

**BEFORE A SPECIAL TRIBUNAL UNDER
SECTION 203 RESOURCE MANAGEMENT ACT 1991**

UNDER the Resource Management Act 1991

IN THE MATTER of an application under Part 9 of the Act

AND

IN THE MATTER of an application for a water conservation order at Te
Waikoropupu Springs and associated water bodies

BY **NGĀTI TAMA KI TE WAIPOUNAMŪ TRUST AND
ANDREW YUILL**
Applicants

AND **TASMAN DISTRICT COUNCIL**
Submitter

**SUPPLEMENTARY EVIDENCE OF ROGER GRAEME YOUNG FOR
TASMAN DISTRICT COUNCIL
1 August 2018**

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Introduction

1. My full name is Roger Graeme Young.
2. I have previously set out my qualifications and experience in my evidence to the Special Tribunal dated 6 April 2018.

Code of Conduct

3. I confirm that I will continue to comply with the Code of Conduct in the Environment Court Practice Note 2014, and that this evidence is within my field of professional expertise.

Scope of Evidence

4. I have been provided with a copy of Dr Gerbeaux's supplementary brief of evidence and have been asked by Tasman District Council to review and comment on it
5. To that end, I prepared a letter to Mr Thomas setting out my views. I attach that letter at Appendix 1 to my evidence. I confirm the views and opinions set out in that letter remain my views and opinions on the matters raised by Dr Gerbeaux.

R G Young

1 August 2018

1 August 2018

Joseph Thomas
Tasman District Council
189 Queen Street, Private Bag 4
Richmond
Nelson

ID:1831

Dear Joseph

Review of submission on nitrate nitrogen in Te Waikoropupu Springs Water Conservation Order application

The applicants for a WCO for Te Waikoropupū Springs submitted a memo to the Special Tribunal panel regarding the nitrate nitrogen limit in the proposed order. Their memo responds to a question from Professor Jon Harding on the last day of the hearing relating to the effects of the proposed nitrate limit on aquatic plants in Te Waikoropupū Springs. The Tasman District Council has asked me to review the memo.

The applicants wish to revise their proposed NO₃-N limit to 0.45 mg/L on the basis that:

- this concentration is equivalent to the average concentration measured at the Springs over the last 2 years,
- this value represents a concession from their original position in the application (0.40 mg/L),
- this limit would ensure that the objectives and purpose of the WCO are achieved, and
- that there is uncertainty that a higher limit of NO₃-N at the Springs will protect outstanding characteristics.

To support their proposed revision the applicants have sought supplementary evidence from Dr Philippe Gerbeaux (DOC) and advice from three NIWA scientists with expertise on aquatic plants (Fleur Matheson, Cathy Kilroy, Paul Champion).

The evidence from Dr Gerbeaux and the advice from the NIWA scientists makes several points including:

1. The range of plants found in the Springs is considered unique although none are threatened or uncommon
2. Nitrogen and phosphorus are key nutrients influencing the growth of aquatic plants
3. The ratio of nitrogen to phosphorus is around 40:1
4. An increase in nitrogen concentration has the potential to increase the growth and biomass of some or all aquatic plants in the Springs, especially the vascular plants (and some algae) that can source sediment-derived phosphorus and are therefore not constrained by the low phosphorus concentrations (and high N:P ratio) in the water.

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5. If phosphorus increases too then an increase in nitrogen would also stimulate growth of plants that are unable to access sediment-derived phosphorus.
6. If plant growth is not constrained by phosphorus concentrations, then increased nitrate concentrations may influence the growth and abundance of aquatic plants and especially types that prefer enriched conditions
7. Increased nitrogen concentrations provide favourable conditions for the growth of exotic as opposed to native vascular plants and thus increase the risk of incursions of noxious plants like *Lagarosiphon*, *Elodea* and *Egeria* to the Springs.

Most of these points are consistent with my evidence (as highlighted by Dr Gerbeaux); specifically, that nitrate concentrations can influence the growth and abundance of aquatic plants (paragraph 84, paragraph 126), that concentrations of nitrogen and phosphorus need to be maintained within levels that will help avoid excessive growth of aquatic plants (paragraph 117), and that phosphorus concentrations rather than nitrogen concentrations are more likely to be limiting plant growth (paragraph 117).

I also note my paragraph 146 which says that controls on both nitrogen and phosphorus levels are ideally required to avoid algal proliferations. However, in the case of Te Waikoropupū Springs, the levels of nitrogen and the ratio of nitrogen to phosphorus indicate that phosphorus is most likely to be limiting algal growth. Any reductions in nitrate levels would have a negligible effect on the risk of algal growth. Therefore, controls on phosphorus should be a higher priority than for nitrogen in terms of reducing the risk of undesirable algal growths.

In addition, I agree that low phosphorus concentrations in the water column will not necessarily control the growth of rooted or mat-forming aquatic plants that are able to source phosphorus from other sources (such as from fine sediment). It is not known if phosphorus-rich fine sediment is present in the Springs Basin, but most of the vascular aquatic plants currently living in the Springs probably rely on phosphorus that they source through their roots. In my evidence (paragraph 116) I noted the importance of controls on sediment supply in areas closer to the springs where shorter residence durations and surface and subsurface flow paths increase the risk of these materials being carried into the spring basin.

Proliferation of nuisance invasive species such as oxygen weeds (i.e., *Egeria*, *Elodea* and *Lagarosiphon*) over native species, particularly in lakes, is a phenomenon driven by reductions in water clarity from phytoplankton growth. Under such phytoplankton-rich conditions, rooted plants that are capable of growing into higher light environments near the water surface are favoured as they can avoid be shaded by phytoplankton. Because spring stream environments are not likely to be influenced to any significant extent by phytoplankton proliferations this reduces the likelihood that the nutrient status would favour these weed species.

Concentrations of nitrate in Te Waikoropupū Springs are already sufficient to support the growth of noxious invasive plants like *Lagarosiphon*, *Elodea* and *Egeria* which represent a

substantial risk to the health of the Springs (see my paragraph 121). Ongoing efforts to avoid the introduction of these aquatic weeds to Te Waikoropupū is critical. In my opinion, nutrient management is not an effective or appropriate tool to address this biosecurity risk. Rather I consider the current management methods, for example the ban on swimming, to be suitable. Therefore, I do not consider that a change in nitrate concentration will significantly alter the risk of invasive plant incursions.

The Science Panel Report (Young et al. 2017) recommended that a trigger for action for nitrate nitrogen be set somewhere in the range between 0.40-0.50 mg/L. This recommendation was intended to enable a range of actions to be put in place in time to avoid any negative effects of nitrate concentrations. The majority view expressed in the Water Quality expert witness statement was that a nitrate nitrogen limit of 0.55 mg/L was suitable for protection of the values in the Aquifer and Springs. I still support this concentration as a limit in the WCO but recognise that actions to avoid concentrations reaching this level are potentially needed at lower trigger levels. I believe this has been what is being considered by FLAG through its recommendation to Council on the Takaka Water Management Plan.

Yours sincerely,

Scientist



Roger Young
Freshwater Ecologist and Manager, Freshwater Group
Cawthron Institute

Reviewed by



David Kelly
Team Leader, Freshwater
Cawthron Institute

References

Young RG, Fenwick G, Fenemor A, Moreau M, Thomas J, McBride G, Stark J, Hickey C, Newton M 2017. Ecosystem health of Te Waikoropupū. Prepared to support decision making by the Takaka Freshwater Land Advisory Group. Cawthron Report No. 2949. 46 p. plus appendices.