LAKE TARAWERA –
LAKE TARAWERA RESTORATION PLAN

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Chris is the General Manager Integrated Catchments for the Bay of Plenty Regional Council. This means he is accountable for delivering the deed funded lakes operations plus other lakes' action plans; he also delivers region-wide Biosecurity and Biodiversity activities, Rivers and Drainage, engineering and land management activities. Previously Chris worked for the West Coast Regional Council for 12 years, ten of those as CEO, and before that was a regional planner at Otago Regional Council. He holds planning and science degrees from University of Otago and has been with BOPRC since June 2016.

TRANSCRIPT

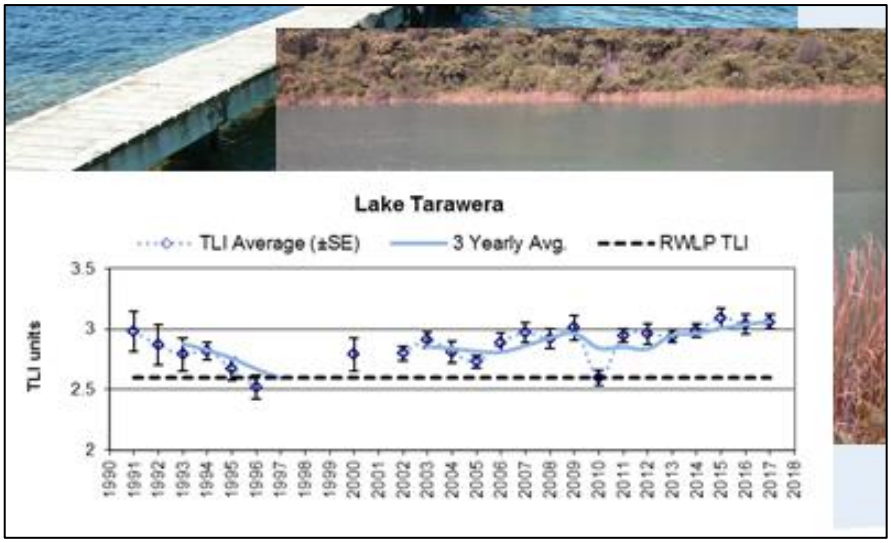
I would like to start by acknowledging the elected members from the Regional Council and the District Council who are here. The work we do together is quite complex and we still have a long way to go to improve lake water quality. I would also particularly like to acknowledge the Lakes Water Quality Society for organising today's events and giving us the opportunity to engage with wider community interest and science groups to look at what the future might hold for the lakes, and what part each of us can play in the solutions.

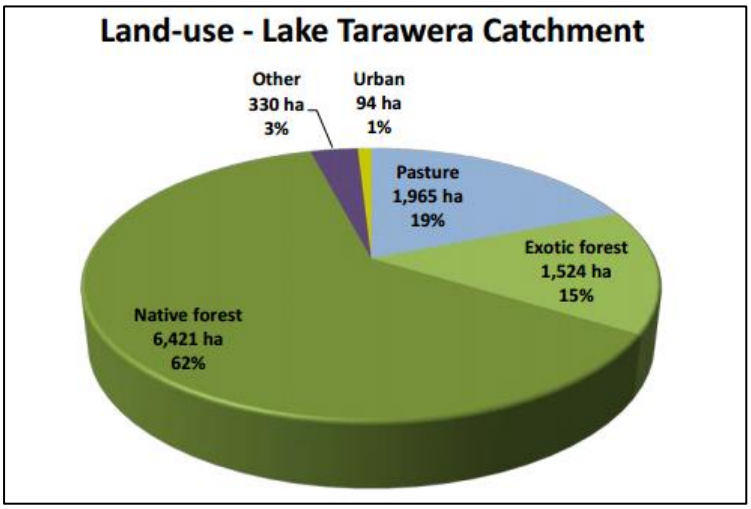
I am quite new in this role and, to be honest, I am still figuring out what the role involves and how this role differs from that of other general managers who have come before me.

I want to acknowledge that I am neither a specialist nor a scientist. I did an undergraduate degree in science but I have mainly practiced as a planner and then as a senior manager. I see my role primarily as connecting people to create opportunities for change or, in this case, help the Lakes Water Quality Society in harnessing science, encouraging and trialling innovative solutions that people have not tried before. Most critically to see if we can agree on a vision of where we want to go: and once the vision is agreed, my job is delivering the results in conjunction with Council's operational teams.

I have been asked to talk about the Tarawera Lakes Restoration Plan. The vision in that Plan is a lake where one can swim, recreate, fish, or do whatever else you want with confidence that the water will be clear, clean and fit for purpose.

Unfortunately it is not always like that. Sometimes it is clear water that we expect in Lake Tarawera but the reality is at times areas of the lake have an undesirable algal bloom with water discoloration from other lakes and streams that feed into Lake Tarawera. The Trophic Level Index (TLI) is an indicator of water quality. High is bad, low is good and the dotted line at the bottom is what we aim for. In the graph that blue line is heading in the wrong direction at the moment and we have to do something about this.





This pie graph summarises the immediate catchment of Lake Tarawera. Dark green is native forest, lighter green is exotic forest and pasture is blue and a little bit of yellow for urban land use around the edge of the lake on one side. It is dominated by forest of one kind or another, and that is good news because that type of land use does not produce a lot of nutrients except at harvesting time for exotic forest. The farming area is about 19% and not intensively farmed.

Lake Tarawera is at the centre of an eight lake complex, so it is not just the immediate catchment on which land use must be managed. These other lakes are variable in terms of their water quality status. Unlike other lake catchments, for Tarawera there is not going to be a simple solution derived from land management in the immediate catchment. We have a complex web of surface and ground water flows between these lakes. This makes management very difficult.

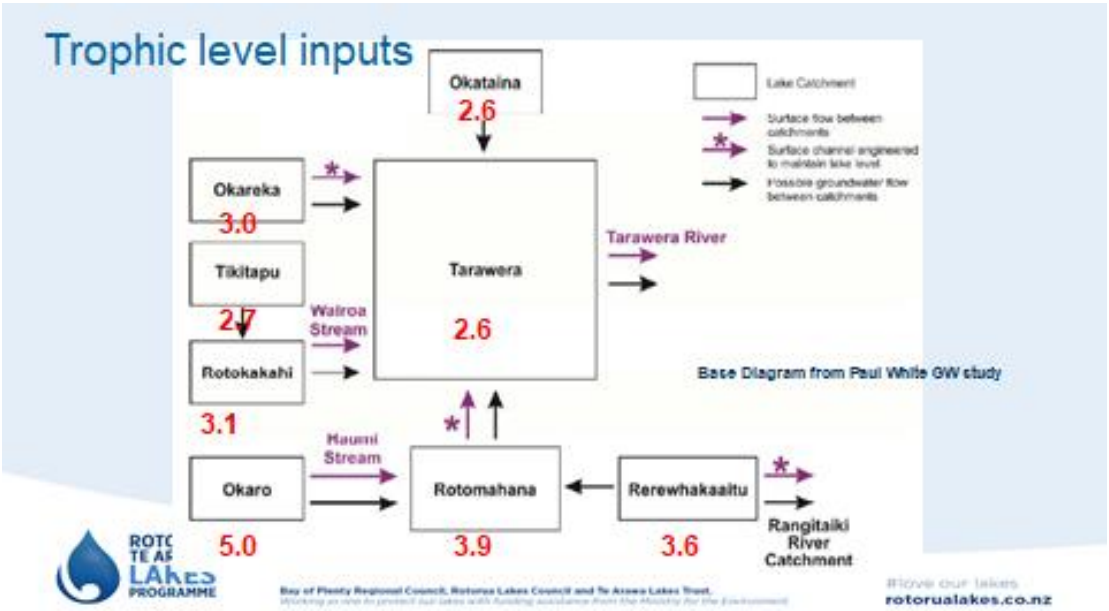
Andy Bruere and I have another problem which has been dominating our time in recent weeks and that is elevated lake levels. After the wet winter, Lake Okareka in particular is at unprecedented high levels and properties around it are at risk of flooding.

We are trying very hard to manage that lake level. There is no natural surface water flow from Okareka to Lake Tarawera. We installed a pipeline and started pumping the water down but it is only going down a couple of millimetres a day. With rainfall events like we had last night it is filling it up faster than we can pump out.

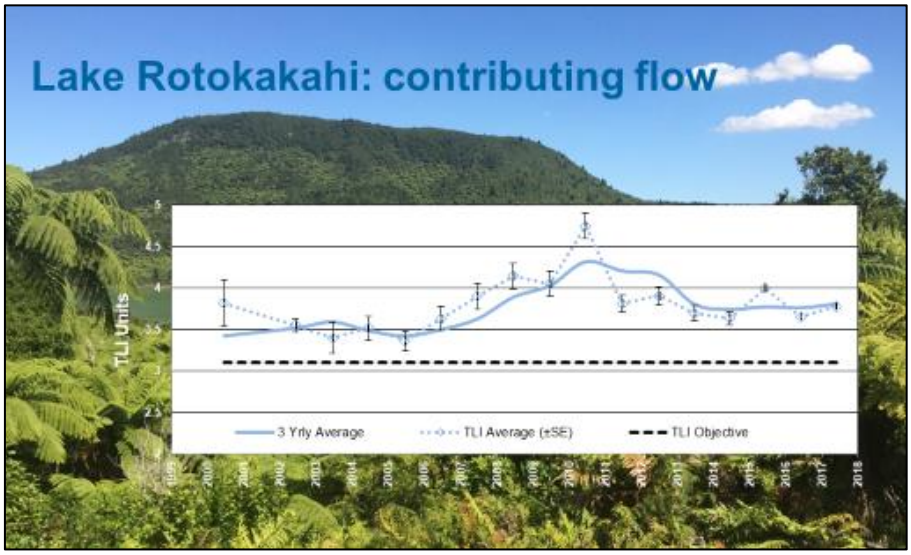
Load	Q (Woods) $m^3 s^{-1}$	Q (adj) $m^3 s^{-1}$	N load $t y^{-1}$	P load $t y^{-1}$	S
Tarawera catchment			66.87	4.47	
Geothermal		0.4	6.30	5.00	
Buried village septic		n/a	0.18	0.02	
Okareka	0.49	0.49	3.40	0.11	
Rotokakahi	0.5	0.5	3.50	0.19	
Tikitapu	0.08	0.04	0.25	0.01	
Rotomahana	2.62	1.31	9.10	1.27	
Okataina	2.58	1.29	5.25	0.32	
Total		4.03	**94.85**	**11.37**	

This table, which a subsequent presenter will comment on in more detail, but it highlights the phosphate load into the lake. Geothermal inputs are something we cannot do anything to manage. Natural geothermal flows are estimated to bring in almost half the phosphorus and whatever we do, that quantum is always going to come into that lake. We need to be aware of that.

This is a slide from Paul White and his ground water study. The purple is surface flow and the black is possible ground water flows. I do not want to go into detail, I will let Paul do that, but the red figures show the TLI targets for each lake. We need to understand how the water quality target for Lake Tarawera will be achieved in the context of the land use within the contributing lakes and their catchment land uses. The first step is the development of a conceptual model bringing together all known catchment information.



At Lake Tarawera we are aiming towards TLI 2.6 and it is currently over 3. There is a mixture of other TLIs there; for example 2.6 for Okataina. You will notice that the lakes at the bottom are generally a little higher in their TLIs because of the nature of the lakes, whereas Okataina, Okareka, and Tikitapu are around the same as Lake Tarawera. It will be interesting to see in the next phase of study and research how those interactions impact Lake Tarawera as the bottom catchment lake, and whether Tarawera can actually achieve a reduction in TLI, when some of the contributory lakes have higher target TLIs. The progress we make on the outer lakes will affect the speed at which we can achieve improvements for Lake Tarawera. There are still many unknowns.

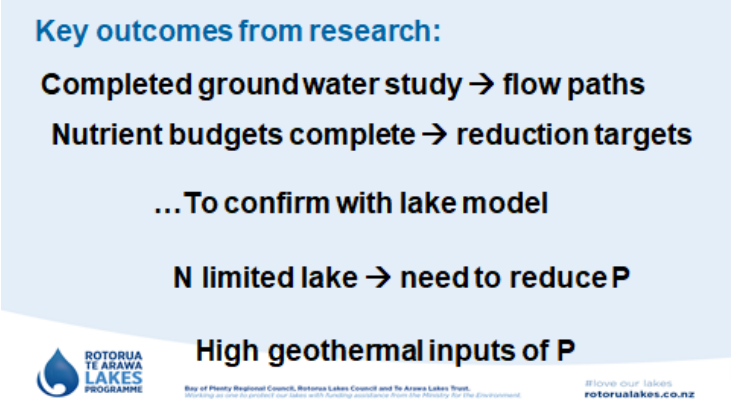


Lake Rotokakahi produces one of the contributing flows. I have picked on a couple of lakes because we have interesting information. This is the TLI graph and again the dotted line at the bottom is the target and the blue line is tracking the actual TLI – clearly we are not there yet and there are a number of fluctuations. We suspect that in the centre of that graph forest harvesting may have contributed to higher TLI levels at the time. There is work to do at Rotokakahi. We have started on an Action Plan but it is not yet complete.

Lake Okaro on the other hand, a farming catchment, has met its TLI target for 4 years, a good news story. Although looking at this year's data I have some concern because it has risen a bit showing that we are not in a consistent downward trend. The light blue line is the 3 year rolling average, to remove the confusion of different seasons and climatic variability. I suspect the very wet winter this year will affect nutrient levels in the lakes, by using the 3 year rolling average we see the longer term trends rather than the noise.

In Lake Okaro a contributing factor to achieving the TLI has been alum dosing. Positive land use change has been going on at the same time, and it is not clear which has had the greatest impact on the TLI. It has not been practical to have a control trial in place to

test the steady state against an intervention. We have instead tried to put all actions in place as quickly as possible to improve the lake. Until we stop using alum we do not know whether the land use change, will result in long-term improvements in water quality.



These are key outcomes from the groundwater research that has been completed, which Paul White will expand upon. Lake models, nutrient budgets and targets will be required to determine the relative need to reduce phosphate and/or nitrogen. These discussions were played out in the Plan Change 10 hearings held recently for Lake Rotorua. Lake Tarawera has high geothermal inputs of phosphate that will be difficult to mitigate.

So, to the nub of my presentation, a summary of the actions on the Tarawera Restoration Plan. We have a bull's eye target, but we are not quite there yet. The key actions include sewerage reticulation, which has been boosted by a recent $6.5 million funding announcement from the Environment Minister. Rotorua Lakes Council is leading that work.

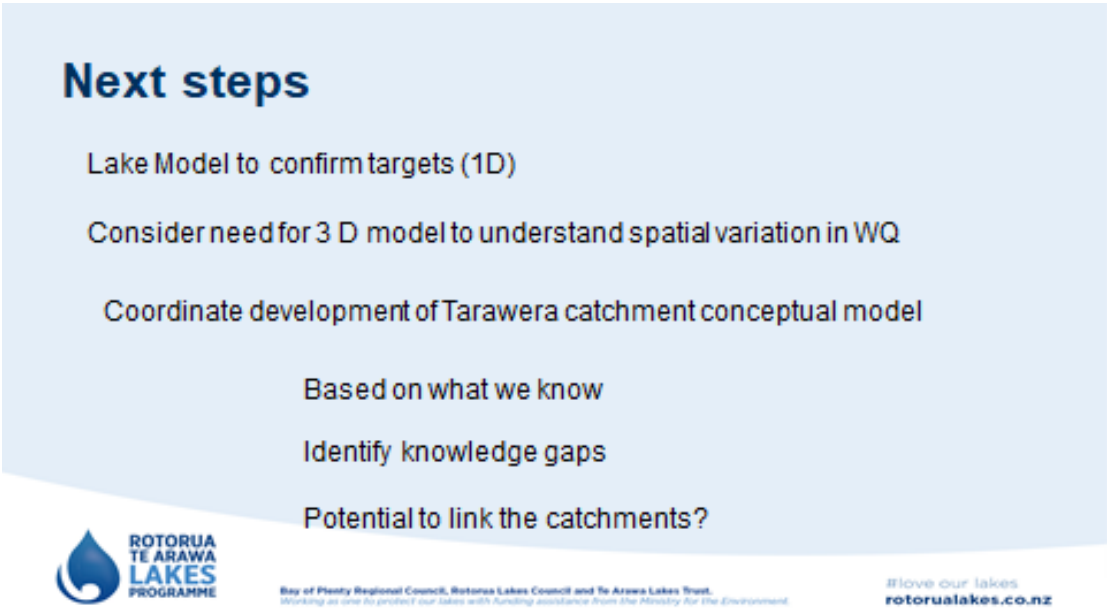
Chris Sutton is helping us with the environmental farm plans project and he is speaking later. They are well under way now in the wider catchment. Work started at Rerewhakaaitu in the early days has now spread out to the whole of the Tarawera catchment. Farmers will be working on that over the next few months; we have given it a tick because it has commenced, but I note that as with most of these targets, it is not yet completed.

The land use rule is an important action that the Regional Council will lead. The Regional Council recently agreed to bring this project forward as the next NPS Freshwater project off the ranks, so that's about to get under way. The actual plan change has not been drafted yet and consultation on that will happen soon.

The Ground Water model I have mentioned several times and that is complete.

The Cultural Health Assessment is also a very important part and Te Arawa will take the lead on that. There is a strategic partnership in place between the Te Arawa Lakes Trust, the Rotorua Lakes Council, Ministry for the Environment and the Regional Council which I assist with and that partnership approach works well.

An important part of the action plan is to investigate the phosphate coming into Lake Tarawera and what can be done to address that. The community will be kept updated as



part of this process, connecting people and bringing innovation in through forums like this one today.

So what are the next steps? We are working on a lake model to confirm our targets. A 3D model is needed to embrace scientific innovation coming in from the Water Quality TAG and elsewhere. We need this to better understand spatial variation in water quality.

We are also considering the development of a conceptual model for the lakes that feed into Lake Tarawera. We need to understand how it all works at a fairly basic level, identify those links between lake catchments and identify any glaring knowledge gaps.

Thank you.