T R A N S C R I P T

LEGISLATIVE COUNCIL ENVIRONMENT AND PLANNING COMMITTEE

Inquiry into Ecosystem Decline in Victoria

Melbourne—Wednesday, 10 March 2021

MEMBERS

Ms Sonja Terpstra—Chair
Mr Clifford Hayes—Deputy Chair
Dr Matthew Bach
Ms Melina Bath
Dr Catherine Cumming
Mr Stuart Grimley
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Mrs Beverley McArthur
Mr Tim Quilty

WITNESS

Professor David Lindenmayer, AO, Fenner School of Environment and Society, Australian National University (*via videoconference*).

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 take the opportunity to welcome any members of the public who may be watching this via the live broadcast today as well.

At this juncture I will just take the opportunity to introduce committee members to you. My name is Sonja Terpstra, I am the Chair of the environment and planning committee; Mr Clifford Hayes, who is the deputy Chair; Dr Sam Ratnam; Ms Nina Taylor, who is appearing with us via Zoom, as is Mr Stuart Grimley. Mrs Bev McArthur is in the room with us, Ms Melina Bath is in the room and Mr Andy Meddick.

In regard to the evidence that you are giving today, all evidence that is taken is 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. 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's website.

Now, for the Hansard record, could you please state your name and any organisation that you are appearing on behalf of.

Prof. LINDENMAYER: Professor David Lindenmayer, AO. I am from the Fenner School of Environment and Society at the Australian National University.

The CHAIR: Thank you. At this point, if I could invite you to please give your opening statement. Can you please keep it to a maximum of 10 minutes. I will give you a 2-minute warning as we approach the end of that 10 minutes in time. If I could just ask other committee members who are appearing by Zoom if you could please mute your microphones while you are not speaking. That will help to keep background noise to a minimum. So, Professor Lindenmayer, over to you.

Visual presentation.

Prof. LINDENMAYER: Thank you very much. I am going to go across some issues to do with biodiversity loss and ecosystem decline. My background goes back to 1983 working in forests and woodlands in this state and we have published over 815 papers and 47 books on this topic.

Particularly the wet forests of Victoria are a focus of our work and in the last 20-odd years, since 1997, we have seen significant decline in Leadbeater's possum. Site occupancy has halved in that time from our long-term field sites. Greater glider decline is even more substantial over that same period of time, by more than 60 per cent. What we see in this graph are some of the key drivers of decline. First of all, the change over time on the left. We see also that the amount of harvesting in the landscape is really very important for this species, as indicated also for the greater glider, and the amount of fire is particularly important for the greater glider as well.

These species are sensitive to the amount of logging, not only at the site level but also at the landscape level. Now, this is supposedly a variable retention harvest site. In fact it does not meet the specific definitions of variable retention. I know this because I have written textbooks on this very topic. We also see that significant parts of landscapes have been harvested, and that has a big effect on biodiversity. We have reported these findings in journal articles, such as this one that was published last year.

We also know that many forest birds are declining—declining significantly—in these forests, and we published this work in 2018 as well as 2019.

We also know that the existing protected area network is insufficient. This has been published in a whole series of papers led by people from the University of Melbourne as well as ANU, and also the Victorian government's own work shows that the reserve system is insufficient.

We also know that the further logging that takes place is occurring in areas of high biodiversity value. There is a high degree of conflict between the timber release plan and areas of high conservation value. Overall, we see that possums, gliders and birds are declining. The amount of logging in the landscape is a driver of decline. Birds are very strongly linked to old growth, as are possums and gliders. There is a high degree of conflict in overlap between biodiversity and logging. Logging is heavily fragmenting the landscape, and the reserve system is inadequate from the science that has been done.

If we look at old-growth forest, across the landscape there are very small areas of remaining old growth. It is very fragmented both in mountain ash and alpine ash. Part of the problem is that there was a change in definition of old growth, which has led to it being much harder to be old growth now than it was 10 years ago. We have seen across the state in the sequence of fires since 1995 a 77 per cent decline in old growth across the landscape—this was published last year. So we need greater protection of old-growth forest and a greater attempt to bring more old growth into the landscape. We also see that some ecosystems are at serious risk of collapse. The mountain ash system and the alpine ash system feature in this paper on ecosystem collapse that was published a couple of weeks ago.

There is also a very important interaction between logging and wildfire. So logging leads to an increased risk of high-severity fire—this was a paper published in 2014. There is nothing unusual in this result. We see this in forests worldwide, and it has also been seen in some new analyses from the fires that we just had in 2019–20. These are data relating the probability of crown burn to the age of the forests from East Gippsland, and we recently wrote a review article about exactly this topic. Why does it occur? Logging leaves a lot of extra debris in the forest, it dries the ground layer—that has been documented—it changes the architecture of the forest to make it more flammable and the effects last for 40 to 50 years after logging has occurred. We have recently reviewed this work in these fact sheets on bushfire.

There are some deep-seated problems with the native forest logging industry in this state beyond what is claimed to be variable retention harvesting, which this is not. VicForests is not truly engaging in a spirit of variable retention. Some new work shows that there is a major problem with uncertainty in resource, and that is that the natural fire frequency in wet forests should be somewhere between 75 and 150 years and the optimal sawlog rotation is about 100 years, but the probability of fire is meaning that very few stands are ever going to reach sawlog age. This means that you have a very high uncertainty in resource availability. You need an alternative feedstock, which is basically plantations that grow on a faster turnover time. This paper will be coming out in the next couple of weeks documenting exactly what I have just shown in the previous slide.

There is more to the story than that. This is from a paper that was published last year. It looks at the amount of recurrent fire in the landscape—these are analyses based on the Victorian government's own datasets—and what it shows is that there is a significant increase in the amount of forest that is burning over time. Many forest areas have now been burnt three or four times in the last 25 years. Sixty per cent of everything that was planned to be logged in East Gippsland was burnt; 30 per cent statewide was burnt this year. Fire is competing with forestry for the resource—and fire is winning.

If we look at the business side of what is happening here—this is from VicForests' own business plan—we see that VicForests is not profitable in significant parts of its jurisdiction. It is losing more than $5.5 million per annum after the distribution of corporate overheads in East Gippsland. It admits that it is not commercial. So when we do the economic and accounting analyses of this, we see that there is actually a material economic benefit to the state of ceasing native forest logging. We see that in terms of extra water supply, extra tourism, extra resources and financial outcomes from plantations. This comes from a paper that uses the United Nations economic and environmental accounting framework to compare the GDP regional values for different natural assets. So some of the solutions here are that the state needs to transition rapidly out of native forests. There are biodiversity, fire, water, carbon as well as employment benefits from doing this. Your forests in Victoria are potentially a massive carbon store, because they are amongst the most carbon-dense forests globally, and I think there is now an opportunity to convert VicForests to an organisation called Vic Carbon.

In that transition rapidly out of native forests, it is possible to source the timber that you need from plantations. Already 88 per cent of all sawn timber in the state comes from plantations, and detailed analysis shows that there are significant emissions advantages of doing that. There is also a substantial amount of plantation feedstock in western Victoria that could add significantly to the state's employment by processing that material in the state. There are also substantial opportunities to be generated from inbound tourism from tourism infrastructure.

Coming back to biodiversity—there are serious threats to biodiversity in this country. We have lost three mammals in the last decade. There is an estimate of somewhere between 77 and 100 extra species that may be lost by 2100.

The CHAIR: Professor Lindenmayer, you have 2 minutes.

Prof. LINDENMAYER: So what can we do? Well, I think there is a need for a direct focus on threatened species management, and there are good models to do this. There is a threatened species hub nationally at the moment, which ceases to exist in June this year, and that has been highly successful. There is an opportunity here to invest in a state-based threatened species hub that has designs around good, science-based and management-based investment and policy to ensure that species do not go extinct and do not continue to decline. Our estimate is that somewhere between $5 million to $7 million per year leveraged with partners at universities and other organisations would make a huge positive difference to the status of biodiversity and ecosystem threats in the state. I am going to leave it there. I have been across a lot of information. I am happy for my talk to be shared. I am happy to provide papers from anything that has been said here and take questions from the panel.

The CHAIR: Great. Thank you very much. I will throw to questions in a minute but also just remind committee members that if we do run out of time, again you can submit your questions on notice to Professor Lindenmayer. Dr Ratnam, I will throw to you first.

Dr RATNAM: Thank you very much, Chair. And thank you, Professor Lindenmayer for your presentation today. It has been really insightful. Firstly, I am not sure whether you have been watching the proceedings to date, but I just wanted to put something to you that was said by a previous witness, just as we get started, because I think it is important for the committee. We had just previously the Institute of Foresters of Australia and Australian Forest Growers. So we have heard from those industry groups today, who made a claim and who were asked about your research particularly. They in response stated that while you had contributed significantly to the field, often your research was based on single case studies and was narrow in focus and that also you had participated in activism around the forests issue and therefore there was a bias in your research. I just wondered if you could comment on that claim made by the previous witness.

Prof. LINDENMAYER: I totally reject those claims. My science is based on some of the largest scale, long-term studies conducted anywhere in the world. We work at a species level, a forests landscape level, an ecosystem level and a global level. We collect the highest quality data possible. We analyse those data with the best available statisticians, some of the best people in the world, and we publish our papers in the world's leading journals. Our work has been cited nearly 71 000 times, so we are in the top 0.1 of 1 per cent of forest ecologists globally. Our work is based on what the science says. Our agenda is the best possible science to make the best possible contribution. So I flatly reject—absolutely reject—this notion of bias in our work.

Dr RATNAM: Thank you very much, Professor Lindenmayer. My second question is also based on some of the evidence we have heard from logging industry groups throughout the day, and the claim has been made several times that logging has not impacted our threatened species and ecosystems. I would like you to respond to that, and that claim has been made multiple times.

Prof. LINDENMAYER: Yes. That is patently absurd. There is work that indicates in Australia—published by James Watson—that over 70 species are at risk from logging operations. There is also a significant effect of logging in the wet forest ecosystems in Victoria. It undermines the ecological integrity of mountain ash ecosystems, alpine ash ecosystems. Logging in East Gippsland has fundamentally changed the composition of the forest, and so that it is dominated in those lowland areas by tree species which are not edible for animals such as koalas and greater gliders. So the evidence is clear, and it is compelling to indicate that logging has significantly altered ecosystems and has contributed to the decline of species. You can see it in our slide number 6 in the presentation that shows the impact of the amount of logging in the landscape on the long-term decline in animals such as the greater glider and Leadbeater's possum.

Dr RATNAM: Thank you very much. I will come back.

The CHAIR: Ms Bath.

Ms BATH: Thank you, Professor Lindenmayer. Professor Lindenmayer, I felt like that was speed information flowing out of your presentation, and there was almost too much, I think, to take in at one time. But interestingly enough, this morning when we had Ms Dawson from VicForests in, she said that VicForests, through the government, have been looking at a form of assessment and data—and I think it was laser data—and there would be information that she could provide and she will provide to the committee. But it actually said that Leadbeater's possums were found in regrowth or regenerated harvest coupes in the vicinity of around 20- to 30-year-old, where there were maximum species, not 200-year-old trees.

Prof. LINDENMAYER: So you need some context there. We have understood that from our own work since 1985—in fact 1983; it was published in 1985. But the important thing here is: what are the animals nesting in? So if you look at slide 6 in the presentation, it shows quite clearly that the abundance of Leadbeater's possum is significantly associated with the number of large old trees—hollow-bearing trees—on a site, and the animal only occurs in regrowth sites where there are large numbers of hollow-bearing trees. So in fact the strongest relationship in regrowth forests is where you have what are called biological legacies in the regenerating stand.

So it is naive and misleading to suggest that the animal is only associated with regrowth forests. In fact it is the combination of old-growth elements in the forest that are incorporated in the regrowth forest that makes the difference to the animal's habitat. We have demonstrated that repeatedly since 1983, and you can see that in the latest data. That is more than 20 years of data summarised in that slide number 6 to show that.

So the problem for VicForests is that they claim that they are doing variable retention harvesting. In fact it does not meet the requirements of variable retention in terms of the limited tree retention. What is stated for 'variable retention'—and I know, because we have written this in a textbook on the whole notion of sustainable forestry—is that you need to retain at least 15 per cent of a logging coupe, and the retention needs to be not at the edges but throughout the logging coupe. So if you look at slide number 8 in our presentation, you will see anything but that, and that is far from an isolated coupe that is claimed to be variable retention.

But the deeper issue is that logging is taking place in the landscape that has the highest conservation value for Victoria's 70 threatened forest-dependent species. That analysis was published together with Chris Taylor in 2019, and it is based on statewide species distribution models coupled with the areas that are slated for logging under the timber release plan.

Ms BATH: Thank you, Professor. Professor, you referenced one of your many works, 'Recent Australian wildfires made worse by logging and associated forest management'. That was released, I think, earlier this year—last year now, because we sort of missed a whole year of life. In reference to that there are certainly other professionals—Professor Peter Attiwill and others—that actually refute your claims. I find it interesting in some ways that unless we believe you we are in the wrong, and that you do not seem to entertain other professionals' opinions.

Prof. LINDENMAYER: That is not true. I do entertain other professionals' opinions. I am acutely aware of that paper. The reality of that paper is that there is actually no statistical analysis in that paper. We actually analysed the same data as the Attiwill et al. paper did, and when you analyse those data properly, as we did—and the analysis was led by Professor Michael McCarthy from the University of Melbourne—and you look for what is called a non-linear relationship, that is exactly what you find in the data; you find that young regrowth forests are more flammable. The important thing is that in more recent work, from 2019–20, which is currently being assessed in peer review, we find exactly the same shaped curve as we see in the Central Highlands. In a global review of these kinds of relationships that was published in 2009 and then an assessment that was done in 2021 there were 51 different scientists from different studies around the world showing that there is a significant relationship between logging and fire severity.

So, two issues there. One is that the data presented in Attiwill et al. 2014 actually shows the relationship that we found in 2014 as well, except that they did not analyse it properly. The second thing is that the results that we find from 2014 are actually replicated in many, many other studies, not only from Australia but from around the world. So the relationship is a frequent one that is seen, and it is a very important one because it drives at the heart of community protection. The recommendation from this, and I will not walk away from it, is that we

should not be logging near local communities, because of the extra fire risk associated with additional fire severity associated with logging.

Ms BATH: All right, I have got more, but that is fine.

The CHAIR: We are going to have to move on. Look, as I said, we may get to a situation where we have questions on notice again. I will take the opportunity just to ask some questions as well. Forgive me for my clumsiness when I ask this, but I guess to summarise what we have heard, and I think both Ms Bath and Dr Ratnam have demonstrated that, we have really had contrasting pieces of evidence given today. Just as an example, previous submitters have asserted that in reality invasive species and climate change from bushfires are a far greater driver of forest ecosystem decline than forestry activities. I note that in some of the evidence that has been given some of those proponents talk about the very small area. If you look at the whole state of Victoria, I think Mrs McArthur quoted it before as 0.04 per cent or something. It was a very small—

Mrs McARTHUR: Annually.

The CHAIR: Yes, annually. So it is really interesting that what we are seeing today are really contrasting pieces of evidence given. So I am just wondering—and I know, again, it is hard in 45 minutes to have this very big discussion, because they are really hotly contested areas—could you comment on that claim that is being made that invasive species and climate change and bushfires are a far greater threat, and what do you then say about the small area that the forestry proponents claim is really in reality the only part that is being logged? What they then say is that because it is so small, it cannot possibly be a threat to the Leadbeater's possum and other flora and fauna. Can you unpack that?

Prof. LINDENMAYER: I can unpack that. So a statement of the area of the state that is logged is misleading relative to the impact, because not all forests are created equal. We know that two of the main forest types that are logged in the state, those dominated by alpine ash and those dominated by mountain ash, are significantly impacted by the amount of logging that takes place.

I refer you to slide 9 in my presentation where we see that, as a consequence of logging across these landscapes, the ecosystem is dominated now by young forest and that has highly significant impacts on biodiversity. We also know that under the timber release plan where logging coupes are planned, those are the same areas of high conservation value based on species distribution models developed for the state. So what that means is that areas of high conservation value are also the ones in conflict with biodiversity. That is a really important aspect of this. If we look at slide 6 of my presentation, that shows the extent of the effect of the amount of logging in the landscape on the decline of species such as the greater glider and Leadbeater's possum.

It is also important to be aware that logging does not take place in the absence of other factors. When you put a logging coupe into the landscape, you put an extensive road network into the landscape and that brings foxes and cats into the landscape. We also know that when we log forests, as I explained to one of the panel members before, we make forests more flammable for several decades after the logging has taken place, so we add an extra fire burden to the landscape beyond what would have happened previously, so our biodiversity has to deal with fire and logging together.

The CHAIR: And just on that point, I think you were also saying that young forests are more susceptible to fire and do not necessarily support the food sources or the ecosystem or the environment necessary for wildlife to flourish. In a nutshell is that correct?

Prof. LINDENMAYER: That is correct. Young forests lack the large old trees which produce the most flowers, the most seeds, the most hollows and the most fallen logs—those kinds of things that are critical parts of the habitats that are essential for the persistence of these species.

The CHAIR: Okay, great.

Prof. LINDENMAYER: We can see that in data that is published in 2019, 2020, 2017—a whole host of other things that I can submit to the committee.

The CHAIR: That is fine. And just finally, you argued that the legislative framework protecting Victoria's environment is inadequate and unresponsive to science. Can you tell us in a nutshell—because I am conscious of time—if you had to wave a magic wand, what are your top three recommendations for modifying that or improving that? What would they be?

Prof. LINDENMAYER: The first recommendation would be to convert VicForests to VicCarbon, because it would be a significant source of revenue for the state. The federal government is desperate to find carbon abatement, given its 2050 target. Victoria has a huge natural advantage in that space. The second thing that I would do would be to establish a threatened species hub statewide so that you can tailor specific outcomes for species that are dependent on that. The third thing I would do would be to make a rapid transition of the native forest industry into plantations, process that material in the state to grow jobs in that area and use the workforce that is presently in native forests for remediating the forest cover as part of your carbon income, but also as elite firefighters. You will never find people that are better on heavy machinery than logging contractors and they can make a huge difference to protecting communities and fighting fires.

The CHAIR: Fantastic, thank you. Ms Taylor.

Ms TAYLOR: Thank you for your contributions today. Just further to the point, previous representatives who were here were associating logging with fire prevention and that is clearly, from my perception, not the position that you are taking. I guess I am seeking confirmation. From my point of view looking to the longer term I see logging of plantation timber as providing a more sustainable way of producing products. I do not actually, based on the input that we have had, see it as a mechanism for preventing fires, because you thin out the forest and you make it hotter and so forth. Is that correct, with my non-scientific explanation? You can be far more articulate than I am being in this moment.

Prof. LINDENMAYER: Okay, let me summarise. To build on what we said before, logging makes forests more prone to high-severity fire. The periodicity of fire—so the frequency of fire in the landscape—means that it is very unlikely that trees are going to grow to a sawlog age. So if you want certainty in your resource, you need to go somewhere where you can grow the trees fast enough to harvest them before they are likely to get burnt. The only place you can do that is in plantations. The carbon work shows that you actually have a significant reduction in emissions if you source your wood products from plantations. That is from a paper led by Heather Keith published in 2014. There is also work showing that thinning of forests does not necessarily reduce the risk of fire and in some cases it actually increases the risk of high-severity fire, so thinning is not an answer. Also thinning costs money, and what you take out of the forest when you thin a forest is pulp and woodchips, which have very little value and, as we said before, potentially add to the risk of fire. So it is clear where you should be getting your wood products in Victoria. It is from plantations. And you can grow the job sector for employment in that part of the world. Victoria produces 3.9 million tonnes of eucalypt pulp logs every year from plantations and exports 2.9 million tonnes. For God's sake, start processing some of that stuff in Victoria for jobs for Victorians.

Mr HAYES: Hear, hear.

The CHAIR: Great. Thank you very much.

Mr HAYES: Could I just—

The CHAIR: Mr Grimley first. Mr Grimley.

Mr GRIMLEY: Thank you, Chair. And thank you, Professor, for your submission. I have a question in relation to fire management practices given what you just said. My concern is ensuring community safety, particularly in heavily wooded areas. Do you have any suggestions for fire management practices that can be employed as opposed to the logging of native forest, which I believe you ascertained as being one of the main causes of fire?

Prof. LINDENMAYER: One of the key issues here is: what are you trying to do? I think the most important thing is community safety, and that means that you are protecting people's houses and people's lives. The work led by my colleague Professor Philip Gibbons shows that prescribed burning has an effect, but it needs to be done frequently and it needs to be done close to houses and infrastructure. So rather than burning extensive areas in remote parts of Victoria, I think it is important to focus our prescribed burning close to places where it is going to increase the chances that it will protect people and protect lives. We should not be logging anywhere near people's houses and other infrastructure, and we should be using the extraordinary skills of logging contractors to help with this process of creating elite firefighters in the summer and using those same resources to target our prescribed burning in the winter during the prescribed burning season. So I think there is an answer to the fire risk issues. When extreme conditions develop, then prescribed burning makes unfortunately relatively little difference. And the big problem in the background here is climate change. We

have seen a tenfold increase in the number of extreme forest fire danger index days since the 1960s. It is a big problem, so we have got to be very smart about how we target our prescribed burning. We have to be very smart about not adding extra fire risk to the landscape through making forests more flammable, which is what happens through logging.

The CHAIR: Great, thank you.

Mr GRIMLEY: Just very quickly—sorry, Chair—you talk about not logging near communities or houses. Geographically speaking, how close is too close?

Prof. LINDENMAYER: I would say within 5 to 10 kilometres minimum, especially in some of the more high-biomass forests.

Mr GRIMLEY: Okay, thank you.

The CHAIR: Great. Thank you. Mr Hayes.

Mr HAYES: Just to follow up on what you were saying about plantations, Professor Lindenmayer, we heard from a previous submitter that transitioning to plantations was pretty well useless in regard to hardwood. She said it is okay for softwood but no good for hardwood because of the long rotation period required. How would you respond to that? I would love to see more investment in plantations, I must say.

Prof. LINDENMAYER: Let me respond by indicating that 87 per cent of all native forest timber cut in Victoria goes to the paper and pulp stream, or as woodchips—87 per cent—so keep that in mind. What are we using that for? We are using that to make paper. Is there another feedstock that we can use to make paper? The answer is: absolutely, and it already exists. It exists in western Victoria. Recall my figures before that Victoria produces 3.9 million tonnes of plantation eucalypt pulpwood every year, but it exports 2.9 million tonnes, so you could readily move part of that material or all of it and process it in Victoria for Victorian jobs in the existing facilities. What you need to do is transport it from one side of the state to the other, but I would argue that that is better to do than transporting it 6000 kilometres to Asia to process, so I do not buy the argument that it is too difficult to process Victorian-grown plantation eucalypt pulp logs in the state. That is a non-argument. The resource exists here, we should be processing it and the industry should be able to access that. In fact there is good data to show that the plantation eucalypt pulp logs are actually preferable for making paper relative to native forest logs because of the higher pulp yield. But to me—

Mr HAYES: What about hardwood, Professor, for construction?

Prof. LINDENMAYER: There is hardly any hardwood used in south-eastern Australia for construction. 88 per cent of all sawn timber—for floorboards, for furniture and for roof trusses—comes from the plantation sector already.

Mr HAYES: Okay. Thank you.

The CHAIR: Right. Great. Mr Meddick.

Mr MEDDICK: Yes. One very quick question for you. Thank you, Professor, and thank you very much for your presentation. Look, as a non-scientist, clearly, I am getting confused here, right? Because I have had other scientists sit here and talk about things and they are saying, and I will refer to Leadbeater's possum as the example, that they only exist in low- to mid-growth regenerated canopy rather than old growth and old hollows and things like that. Taller trees is what you have said, so that is a conflicting argument. Are they cherrypicking data to bolster their argument to benefit industry? But as a non-scientist, I get confused by these conflicting arguments, so I refer back to an old standard, and that is to find out if a scientist's or a researcher's body of work has been peer reviewed. Clearly, you have got an enormous body of work here. I take it a large percentage of that, if not all of it, has been peer reviewed, yes?

Prof. LINDENMAYER: So my total publications record is 1300 scientific publications, and 816 of those have been in international peer-reviewed scientific papers.

Mr MEDDICK: Wonderful. Thank you.

Prof. LINDENMAYER: There are another 41 that are presently in review with journals, but I emphasise that our understanding of the habitat requirements of Leadbeater's possum is based on data that goes back to

1983, and it is measured in national parks and state forests across 183 long-term sites which are carefully measured on a daily basis. In fact while we sit here, one of my field staff is out measuring the forest as we speak.

Mr MEDDICK: Wonderful.

Prof. LINDENMAYER: And he works in the forest every day, so the key issue here is that Leadbeater's possum cannot survive without access to large, old, hollow-bearing trees that are at least 150 years old. That is the only place that they nest.

Mr MEDDICK: Great. Thank you so much. That clears that up magnificently for me. Thank you.

Prof. LINDENMAYER: Thank you.

The CHAIR: Mrs McArthur.

Mrs McARTHUR: Thank you, Professor Lindenmayer. Given that logging takes place in 0.04 per cent of the forests, are you suggesting that the bushfires have only occurred where that logging has taken place and not in the other 99.06 per cent of the state forests?

Prof. LINDENMAYER: No, I am not suggesting that at all.

The CHAIR: If I can just interrupt here, we are going to run out of time very soon, so just a very quick answer, but also feel free to answer this question on notice, because we have got about a minute left.

Prof. LINDENMAYER: No, I am not suggesting that at all. What I am suggesting is that when forests are logged, fires burn at higher severity in those vegetation types. And what we are seeing is that those forests that are heavily targeted for logging—alpine ash, mountain ash and other lowland forests—are burning at very high frequency, much higher frequency than they would have done in pre-European times, so there is a climate change affect there, no doubt. The most important drivers of fire behaviour are climate and weather, but underneath that there is also an effect of stand age, and forests' age is reduced by logging, which increases fires severity.

Mrs McARTHUR: So what about the other over 90 per cent of the forest? What are we doing wrong there that we are not protecting the ecosystems and the native species?

The CHAIR: I am going to have to pull it up there, I am sorry. Professor Lindenmayer, I will get you to answer that question on notice, and again I will encourage committee members if they have any other questions, to please submit them on notice. With that, Professor Lindenmayer, I would like to thank you for your contribution today.

Witness withdrew.