

TRANSCRIPT

LEGISLATIVE COUNCIL ENVIRONMENT AND PLANNING COMMITTEE

Inquiry into Ecosystem Decline in Victoria

Melbourne—Tuesday, 20 April 2021

MEMBERS

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Mr Clifford Hayes—Deputy Chair

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WITNESS

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The CHAIR: I declare open the Legislative Council Environment and Planning Committee public hearing for the Inquiry into Ecosystem Decline in Victoria. Please ensure that mobile phones have been switched to silent and that background noise is minimised.

I would like to begin this hearing by respectfully acknowledging the traditional custodians of the various lands which each of us are gathered on today and pay my respects to their ancestors, elders and families. I particularly welcome any elders or community members who are here today to impart their knowledge of this issue to the committee or who are watching the broadcast of these proceedings. I would also like to welcome any members of the public who may be watching these proceedings via the live broadcast today as well.

With that, I will just take the opportunity to introduce you to the committee members who are here today and joining us via Zoom as well. I am Sonja Terpstra, the Chair of the Environment and Planning Committee, Clifford Hayes is the Deputy Chair, and Dr Samantha Ratnam. Up on Zoom we have Ms Nina Taylor, Dr Matthew Bach and Mr Stuart Grimley. Back in the room, Mr Andy Meddick, Ms Melina Bath and Mrs Bev McArthur.

All evidence that is taken today will be protected by parliamentary privilege as provided by the *Constitution Act 1975* and further subject to the provisions of the Legislative Council standing orders. Therefore the information you provide during the hearing is protected by law. You are protected against any action for what you say during this hearing, but if you go elsewhere and repeat the same things, those comments may not be protected by this privilege. Any deliberately false evidence or misleading of the committee may be considered a contempt of Parliament. All evidence is being recorded, and you will be provided with a proof version of the transcript following the hearing. Transcripts will ultimately be made public and posted on the committee website.

If I could just get you now to state your name and the organisation you represent, just for the record.

Assoc. Prof. NITSCHKE: Associate Professor Craig Nitschke from the University of Melbourne.

The CHAIR: Great, thank you. And with that, I will ask you now to give your opening statement, if you could please just keep it to about 5 minutes. I will give you a 1-minute warning as we get closer to the time.

Assoc. Prof. NITSCHKE: Oh, 5 minutes? I was told 10. Okay.

The CHAIR: Well, it is 5 because there are so many of us who will want to ask you questions and we have got a very short window of time. So over to you.

Assoc. Prof. NITSCHKE: That is not a problem. Thank you so much, everyone. Thank you for the invitation to join you today. Well, if I have got 5 minutes, I had better get going.

Visual presentation.

Assoc. Prof. NITSCHKE: What I thought I would do is present four cases to discuss and to think about around ecosystem decline in Victoria. Some of this is based on quite an extensive bit of work I and my research group have been doing for the last 10 or so years, and what all these studies kind of point to is that our vegetation, or flora, is very sensitive to climate, and if we start seeing changes in climate or just more variable climate—more droughts and so forth—we can expect to see some negative consequences.

Some of those consequences we have developed models for so we can project where they may go, but how do they work in reality? Some of our recent work that is just about to get out there for review suggests that—for example, we had the millennium drought—regeneration of this mountain ash, *Eucalyptus regnans*, was reduced by 50 per cent during the millennium drought. This kind of aligns very strongly with our model, suggesting that going forward we might see greater changes, and these changes can manifest at quite broad scales and affect the age structure of the forest.

More importantly is observed climate change—what has happened more recently. Our paper that came out last year showed quite clearly that East Gippsland, so that area of forest impacted by bushfires in 2020, has seen a big change in climatic factors that influence the occurrence of the greater glider. In this case, that bottom right-hand corner is showing you where the number of hot nights meets the threshold for greater gliders. So it is the number of hot nights, warm nights, that has changed over the last 30 years. This coincides with the observed occurrence and historical occurrence of the greater gliders. So this is suggesting that the current climate in that region is getting drier, especially at lower elevation, but warmer, and that is impacting the greater glider. That is in habitat that would be suitable—lots of hollows, lots of foraging habitat.

The third case is changing fire regimes. You have probably had a few discussions of this topic in this committee, but it is a thing we are quite concerned about. This is Mount Useful after a couple of bushfires. You can see some extensive mortality of *Eucalyptus delegatensis*. More recently—this was taken this February—up in the Dargo High Plains we have had three fires, and we are seeing changes in structure. We are currently measuring the data on this one, but what we do know from a lot of our work is that we are getting changes in the composition of the forest. We tend to get lost in the trees: we focus on that main tree species and we tend to ignore the bulk of the other biodiversity in the floral community. Ninety-five per cent of it will be in understorey, and that is changing—not just in alpine ash. This is some modelling about where that risk could be in the future. We are already seeing these impacts. We can use the observed information to build our tools, and what we can see is quite a bit of risk going forward—current climate change and future climate change are going to facilitate declines.

This is from alpine woodland forest, so *Eucalyptus pauciflora*, so resprouter forest. Resprouting forests are thought to be quite resilient to climate change, and what we are finding is that they are not, so we are changing fire regimes. And this is just telling us—in the bottom right is the four different fires: unburned, single, double and triple burn—so three burns in less than 15 years, and pictures on the right. And what we are finding is complete changes in the composition of those understories and the increases in mortality of the snow gums, so essentially going from a sort of alpine woodland to a sort of alpine savannah, if you will. This is observed data as well that I modelled.

Moving along to some of our dry mixed eucalypt forests, which have this really strongly resprouting capacity—when we subject them to more frequent fire, or when frequent fire impacts them, we start to see increases in mortality and reductions in recruitment. One thing that we do not have in this paper but we have been working on is looking at the compositional change of the understorey, and not only is the species composition changing but the soil seed bank. The plants that are residing in the soil seed bank have fundamentally changed as well, so we are getting changes in biodiversity due to these repeat fires. This is important because fire can have a really big impact. This is, for example, for Leadbeater's possum—what is driving potential habitat in the future, and wildfire is the big driver as a direct effect and in interaction with how it affects hollow-bearing trees and foraging resources.

The fourth one is community dynamics, and this in part relates to disturbance but also the absence of disturbance or other disturbances. We have been in charge of doing the monitoring for *Astelia australiana*. It is a tall astelia. It is a threatened species in Victoria, only found in Victoria, and what we have found is that it has declined by 68 per cent since 1993 across monitoring sites. Now, there has been some increases in some sites and decreases in a lot of other sites, but what is happening here is a systematic decline across a lot of sites. Why is it happening? Well, this is the model, if you will. If you look at the threatened species recovery plan, these are all listed as stressors and threats to this species. Our research has showed that there are some things missing. Things like myrtle wilt, the orange tree there—that is actually a positive effect. Wind is a good thing. Fire can be good and bad for that species. Deer—they are bad. Drought [inaudible] change in water—that is not having an effect on the species based on the regulatory practices in place and in this location in riparian gullies. But the big factor is the forest growing. The species needs light and the forest is growing around it—the rainforest is growing around it—and shading it out. When that shading happens the species declines. We know we can reverse that by manipulating the light in the canopy. Given that species want light, we can get them to reproduce and survive.

That is not the only one. There is a raft of species. We are just starting to understand that they change over time in response to the forests around them developing, both with disturbance and in the absence of disturbance. I think we need to make an increased effort to understand what of these declines are driven by climate change, which ones are declined by changing fire regimes, which ones are declining just in response to the natural

dynamics of the system. If we are concerned about them from a conservation point of view or what they mean for other species like Leadbeater's possum, for example, how can we work to ensure that these elements are on the landscape? That is it. Hopefully I am close enough to 5 minutes.

The CHAIR: Perfect. Thank you. I gave you a little bit extra, but that is all right. Mr Meddick.

Mr MEDDICK: Thank you, Chair, and thank you, Professor Nitschke. I am particularly interested in your work around bats. I am a big fan of bats and their role in the environment. I note that you are talking specifically here about bent-wing bats. I just wonder if you could elaborate—I know that they are largely endangered and there are several different species and subspecies of them—on which ones are specific to Victoria and where they are at in terms of how close are they to extinction et cetera. And you have also mentioned that there need to be actions taken to protect the species in terms of targeted conservation programs. What do you suggest? What would those actions look like?

Assoc. Prof. NITSCHKE: So this is a new research program for us, looking at the southern bent-wing bat, which was restricted to western Victoria and South Australia, but also comparing it to the eastern bent-wing bat, which is occurring mostly in eastern Victoria up the seaboard of Australia and pushes I guess mid-west, almost to the Otway Range in that sense. Our research today is trying to understand, one, their population structure. There are three roosts that we know of for the southern bent-wing bat. For the eastern bent-wing bat we have got one maternal roost in Victoria. So we are trying to understand what are the population structures happening. Are these bats actually moving around the landscape?

The other part of our research with both is trying to understand how they use the landscape. So with the southern bent-wing bat, they are occurring in a more fragmented landscape. There is much more agricultural land out there and smaller fragments of forest and so forth, and so we are trying to understand actually how those bats are using those landscapes. Are they just staying in the native forests and woodlands? Are they venturing out into plantation areas? Are they using farmers' fields or the tree belts and so forth? So we are really trying to understand that. At the moment we do not have a good idea if bats are moving around and sharing between colonies, and that is important for understanding the potential adaptability of the species if they are sharing genes and so forth.

The other thing we are trying to do is are we actually separate the eastern bent-wing and the southern bent-wing bat from surveying, because a lot of the surveying that is done for these species uses acoustic recorders, and their calls at the moment we cannot pull apart. So we are trying to actually develop some methods to be able to do that so when we put recorders out on the landscape to understand, 'What bats do we have here?', can we actually get a good idea of which species are there. There are a whole bunch of bats that overlap in that space, and so the only way you can be certain actually at the moment is to capture them. And with the southern and the eastern bent-wing bat you need some genetic information with that as well. We would hope that the bats are able to use these landscapes. But we simply just do not know what constraints historical land use change and current management are having on those bats, and that is the part of the research that we are interested in.

Mr MEDDICK: Thank you.

The CHAIR: Ms Bath.

Ms BATH: Thanks, Chair. Thank you, Professor Nitschke, very much for all your extensive work and knowledge. There was an article in the *Conversation*, I think it was a year ago, probably now, in terms of:

We modelled the future of Leadbeater's possum habitat and found bushfires, not logging, pose the greatest threat.

I am interested in you sharing maybe some of your knowledge around your investigations but specifically in terms of disturbance of timber harvesting on the ecosystem and the regrowth of possum numbers. Some would say that it is all bad. I would like your opinion to, I guess, flesh out your work and what you have done on that.

Assoc. Prof. NITSCHKE: The way I would view this is a question of 'It depends'. I will start with that, and it is definitely a question of scale. If you go to an area that has timber harvesting in it and you look at 20 hectares, for example, before harvesting and then you look at those 20 hectares after harvesting, there is no doubt going to be a change in ecological condition of that site, and for Leadbeater's possum, if it was using that site beforehand, it will not be using that site for a time. What people are finding is that if you go back to that site 10 years later where there is a dense regrowth occurring, the possums will be using that habitat.

Ms BATH: For?

Assoc. Prof. NITSCHKE: For foraging, most likely. We do not know if they are nesting in those habitats. The models and the observations and the science suggest the hollow-bearing trees that they use likely do not occur in those areas, so they must be using those hollows adjacent. That is where the scale question comes in, so if you have hollow-bearing trees in an adjacent forest that the possums can nest in and then move through, then they will use those areas. If you retain some of those features within harvested areas, then over time the possums may recolonise them and use them. So we have got sites up at a historical silvicultural trial. It is 30 years now past harvesting, and we have detected Leadbeater's possum in every single treatment that has been harvested except for the control.

Ms BATH: Every single?

Assoc. Prof. NITSCHKE: Silvicultural treatment, so it was an experiment where they did clear-felling, they did what is called seed tree and then shelterwood so there was a range in the small gaps and big gaps and things. We have detected them in every one except for the control. This is because there is dense understorey in there, midstorey, and in some of those—particularly the shelterwood areas—large trees were left behind at the time, very large living and dead hollow-bearing trees. One would think that they must be living somewhere, nesting in there. They are a complex little animal because they do not need necessarily to have both habitats on top of each other—so the midstorey and the hollow-bearing trees. They seem to be using areas without hollow-bearing trees; they are foraging in there, so they have to be nesting close by, in proximity.

Ms BATH: So one is the supermarket and next door can be the bedroom?

Assoc. Prof. NITSCHKE: Or the hotel.

Ms BATH: Chair, just a really brief one—thank you. You have talked about, in that article and your work, a site-specific approach, so just looking at small sites as opposed to a landscape approach to, I guess, modelling but also restoration and, what would you say, species protection. Could you elaborate on that?

Assoc. Prof. NITSCHKE: Yes, that comes to that question of scale here, like I said. One of the things that we found in the paper was over time the cumulative effects of timber harvesting, particularly in interaction with wildfire, do add up—and the last speaker was mentioning cumulative effects. We are just quite a way away from, based on the modelling, those impacts occurring, but we do have to be mindful of them.

The current debates are usually centred on these point-based decisions, you know, about this logging coupe or this area, but there is habitat around that, and the habitat is fluxing over space and time in response to the harvesting or planned burning and wildfires—and particularly wildfires. Those are really what shape the amount of habitat and its structure and its composition. When you go to a bigger scale you start to lose some of those negative impacts that occur at finer scales because, for example, you might timber harvest an area; for 10 years it is not going to be a good habitat, but within 10 years it starts to become foraging habitat and remains so until the midstorey collapses, and if you have got areas where you are managing your hollow-bearing trees around that sufficiently, then those areas that were habitat and that then went out of being habitat come back into being habitat. So as you go up to bigger and bigger scales all those interactions start to downplay the effect of the timber harvesting, of those small-point events. But the cumulative effects do build, and we do need to be mindful of that.

Ms BATH: Thank you. If there is any evidence or reports that you have as the basis of your comments just now, could you provide them to the committee?

Assoc. Prof. NITSCHKE: I can, yes. Part will be that paper that we have provided, and there are obviously some other observations now that have been collected of, for example, the Leadbeater's possum occurring in areas that were subjected to the 2009 wildfire.

The CHAIR: Okay, great. Thank you. Dr Ratnam.

Dr RATNAM: Thank you very much for your evidence. Just following up from that series of questions, Professor Nitschke, I am just going to ask about the thresholds for critically endangered species protection. It strikes me that a number of things you are talking about in terms of the research you all have conducted are

about what happens when you have got these human-induced disruptors and even fires—human-induced climate change becomes a disruptor, then there is a flow-on effect, even indirectly—and then you get species that are in decline, critically endangered, and then what you need to be able to do to manage those low numbers. For example, with the Leadbeater's possum, one of the reasons we are talking about it is the numbers are just getting so low and we know habitat loss will impact their ability to survive. Is there a threshold at which point you go, 'Well, we have to do everything possible', so you cannot just hope that they will be able to find a neighbourhood close by an area that has been cleared? Is there a threshold in planning your research where you go, 'Actually these are such low numbers that we have got to do everything we possibly can', including about habitat loss, which logging does cause?

Assoc. Prof. NITSCHKE: Yes, I mean, I think the numbers around the Leadbeater's possum population are a bit ambiguous. We do not know if they have declined or not. We definitely know there are more of them—colonies—reported now from all the surveying that has been done since the 2009 bushfires. There has even been a range expansion of Leadbeater's found in habitats where they have not been found before. That is not to say that the populations have not declined, though, but I do not think we have the basis at a broad spatial scale to actually say that they have declined.

Dr RATNAM: We have actually heard quite contradictory evidence previously in this hearing—that we have quite substantial evidence, really significant research.

Assoc. Prof. NITSCHKE: Oh, for sure. Yes, so there are places in the landscape where they will have declined, and with our models and our understanding analysis would suggest that that is normal—that is something we would expect to happen. Part of my last point in my talk was there are things happening in these landscapes. They are changing. So, for example, you can have all the hollow-bearing trees that you possibly need for a Leadbeater's possum, and if the midstorey collapses in that site, there is a chance that you might not find Leadbeater's possum there because forest structure and that has changed. And we know the effect size of the amount of wattle in a site and the amount of hollow-bearing trees is equal, based on that research. We also know that the greatest probability of seeing a Leadbeater's possum if there are hollow-bearing trees present is in regrowth sites, not in old-growth forest, and so it is about trying to untangle what is going on there.

But my point is I would say we do not know if across the whole landscape Leadbeater's are declining. They are certainly going to decline at certain locations, and if you study a location for a number of years you would expect to see change. I think we need an effort to go out and actually resample much more broadly across the landscape. There has been a lot of effort put in by the government and others over the last 10 years to go to plots and sample and find the possum. There is a great opportunity to go back, you know, five years later, 10 years later, and resample that, and that will give us the population estimate that we need.

But that being said, the question of thresholds—when does something get low enough? When we have got a critically endangered animal, irrespective of whether Leadbeater's possum populations are lower today than they were 10 years ago, you know, it is still a restricted species. It only occurs in this region, as far as we know, and so we have a responsibility to ensure that we protect it. It is also our faunal emblem, so it would look really bad at the end of the day, but we do have a responsibility, when we are dealing with endemic species with narrow ranges, to make sure that we do operate in a way, if we are doing management, that makes sure that we do not harm that species.

Does this mean that we should timber harvest or should not? Well, our analysis suggests that timber harvesting has a much lower effect than wildfire does, but it also suggests that the two together cumulatively do operate in a negative effect, so we need to be mindful of that. And if we harvest too much of these landscapes, we will have negative impacts on the habitat of the species. So there is a consistency with others in their opinions on this. It is just the scale and the time—our analysis suggests that it is probably a bit further away, but it does not mean it is not there. And then again also, models are wrong, right? So it very much might be that we are underestimating the effect, as with any other kind of research as well.

I think a parallel to this is the tall astelia example. We are monitoring—we did the 25-year monitor a few years ago, and we will do the 30-year monitor in the next couple of years—and we know how we can reverse the decline in this species. It takes a little bit of active management restoration—probably some tough decisions that some people might not like because you are dealing with a cool temperate rainforest ecosystem, which is itself an endangered ecosystem. But, you know, we are watching this and monitoring this species. We have

been to every known site that we know this species occurs at and we are watching it decline, and it is declining because the forest is growing around it.

To me that is equally as important—to think about a management threshold. And this is not about going in and managing the forest for any economic value; this is just going in and making a decision and saying, ‘Well, you know, we’re going to spend some money; we can make an active engagement to actually save this species and turn its growth rates around so that they become greater than one’—and we have vibrant species that we keep in the landscape. We have been fortunate to have some funding to set up new populations. We have been doing translocations and moving it around. We know it works. But that is a species that is at the cusp. We know its entire population has declined by 68 per cent in the last 25 years.

Dr RATNAM: I have one more question if we have time to come back, or do you want me to ask it now?

The CHAIR: Yes, very quickly.

Dr RATNAM: Sure. If I can beg your indulgence for this question, we had an academic present to us earlier today and he was talking about kind of research interests and funding, and you just talked about funding. I suspect I am going to ask this question of all our academics—I believe in the institution of academia and you have got my wholehearted support there—but I would like to ask if any of the research that you have conducted has been commissioned by particular groups, and if so can you declare those?

Assoc. Prof. NITSCHKE: Yes, I have done research that has been funded by the Department of Environment, Land, Water and Planning. I have done research that has been funded by VicForests. I have done research that has been funded by Parks Victoria, Melbourne Water, Eucalypt Australia, the Paddy Pallin Foundation, the Wettenhall trust. There are probably a few other ones—FAME. Yes, so I have been a part of research by many, many organisations that represent a very broad spectrum of land management and I guess values.

Dr RATNAM: On notice, can I ask if you are able to provide the research that you did for VicForests to the committee?

Assoc. Prof. NITSCHKE: Yes, I can.

Dr RATNAM: Great, thank you. That is all.

The CHAIR: We are running out of time, but I will say if we run out of the ability for committee members to ask you questions, they can submit further questions to you on notice and then you can provide answers later on. I will go to Mr Grimley.

Mr GRIMLEY: Thank you, Chair. Thank you, Professor, for your submission and for your presentation today. It was very informative. My line of questioning is along the lines of data collection. Dr Ratnam spoke before in relation to some possibly contradictory evidence that we have received in terms of the Leadbeater’s possum. In terms of the lack of data, it has been spoken about previously in particular with Professor Brendan Wintle from the Threatened Species Recovery Hub. He stated that data was the key driver to change. Given your presentation and seemingly extensive data collection and analysis, I must say, what is your view on data collection and how can this monitoring and collection of data that informs the management of ecosystems be improved?

Assoc. Prof. NITSCHKE: Yes, I mean, we do a lot of work, and though a lot of work gets done we do really just touch on problems, I think. You know, sometimes we are fortunate to get longer-term datasets. I will bring you back to the example of the astelia. That was a program set up in 1993 by the Arthur Rylah institute. It was under somebody’s desk in a box, and we were able to recover that and take over that and are very fortunate to have a 25-year dataset. It is really those kinds of longitudinal studies over time that are really, really powerful.

To really understand, we have to try to pull apart, you know, why are things changing? Is it because of climate change, is it because of a change in a disturbance regime or a management element that we do, or is it something else that we have not even thought about? I think that is where having the space for time studies is useful. However, I think being able to monitor and see what happens over time, that is when we get to

questions like Samantha's around the Leadbeater's possum populations. I think if we have a broader scale in representation of that kind of data over time, we can start to understand not only what is happening on one site but other sites as well. You know, 'Where do these things move around the landscape?' and 'Do they move around the landscape?' when you are talking about fauna.

With flora, you know, what we are finding is there is incredible variation out there. You know, one site or 10 sites or 30 sites to be honest are not necessarily enough to actually pick up the strong signals that we are to have. So what we found looking at plant diversity is, well, time since fire is actually a very poor predictor of plant composition in the landscape. All other factors around soil nutrition and climate and topography and all these things are way more important. That becomes problematic when we start to think about how we design a study, because now we have all these other factors that we need to account for, so we need to do more plots, put more investment in.

But I would say we do not have a lot of data, and a lot of our data that we do have is focused on certain groups of species. It does not capture the overwhelming amount of biodiversity that is in these landscapes, and so we suffer from a bias. We target certain species—may they be social hooks, flagships, personal pets, whatever they may be. What I mean by personal pets is somebody loves that species. There is nothing wrong with that, by the way. I have got my favourite species as well. But what it happens to do is that it focuses us to this kind of very narrow perspective when for the overall amount of biodiversity, we do not actually have enough data. And if you actually went through and looked to see, well, 'What proportion of vertebrates do we have enough information to make good decisions on?', it might be 20 to 30 per cent of plants. If you get down to insects and vertebrates, you are probably looking at 1 per cent or 2 per cent if you are lucky. If you look at plant diversity in Victoria and Australia, vascular plants, again, maybe it is 20 or 30 per cent. When you get down to bryophytes, there are two people, three people, in all of Australia that can identify bryophytes.

The CHAIR: What is a bryophyte?

Assoc. Prof. NITSCHKE: A moss. And what is really interesting is that this is a big component of biodiversity, of floral diversity, and we just simply do not have the expertise and knowledge to do that. My point, I guess, for your question around data, is that we do not need to give up on the species that we spend a lot of money on. We definitely need to keep working on these species and to think about how we get the data—you know, those longitudinal studies more often. But I think we should start thinking about these other species that we just assume are going to be there. I think our research is showing that for this whole, for example, 'We'll use "time since fire" as a model for species diversity', when it explains 2 per cent of your plant turnover in the Central Highlands, it is kind of hard to put much stock into thinking about it as a correct metric for understanding change.

Mr GRIMLEY: Wonderful. Thank you, Professor. Thank you, Chair.

The CHAIR: I will go to Dr Bach.

Dr BACH: Thanks very much, Chair, and thanks, Professor Nitschke, for being with us today. I want to pick up a couple of elements if I may, about both the questions and the responses over the last few minutes, to talk a little bit more about the data and your scientific opinion regarding it. Notwithstanding the fact that I have heard you loud and clear regarding some of the gaps that exist, I am keen to get your expert view upon the role that national parks and reserves also play in the protection of vulnerable species. When looking at the best data, what do you think of these parks and reserves—as I understand it as a layman and just wrapping my head around the literature now—as providing a form of passive conservation? What role do they play?

Assoc. Prof. NITSCHKE: As a landscape ecologist, if we could zoom out to a broader scale and look at these reserves, ideally, they provide a representation of the ecosystems that we have in our jurisdiction. If they do not, then the parks system or reserves system is missing something important. But if, say in an ideal world, there are healthy representations of all ecosystems, then that is what we call a coarse-filter approach to management. We make the assumption that because we have them protected in these park systems that biodiversity is protected. So they can play a really important role.

The idea, I guess, from a lot of perspectives is that depending on where we are at, we do not have enough of these reserve systems in place. Or people that I know in the industry would argue, 'Well, that's where the biodiversity conservation is supposed to be'. You know—that is the stronghold of it, and the other management

that happens in the landscape, in those areas that are zoned for it, is there to support those reserve systems. So I think they play a critical role. Do we have enough of them? I do not know of any analysis that has actually tested that question. When we do put them into our analysis, into our models, they play a really important role, because these are areas where you do not have human-based management, and so there are parts of these landscapes—I think in the Central Highlands and a lot of other jurisdictions you are looking at around 50, 60 per cent potentially of these landscapes—that are either in formal or informal reserves. So that is a really big chunk of protected area, but it does not mean that biodiversity is not at risk in those areas. Bushfires do not care about tenure. The dynamics of the system—the plant community changing over time in response to the community around it—do not care about the tenure system.

So I think they are really, really important because we exclude a lot of cases, some of the human-based drivers—yet some of these parks and reserves we still do management in and we still do planned burning in. Just the act of not doing any management in some cases is a decision to manage. For some species that might be detrimental. *Astelia* is another great example. It is in a protected area; it is part of these formal and informal reserves that occur on the landscape. The species is still disappearing, so what do we do about that?

The CHAIR: What is that species?

Assoc. Prof. NITSCHKE: It is called tall astelia—*Astelia australiana*. It is a giant herb. Actually sometimes they are almost as tall as me, 2 metres tall. It is of Gondwanan origin, so it has been around in Australia for a while. It is pretty much exclusively restricted to cool temperate rainforests, so riparian gullies and so forth. A lot of them are either in parks or within state forests but within special protection zones and so forth. Again, even with that reservation protection that is afforded that species, it is still disappearing, right. So it is important to know that even within these reserve systems things are not necessarily protected, yes. I hope that answered your question, Matthew.

Dr BACH: It certainly did. Thank you very much.

The CHAIR: Mr Hayes.

Mr HAYES: Thanks, Chair. Thanks, Professor Nitschke. I just wanted to ask you, and I do not know if you have got the data on this: what do you see now as the obstacles in moving away from native forest logging to plantation timber?

Assoc. Prof. NITSCHKE: I think the obstacle is probably a question of cost. Is there enough land that is available and that is economically affordable to make it actually a viable investment?

Mr HAYES: You do not think there is enough currently under plantation at the moment?

Assoc. Prof. NITSCHKE: I do not know the answer to that because I have not done that analysis.

Mr HAYES: All right.

Assoc. Prof. NITSCHKE: From a point of view of moving away from native timber harvesting, the big question becomes around a lot of the plantations, hardwood plantations, if we are, say, concerned about keeping some of these local communities going and the mills that produce sawlogs, take sawlogs to produce high-end furniture products and so forth, you know, if we wanted to keep those mills going, we would need to be thinking about a very different plantation model of forestry from what we have right now. I mean, yes, maybe they could switch to pine, but then that would be millions of dollars in investments into those mills to have them transition. Also a major investment would be needed to transition to higher end technology to cut smaller pieces of wood. But there is also the time frame. The exit plan is 10 years, if I recall, or probably less than that now.

The CHAIR: There is an extensive plan over it, yes.

Assoc. Prof. NITSCHKE: If you wanted to grow those same wood products for timber—and we are talking about high-value timber products, not pulp, because I do not think that is an issue in my mind—we could plant stuff today and in 10–15 years it could be ready to go to the pulp mill. ‘Are we doing that?’ is the other question. But if you want to think about high-end hardwood timber products, then those have longer rotation times and changes in technology, and that is a cost; it is a big cost to invest, thinking 50–60 years down the

road. So I think that is probably the biggest constraint to that part of the industry. That being said, the model to shift from native forest to plantations is something that has been discussed for decades as a way of helping take pressure off forests for biodiversity conservation and so forth. So there is a really strong role there, and it is definitely a road worth walking down. But I think, with that last witness' comments around restoration, we have to be careful about thinking about how we want to manage our native forests still and silviculture. Thinking about climate change and how we make our forests more droughtproof, for example, is a very good question, and there may be a role for managing these forests—not how they are managed today. With a very different perspective that could still provide some of these products for some of the industry, but it will never be to the same scale as it would be right now.

Mr HAYES: Okay, thank you.

The CHAIR: Just a very quick question from me. The government released its *Biodiversity 2037* plan a few years ago. Are you familiar with that, and do you have any comments on the aims and objectives of that plan?

Assoc. Prof. NITSCHKE: I am familiar with it. My thinking on this one is that it is nice to have a plan. It is ambitious but it lacks detail, and I think it is a bit ambiguous how some of that will be achieved from reading the plan, but that does not mean the plan does not have value.

The CHAIR: And also, what role should traditional owners play in ecosystem management?

Assoc. Prof. NITSCHKE: I think they should play a significant role. I am a bit biased because I am First Nation—not from Australia—so I do have a bit of a probably biased perspective in my personal feelings on it. But I look back. You look at the research and you look at how these landscapes have changed. We have inherited a great deal of biodiversity from landscape management practices for thousands and thousands of years. How was that achieved? How were these landscapes managed? I think being cognisant that we have inherited the outcomes of that and now we are trying to conserve that, to me it makes a lot of sense to maybe step back and say, 'Well, if this is the sheer amount of biodiversity we had after 40 000 years, 50 000 years of landscape management, perhaps they were doing something beneficial to the environment and maybe we should seriously step in and have a look at those processes and understand them, and try to help Aboriginal communities recover that learning as well'.

The CHAIR: Great. Mrs McArthur.

Mrs McARTHUR: Thank you very much, Chair, and thank you, Professor. Surely the greatest abusers and disruptors of the environment are governments themselves. Look at the lack of controlled burning to reduce fuel loads in forests—and you have indicated that fire is really the major disruptor to species, whether they are animals or plants—and the whole green jobs argument of climate change versus the environment. We have a situation now where to ensure that we accommodate climate change through renewable energy the transmission lines potentially are traversing very sensitive environmental areas—a biolink area, to be precise, in one particular area, the reservoir conservation area, the Lerderderg forest et cetera—and we have got potentially waste going into an area which drains into waterways at Parwan Creek and Werribee River. Governments at whom seem to change the rules and regulations to accommodate this disruption. How do you think that we can better approach the situation of government being the problem, not the solution?

Assoc. Prof. NITSCHKE: I do not know how to answer that. I am going to be honest; that kind of lands into a question that takes me a while to think through. I think one thing is just thinking about cumulative effects, irrespective of what agency is responsible for what—thinking about it all together over time and space—and thinking about those trade-offs. I mean, sometimes trade-offs are made for the economy and jobs. So my only perspective on this would be, let us just step back and think about what are the impacts, where are all the impacts, and then come up with a quantification of those and sit back and say, 'Okay, have we made an irreversible decision here?'. There are opportunities to say, 'Well, yes, we can put a blame game up there and say a decision was made in whatever year and it led to this negative impact, but we have an opportunity to potentially rectify that through good environmental management', and maybe that links into green jobs. I think there is a significant role for active environmental management, not preservation but what I call conservation. It can play a big role in the future, and if that is through restoration or if it is through maintenance of ecosystem health and vitality through actions that we make or through remediation, then I think there is a good place for that and maybe that is where green jobs—some of them—could be.

The CHAIR: Great. With that, we are out of time. Thank you very much for giving your evidence today and for your contribution. It was very much appreciated.

Witness withdrew.