How and why prescribed burning mitigates bushfire losses

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Rick Sneeuwjagt has 50 years' experience in bushfire research and management at District, Regional, State and national levels. He carried out pioneering research into fuel classification and fire behaviour in WA forests leading to the development of the famous Red Book, and was State Manager of the fire protection branch of the WA Department of Conservation and Land Management.

28 Jan.—Considerable publicity is being given to an article by Byron Lamont and Tianhua He titled "Why prescribed burns don't stop wildfires" (published in New Matilda, and also WAToday 22 January 2020). Lamont and He are academics from Curtin University in WA, the former a botanist and the latter a molecular biologist. They argue against the use of fuel reduction burning in bushfire management because it does not "stop bushfires".

The article is work of complete fiction. It exposes the fact that the authors have no experience or operational understanding of fire behaviour, and have not got the faintest appreciation of how a prescribed burning program works, or how bushfires are controlled. Their baseless and inhumane opinions, if given any credibility, would give rise to dangerous fire management policies, a continuation of the cycle of devastating bushfires in Australia, and to further losses of lives and beautiful forests.

The title of their article is a clue to their utter lack of understanding. Fuel reduction burning is not designed to "stop wildfires". The purpose is to make them easier, safer and cheaper to control. Experienced land managers, firefighters, and bushfire scientists, are in no doubt about this. The scientific, experiential and historical evidence all demonstrate that prescribed burning, done properly, is highly effective at mitigating the bushfire threat, and assists with the control of fires even under severe weather conditions.

Identifying the flaws in their argument takes only a few seconds.

Firstly, Lamont and He ignore fire science. Reducing fuel loads and simplifying fuel structures by regular burning reduces the speed of a bushfire, its intensity (heat energy output), the size of the flames and its ember and spotting potential. All of this makes bushfires easier to put out, and less damaging. In mature forests, crown fires cannot be sustained if the surface and near surface fuels are at low levels as a result of regular fuel reduction burning.

Lamont and He make the extraordinary assertion that long unburnt forest fuels are of low flammability and therefore of no significant threat to communities. This is not only demonstrably untrue, it is dangerously wrong. For example, in long unburnt karri forest, much of the live, green understorey dies and becomes dead, dry fuel on the forest floor after about 25-30 years. Bushfires are most likely to occur well before that time. Dead scrub, together with accumulated dead leaves, twigs and bark, the surface and aerated near-surface fuels can be a meter or more deep with total fuel loads of up to 50 tonnes per hectare. In dryer stringybark forests, the sparser, lower understorey vegetation comprises a small component of the total fuel complex.

It is the accumulation of dead fuels (leaves, twigs, branchlets, bark) that drives forest fires. This is because it is at the base of the "fuel ladder", it is dry, and it reaches very high loadings if left unburnt. We have studied actual fuel measurements in forests all over Australia, and never once have we found a situation where the forests become nonflammable in time. The reverse is the case.

Second, Lamont and He ignore the real-world experience of generations of land managers and firefighters. We know of hundreds of examples where prescribed burning has "saved the day". Hot fires ran into areas of low fuel, and the resulting reduced fire behaviour enabled firefighters to gain the upper hand. Conversely, we can cite numerous recent examples where a lack of prescribed burning has resulted in unstoppable fires and considerable losses. Ask any firefighter whether they would rather fight a bushfire in 4 year old fuels or in 40 year old fuels?

The forest to the left of the track near Orbost, Victoria underwent a controlled burn last April. In late December, the fire front came from the northwest (right side of photo) under strong winds and the heat singed trees on the left side of the track but soon came to a halt. The lack of fuel-load on the ground ensured the crown-fire did not propagate. Photo: Garry Squires

We know what the answer will be. Academics like Lamont and He disdain the experience of bushmen and experienced firefighters seemingly preferring computer models developed on a green, leafy campus. In doing so they reject the experience of real-world Australians over the last 200 years.

Third, Lamont and He seem never to have studied bushfire history. There are almost 60 years of historical data from the forests of southwest WA, and these data unequivocally show that when the area of prescribed burning trends down, the area burnt by bushfire trends up. There is a simple explanation: bushfires are more difficult to put out in heavy fuels. The area burnt by wildfire escalates rapidly when the area of prescribed burning in a region falls below about 8 per cent per annum. Burning about 8 per cent per annum results in about 40 per cent of the bushland carrying fuels 0-5 years old. There are also numerous published case studies in which the value of fuel reduction is demonstrated by actual examples on the ground. Lamont and He chose not to quote from these.

A powerful factor in the recent bushfire tragedies in NSW is the fact that prescribed burning in NSW has amounted to less than 2 per cent per annum. This means only 10 per cent of the bushland is carrying fuels 0-5 years old and 80 per cent is carrying fuels older than 10 years. This is well below the threshold for effective bushfire mitigation because a high proportion of the region is carrying very old, heavy, flammable fuels. Fires in these fuels rapidly become unstoppable, especially when they have been dried out by years of drought.

Finally, Lamont and He have no understanding of the strategic planning involved in a prescribed burning program. To be effective, the burning must also be strategic—that is, done in the right places to protect communities by intercepting fire runs under the worst fire weather conditions. The fuel reduction cells need to be large enough to ensure a sufficient area for the spread of a bushfire to be slowed and controlled. Burns must be bounded by roads or tracks to enable rapid access by fire fighters and the edges to be mopped up. Burning must be done to appropriate standards of fuel removal and fire intensity. Prescribed burns that are too patchy or too small or narrow may not slow a bushfire, and in some forests, burns that are too hot can stimulate the regeneration of dense scrub.

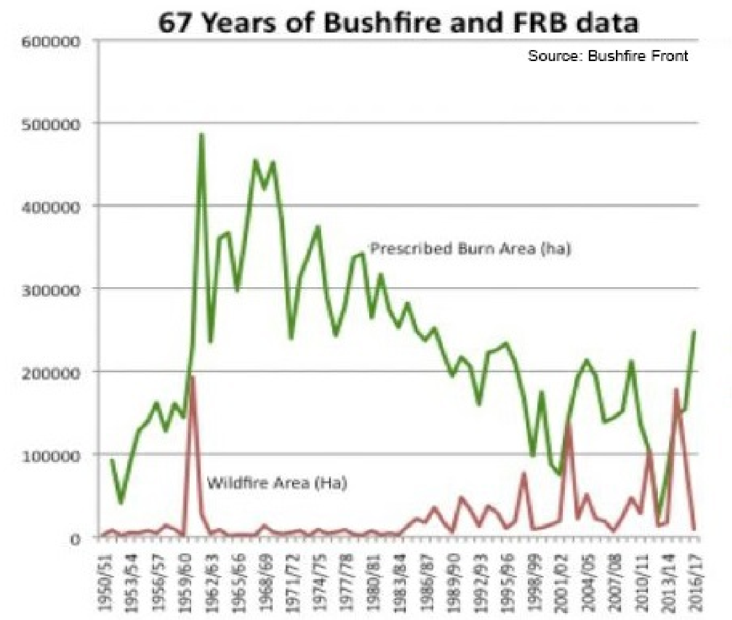
Prescribed burning–how and why it works

The purpose of a fuel reduction burning program is not to stop bushfires, but to assist with their safe suppression. To understand this properly it is necessary to understand the complex and dynamic process of bushfire suppression. There are a variety of firefighting strategies and tactics that can be used in different situations, depending on weather conditions, fuels, topography, fire behaviour, fire shape, fire position in the landscape, fire intensity around the fire's perimeter and the resources available for suppression work. A fire controller needs to take all of these factors into account when planning his/her strategy.

Rarely is a direct attack on the head fire possible—it's usually too "hot". Instead, firefighters resort to alternative strategies including a combination of direct, indirect and parallel attacks. But in every case, the options, and likelihood of success, are greater if the fire is burning slower and at a lower intensity because it is burning in young, light fuels. Appliances such as water bombers have little effect on an intense forest fire, but can assist to control slower-moving, lower-intensity fires. Fire intensity varies around the fire's perimeter, and can drop overnight, affording suppression opportunities. There will almost always be a place on the fire's perimeter that can be attacked—even under severe fire weather conditions—and if fuel loads are low, this window of opportunity widens significantly.

The most trying bushfire situation occurs when there is wind shift and the long flank of the fire becomes a wide head fire. Therefore, containment work on the "pressure" or "danger flank" is always the priority. This is more likely to succeed in young, low-fuel situations when flank fire intensity is relatively low, even under severe weather conditions.

If part of the fire is burning in very light fuels as a result of prescribed burning, this section can take a lower priority, allowing resources to be deployed to higher priority areas around the fire perimeter, or to defending properties, or they can be dispatched to other fires in a multiple fire situation.



Prescribed burning provides “anchor points” and “tie-in” points for firefighters. These low-fuel areas are very important for indirect suppression strategies including back burning. Attempting to back burn in old, heavy fuels against old, heavy fuels is a slow, demanding, dangerous and risky process. Back burning in young, light fuels surrounded by young, light fuels is much safer, more likely to be successful and requires fewer resources. Low fuel areas are also very important for “tying in” containment lines, enabling faster, more efficient suppression.

The speed of construction of containment lines is crucial in the battle against a growing fire. Fire suppression is a race between rate of fireline construction and containment versus rate of perimeter growth of the bushfire. Fires burn more slowly in younger, lighter fuels, not only improving the likelihood of early control, but improving the odds of firefighters getting the upper hand.

Severe fire weather conditions don’t last very long in the life cycle of a bushfire—when fire weather conditions ease (and they always do at some point), and if the fire is burning in young, light fuels, there is a larger window of opportunity for safe suppression, than if the fire is burning in old, heavy fuels.

There are two other critical ways in which fuel reduction programs assist with wildfire control. The first is that it allows fires to be suppressed in the lead-up days to extreme conditions. Firefighters are nearly always overwhelmed when “catastrophic” conditions (i.e. hot, dry, windy weather) affect fires that are already burning in the landscape.

The presence of low-fuel areas makes it more likely that these fires can be controlled before the catastrophic conditions occur.

The second is that when there are multiple fires on the same day, as occurred during the Cyclone Alby crisis in WA in 1978, fire controllers can set up a “triage” response. Fires burning into 1 or 2 year old fuel can be temporarily ignored, while all the focus is placed on the fires that threaten greatest damage. This allows the best use to be made of resources.

Regardless of fire weather conditions, to firefighters, fuel load matters. It directly affects fire intensity (heat energy output) around the fire’s perimeter, and the size of the suppression windows in space and time. Also, containment line break outs such as hop-overs and spot fires, are much easier to control in light fuels than in heavy fuels.

The fuel load burning behind the flame zone, which is greater in older fuels, is critical for suppression difficulty because total heat output acts in a number of ways. It is an input to convection which increases wind speeds in the flame zone, boosting ember spotting and fire behaviour. It increases the likelihood of high energy release rates and deep flaming, conditions that can trigger a transition to a dangerous and unpredictable plume-driven fire. It increases the likelihood of re-ignition and breaching of the containment line by burning across it or by blown embers or by hop-overs. Radiation from glowing combustion adds to the heat load on firefighters and increases the time that the burnt ground can be used for safe refuge. It substantially decreases the effectiveness of water and other retardants applied from the ground or from the air. Heavy fuel also hinders fire line construction and in some fuels they make it impractical.

Of the elements that make up the bushfire triangle— fuel, weather and oxygen—only fuel can be managed. But this must be done the right way. It must be underpinned by good science, it must be well-planned and then well-executed by trained, experienced people who are well-resourced. Prescribed burning is costly and comes with an element of risk, but the alternative, a cycle of bushfires, is a far greater risk to humanity, to communities and to the environment.

Conclusion:

We conclude that the article by Lamont and He in New Matilda and WAToday is not only factually incorrect, and demonstrates a profound ignorance about bushfire science, history and management, it is dangerous and inhumane. If the authorities were to take any notice of their assertions, and curtail the fuel reduction program, the result in WA would be identical to that currently occurring in NSW and Victoria, in other words, death, destruction, and heartbreak. Our advice to Lamont and He is to get some actual fire experience in the bush, spend time on the back of a fire truck or the end of a hose, and then let’s see what they think about the value of fuel reduction in assisting with bushfire control.

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