Bushfire Resilience Inc. Webinar 4 2024. Panel and Q&A Session

Understanding our changing bushfire weather

Chair: Malcolm Hackett OAM. Asks questions submitted by the audience

Presenters: Mika Peace, Justin Leonard and Kevin Parkyn

Malcolm
When will the FDR and FBI be made relevant by postcode rather than blanketing a whole district?

Kevin
Probably a question better directed to your state or territory based fire agency. It may happen in the fullness of time. I know in the United States the areas of fire danger ratings are in much smaller zones. I wouldn't quite say municipality based but it may be that in the course of time that happens as long as people can, I guess, juggle their understanding going from one municipality to the number. They might be going from Moderate to Extreme to Catastrophic back to Moderate again if we do have them over smaller zones.

Malcolm
Can you give your opinion on how fire danger ratings lower than Catastrophic can pose a risk to life and safety?

Justin
Around 40% of our life and house losses actually occurred below catastrophic. The typical numbers of lives lost per event drop well below 100 per event but there's plenty of problematic fire behaviour that will present a risk to anyone caught in a car. House loss occurs quite frequently. It's just a lower category of severity with a few less unknowns compared to catastrophic where the extra wind context really starts disrupting houses and making things problematic. And yeah you just get a slightly more moderate version but plenty of life risk to consider. And many vulnerable people should consider that as a trigger to not be in a bushfire prone area if they can help it.

Malcolm
Ignoring recent major wind events, and we've had a few in Victoria, has climate change affected the weather by there being more windy days?

Mika
It's a good question. And there's not a strong signal for wind in the climate outlooks. It's one of the things they have looked at. There's stronger signals in some of the other meteorological elements particularly temperature obviously but also dew point. But the wind signal is actually quite mixed.

I'm curious about that because when you look at the wind signal it's usually associated with low pressure systems. And there's a lot of questions about how well the climate models are actually resolving the processes in the upper atmosphere.

The upper atmosphere of course drives the development of the surface system. If we've got strong winds at the surface we'd expect them to be associated with stronger low pressure systems. And we're really not quite sure how the climate models are driving that upper system that the surface system becomes a reflection of. Much stronger response in elements like temperature and also rainfall but there is that uncertainty in how wind's going to play out in future climate regimes.

Malcolm
What data is available online to assess current fuel loads around my house for a five kilometre radius?

Justin
Nothing available in a public sense at the moment but certainly plenty of work to create those consistent data sets that will probably be updated around every two to three months. And aspects of those will make it into the public domain I'd say within a year you could expect to find resources like that to further understand your local context.

Malcolm
And is that work that the CSIRO was doing or is it a multi agency?

Justin
Yes we're building national versions and the states are reviewing the adequacy of that and they'll adopt that according to whether they feel comfortable that it's relevant for their state and the various regions in their state.

Malcolm
How can we get more information about weather hazards and climate change into schools?

Kevin
Some very good resources are available on the Bureau's website and some of them I included some at the end of my presentation. So if you didn't capture that make sure you get the slides afterwards. I'm obviously only aware of what the Bureau makes available via its online platform. There are some educational resources including climate change resources as well that you might be able to avail yourself of. A little bit of searching on the Bureau's website will probably reveal a treasure trove of information that will probably answer your question.

Malcolm
What influences the strength and direction of northerly wind in Victoria from a northwesterly or northeasterly or direct northerly?

Mika
It's usually the position and the strength of the high pressure system. When we get northerly winds over Victoria it's usually associated with a high pressure system in the Tasman Sea. And the wind is going anti clockwise around that system so it's coming down off the continent.

It really depends on the size of the high the location of the high and also the mobility of the high. Where the high is moving. On a frontal change day for example we'll start to see the winds starting off maybe northeasterly. And then as the high moves out and the next system comes in the winds turn more to the northwest. They tend to get hotter and drier obviously the more they've got a land trajectory. All of the hot dry reservoirs are usually over the centre of the continent. But it really comes down to the position and location of that high pressure system. And there's a lot of nuance in that as well. So high pressure systems can be quite different. But also whether or not you've got an approaching change as well.

Malcolm
Kevin what will be the latest time of day for an FDR to be changed for the following day?

Kevin
I've known the fire danger rating to sometimes change in the morning of the current day. What typically happens is the algorithms that determine the Fire Behaviour Index value I talked about underpins the fire danger rating. They get calculated at the Bureau of **[01:05:30]** Meteorology with input from the fire agencies about fuel. And that's usually made available by 4 o'clock in the afternoon to determine those ratings that appear suddenly on your fire agency website and also the Bureau's website.

Then overnight there's further work done by meteorologists and observing the weather in the latest model guidance. And the numbers crunched again and the ratings come out for the **[01:06:00]** current day usually by around 6:30am.

Probably 95% of the time they don't change. But occasionally the weather is really dynamic. Maybe the front is moving a lot faster, maybe a lot slower, there's more cloud coming in overnight can all impact the fire danger rating and that'll be evident at 6:30 am. So that's usually the last time that the rating will be locked in 6:30am if there has been any change compared to what was issued the previous evening.

Malcolm
How accurate is the new AFDR system and FBIs compared to the old FFDI? And are there other things like TFBs that should be taken into account when setting triggers?

Kevin
Look very simply it's out of my realm of expertise. Mika might be able to add more. But I know the CFA who I work with they've got people they've got scientists and technicians that are looking at the relationship between the old FFDI system and the current AFDRS and trying **[01:07:30]** to interpret it better and what it means for fire risk and fire danger rating. That's an ongoing project. The science is there and it supports the move to this new system. So it's about bedding it down and understanding it, not only internally for the fire agencies but also for the community when you see that fire danger rating outside and online.

Malcolm
Total fire ban. I don't think it was anyone's presentation?

Kevin
Of course that's the responsibility of the fire agency in your jurisdiction based on the Fire Behaviour Index information the Bureau provides the agency. So that's poured over. And often it's related to extreme fire danger. Not always. Sometimes a TFB, as couple of weeks ago in Victoria, was issued when the fire danger was only high. And that's due to the fact that there was already fire in the landscape. So there's a number of decisions that the fire agencies lean on to issue a TFB and it's not solely fire danger rated but often is linked to extreme or catastrophic fire danger.
Malcolm

Malcolm
Climate is changing rapidly. Is the CFA able to handle this change as nothing is going to be the same as it was given that fire behaviour will be unpredictable? And I think that's what you've been demonstrating to us that this is the challenge for them

Mika
Can I make a comment there Malcolm. I think one of the things that's really concerning the fire agencies looking at future climate regimes is resourcing. Because obviously the resourcing available in terms of fire fighting capability the number of volunteers on the ground and also the infrastructure is really limited. There's going to come a point where they simply don't have the resources to respond in the way that would be optimal to the fires that we're going to see in the landscape. There's going to be decision points about how do we optimise the use of resources that we've got. It's worth mentioning there was a great piece of research that was done by RFS after the Black Summer fires. And the statistics were something like there were 2,500 homes lost in New South Wales but 14,500 homes were saved and that was with the volunteer capability of RFS. We often hear about the homes that are lost but we much less often hear about the homes that were saved.

Malcolm
Do most bushfires start from lightning strikes?

Justin
No. I think across Australia human ignitions result in the most number of fires that cause loss. There may be a slightly different statistic for fires in general including fires that start but are benign and don't lead to loss.

Malcolm
Does humidity above 30% slow the spread of fire or reduce the risk of fire occurring?

Justin
The right answer is it does both. So a higher fuel moisture level moderates the rate of spread but also the same influence, a high moisture content fuel, will have a less propensity to ignite and start growing from that ignition.

Malcolm
Is the correlation between weather and fatality due to people realizing too late that the weather has induced fire conditions they had not anticipated and the situation has escalated too quickly for them to act or escape?

Justin
Yes the vast majority of people who die either in their house or outside. In the house its kind of "Well it's too late to leave. I'm not going to make a run for it." That's by and large the right thing to do to try and shelter in the house when you've realized that situation's too late than to move out into the landscape.

The really interesting statistic is that of the people that lose their lives outside close to 90% of those are within 500 metres of their own home which really does flag the issue that they may quite likely have attempted a late evacuation when they've realized that things have escalated and fires have begun that will become active in their immediate region and they've fled and escalated their risk or put themselves in harm's way. Because moving away from the protection of a house into say a car or out in the open is an escalation of your exposure to those severe conditions when they come to pass.

Malcolm
Kevin is there any way we can get better localized data from the BOM? And the example here is my area was hit by a storm cell at 8:30 last night which dropped 35mm in 30 minutes. According to the BOM we had 11.6 for the 24 hours. Is there likely to be or are there places where you can get more localized data?

Kevin
I would love as much data as possible to look at and analyse. And obviously every time we put instrumentation in there's a cost associated with it. We actually rely on a lot of volunteers just like there might be on this call today in reporting rainfall reports into the Bureau. And of course we don't have them everywhere.

There's a couple of things I can point you towards. The Bureau has its own WOW website. If you search for it on the Bureau's website it's people with private weather stations that make their information available to the Bureau. It might not necessarily make it into the official Bureau's network of data but it's available to look at.

There's also another website called Wunderground and there's thousands of weather enthusiasts I'll call them that are happy to share their weather observations with the world. And operational meteorologists like myself will actually rely on this information in areas where we don't have data just to see what might be going on and knowing that the data might not exactly meet Bureau specifications.

The other thing you can do is on some of our major radars especially the city radars there is an option to turn the 21, 22 or 24 hours of radar imagery into a spatial map of rainfall that might give you a bit of a better indication than a point value that might be further from where you are and not representative.

Sometimes that spatial map from the Bureau's website can be just what you need if you want more detail around the rain in your area compared to a nearby suburb.

Malcolm
How many catastrophic days should we expect into Wimmera and Mallee in a future bad fire season?

Mika
I think probably the point that we've tried to make tonight is it's really hard to put a number on it. But it could be a lot more than what we see at the moment. That's certainly the expectation that things are going to get worse. And they're likely to be longer the shoulder season as well, so we're probably more likely to see those really bad days in spring and in autumn and not just in the traditional summer months.

I think probably one of the concerns is that you might see more back to back days as well that are really bad because we'll see increased frequency of heat waves is one of the main drivers there.

It might not just be a single day event but a multiple day event where you've actually got fire perimeters expanding day and night. And that was one of the big problems they have had in the Canadian fires and the Northwest American fires in recent seasons is that they've just seen fire perimeters continually expanding day after night which obviously has different implications in terms of resourcing. So hard to put a number on the exact number of days but certainly longer seasons with more concern about multi day events inside those.

Malcolm
Mika mentioned that pyrocumulonimbus clouds are hazardous for firefighters. What should a firefighter watch out for on the fire ground to see if such a cloud is forming and where would be the best direction to head to protect themselves and their crew?

Kevin
I've got a couple of examples I can provide. The Grampians Mount Lubra fires back in 2014. The terrain obviously has a big influence on the fire spread direction. And on one of the days the upper atmosphere as Mika explained in her presentation interacted with the fire at ground level generating its own pyrocumulonimbus.

And before that occurred the fire behaviour analysts working with the operational meteorologists were able to identify that risk and it was communicated through the incident control centre. They set up air observers and people at a distance from the fire to monitor every 5-10 minutes what was going on with the smoke column, and let the incident control centre know if and when pyrocumulus was starting to develop and if it was exploding upwards.

And that's what happened. And when that did occur, and there's been many instances like this and fires across the landscape since, they just take the firefighters typically off the fire ground until fire behaviour becomes much more predictable and safe to re-engage.

You are right in that there are risks associated with people and crews on the fire ground. Because if you're in the smoke and you don't know what's going on upstairs you're relying on that intelligence coming to you from the incident control centre because you have no idea that there might be a massive pyrocumulonimbus brewing.

As Mika said it can thrust up into the atmosphere 10-12 or more kilometres very rapidly. And as someone explained to me once it's like holding a massive vacuum cleaner at the top part of the atmosphere right above your fire in terms of the amount of vertical motion that's going on.

And just to give you an idea of the strength of that vertical motion. This is going back to 1985. There was a fire called the Avoca Fire and I was fortunate enough about a decade ago to speak to an air observer who had to go near where the fire was in and around the smoke. They were looking for some crews. And he said all of a sudden the plane got sucked up into the fire.

What they didn't realize at the time was that there was this massive developing with a very strong vertical acceleration. And some of the research suggests maybe as much as 200km/hr in events like this. Fortunately they got spat out of the pyrocumulonimbus. It meant that the aircraft went turtle and I believe they said a couple of thousand feet above the ground they were able to upright themselves and fly to safety.

But they didn't know what was going on upstairs. But they're very aware of this now in the incident control centres and they set up plans in advance to make sure this sort of messaging is communicated. And because of the erratic fire behaviour that can occur during these events the strategy in most instances is to take people off the fire ground. So if they're taking fire agency staff off the fire ground you can imagine you don't want members of the community in and under around these sorts of beasts.

Malcolm
If there was one thing you wanted people to take away and act on or build into their fire plan what would it be?

Justin
I would say the messaging around how our weather context is changing under a changing climate will be a constantly evolving process as better models and better analysis of those models come out.

In the meantime, while that knowledge is developing trust the knowledge that we already have and the recent history and distant history that define fires and the likelihood that they occur. In the process don't become helpless in your thinking that it's all changed. We have to progress from that history to how it evolves but it'll happen incrementally and progressively. So keep your ears open.

Malcolm
Thanks Justin. Mika?

Mika
Probably echoing Justin's comment but also going back to the previous question about pyrocumulonimbus. There's a massive multi-million dollar field campaign is being set up with NASA funding in the United States. It's probably the biggest ever field campaign looking at fires over the next two fire seasons. We've been talking to some of the people who are involved.

There's a huge amount of research that's going on in understanding these processes and then being able to predict them better. And we're also constantly developing new and better ways to use the satellite imagery in real time to monitor fires and also to predict them.

A lot of what we've talked about today was about ratings and also understanding what happens after a fire. But we're getting much much better and the science is really evolving about real time fire activity and what's happening in real time. We're getting better tools to monitor that and understand that through things like satellite data and predictive tools.

So when a fire is in your area make sure that you're tapping into the information that's available through the fire agencies. ABC Radio is a great source of information and we'll often be updating them in real time. So just use the information sources that you've got in real time to stay informed and be aware of how the situation is changing because fires move fast and they can change really quickly.

Malcolm
And Kevin, what would be the big takeaway do you reckon that hasn't been mentioned?

Kevin
Just leveraging off what Justin and Mika said around situational awareness. Know what's going on.

We think we've seen fire and most fire move predictably in the landscape put out by fire agencies. But it's those events that are rare, and Mika touched on some of the extreme fire behaviour that can occur, that can often catch us out. So be situationally aware.

What is a northerly wind or an easterly wind? What does that mean for you? What is the forecast temperature and what's the actual conditions the closest weather station to you on those extreme days? And I think it's almost mandatory now that everyone has their emergency service at whatever jurisdiction you're from so you get this latest intel of where the fires are in the landscape. You've already got a good conceptual model of the weather of the day. So yes that'd be the take home message. It's all about situation awareness.

Malcolm
Thank you all. That was a fantastic session. We really appreciate your contributions to the webinar.