Conference Proceedings – Speaker Transcript

Reducing the effect of planned burns on hollow-bearing trees

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[Link to slides]

Luke Smith
Thank you. I work with the Department of Environment, Land, Water and Planning which is Victoria's environment department (Slide 1). I'll let Emily introduce herself a bit later on. We're going to be talking about planned burns and hollow bearing trees. Just get a show of hands before we start, who here would think that hollow bearing trees collapse during planned burns? There's a lot of anecdotal evidence out there to suggest that there is an increased collapse rate of hollow bearing trees with planned burning. That's something that we, particularly in eastern Victoria, were quite keen on finding out more about.

As we just found there's a lot of anecdotal evidence out there that hollow bearing trees collapse with fire (Slide 2). However, there are a very few published studies and those that are available had design limitations, like the lack of before and after studies, or lack of replication. As Alan York was mentioning before about the importance of habitat for fauna, hollow bearing trees are an important habitat attribute for arboreal fauna and other species that use tree hollows. The loss of hollows is listed as a threatening process, in particular in Victoria, under the Flora and Fauna Guarantee Act. At the same time, DELWP have an obligation for bushfire management which involves planned burning. So we've got that land manager's conundrum that we have to protect this asset of the hollows and we've also got to protect human life.

Today, we're going to break the talk up into three sections (Slide 3). I'll talk about the original project of quantifying the collapse of hollow bearing trees. Then I'll hand over to Emily to talk about what she was working on in her Honours project. And then we'll finish with a summary and some management options.

Firstly, here's an overview of the study site (Slide 4). We did this work in eastern Victoria in Gippsland. For those aren't familiar, that's about 3 to 5 hours due east of Melbourne. So the areas we operated from were just around Sale, all the way to Orbost in far east Gippsland. So on the map there, you can see the yellow triangles. Those were our sites and those black, hatched areas are the planned burns. We made sure we had quite a spatial representation across the landscape, and we had sites across different planned burns, but also control sites outside of the planned burns. We had about 1500 odd individual habitat hollow bearing trees across a number of different plots.

I would just like to highlight also that while we had transects, the actual hollow bearing trees themselves were our sample unit, not the hollows (Slide 5). The tree itself was the sample unit. The definition of a hollow for this study was it had to be a minimum of five centimetres deep, as it was wide. We measured a number of things including the number and size of hollows in each tree, also the DBH (diameter at breast height) and the characteristics that we thought would lead to its collapse. For example, how much debris at the base of the tree and defects like basal hollows and things like that.

At least 25 pre-fire variables were measured before the fire and then we burnt them (Slide 6). The planned burns varied across the study area, but they mainly had similar burn objectives. They were mainly for asset protection, so they had to have a high coverage. The objectives varied slightly, but we tried to keep them similar.

After the burn we had about 22 variables that we measured but the main things we were measuring after were quantifying the collapse or the effect of the fire on the trees (Slide 7). We had collapsed trees, including trees that collapsed or had greater than 45 degree angle to the ground. Then we also had damaged and undamaged trees. In the analysis, we found that the damaged trees category was quite subjective, so we just merged that with the undamaged into a non-collapsed category.

Now looking at the first set of results (Slide 8). You can see here that automatically we've, already dropped down to analysing 500 or 600 odd trees in our results, because not all sites burnt. We're starting with the control sites here. So, no surprise, most of the trees remain undamaged and there's a low collapse rate. Then we move into areas with the planned burns where they were ignited, but no fire reached the tree. Again, a similar trend is seen there and we've got most of the trees intact. Now we reach the trees where there was fire in our plots, but the trees also didn't receive fire again, so once again very little happening. It's not until fire reached the trees, as you'd expect, we've seen a collapse rate of about 25% across the study area. Was this a concern? Well, for us it definitely was and so the story didn't just stop there. Now that we'd quantified it we wanted to see what options were open to us to mitigate that. So this is where Emily comes in with her enthusiasm and hard work.

Emily Cordy

Like Luke said, I was lucky to fit in with this work at the right time because I got to actually ask and answer the question, “Are hollow bearing trees collapsing in prescribed burns?” This also further develops onto what Luke has just spoken about.

This initial question leads into my second research question that I asked within my project (Slide 9), “is manual clearing, using a rake hoe, an effective method of mitigating hollow bearing tree collapse?” Actually, talking to a lot of people in this room, I’ve noticed that that’s often the technique that’s utilized, when trying to prevent fire from reaching an object. But there wasn’t this scientific evidence to support those claims. So that’s where my project comes in.

The first question I was asked was whether manual clearing is an effective method of reducing hollow bearing tree collapse rate. And secondly if so, is there a specific distance that is most efficient to also mitigate this hollow bearing tree collapse rate using a rake hoe? Basically, I’m testing the best way of getting the most ‘bang for buck’. Given that most prescribed burns have a limited time frame for preparation and budget. Thirdly, are there certain characteristics of hollow bearing trees that make them more susceptible to collapse, and thereby prioritize them for rake hoe treatment? These are the three questions that I want to talk to you through today. However, like any research project there was a large range of factors tested. I will focus on these three today. However, if this presentation poses additional questions, I would be happy to answer them at the end.

The main experimental design of this project considered four different treatment types around the base of the tree (Slide 10). Firstly, control trees, with no rake hoe treatment delivered to them. Then there are three other clearing widths - clearing to half a metre, one metre or two metres. This involved clearing any kind of shrubs, grasses, any debris on the ground, so all that was remaining was mineral earth within this distance from the base of the tree to the prescribed rake hoe distance. This raking technique is often employed when preparing trees before a planned burn. So the basis of this project was looking for data to support this approach.

Before I could actually implement these treatment widths, I had to go out and locate and assess each of my hollow bearing trees (Slide 11). I assessed each of them using the same criteria that Luke talked about in his pre-burn slide. After that, I was able to gather all this data together and randomly allocate one of the four treatment types to each of the trees. I examined over 325 hollow bearing trees altogether.

I then went out again and revisited each of my trees for a second time and delivered each of these treatments manually, using a rake hoe. Then I sat back and waited for the planned burns to go through. Once it was safe to enter the burnt areas I revisited the trees for a third time, to reassess the status of the tree post-burn. This used a similar technique that Luke talked about in his post-burn assessments. Then, every scientist’s favourite aspect, conducting statistical analysis to determine whether there's a correlation between this manual raking and the status of the tree post-burn.

I'll talk you a little bit through the actual burn itself (Slide 12). I looked at four specific sites within my study. Being four different burn sites, they happened on different days, with different topography, along with a whole range of factors occurring at each of these sites. It goes without saying that all the different sites had varying degrees of burn cover and varying degrees of fire severity. This also influenced the collapse rate.

I'd like to go through some of the data that I collected (Slide 13). So firstly, answering that first question I posed. Is rake hoeing treatment an effective method of reducing hollow bearing tree collapse? If you have a look at my control trees, you'll see that about 20% of the control trees collapsed. Just for interest's sake in the study that Luke talked you through, it was found that 25% of hollow bearing trees were found to have collapsed. I realise there is a 5% difference between the two studies, however both these figures were found to be statistically significant. Thereby, controlled burns were found to influence the hollow bearing tree collapse rate.

If we look at the rake hoed trees, regardless of the rake hoe distance, you'll see that about 10% of these treated trees collapsed. Therefore, the rake hoe treatment has effectively halved the rate of hollow bearing tree collapse rate, just by rake hoeing to any old distance. That is quite a significant result and my statistical analysis also supported that claim.

Secondly, what is the most efficient rake hoe distance (Slide 14)? If you look to the two metre rake hoe distance width, you'll see that there's only about 8 hollow bearing trees that would be able to be mitigated from collapsing per team member per day. If you compare this with the half metre treatment width, significantly more trees can be attended to. This is to do with the amount of effort needed to be put in. It's obviously a lot easier and quicker to implement a half metre treatment width compared to a two-metre treatment width. When we consider the one metre treatment width, more trees loss can be mitigated within a shorter time frame. Although one metre treatment width actually requires a little bit more effort, compared to the half metre treatment width, this distance is suggested to be more effective at stopping fire from reaching the base of the tree. I can hypothesize that this extra distance was just enough to stop the fire from reaching the base of the tree, however my study didn't act to directly answer that question.

Thirdly, which hollow bearing trees should we prioritize for this rake hoe treatment, to save time and money (Slide 15)? Basically, I found that stags, dead hollow bearing trees were more likely to collapse within a prescribed burn. As well as trees with any kind of basal damage or a hollow butt, which you can see in these pictures on the right hand side of the slide, were also at risk of collapse. Along with trees with large hollows. These characteristics aren't exclusive as they often double up or triple up.

Going back to the actual fire severity across each of the four different sites, it was found that sites with a high fire severity increased the probability of collapse. So if you were to conduct the burn at a lower intensity, it also has the effect to mitigate the hollow bearing tree collapse rate.

This answers each of my research questions. I was then lucky enough to be able to handball this data and these recommendations back to the DELWP. I'll now pass you back over to Luke, who'll talk a little bit about how these recommendations and findings are being utilized within DELWP.

Luke Smith
As Emily was saying, we received the results of her work and closed that adaptive management loop (Slide 16). We fed this information straight back into our on-ground actions. You can see here on this diagram what we're talking about here is more direct protections. So it's our standard operating procedure when we do burn prep, mainly along the burn edges for the fire-fighters' safety but there's also some potential there for protecting habitat trees.

We fed what Emily had found back into the on-ground delivery, telling crews that not only is one metre an effective distance, you don't have to go to two metres if you don't have the time, and also triaging what characteristics they should be looking for. That's actually been put into practice. I did say it before, but the rake hoeing is one method we use. We also use machinery to protect around trees, but that can be quite destructive, putting a dozer through patches of bush. But you can see here that we have this conceptual idea of how to mitigate the risk and the rake hoe, while it is effective at an on-ground level, we want to have a more strategic approach to this so we can get the best results for this hollow bearing tree asset. So if we're just mitigating tree by tree, that's not going to be an effective use of our time.

We're now considering this trade-off process here (Slide 17) looking at trading off hollow-bearing tree habitat value with human risk reduction. It's something we're brainstorming at the moment, being able to apply this process at a landscape level. Representing the hollow tree habitat value across a landscape allows us to consider the trade-off of human life and property, against those flora and fauna values. We think by potentially reducing burn coverage and severity we can mitigate, more cost effectively, hollow bearing tree collapse. We may still run into the issues where potentially we've got high human life bushfire risk and also a high hollow and habitat value risk. We've still got to have those one-on-one discussions. That's where the rake hoeing comes in handy and is likely to be applied. This is something that myself and authors of this work are investigating in the next steps.

To sum up the key messages here today (Slide 18). On average, hollow bearing trees have a 25% increased probability of collapse with planned burning. But we've found that we can mitigate that somewhat with rake hoeing and also looking for those three main characteristics of the trees. We recognize that we need more of a strategic approach to this.

I would like to acknowledge Dr Lucas Bluff and Professor Wendy Wright (Slide 19). They were the main drivers behind this project. Without them we wouldn't be here, so thanks to them and also the others on the project. I also wanted to highlight that we've just given a brief overview of this work today, so if you want more information, feel free to jump online and have a look (Slide 20). Thank you.

Questions from audience

Question: Den Barber from Koori Country Firesticks. I just want to preface what I'm about to say by saying that we do value our hollow bearing trees in our burn areas. I had an uncle say to me that, Den, if you're going to do the cultural burn, make sure you look after those big trees, especially the hollow bearing ones, the more mature ones. I just was interested in the presentation, what was the prescription of fire?   I know you said, you suggested it was a cool burn. I was just hoping you could explain more about the methodology of the burn. I was interested in the amount of fuel at the base of those trees that weren't raked and the type of fuel. I also have noted that despite some of our raking around trees, fire can still enter into an exposed root system sometimes, especially a dry root system of more mature trees. I'm also interested in your view, from our view it is against our law to burn the crown, but we do concede that fire will do its own thing and it will bring trees down. But then those trees that are hollow serve a purpose to ground dwelling animals as well. So what is your view on that?

Luke: I'll start with the planned burns. As I was mentioning, they were in a bushfire moderation zone. In Victoria we have an asset protection zone, then bushfire moderation and then landscape management zones. So it sits in that strategic wildfire moderation area so the burn coverage is high. For those burns we're expecting 80% plus burn coverage and the severity of the fire is always aimed at being a low intensity. Those sites that we worked across had maybe 20 years in some areas since the previous fire. In terms of the fuel hazard, it was often high in those places. Right up against those trees you had loads of shrubs and grasses as well, so quite a high fuel hazard. While we intended to have low severity, in some of those burns we did get that high severity fire. One particular burn, Currajung, down in Yarram, there was quite a bit of crown scorching. But across most of the sites it was low intensity and we didn't have that crown scorching.

So, to address your question about the ground-dwelling animals. Some of the trees did collapse and remain onsite as coarse debris. And that's still important for the little critters on the ground. But most of the sites we found that we weren't creating more hollows than we were losing. So that was something we were quite concerned about. Even though we're providing maybe some habitat on the ground, it was still on net losing more hollows than we wanted.

Emily: This slide that I've got up at the moment (Slide 22) gives you an idea of how intense some of the burns actually were. If you look at this second picture up here, this darker yellowy colour represents the higher canopy scorching. So that's actually the Currajung site that Luke was just discussing then. That's where we found that in this area a lot of the hollow bearing trees collapsed regardless of the treatment type. Like you said, fire tends to do its own thing. Though it was meant to be conducted as a really low intensity burn, just aspects of this site and the way it was burnt meant it was burnt to a higher intensity. At this site we found at that high intensity a lot of these hollow bearing trees collapsed regardless of their treatment.

Luke: Yeah. At that site too, even though we had similar forest types, the fuels were a bit longer unburnt at Currajung. Also the fuel moisture levels were that little bit drier compared to, say, on the top right hand side at Tyers, where we had quite a bit less coverage. So it's that, fuel and fuel moisture level were the things that drove that fire differently compared to the other ones.

Links

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