**QUESTIONS**

*Ken Hughey, DOC:* I am confused about the issues of water quality and biodiversity. If we achieve, for example, a 95% reduction in wallaby densities in these forests or get to the level required where seedlings survive would that achieve a water quality outcome? But if we only achieve a 50% reduction which might achieve a water quality outcome but unlikely to achieve a biodiversity outcome. We need to be clear about these questions and what we seek to achieve.

*Dale Williams: BOPRC:* The whole density thing is academic. Those 95% reductions mean diddly squat, the important slide was the next one, are you getting the forest regeneration? To do that you have to measure the forest. We believe that it is more important to know how many possums are left rather than how many have been killed. Our trail cameras may be giving us that for wallabies. We want to see very few wallabies in the cameras after our controls. To answer your question about achieving outcomes, you have to suck it and see, which is what Cam was saying, give it a go and find out.

*Cam Speedy, Wildlife Management Associates:* I will also make a comment about how low you can squeeze things down. I think back to the Pureora Forest operation in my last year at EPRO with 83,000 hectares and two pre-feeds before the operation, afterwards possums were very hard to find. People 20 years ago would never have thought they could get possums down that incredibly low. But with advances in technology you can, and I am confident that with trial and error and a bit of work you could get wallaby numbers down too. The challenges will be to understand the dispersal mechanisms and how quickly they come in from adjoining uncontrolled landscapes. So there is a lot of work to do in the wallaby space and having tools to measure abundance and density, but I am confident that we can come up with a regime on a landscape scale that would squeeze wallaby densities down to infinitesimally low levels. That would make a difference in the forest understory.

*Alastair Fairweather, DOC:* The only way to determine if the operation is a success is to monitor the outcomes; monitoring forest plant species, bird species and water quality. Only then will you know the effectiveness. I question whether water quality will be influenced by pest control. Numbers are quite low and there are other natural processes in effect that are probably more important in the long term.

*Rob Allen, Landcare Research:* We have been controlling pests in this country for many decades but can someone pull out a list of achievements from all that investment? I believe we are surprising lacking in that, but there are reasons for that. Whatever these benefits are, and we will come to them in a minute, were they possible and then, if you undertook an action, could it be achieved? I would say we are littered with the lack of demonstrable achievements. We need to go into these things very carefully; are the benefits possible and can we achieve our desirable outcomes?

I will give a few little examples. One of the long term pest controls in New Zealand is the control of red deer in the Murchison Mountains in the name of protecting takahe. That has been done for more than 30 years and good quantitative data has been collected on the vegetation. Recently there was a publication on that which struggled to demonstrate any recovery in the understory. That parallels Dale's presentation where they are struggling to detect a change in the forest understory with a mish mash of pest control at Okataina in the past.

That is one aspect. I was pleased that Alastair made comments about the pests. There is a biodiversity outcome there and we have been talking about the water quality outcome. In the fifties and sixties water quality was a major driving force of pest control. We gave up on it for a couple of decades and it is now coming back. But Alastair's specific words, and I will not hold him to this, were, 'Water quality impacts of pests is generally low'. There have been quite a number of studies and when you average across these studies there is a pattern, whether it be wallabies or deer. When I see the word 'pests' I think they mean 'across all pests'. We do not have data on those species because there would not be a quantitative study in New Zealand demonstrating a water quality impact of pests. I accept we can control pests dramatically, that is repeatedly demonstrated, but can we achieve the outcomes we are interested in after investing a lot of money in places and not achieving them?

To paint a picture of this introduced biota as always being bad is not entirely correct. In Banks Peninsula the best distributer of matai seedlings, which was widely distributed in the area, are now pigs. If we want our matai forests back and want pork should we be allowing the pigs? Are benefits possible and are they achievable?

*Willie Shaw, Wildland Consultants:* Monitoring is essential as Alastair said and the results will always surprise. There will be unexpected results from any monitoring to do with pest control, especially dealing with multi species groupings and varied vegetation and habitat cover.

*Rowland Burdon, Royal Society of New Zealand (Rotorua Branch):* Dale you mentioned that there were very successful poisoning operations in terms of % kill with wallabies but they were generally one-off operations in particular areas. My question is what is known about how follow up poisoning operations might decline in effectiveness?

*Dale Williams, BOPRC:* In terms of wallabies almost nothing is known because most of those operations were one-offs. Cam raised an important point about sustained control. There is no point in starting unless you intend to carry on. To me it was almost criminal that those operations were not carried on. We might be having quite a different presentation today.

I would like to take this opportunity to talk about eradication because that is a term I have heard a lot over the last 2 days. The scientists in the group understand what eradication is, but there may be a few people who do not realise there are very defined rules around eradication. Considering the wallaby distribution map I put up, we are trying to eradicate the isolated populations and ideally eradicate them completely.

The rules state that:

- your pest has to be vulnerable to your control technique
- you have to expose all your pests to the control technique
- you have to kill them faster than they can breed
- in the case of weeds you have to keep on killing the propagules as they pop up

Then there has to be either no or a very low chance of reinvasion.

Pest control falls into two camps. Site led control trys to get the benefit that you are after. When you are trying to limit dispersal or eradicate you do not care about a conservation outcome specifically in the site where you are killing the things. Targeting the animal we call pest led control. At the moment with wallabies our control is pest led. We are trying to

limit dispersal and eradicate those isolated populations. Our monitoring is based on finding the last individual.

*Angus McKenzie, Latitude Planning Services:* Thank you very much for that informative summary. I like what you were saying Cam around achievability and it being a long term game. You touched on the social science around pest control and mentioned that it has a long way to go. I wonder whether you could just explore that a little bit more and maybe outline a couple of successful approaches in that sphere.

*Cam Speedy, Wildlife Management Associates:* I am not sure I can because folks have a very different perspective on everything based on their own personal world view and there is no consensus around what is the best approach to controlling pests. Some people are happy with toxins and some are not, and that will always be the case. When working with communities, if we have a shared vision about what we are trying to achieve then we can work our way through the ins and outs of how to get there. But it is sharing the vision which is most important. I have got away from trying to work out the journey and just get everybody on board with what we are aiming for. I do not profess to be a social scientist, I just know that there is a lot of debate in New Zealand about pest control and how it is done and I think there always will be. But I think we should all focus more on a shared vision of what we want our place to be.

*Hilary Prior, LWQS:* Dale do you know why the Bay of Plenty Regional Council Draft Long Term Plan has a significant decrease in effort for wallaby control?

*Dale Williams, BOPRC:* No. I guess there are always limited resources. My slide said that we have not got enough runs on the board, we are losing stakeholder support and that might well be an example of exactly what is going on.

*Theodore Kpodonu, Waikato University:* Two quick questions. The first is that these animals have been around for about 100 years. From an ecological point of view are we seeing them as being integrated into the ecology of New Zealand? For instance Rob gave an example of peak dispersals of seeds of certain plants, so are we looking at them as just pests or are we looking at them as becoming an integrated part of the ecology of New Zealand? My second question is for any wildlife to have an impact on an ecosystem they should exceed a certain threshold. Do we have numbers of populations for the different animals for each catchment or we are just eliminating, eliminating, eliminating and do not have a threshold.

*Dale Williams, BOPRC:* I think the threshold question was the same question I asked - let's see. The first part was about what we call technically 'recombinant ecology'. Are these species now a part of New Zealand's heritage?

I guess they are, and some introduced species people rate highly, such as deer, which Cam mentioned as a deer hunter, and so am I. We live off sheep and beef which are introduced species as well. So it is a value judgement. In terms of being an integrated part of our ecosystem, Rob mentioned that we used to have a lot of native browsers and the argument is whether these modern introduced herbivores are simply replacing the extinct ones. It is one of those arguments that could go on forever. Looking at introduced species that we should consider bringing in, Rob's photograph of a bird that looked very much like a Cape Barren goose, why don't we bring that back? There was a duck that looked very much like the Australian Wood duck, why don't we bring that back? There is a sub species of the New Zealand quail that lives in Australia, why don't we bring that back? It would be something that might fit into our ecosystems a bit better than wallabies do.

*Max Gibbs, NIWA:* Would it be appropriate, rather than to eradicate wallabies, to convert Lake Okataina into a Maungatautari type situation where we exclude within a certain range from the lake the impact of wallabies. In other words the exclusion cages are 20 x 20 metre control plots within the forest, if we took that around the entire lake would that make a difference. Then the understory regeneration would reduce sediment run off which is the fine material taking phosphorus into the lake. It is lateral thinking, but would the cost be achievable and better spent that way?

*Cam Speedy, Wildlife Management Associates:* I will have a crack at that since I was involved with the Maungatautari pest eradication. The fence was $200 a metre to build, how many thousand hectares did you say the catchment was? 6,290, Maungatautari is 3,500 hectares more or less and it has cost in excess of $10 million so far. The regeneration in the forest understory is unbelievable, within the first 18 months all the slip scars and even the tracks that were put in the southern enclosure vegetated overwhelmingly. That would achieve exactly what you are talking about. There would be prolific regeneration at every square inch of the catchment. But at a catchment scale of 6,290 hectares I would really question the economic viability and the long term maintenance costs. Looking after a 40 kilometre Maungatautari is a huge undertaking and not without its problems. A fence would be twice or three times that around Okataina. But if there is the political will, and the finances available, it is achievable absolutely.

*Dale Williams, BOPRC:* On a smaller scale there is a peninsular in Lake Rotoiti that is an ideal case study. It would only cost about $200,000 to build a fence across the isthmus. It has wallabies, possums and rodents fringed by pohutukawa, very similar vegetation to Okataina but whether you could monitor the benefits to the lake from an operation that small would be anyone's guess.

*Jacqui Aimers, Freelance Scientist:* A question about dama wallabies. They are a nasty pest here but they are endangered in their natural range, virtually extinct in mainland Australia and there was a repatriation attempt made some years ago that had limited success. Is there any potential for some repatriation taking the pest back to South Australia and whether that would be a positive PR story that could counteract any negative PR with the extermination of a very cute pest?

*Dale Williams, BOPRC:* You are right. A decade ago there was a reasonably lucrative export going on. I suspect a lot were going to game parks and possibly the freaky pet trade in the States. About 40 animals went back to South Australia because the ones that came to New Zealand were from the Australian mainland and genetically they are already extinct. Dama wallabies still exist on the offshore islands of the southern coast but the ones we have are the mainland gene type. Recently we processed permission under the Biosecurity Act for wallabies to be exported to zoos in the States. They have got a genetic breeding programme and there were two shipments of about 40 animals. But one of our requirements was an indication from the Australian Government that they see these zoos supporting the conservation of their wallabies and we did not receive that. There is potential but it could be a double edged sword because it is back in the cute and cuddly thing.

*Ken Hughey, DOC*: Before we take another question I am reminded Max that there has been a request from Maungatautari for an additional injection of $600,000 per year to operate that sanctuary over and above the costs that they thought they had budgeted for. These mainland sanctuaries are huge investments and something the communities must enter into pretty carefully, but they do have a lot of benefits as you talked about.

*Don Atkinson, LWQS:* The last kill was about 15 years ago. Are we now at a sustainable population level or will it get worse if we do nothing?

*Dale Williams, BOPRC:* It has not been measured, but Cam inferred those wallabies will probably be back to some equilibrium. From what I understand the numbers are way lower than they were prior to those operations, they will probably never get back to those levels. They have already eaten themselves out of house and home, but they are spreading and that is our biggest concern. From a wildlife management background, when resources become limited it is one of the factors that drive dispersal.