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# THE COST OF AQUATIC WEED CONTROL IN THE ROTORUA TE ARAWA LAKES

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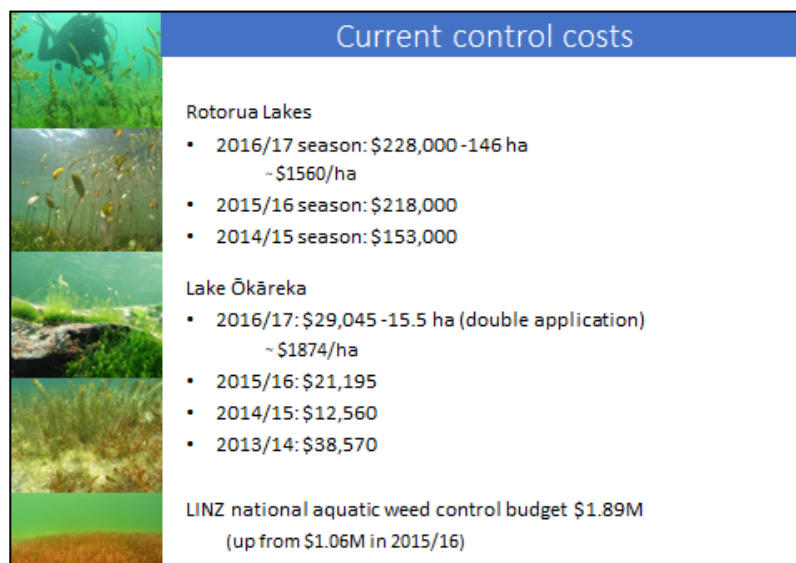
## TRANSCRIPT

Firstly, we would like to acknowledge Don Atkinson and the LakesWater Quality Society for the topic. We will present information on the costs of aquatic weed control in the Rotorua, Te Arawa Lakes and thank all of the people who have willingly given us their estimated costs. Hopefully, this provides guidance on what current activities cost and what future scenarios might be feasible.

We will cover current control, organisations and responsibilities, lake focussed management plans, comparative control costs and then considering the future and gaps in the picture of aquatic weed control. This talk draws on all of the talks from the last two sessions yesterday and the talks we have heard this morning.

Currently the control of pests within the Rotorua Te Arawa Lakes is co-ordinated by the Aquatic Pest Co-ordination Group, with members being Bay of Plenty Regional Council, Te Arawa Lakes Trust, Rotorua Lakes Council, Land Information New Zealand, Boffa Miskell, Fish & Game, Department of Conservation and NIWA.

There is a range of activities already happening in the lakes. The Biosecurity Awareness Programme that Hamish was talking about, which is run by Bay of Plenty Regional Council; MPI put some funding into this. There is the Bay of Plenty, Weed Cordon Programme and the Lakes Surveillance Programme involving 8 at-risk lakes, to ensure that new weeds do not get into these water bodies. Then there are the incursion responses in lakes Ōkātina and Lake Ōkareka. There is also the lake weed spray programme co-ordinated by Boffa Miskell, funded by LINZ and also with input from the Regional Council. Other lakeweed work by BOPRC involves harvesting in Lake Rotoehu which is nutrient management rather than a control of the pest plant per se.



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These are the costs: \$228,000 was spent on the biosecurity and amenity weed management of the Rotorua lakes. The area treated with diquat was 146 hectares at about \$1,500 a hectare for the control costs. Lake Ōkareka has had an eradication programme for hornwort and reduction of other introduced weed species. There was an initial big investment in 2013 when hornwort was first detected and inputs increased in the following year with a double diquat application showing real benefits. Diquat was used on 15.5 hectares and the treatment costs in 2016/17 were \$29,000 or nearly \$1,900 per hectare.

The Rotorua Lakes' costs (that LINZ run) compare with the national budget of \$1.89M for aquatic weed management. That budget includes a lot of South Island systems as well as lakes like Karapiro in the Waikato hydro-system.

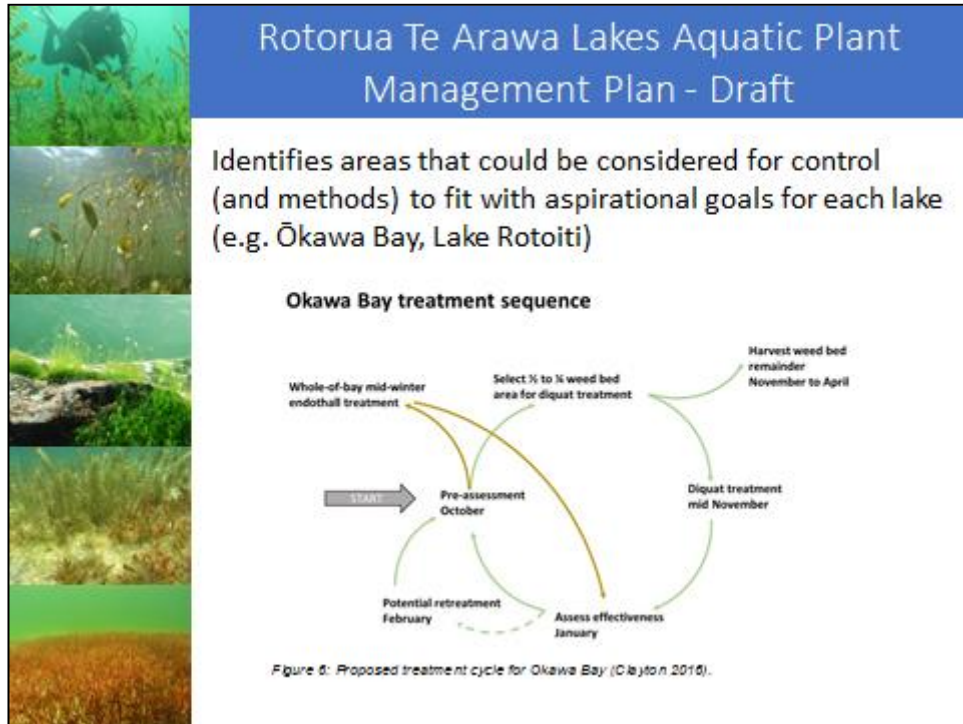
**Weed management** - The Rotorua, Te Arawa Lakes are 12 separate, very different water bodies, all with different values, human use and each with a unique spectrum of not only the weed types but the issues and impacts that they cause. It is quite different from the water quality issues. Each lake requires a tailored weed management plan. Invasive plants grow where people access the water bodies. It is not about monitoring in the middle of the lake, but rather the littoral zone or lake edge. A lot of nutrients enter via the margin of the water body. It is not just about nuisance weed issues; there is a role for the aquatic plants in nutrient uptake as well as other impacts.

Reactive management addresses the immediate issues and provides tangible benefits at targeted sites. To effectively manage the whole suite of lakes in a long-term goal, we need to account for actions in one lake having an impact on adjacent lakes. The current surveillance plans are integrated into the management plans.

In developing management plans for each lake it is important to define the problems in each lake, identify the weeds, the risks and the impact potential. It is vital that the community and the agencies align and develop a shared vision. Weeds need to be prioritised for each lake, and the plan must clarify roles, and identify the best tools.

The Lake Weed Management Plans have been developed by BOPRC jointly with LINZ and prepared by Boffa Miskell with NIWA technical input. The draft document is currently out there for stakeholder input with medium term goals, guide objectives and outcomes, as signposts pointing the way to the desired destination. These plans are the initial part of the process.

The draft plans identify areas and methods (next page) that could be considered for control strategies to fit aspirational goals for each lake. Within Okawa Bay (Lake Rotoiti) a treatment sequence is presented as a series of flow diagrams. It has to be based on feedback mechanisms; pre-assessment firstly then scenarios to test options, such as using endothall or diquat in split applications, or even a harvester. All the different techniques that could be used for management of each situation like this are being considered.



Below is Okawa Bay; it is about 43 hectares in area. We have done a cost option for the management of Okawa Bay weed. Rohan talked about the spectacular result we got for the eradication of weeds at 0.1 part per million active ingredient of endothall. Three metres is the average depth to which these plants grow, so applying 6 litres per hectare, you would need 258 litres. That is \$7,380 for the aquatic herbicide Aquathol K, plus application costs of \$1,300 per hectare. For one treatment that is \$20,380. However, for maximum effect, you could use the maximum label rate but this \$20,000 ramps up to \$382,000. That is a big difference, and it really needs more than just a dollar figure for how much it costs to control weed.



Ōkawa Bay Endothall control costs	
	For target concentration of 0.1 ppm = 43 ha at average 3 m deep x 6 L per ha = 258 L (\$7,380 for Aquathol K)
	\$1,300 per hectare for application = \$13,000 for 25% of area - one treatment
	Total - \$20,380
	Maximum rate 5 ppm
	Total - \$382,000

Comparative control costs	
	<b>Hessian bottom lining</b> <b>\$50,000/ha</b> 30 hours/ha
	<b>Suction dredging</b> <b>\$20,000/ha</b> 100 hours/ha
	<b>Harvesting</b> <b>\$10,000/ha</b> running costs only 24 hours/ha
	<b>Herbicides</b> <b>\$1,800/ha</b> Diquat                      \$15,000/1,000 L (20% a.i.) Endothall                      \$28,607/1,000 L (51% a.i.) 50 ha/8 hours
	<b>Duration of control not factored into costings</b>

Looking at the various control options, the most expensive is the hessian bottom lining at \$5.00 per square metre or \$50,000 per hectare and taking about 30 hours to cover 1 hectare of lake bottom. Suction dredging using a diver and venturi pump costs about \$20,000 per hectare and 3 times as much time as the hessian.

For harvesting I have used a costing derived from Lake Karapiro and thanks to Andy Bruere and Hamish Lass for a costing of the harvester work in Rotoehu. The running costs are \$10,000 a hectare, not including the purchase of the machine or the disposal costs of the weed. It takes about 24 hours to 3 days to harvest a hectare.

An average cost for herbicide is \$1,800 to \$2,000 a hectare. Boffa Miskell has obtained diquat for \$15,000 per 1,000 litres and endothall at \$28,500 for 1,000 litres. However, the important thing is the active ingredient and herbicidal rate. Diquat is only 20% of the formulation applied. Endothall is just over 50% active in Aquathol K. They are quite a similar cost for the active ingredient and dose rates.

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What is not factored into these costings is the duration of control. In the case of harvesting, it is really mowing the lawn and is going to need frequent repeats. With endothall, potentially there is long term control. Rohan showed the advantages of double applications of diquat where initially the plant is knocked down followed by re-growth. A second treatment is much more effective, so there is a range of techniques that can be used to improve outcomes.

The management in the Rotorua Te Arawa Lakes was underpinned by a funded research programme run by John Clayton back in the days of MAF through to the early 2000's. The funding optimised the use of the control tool diquat. In the present we do not have such funding, but there remains a need to ensure that any proposed management actions are independently peer reviewed and scientifically justified. There must be a consistency of approach, best use of resources, protection of public safety, compliance with relevant legislation and statutory monitoring.

Returning to the Okawa Bay example, there are a wide range of costings, There was nearly \$300,000 difference between the maximum and minimum rates using endothall. Compliance agencies could reduce compliance costs, there could more targeted effective control methods and the possibility of lake-wide eradication, which is going to markedly reduce costs.

Monitoring is another important part of a control programme. As soon as something different is done, many observers attribute lake changes to that new action. A good example of effective monitoring is the Hawke's Bay hydrilla eradication programme which the Ministry for Primary Industry funded. They also funded major monitoring of the biota in the lake and water quality. When there was a long hot summer, which led to stratification and problems, we saw the result but could show that the grass carp had been in the lake for 3 years, with no problems in the intervening years and there were no beds of hydrilla involved in the algal bloom. This allows us to conclude that whatever was causing the issue, it was not necessarily from the weed control programme.

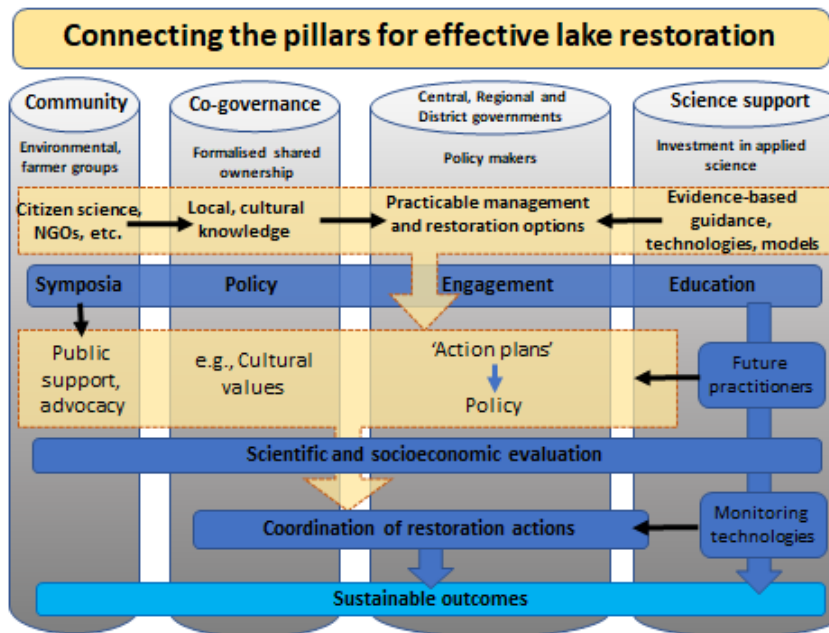
Research will support the implementation of operational plans that come out of this proposed way forward with weed management plans and the best tools, trialling new techniques as they are developed and monitored to assess effectiveness, selectivity, cost efficiency, all feeding back information into the action plan.

What is missing? There are different rationales for controlling weed in these lakes. Biosecurity seems to be the major focus and quite rightly so, but also the impacts of the plants growing and how they interact with water quality in shallow marginal areas is not well understood. Deborah Hofstra talked about restoration and the benefits of doing that work.

There is some confusion about central government agencies? Sections of the Regional Council are also different for each of these goals. Not all legislation is aligned with the goals and can impede progress. For example, the Hazardous Substances New Organisms Act is overseen by the Environmental Protection Authority and there are delays which Rohan talked about such as the label issues with the herbicides, and there are similar issues with rotenone and other formulations that cannot be used in New Zealand at the moment.

We need a pathway for the evaluation of new tools and experimental use permits. When we develop new products, the largest size tanks are 1,600 litres in our testing facility. These new products need to be tried in small areas in the field prior to widespread use,

but we do not have a practical mechanism to do that. Remember with incursions, time is the enemy because they keep on increasing in an exponential way.



Thank you very much David Hamilton for giving us this slide. It reflects what a well-resourced and science-backed programme can provide. These are the water quality management action plans that are happening within these lakes and here in New Zealand we are world leaders and are seeing the benefits of improving water quality. It would be great to have a similar approach to the weed management where everyone is on board and potentially we could have a Rotorua Te Arawa Lakes Biosecurity Research Programme and look at massive gains.

Another example, Peter Beets talked about the work in forestry where they have a research model where all of the plantation forestry groups are contributing to the research programme. They are involved in governance, goal setting, funding and measurement of outcomes. A similar approach could be used with all organisations involved with aquatic weed and pest management. However, in this case not everybody will have the same goals and you are never going to please everyone.

The Aquatic Pests Co-ordination Group is a good start as far as getting everyone together. Currently it is very much focussed on the implementation of these strategies. Maybe if there was a bit more strategic input and policy, potentially there is also a link to the Ministry for Primary Industry led Freshwater Biosecurity partnership, which includes other government departments.

We would really like to thank the LakesWater Quality Society for putting on another splendid symposium and all of the Aquatic Plants Team, thank you for all your input. Big thanks to Marcus Girvan and Kieran Miller from Boffa Miskell for providing a lot of the figures, Dave Mole from LINZ, Hamish Lass, Andy Bruere and Greg Corbett for their input from Bay of Plenty Regional Council and also Geoff Angell (AquaAg), Pieter van der Westhuizen (Etec). Prof David Hamilton and Stu McNaughton (Aquateq) and finally NIWA SSIF F/W Biosecurity Programme funding.

Thank you very much.