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How houses are destroyed by bushfire

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I'm here to present about the topic of how houses are destroyed by bushfire, and I want to start with the broader landscape topic, and as we move through this evening, we'll get closer and closer to the structure and then finally work through the structure itself. So, let's start in the broader context of the landscape.

In a bushfire sense we can simplify things and say, "Look, we're a house in a broader landscape." There's the house in question. The large unmanaged bushland that presents the hazard and carries the event to the local proximity. We have the urban context, or the design and the layer, involving many complexities, some that certainly support and help the house in shielding it, but others which provide additional fuel loads and threats to the house itself, including neighbouring properties and fences and whatnot.

Quite importantly, the environmental conditions that precede these fire events and occur during these fire events, both drive the fires and prime the bush to carry those fires to our assets. But, quite importantly, also act on our urban environment and drive them out, and make them more vulnerable and prepped to be ignited by fires at the same time. So, it's very important to not think about our structures and our environment how they are right now, but how they would respond and behave when they're in a dried out, desiccated state which coincides with when the fires are most aggressive and virulent in the landscape.

I want to take you through an important terminology that our regulations use within the broader context of defining our broader environment. One is the term BPA, which means Bushfire Prone Area, and the other one is called a BMO, which is a Bushfire Management Overlay. They're two areas that we can map, or have been mapped, and they play two important roles. The BPA itself forms a trigger for you requiring to build in a particular way. So, it's a building control. This is where you might be required or asked to build a specific way to a certain BAL level using a standard such as AS3959 or the Nash building code.

It's an area where it's considered that fires are frequent enough that it warrants a specific approach to build in response to that risk of fire arrival. And within that BPA region, you get this opportunity also to consider certain types of vegetation management, and that vegetation management can follow something called a 10/30 rule, which might be something you're already familiar with or a new term, and I'll certainly come back to that 10/30 rule later in the presentation.

Now, BMO is an area within the BPA, so it's a sub-area of a BPA, that's of particularly high risk. So, the fires within a BMO are particularly severe and therefore warrant additional requirements which are called Planning Controls, where specific setbacks and extra measures are required if you plan to build and therefore need a Planning Permit in that area.

If you already have a house or you've bought a house that's already built, the BMO is actually a really useful indicator of whether you're in an exceptionally bad location in the landscape as far as bushfires control are concerned. The Vegetation Management options you have within this BMO area is called a 10/50 rule, which is quite similar to the 10/30 rule, you can just do a little bit more, and I'll explain that.

You can access maps where you can type in your own street address and zoom into these locations and actually see where these layers exist and where you sit in the landscape in relation

to them, and the webpage at the bottom of the screen there is the link that takes you to those publicly available maps (https://mapshare.vic.gov.au/vicplan).

If we go there and have a look, for example at the area of Nillumbik. On the left we see that the vast majority of Nillumbik is actually declared bushfire prone, so it's within the BPA. And a smaller subset but well over 60% of Nillumbik is actually within the BMO. And you'll see from these two maps how the BMO is simply a subset or sub-area of the larger Bushfire Prone Area designation.

What's interesting is if we zoom into quite a small region. So, let's go down and have a look at Diamond Creek. Let's look at how the Urban Interface shows up when we zoom right into these maps. So, here's Diamond Creek up close, and this is actually what the page will look like when you go into actually the VicPlan Maps. And you'll see on the left there's a really informative set of click boxes where you can turn various layers on and off for things around bushfire, but also many other useful overlays and interesting landscape related mapping features.

If we actually flipped to a different type of view, which is also available in this website, we look at the streetscape and the land parcels. So, we can basically see how we've got a heavily urbanized area through Diamond Creek, with a couple of creek lines and forested areas within the environment, and then a broader outer landscape of treed and untreed rule. So, you can see how that sits. Now, let's see how the BPA layer designates. So, it designates all of that treed area and the grass therapy in the mix. And it also extends quite a distance into the urban interface. And that's because the actions of bushfire can reach over houses and deep within urban interfaces and affect houses many rows in. And those distances and that reach has been carefully considered when they consider the extents of these maps.

Now it doesn't rule out the likelihood that you could have bushfires and ember drop and ignitions well beyond the BPA. It simply says that at this extent it's more or less a nominal threshold, where the risk is dropping low enough that it doesn't warrant specific building controls. So, I encourage anyone that's trying to get out of a Bushfire Prone Area into a safer place to be well within the non designated BPA areas to assume you've got to a place of relative safety.

If we look at where the BMO maps in relation, it covers most of that BPA area and if you're out into these areas where you've got an exceptionally high risk. So, you're embedded deep within a high fuel load area, where there's slope and other contexts. So, fire behavior in this area is definitely higher than the BPA only region.

So, as I said before, a 10/50 rule is allowed in a BMO, and a 10/30 rule is allowed in a BPA. The 10 refers to the distance in metres, that you can clear trees for the purposes of bushfire safety from the boundary of your house. And the 50 refers to the clearing of shrubs and surface scrubby fuels as a function of distance from your house in metres. So, you can just see that where the fire may arrive with far more severity, you need a greater clearance of undergrowth under those trees to present a lesser threat to your structure.

Now, those clearance options alone do not remove all the threats that your house may face in a bushfire, but it starts to reduce the intensity of fire arrival and helps that approach a more manageable level.

If we look at this scenario in plan in a simplistic way, we could be faced with forest right up to our structure. You can see the relative distances marked out below. So, issues with trees less than 10m. Well, tree strike is an obvious scenario that should be carefully considered and eliminated. Fires act on trees, they weaken them during the fire events by burning out knots and attacking the bases of the trees, and if you've been through a fire previously, you'll notice that there is extensive tree fall occurring during and for the many days and weeks after these fire events. So, tree strike risk is an obvious one, and that's where the 10m rule plays an important role.

The other aspect is the removal of shrubby vegetation under the trees, not the trees themselves. And that's a very important distinction. And obviously where you're in a BPA and a BMO, you actually get the option to clear your shrubby vegetation to 50m.

Now, most importantly, the trees themselves haven't been removed. And why would that be the case? Well, there's many things to consider in terms of trees and their role in a bushfire. There's many pros and cons, and I've spelled some of these out in a table here. So, some of the issues with trees is, well, they're a source of embers. Certainly, the bark, and the bark on those trees and that'll be the rough woolly bark trees are certainly a high ember risk, whereas the smoother barks don't present an ember risk at all.

They drop debris on the houses themselves, so that builds up in gutters and in roof valleys and up underneath houses and decks. They drop debris on the ground, which needs to be managed and cleared. And of course, they bring the risk of tree strike from either branches or falling over.

But on the pro side, they actually provide important shade and moisture retention for your landscape. So, as our landscapes dry out, it's the treed areas that are the last of the landscapes to lose their moisture. And that moisture can play an important role in meaning that your house is less ignitable because it has higher moisture content in the decking, and less stress on the plants that are around the structure.

They attenuate wind, which can mean less wind action on your house to weaken the house during these events, which is an important process that can lead to loss if you have a structure that's been compromised by wind damage first. They act as radiation shields between you and the unmanaged bush. So, they obscure the radiant heat as it's trying to travel between the unmanaged forest and your house.

They're obviously aesthetically pleasing to most. And they certainly help in retarding the growth of surface fuels under them by shading the ground. So, you can actually end up with less work of in terms of surface fuel management.

Tree strike risk is an ever present issue and it can't be underestimated, not only for the house, but for the pathways and routes that you might take through the landscape in a fire event. Wind damage itself. The fires happen to occur on very windy days. That's just one of the important aspects of a severe fire weather day. Those winds themselves can act on the houses and damage them. The fires can also contribute to increasing the local winds that the houses experience during the event.

Now, when a fire turns up, it can do a number of things. And a good way to describe fire arrival was an account from a fellow scientist called Malcolm Gill who experienced these fires in the Canberra events. Now, he noted that the first fire arrival was actually a surface fire that ripped through all the ground fuels and arrived and very quickly tracked through and consumed all the surface fuels around his neighbourhood. That, in turn, ignited many things within his urban environment that you wouldn't consider fine fuels. And when I say fine fuels, I mean things smaller than the diameter of a pen. That's what gets consumed in phase one. Phase two was the burning out of heavy fuels. So, this was fences and other heavy elements within the immediate surrounds of the house. And that was actually the most challenging phase when Malcolm was presented with the threat of losing his house, and the hardest one for him to defend.

In that process, there were things like hedges burning adjacent to his structure. Particularly problematic vegetation up close that didn't need any ground support or connection, that was just simply a bad behaving plant on its own. And also fences and other elements burning up to the structures. And in fact, this was the photo taken at the peak of that second wave event, taken from the back porch of Malcolm's house, where his back fence and a power pole were the only points of illumination during the thick of that fire event.