Session 7 : RESPONSIBILITIES, VALUES AND FUNDING

SESSION CHAIR - Bill Cleghorn, Bay Trust

CLEAN LAKES – WHAT VALUE? WHAT COST?

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Hannah is an ecologist working at Kessels Ecology in Hamilton. Earlier this year, she finished her PhD at the University of Waikato, which focused on an assessment of ecosystem services of lakes. Her research analysed catchment and lake values, the impact of land use on water quality of the lake, and the context of lake restoration of the Rotorua Te Arawa Lakes. Her talk today focuses on the values associated with the ecosystem of Lake Rotorua and its catchment, the costs of restoration, and some ideas around getting the best value out of future management of the lakes.

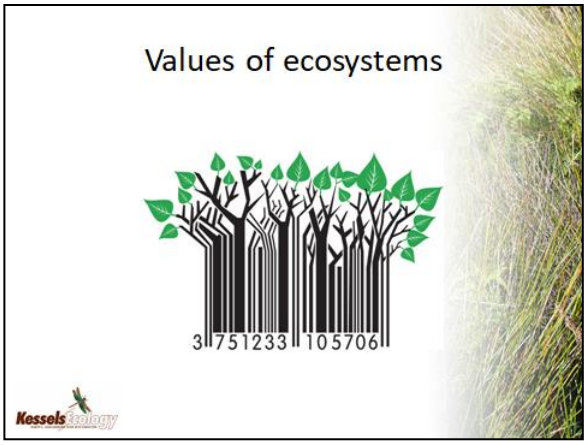
TRANSCRIPT

Kia ora everyone and thank you so much for making it back to the last session of this wonderful symposium. Thank you so much to the LakesWater Quality Society for inviting me here to speak today. I am excited by the opportunity to share with you some of the findings of my PhD research that I finished earlier this year.

Before I dive into costs and values of Lake Rotorua and its catchment, take a moment to look at this beautiful lake and think about what values you personally associate with a lake. It is actually not Rotorua but Lake Rotoma.

In this very diverse audience there will be many different values that come to mind. A lake ecosystem is hard to value because there are a lot of complexities and things that I have not been able to address. This was a pilot study to explore the values that we can associate with ecosystems rather than being a comprehensive study.

I will talk about the lake itself and the ecosystem services as values that it provides, as well as looking at the potential costs associated with degradation of that ecosystem. Then I will look at catchment land use values and ecosystem services as values that are associated with the catchment. Lastly I will look at the opportunity costs that might be associated with looking at different land use change scenarios.



When we talk about values of ecosystems, people associate something like putting a barcode or dollar on nature but that is only half the story. My study looked at what alternative options we have in looking at the value of an ecosystem such as a lake, what means can we describe the values and how can we put that into a context of weighing up the cost of restoration? What might we gain from the restoration and the complex interaction between the lake and its catchment?

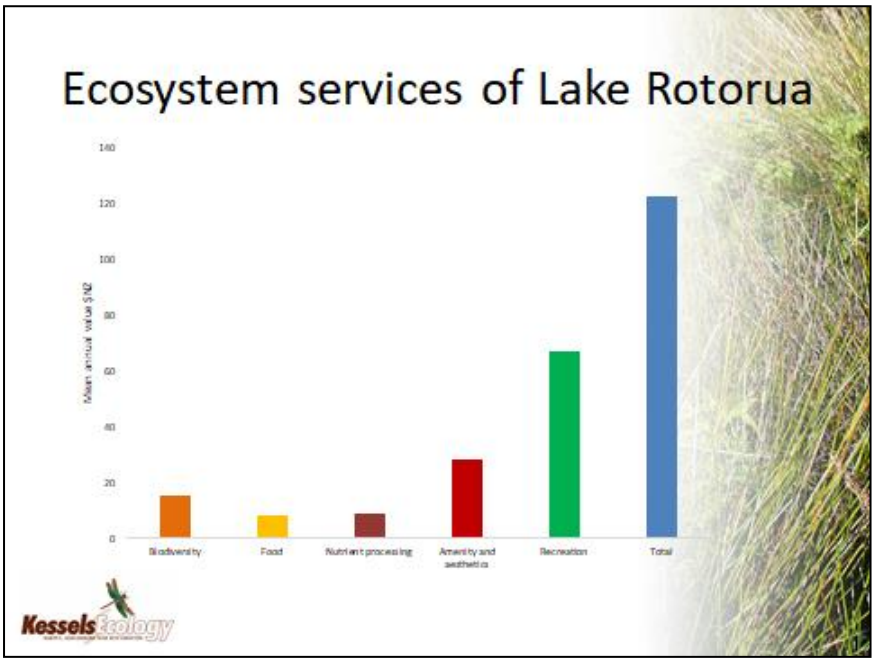
It is not purely about putting a dollar figure on an ecosystem, rather looking at values beyond traditional land pricing. How else can we derive value? There are a lot of values that I have not been able to address in the small scope of my study and a lot more that can and should be done in this sphere.

The main concept I used for my study was ecosystems services which are a tool developed to describe those services that are provided by a certain type of ecosystem that benefit humans, whether they be flood regulation or climate regulation or food provision. There are many kinds of services that humans benefit from. You will notice that by definition this concept is very human focussed and a human centric concept. It is all about what benefit we derive from this ecosystem?

My study also looked at different types of land use especially in the catchment of Lake Rotorua and I would like to point out that often when we look at land use we have a very one-sided perspective on how we value land use types. So often we only look at the productivity of the land and what money we might be able to get out of, say, productive uses of the land. But there are all kinds of other land use or land cover types as well that come with

their own different values, whether that is plantation forest, indigenous forest or wetlands or other areas. These types of land uses are also very valuable to consider when looking at the catchment and its interaction with the lake.

My case study was Lake Rotorua, one of the Rotorua Te Arawa Lakes. We are very familiar with it and in fact right next to it now. I studied both the ecosystem services of the lake and the catchment as well.



I identified 5 different ecosystem services. This is the bare minimum in terms of value and there are a lot that I have not accounted for but it does not hamper my outcome of concluding that this lake ecosystem has a very large value and even larger than I estimated.

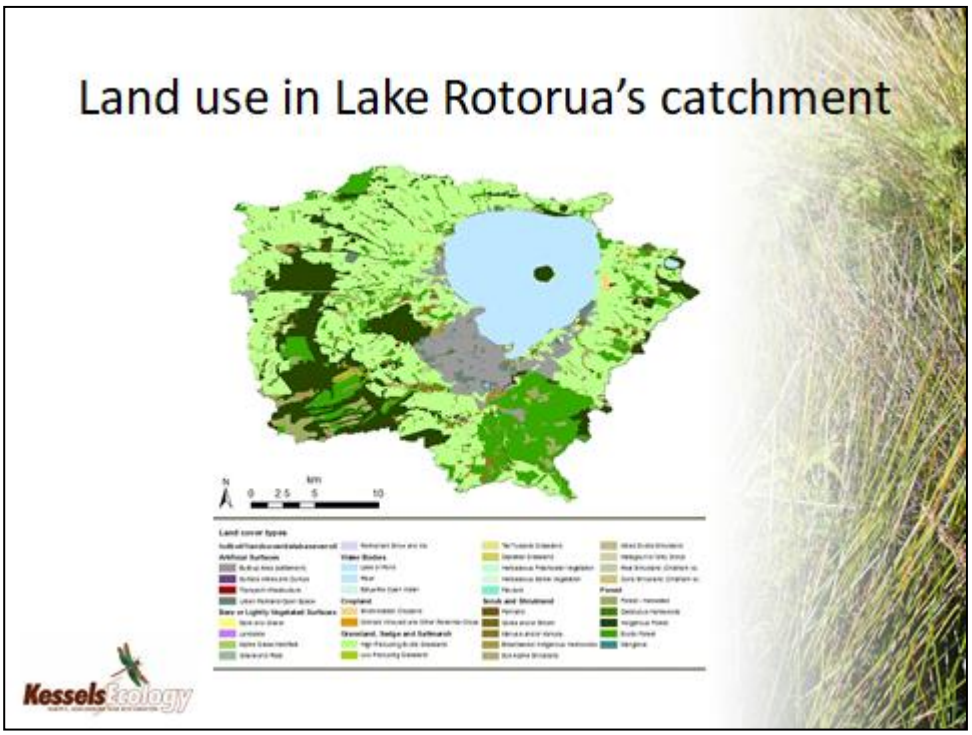
The 5 ecosystem services were:

- biodiversity or habitat values
- food provision
- nutrient processing capacity of the lake as a value
- amenity and aesthetic values
- recreational values

As an iconic lake, it is not surprising that the recreational values were the highest value, any type of recreational usage such as fishing, boating and visitors to the lake are very important for this ecosystem. The total value was an average of about $122 million contributed by the ecosystem services of the lake every year. That is a fairly substantial contribution considering that we have not even looked at the wider management decisions at this stage.

As a second step I looked at the values we stand to lose if we allowed the ecosystem to degrade further from the state that it is now. I looked at a scenario predicted by a water quality model, indicated by the Trophic Level Index as a representation of the state of the ecosystem. I looked at the degradation of the current status of the TLI to 4.8 which is a slight degradation within the eutrophic range. Looking at the associated degradation of

ecosystem services provided the annual cost was approximately $30 million that we stand to lose if we allow further degradation to happen.



As a third step I looked at the land use in Lake Rotorua's catchment. About half of the catchment is agricultural land, particularly dairy and dry stock farming. We also have a relatively large area of urban cover, the city of Rotorua itself and some indigenous and plantation forest cover as well.

Looking at the types of land use and how we can value them, there are different options. I have chosen 2 for my study. Firstly I looked at the very basic traditional profitability of the land, how much money is derived per hectare for each of those productive land uses? Then I looked at the ecosystem services provided by different types of land cover and how they can be valued using that concept.

Current management decisions tend to focus on traditional land use values only, land profitability. But consideration of ecosystem services showed substantial amounts of value associated with different land use types. I believe it is important to try and account for those as well and inform management decisions that way.

The current catchment ecosystem services were about $176 million per year which comes to about $3,300 per hectare per year of the entire catchment. Examples of other recreational values of forests in this Rotorua region include:

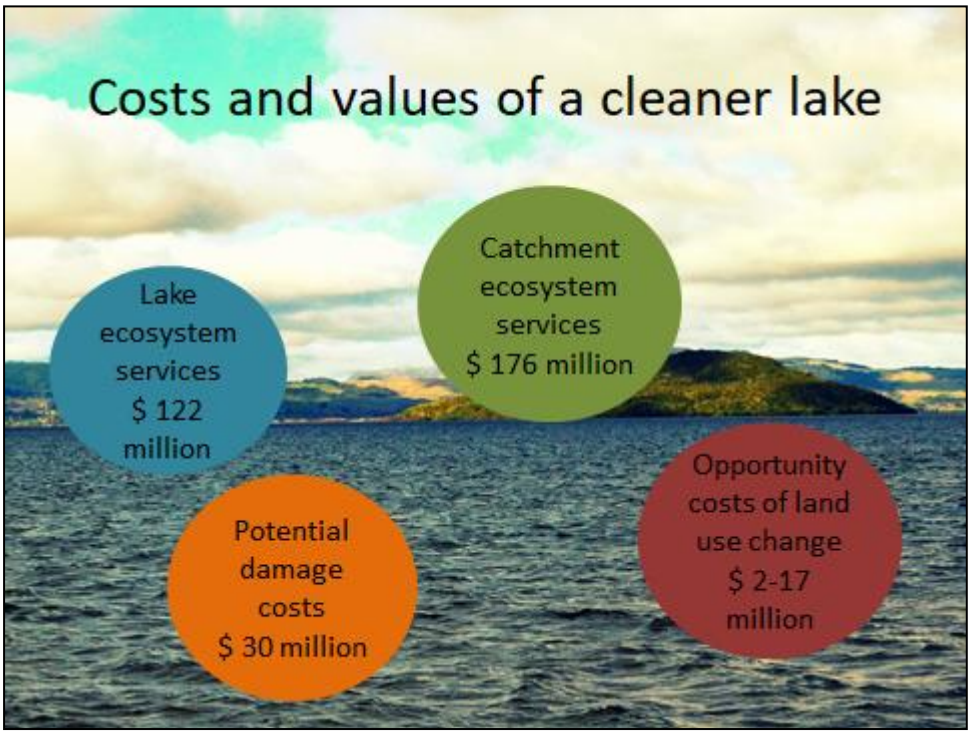
- Hunting usage: $15/ha/year (Yao et al. 2017)
- Conservation forest: $200/ha/year (Yao et al. 2016)
- Mountain biking: $50/visit (Dhakal et al. 2012)

These are not figures I have taken into consideration in my studies but examples of other studies to put it into context.

Lastly, we want to know the costs associated with different scenarios of land use change. For example, moving away from dairying to a different type of land use, what are the costs associated with the loss of profit? The loss in profit from agricultural land use converting to other uses such as forests, depending on the scenario, was about $5 to $17 million per year and mitigation costs. These are the opportunity costs of lost opportunities and productivity of the land.

There were quite a few scenarios on different combinations of land use and mitigation on land which I do not have time to give here. **But if you are interested in the details it is neatly packaged and written up in my PhD thesis that is publicly available on the Waikato University website.**

An interesting finding that came from my studies was that this value is slightly lower when looking at ecosystem services value as well due to the fact that certain amounts of value are gained in the ecosystem services through a change in land use. We reduce the cost of loss and profit slightly by $2 to $13 million per year roughly. Putting that into context, the mitigation costs within the lake at this stage might have gone up a little now especially through alum dosing which is about $1 million a year spent on maintaining the current water quality level on the lake.



This slide summarises the different costs and values of a cleaner lake. First of all the lake ecosystem services of the lake itself were about $122 million and the potential damage costs of further degradation of the lake would be around $30 million a year. In comparison the catchment ecosystem services provide about $176 million a year and we could face the costs of between $2 and $17 million in opportunity costs playing through scenarios of land use change away from the more intensive land uses towards potential alternative options.

I am not going to do the maths because I do not think it is an equation done from a scientific point of view, but it definitely shows that it is worth spending money to incentivise

land use changes. In order to protect the lake, the Council is already proposing the intention to save money at the other end with a lake that is in a healthier state.

The Hon Dr Nick Smith said there must be pain on all sides including Council, land owners and ratepayers. He might have a point but I have to slightly disagree. That is a very negative way of phrasing it and not necessarily the way to go. It is not how to motivate people to bring about change. While I am not naive enough to believe there will be a win, win scenario in all kinds of different situations within the catchment, there are a lot of diverse options for profitable land use while also improving environmental outcomes.

Looking into the future, it is possible to come up with solutions where landowners can diversify and make a profit with a more limited impact on the environment, be it through a change in farming or a change in land use or a combination. We need positive motivation rather than further costs. In some cases, new land use types might be more profitable than further intensification. I am not expecting everyone to start mountain bike parks on their farms but it could be a good idea for some farmers, or a combination.

New regulation sets out funding for land use change and we need to future proof land use and find concrete options that work for all. How can we incentivise positive change toward different types of land use that can create profit in the end for the land owner and the wider region rather than punish a few farmers who struggle with the way their farm might impact the environment?

To conclude, it is definitely time to rethink how we look at the different ecosystems and how we look at land use and value it or look at alternative more holistic points of view. So many people have already come up with innovative ideas and new ways of dealing with the challenges that we face in water quality and the protection of these Rotorua Lakes. I am very optimistic. Listening to all the talks at this symposium, great things are going to happen in managing water quality and Rotorua is definitely ahead of the curve in New Zealand. We need a lot of positive motivation, good thoughts and great innovators working together. We need to plan in the long term. If you plan in the long term the opportunities are there to take up.

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Kia ora, thank you.