
Tutaekuri Rv U/S Mangaone Rv	B	31%	Good	>30%	1%		
*Tutaekuri Rv at Puketapu		23%	Good	<30%	10%	Medium	
Tutaekuri Rv at Brookfields Br	2013: 460 mg/L	30%	Good	>30%	18%		
*Mangatutu Strm	2013: 590 mg/L	17%	Excellent	<30%	81%		Medium
Mangaone Rv at Rissington	(B)	1%	Excellent	<30%	2%		
*Mangaone Rv at Dartmoor		7%	Excellent	<30%	1%		

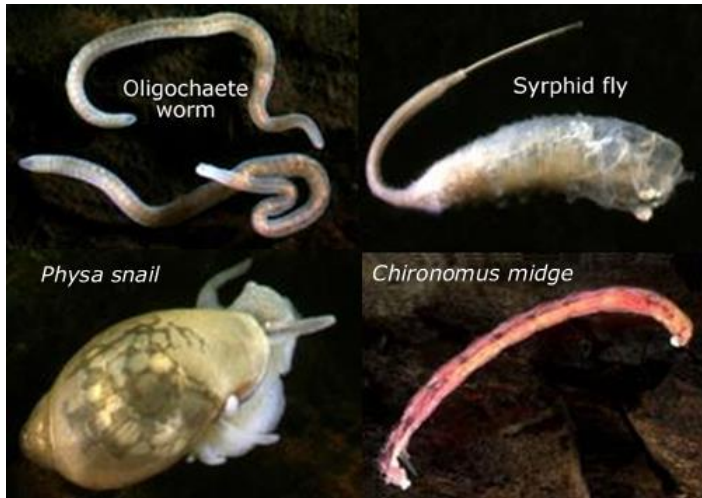
Discussion and feedback

- Algal biomass and cover in relation to values ecosystem health, recreation and aesthetics and human health
- Agreement on response rating for the Ngaruroro and Tutaekuri catchments



Macroinvertebrate community index (MCI)

Tolerant taxa → low MCI score Sensitive taxa “EPT taxa” → high MCI score



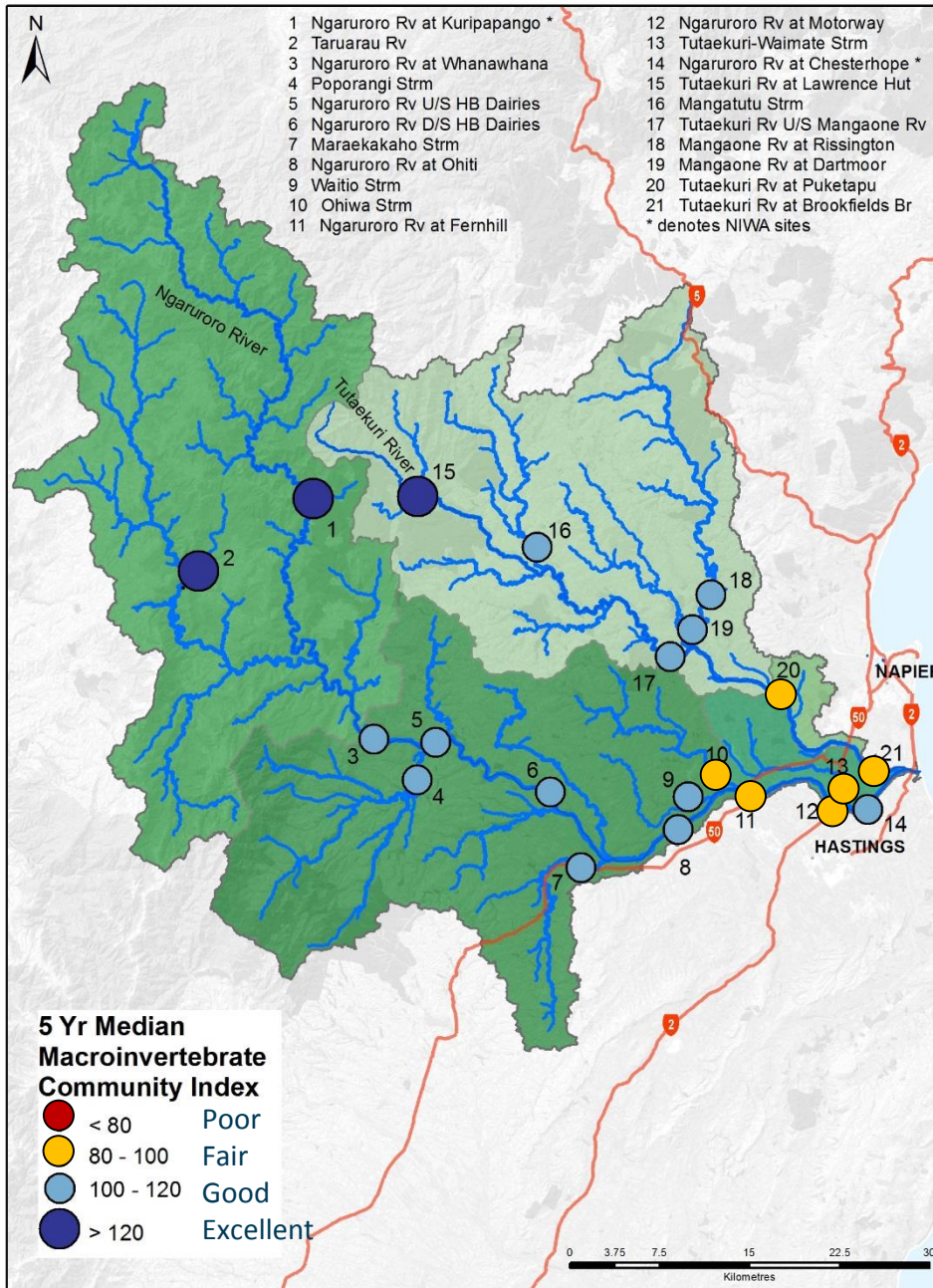
Photos: Landcare Research



Macroinvertebrates are aquatic bugs

The community at a site indicates good ecological condition when

- many different bugs are present (diversity)
- A high proportion of sensitive species is present (high score)



MCI

Macroinvertebrate Community Index

Factors influencing MCI

- Organic pollution / oxygen
- Temperature
- Habitat (clean gravel, habitat variability)
- Toxicants (e.g. ammonia, nitrate)
- Flow

Macroinvertebrate community index, Ngaruroro catchment

Guideline source:	Stark et al. 2007
Attribute/Indicator:	MCI (index)
Value:	Ecosystem health indicator
Statistic:	5-year average
Ngaruroro Rv at Kuripapango NIWA	Excellent
*Taruarau Rv	(Excellent)
Ngaruroro Rv at Whanawhana	Good
Ngaruroro Rv U/S HB Dairies	Good
Ngaruroro Rv D/S HB Dairies	Good
Ngaruroro Rv at Ohiti	Good
Ngaruroro Rv at Fernhill	Fair
Ngaruroro Rv at Motorway	Good to Fair
Ngaruroro Rv at Chesterhope NIWA	Good
*Poporangi Strm	(Good)
*Maraekakaho Strm	(Good)
Waitio Strm	Good to Fair
*Ohiwa Strm	(Fair)
Tutaekuri-Waimate Strm	Fair

Main stem:

Possible factors for lower MCI
Temperature, Sediment?

Lowland streams with macrophyte (aquatic plants) and fine sediment, but gravel bed.

Waitio: MCI 99, MCI-sb 97, Ohiwa: MCI 84, MCI-sb 80, Tut-Wai: MCI 78 MCI-sb 68

Summary Macroinvertebrate community index Tutaekuri catchment

Guideline source:	Stark et al. 2007
Attribute/Indicator:	MCI (index)
Value:	Ecosystem health indicator
Statistic:	5-year average
Tutaekuri Rv at Lawrence Hut	Excellent
Tutaekuri Rv U/S Mangaone Rv	Good
*Tutaekuri Rv at Puketapu	(Fair)
Tutaekuri Rv at Brookfields Br	Fair
*Mangatutu Strm	(Good)
Mangaone Rv at Rissington	Good
*Mangaone Rv at Dartmoor	(Good)

Possible factors for lower MCI
Temperature,
Sediment?

Guideline source:	Stark et al. 2007		
Attribute/Indicator:	MCI (index)	Priority level	Priority level
Value:	Ecosystem health indicator	upper Ngaruroro & main stem	Tributaries
Statistic:	5-year average		
Ngaruroro Rv at Kuripapango NIWA	Excellent		
*Taruarau Rv	(Excellent)		
Ngaruroro Rv at Whanawhana	Good		
Ngaruroro Rv U/S HB Dairies	Good		
Ngaruroro Rv D/S HB Dairies	Good		
Ngaruroro Rv at Ohiti	Good		
Ngaruroro Rv at Fernhill	Fair		
Ngaruroro Rv at Motorway	Good to Fair		
Ngaruroro Rv at Chesterhope NIWA	Good		
*Poporangi Strm	(Good)		
*Maraekakaho Strm	(Good)		
Waitio Strm	Good to Fair		
*Ohiwa Strm	(Fair)		
Tutaekuri-Waimate Strm	Fair		

Tutaekuri Rv at Lawrence Hut	Excellent		
Tutaekuri Rv U/S Mangaone Rv	Good		
*Tutaekuri Rv at Puketapu	(Fair)		
Tutaekuri Rv at Brookfields Br	Fair		
*Mangatutu Strm	(Good)		
Mangaone Rv at Rissington	Good		
*Mangaone Rv at Dartmoor	(Good)		

Summary MCI Ngaruroro and Tutaekuri catchments

Water Clarity and Turbidity

Objective for this session;

- Response ratings (prioritisation) are agreed on where needs of values are not met
- Revision when SedNet modelling results available

Format of session

- Presentation of states in relation to guidelines and values

Water clarity and turbidity, deposited sediment

Particles from soil erosion (mainly) or point sources (e.g. sewage outfalls, stormwater)



Variable

Measurement

Visual Clarity

Measured as viewing distance (metres Black Disk distance)

Turbidity

'Cloudiness' of water (NTU): particles (clay, silt, organic matter) cause light scattering in water

Deposited sediment

(Sand, silt, mud) on stream bed (new protocol)

Water clarity and turbidity, deposited sediment



Impact on values

Clarity/visibility

- Recreation: Safety, aesthetics; Determines how well you see in the water
- Ecosystem health, fishery: Visibility determines success of fish catching prey (visual drift feeders like trout)

Amount of particles

- Clogging/destroying nets of filter feeders,
- Abrading, damaging gills.
- Fills stomach of filter feeders with indigestible silt/clay → less energy for growth, reproduction

Water clarity and turbidity, deposited sediment

Impact on values

Tutaekuri at Lawrence Hut



Mangatutu



Tutaekuri at Brookfields Bridge



Impact on values

Clean sediment functions:

- Spaces between gravel and cobble are (1) habitat, (2) refuge during flood events and high temperature!
- Flow between gravel keeps temperatures cool (braided main stems)
- Exchange with groundwater
- Reaction surface for microorganisms (cleans water)

Water clarity and turbidity

Impact on estuarine values

Eelgrass



Phytoplankton



Clarity/visibility/ light penetration

- Recreation: Determines how well you see in the water
- Ecosystem health: Visibility determines success of fish catching prey
- Shift from eelgrass and macroalgae to phytoplankton and high turbidity

Amount of particles in the water:

- Clogs and abrades gills of filter feeders
- Filter feeders have to filter more → less energy for growth, reproduction

Deposited sediment

Impact on estuarine values

Waitangi estuary



Waitangi estuary

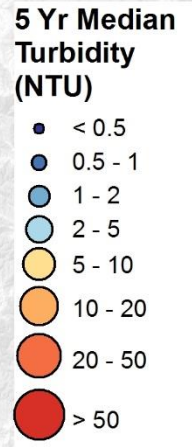
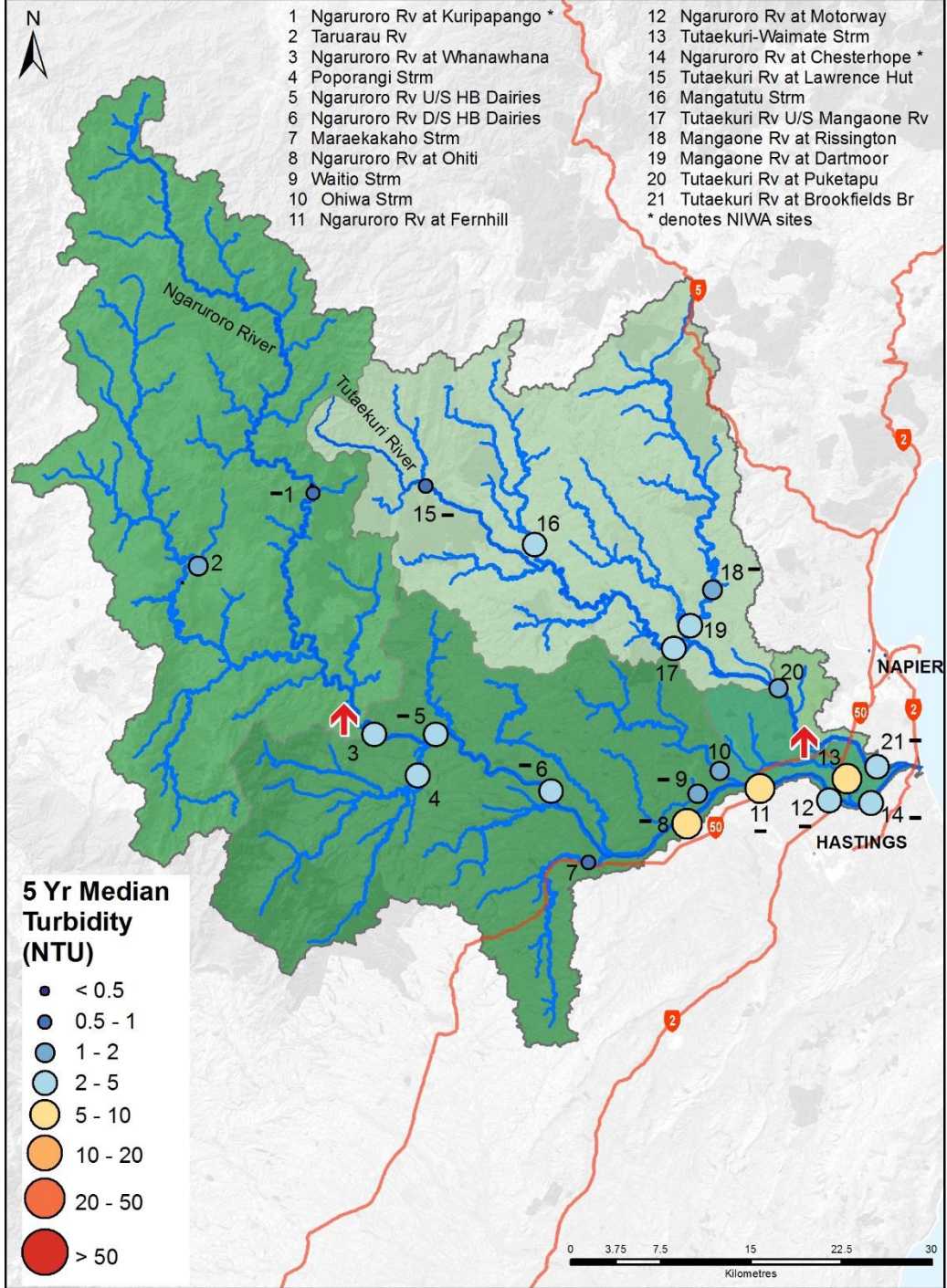


Ahuriri Estuary



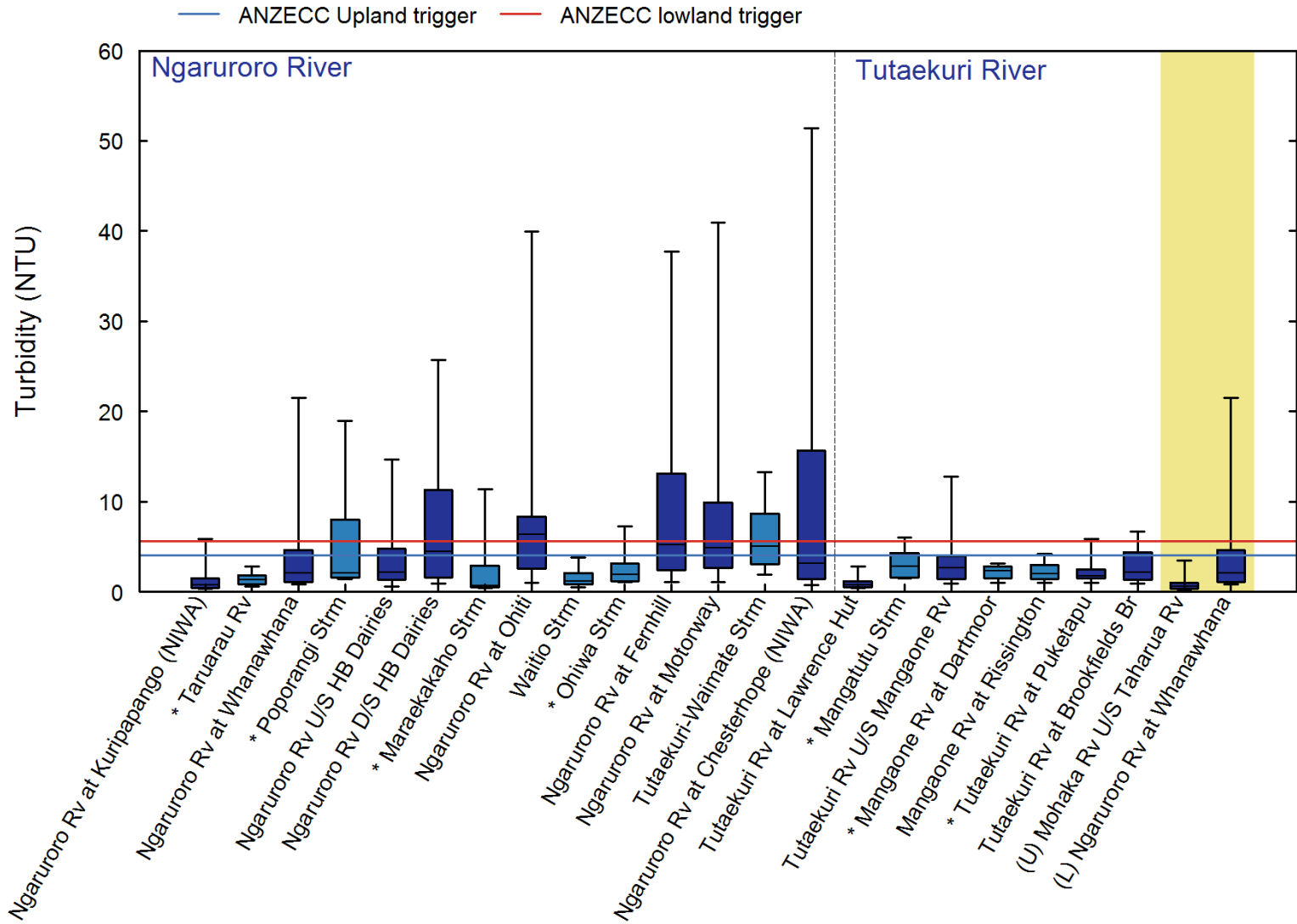
Deposited sediment:

- Change in substrate from gravel and sand (slide on left) to mud (centre slide) means change in species (SoE monitoring)
- Smothering of eelgrass and intertidal vegetation (left slide)
- Smothering of shellfish beds and other infauna (middle slide and SOE data)
- Anoxic layer at surface a sign of increasing fine sediment – nothing can live in this (right slide) !

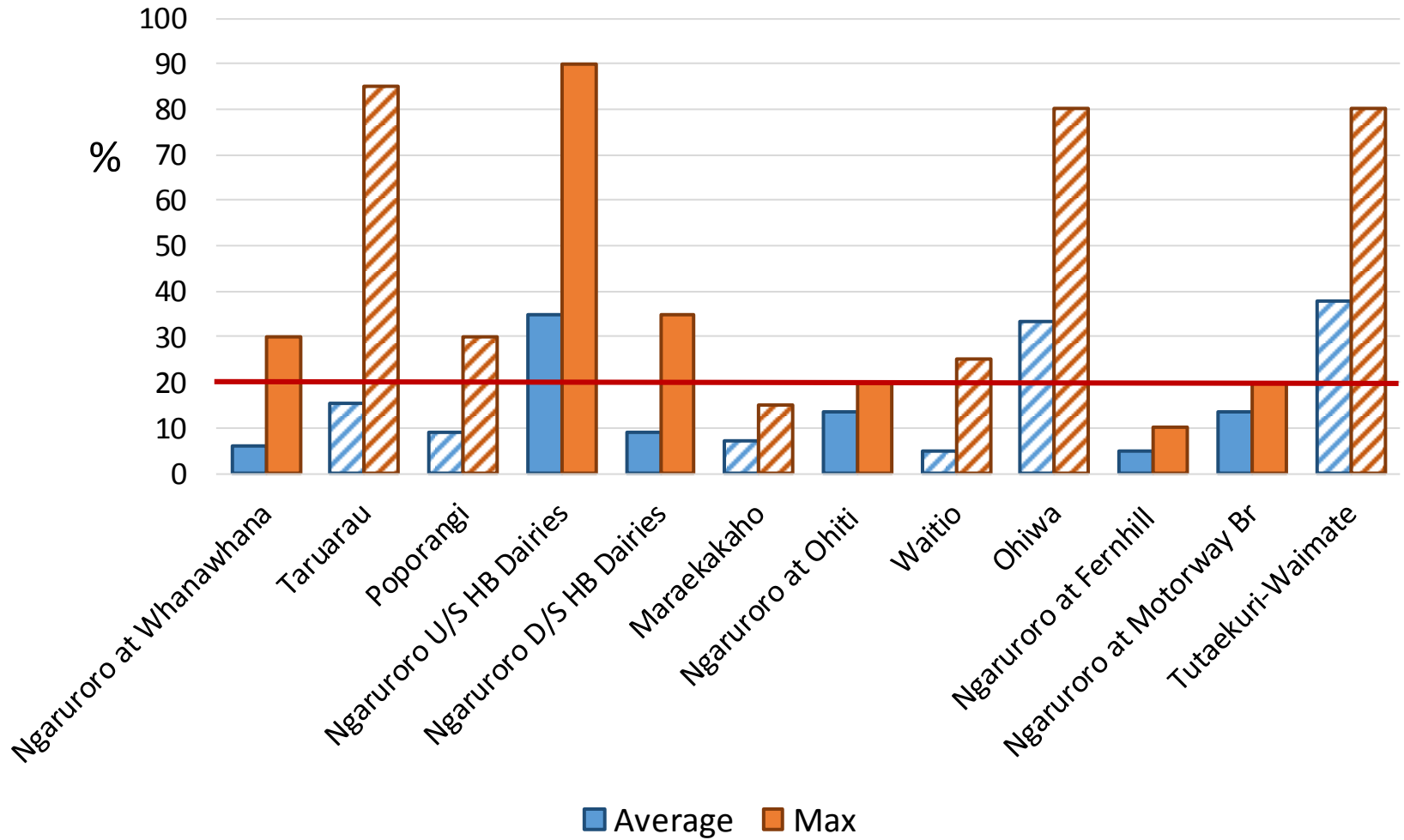


- 1 Ngaruroro Rv at Kuripapango *
- 2 Taruarau Rv
- 3 Ngaruroro Rv at Whanawhana
- 4 Poporangi Strm
- 5 Ngaruroro Rv U/S HB Dairies
- 6 Ngaruroro Rv D/S HB Dairies
- 7 Maraekakaho Strm
- 8 Ngaruroro Rv at Ohiti
- 9 Waitio Strm
- 10 Ohiwa Strm
- 11 Ngaruroro Rv at Fernhill
- 12 Ngaruroro Rv at Motorway
- 13 Tutaeuri-Waimate Strm
- 14 Ngaruroro Rv at Chesterhope *
- 15 Tutaeuri Rv at Lawrence Hut
- 16 Mangatutu Strm
- 17 Tutaeuri Rv U/S Mangaone Rv
- 18 Mangaone Rv at Rissington
- 19 Mangaone Rv at Dartmoor
- 20 Tutaeuri Rv at Puketapu
- 21 Tutaeuri Rv at Brookfields Br
- * denotes NIWA sites

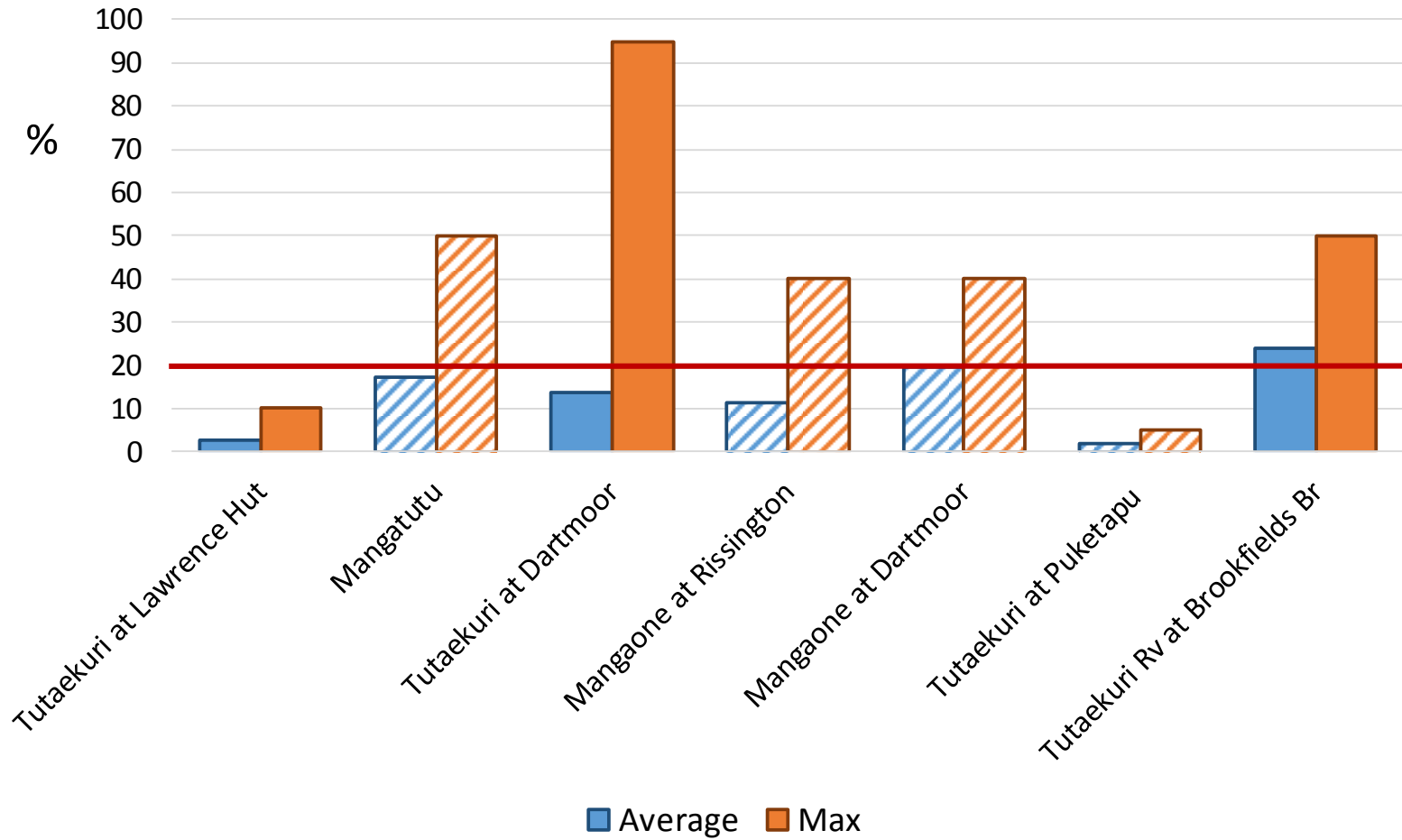




Deposited fine sediment cover Ngaruroro catchment



Deposited fine sediment cover Tutaekuri catchment



Summary water clarity and turbidity Ngaruroro catchment

Guideline source:		Hay et al. 2008	Hay et al. 2009	ANZECC		ANZECC	apcott et al.
Attribute/Indicator:		Black Disc viewing distance (metres)	Black Disc viewing distance (metres)	Black Disc viewing distance (metres)		Turbidity (NTU) trigger	
Value:	Black disk (m)	Outstanding trout fishery	Significant trout fishery	Contact recreation (1.6 m)	Turbidity (NTU)	Ecosystem health	Deposited sediment (%)
Statistic:	median all flows	Median (threshold 5m)	Median (threshold 3.5m)	Median (threshold 1.6m)	median all flows	Median (Upland 4.1 NTU Lowland 5.6 NTU)	Average (3 years)
Ngaruroro Rv at Kuripapango NIWA	5.3	> 5m	> 3.5 m	> 1.6 m	0.8	< 4.1	
*Taruarau Rv	4.7	(< 5m)	(> 3.5 m)	(> 1.6 m)	1.4	(< 4.1)	15
Ngaruroro Rv at Whanawhana	2.4	< 5 m	< 3.5 m	> 1.6 m	2.1	< 5.6	6
Ngaruroro Rv U/S HB Dairies	2.4	< 5 m	< 3.5 m	> 1.6 m	2.2	< 5.6	35
Ngaruroro Rv D/S HB Dairies	1.2	< 5 m	< 3.5 m	< 1.6 m	4.5	< 5.6	9
Ngaruroro Rv at Ohiti	0.8	< 5 m	< 3.5 m	< 1.6 m	6.4	> 5.6	13
Ngaruroro Rv at Fernhill	1.2	< 5 m	< 3.5 m	< 1.6 m	5.2	< 5.6	5
Ngaruroro Rv at Motorway	1.0	< 5 m	< 3.5 m	< 1.6 m	4.9	< 5.6	13
Ngaruroro Rv at Chesterhope NIWA	1.3	< 5 m	< 3.5 m	< 1.6 m	3.4	< 5.6	
*Poporangi Strm	1.7	(< 5m)	(< 3.5 m)	(> 1.6 m)	2.1	(< 5.6)	9
*Maraekakaho Strm	3.4	(< 5m)	(< 3.5 m)	(> 1.6 m)	0.7	(< 5.6)	7
Waitio Strm	3.0	< 5 m	< 3.5 m	> 1.6 m	1.2	< 5.6	5
*Ohiwa Strm	3.0	(< 5m)	(< 3.5 m)	(> 1.6 m)	1.9	(< 5.6)	33
Tutaekuri-Waimate Strm	1.1	< 5 m	< 3.5 m	< 1.6 m	5.1	< 5.6	38

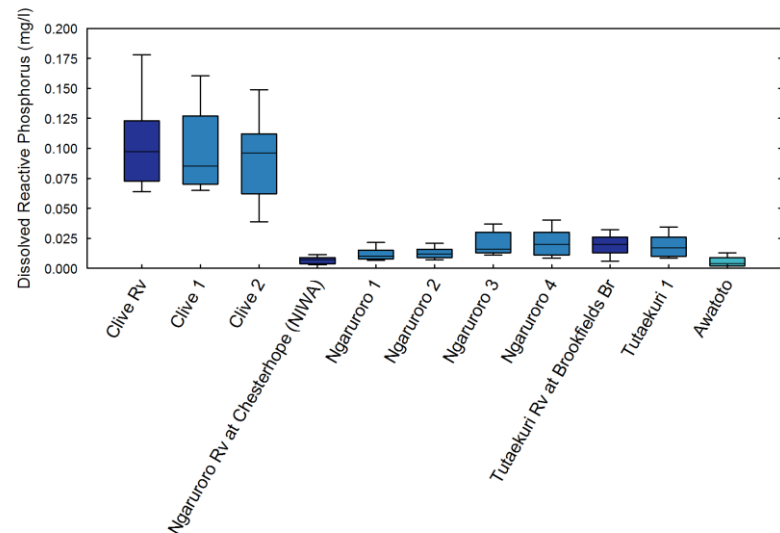
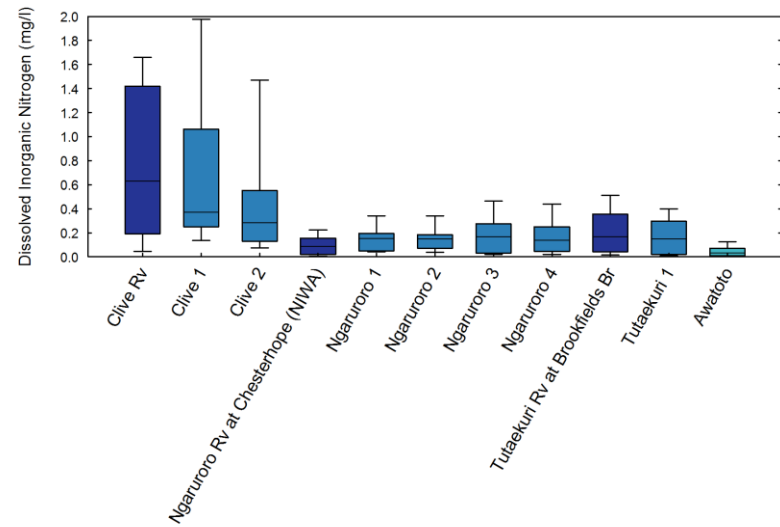
Summary water clarity and turbidity Tutaekuri main stem and tributaries

Guideline source:		Hay et al. 2008	Hay et al. 2009	ANZECC		ANZECC	apcott et al.
Attribute/Indicator:		Black Disc viewing distance (metres)	Black Disc viewing distance (metres)	Black Disc viewing distance (metres)		Turbidity (NTU) trigger	
Value:	Black disk (m)	Outstanding trout fishery	Significant trout fishery	Contact recreation (1.6 m)	Turbidity (NTU)	Ecosystem health	Deposited sediment (%)
Statistic:	median all flows	Median (threshold 5m)	Median (threshold 3.5m)	Median (threshold 1.6m)	median all flows	Median (Upland 4.1 NTU Lowland 5.6 NTU)	Average (3 years)
Tutaekuri Rv at Lawrence Hut	5.9	> 5m	> 3.5 m	> 1.6 m	0.8	< 4.1	2.8
Tutaekuri Rv U/S Mangaone Rv	1.5	< 5 m	< 3.5 m	< 1.6 m	2.7	< 5.6	13.7
*Tutaekuri Rv at Puketapu	2.8	(< 5m)	(< 3.5 m)	> 1.6 m	1.8	(< 5.6)	2.0
Tutaekuri Rv at Brookfields Br	1.9	< 5 m	< 3.5 m	> 1.6 m	2.2	< 5.6	24.0
*Mangatutu Strm	1.4	(< 5m)	(< 3.5 m)	(< 1.6 m)	2.8	(< 5.6)	17.2
Mangaone Rv at Rissington	2	< 5 m	< 3.5 m	> 1.6 m	2	< 5.6	11.4
*Mangaone Rv at Dartmoor	2	(< 5m)	(< 3.5 m)	> 1.6 m	2.3	(< 5.6)	19.4

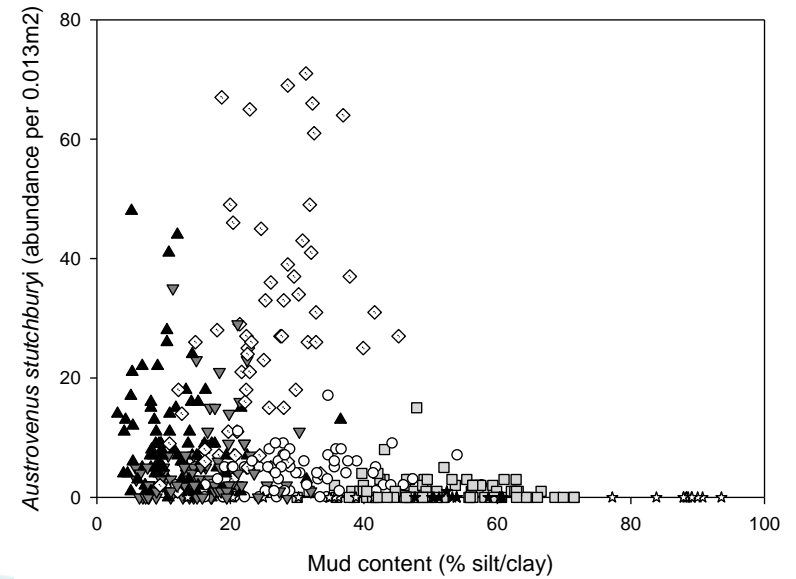
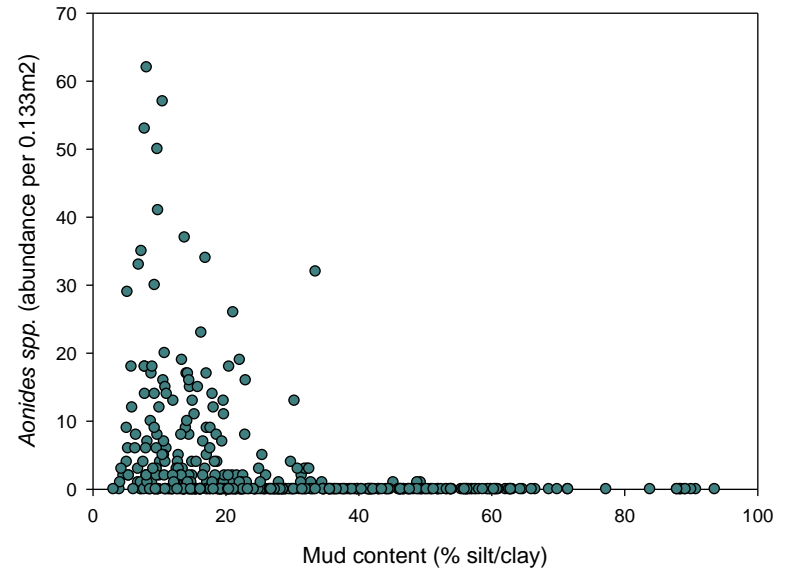
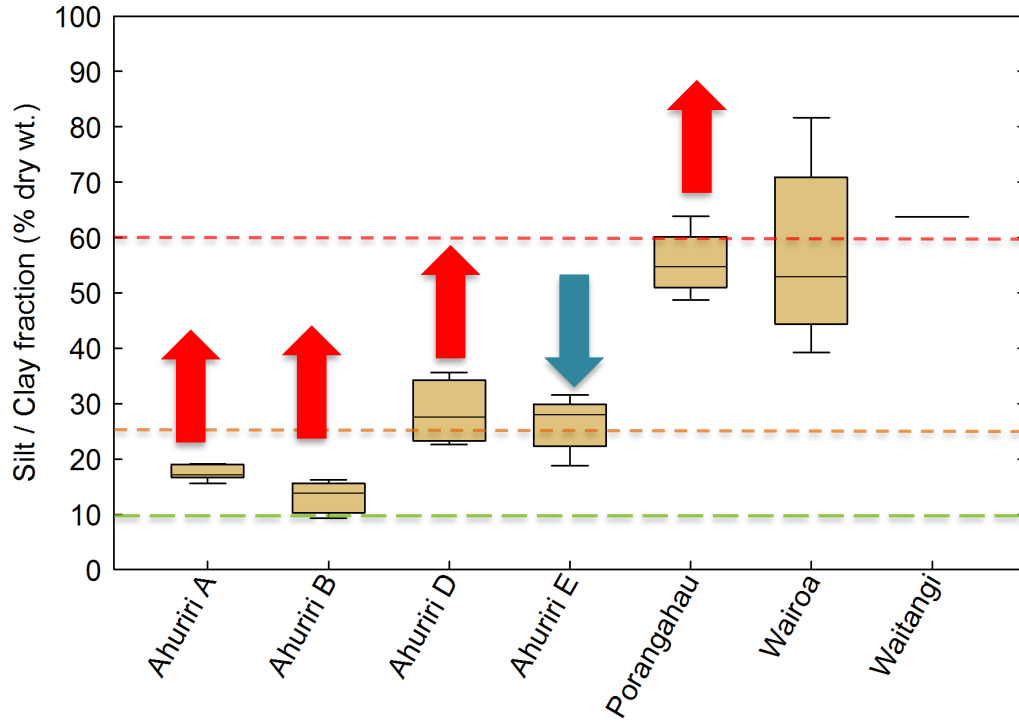
Deposited sediment



- 12 months data 2014
- Estuarine conditions reflect freshwater inputs
- Load more important than concentration to look at impacts on coastal environment



Estuaries - SOE



Summary clarity, turbidity and deposited sediment

Discussion and feedback

Guideline source:		Hay et al. 2008	Hay et al. 2009	ANZECC		ANZECC	apcott et al.		
Attribute/Indicator:		Black Disc viewing distance (metres)	Black Disc viewing distance (metres)	Black Disc viewing distance (metres)		Turbidity (NTU) trigger		Priority level	Priority level
Value:	Black disk (m)	Outstanding trout fishery	Significant trout fishery	Contact recreation (1.6 m)	Turbidity (NTU)	Ecosystem health	Deposited sediment (%)	upper Ngaruroro & main stem	Tributaries
Statistic:	median all flows	Median (threshold 5m)	Median (threshold 3.5m)	Median (threshold 1.6m)	median all flows	Median (Upland 4.1 NTU Lowland 5.6 NTU)	Average (3 years)		
Ngaruroro Rv at Kuripapango NIWA	5.3	> 5m	> 3.5 m	> 1.6 m	0.8	< 4.1			
*Taruarau Rv	4.7	(< 5m)	(> 3.5 m)	(> 1.6 m)	1.4	(< 4.1)	15		
Ngaruroro Rv at Whanawhana	2.4	< 5 m	< 3.5 m	> 1.6 m	2.1	< 5.6	6		
Ngaruroro Rv U/S HB Dairies	2.4	< 5 m	< 3.5 m	> 1.6 m	2.2	< 5.6	35		
Ngaruroro Rv D/S HB Dairies	1.2	< 5 m	< 3.5 m	< 1.6 m	4.5	< 5.6	9		
Ngaruroro Rv at Ohiti	0.8	< 5 m	< 3.5 m	< 1.6 m	6.4	> 5.6	13		
Ngaruroro Rv at Fernhill	1.2	< 5 m	< 3.5 m	< 1.6 m	5.2	< 5.6	5		
Ngaruroro Rv at Motorway	1.0	< 5 m	< 3.5 m	< 1.6 m	4.9	< 5.6	13		
Ngaruroro Rv at Chesterhope NIWA	1.3	< 5 m	< 3.5 m	< 1.6 m	3.4	< 5.6			
*Poporangi Strm	1.7	(< 5m)	(< 3.5 m)	(> 1.6 m)	2.1	(< 5.6)	9		
*Maraekakaho Strm	3.4	(< 5m)	(< 3.5 m)	(> 1.6 m)	0.7	(< 5.6)	7		
Waitio Strm	3.0	< 5 m	< 3.5 m	> 1.6 m	1.2	< 5.6	5		
*Ohiwa Strm	3.0	(< 5m)	(< 3.5 m)	(> 1.6 m)	1.9	(< 5.6)	33		
Tutaekuri-Waimate Strm	1.1	< 5 m	< 3.5 m	< 1.6 m	5.1	< 5.6	38		
Tutaekuri Rv at Lawrence Hut	5.9	> 5m	> 3.5 m	> 1.6 m	0.8	< 4.1	2.8		
Tutaekuri Rv U/S Mangaone Rv	1.5	< 5 m	< 3.5 m	< 1.6 m	2.7	< 5.6	13.7		
*Tutaekuri Rv at Puketapu	2.8	(< 5m)	(< 3.5 m)	> 1.6 m	1.8	(< 5.6)	2.0		
Tutaekuri Rv at Brookfields Br	1.9	< 5 m	< 3.5 m	> 1.6 m	2.2	< 5.6	24.0		
*Mangatutu Strm	1.4	(< 5m)	(< 3.5 m)	(< 1.6 m)	2.8	(< 5.6)	17.2		
Mangaone Rv at Rissington	2	< 5 m	< 3.5 m	> 1.6 m	2	< 5.6	11.4		
*Mangaone Rv at Dartmoor	2	(< 5m)	(< 3.5 m)	> 1.6 m	2.3	(< 5.6)	19.4		

Sediment sources

Sediment sources:

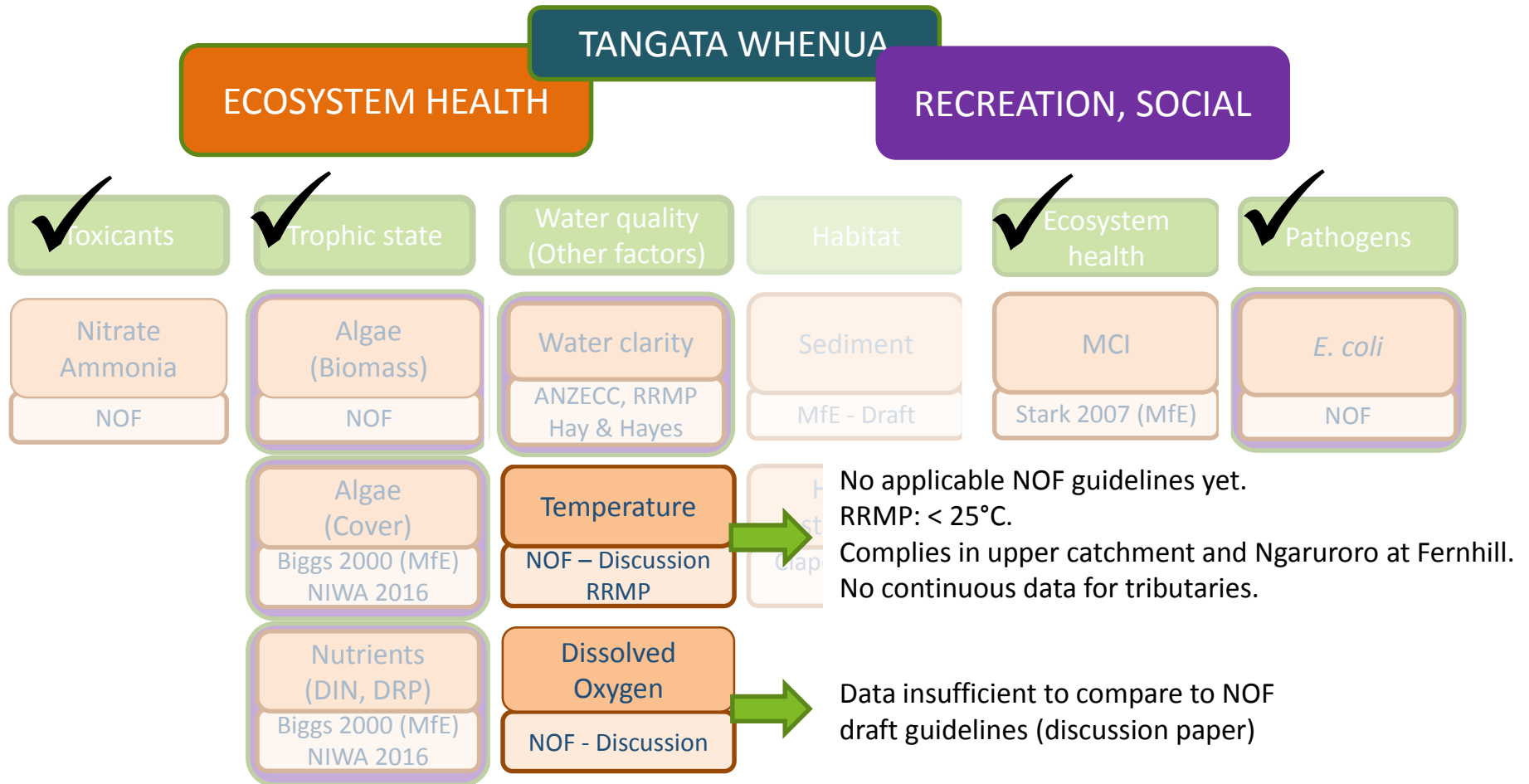
- land use activities
- cliffs on main stem

SedNet modelling

- Where does it come from?
- What can we manage?

SOE site Ngaruroro at Whanawhana

Potential available indicators (with thresholds) to come



Verbal updates from Working Groups

- Engagement
- Economic Assessments
- Stormwater
- Wetlands/Lakes
- Tangata whenua

Update on Water Conservation Order

- Process plan and timeframes

BBN (Bayesian Belief Network)

1. The BBN:

- Tool to communicate complex science and technical information
- Organises science knowledge and integrates it with other knowledge in a decision making framework.

2. Focus of further development ;

- Sediment loads in rivers and delivered to estuaries
- Managing the Karamu
- Managing the Ahuriri
- Setting minimum flows
- Managing e.coli levels in surface water
- Periphyton management

Update from the RPC Meeting

3 August 2016

An update was given on the TANK Iwi/Hapu Engagement Plan

Key points included:

- A meeting has been coordinated with Te Manaaki Taiao to work together to finalise this important piece of work as a priority.
- NKII have been contracted to deliver the “Translating Mana Whenua Values to Attributes for the Ngaruroro Awa” study.
 - The estimated completed date is 8 September 2016
 - A presentation will be given by NKII to the next TANK Group (20 September)

Update from the RPC Meeting

3 August 2016

The following SOE technical reports were presented by HBRC scientists:

- State of the Hawke's Bay Coastal Environment: 2008 – 2013
- Ngaruroro, Tutaekuri, Karamu and Ahuriri Estuary Catchments – State and Trends of River Water Quality and Ecology 2004-2013

The results from these reports are what Sandy has been presenting.

The reports are now available on the TANK Portal