

# Are hazard reduction burns effective in managing bushfires? The answer is complicated

abc.net.au/news/2019-12-20/hazard-reduction-burns-bushfires/11817336

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RMIT ABC Fact Check

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**Photo:** A NSW ranger carries out a controlled hazard reduction burn. (NPWS: Ian Dicker)

During one of the most severe droughts in Australia's recent history, early-season and deadly bushfires have raged for weeks across parts of NSW and Queensland.

The effects of climate change are being blamed for having worsened conditions, while some politicians from the fire-ravaged states have criticised government policies and planning, "green" laws and a lack of hazard reduction burns.

Nationals MP Barnaby Joyce pointed to three major "issues" that he said needed to be addressed: access to the fires, central watering points, and a lack of hazard reduction burns. The latter he blamed largely on current conservation laws.

Speaking on [Sky News](#), he said: "One [issue] is a lack of controlled burns — fire reduction burns ... that policy needs to be changed so we can get those controlled burns."

Similarly, Queensland and One Nation Senator Pauline Hanson [accused](#) the Greens and Labor Party of restricting fire-reduction burns.

## Key points

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- Hazard reduction burns are highly dependent on weather conditions — some areas go from wet to dry too rapidly to safely conduct burns.
- Research has shown that during catastrophic fire conditions, hazard reduction burns do little to mitigate the intensity and spread of a fire.
- Hazard reduction burns should not be confused with backburning, which is a last resort burn during a fire to try and contain it.

"They've actually shut down the national parks, where you can't actually even clear the fuel on the floor," she claimed.

"...They won't allow farmers to actually clean up their own properties."

NSW Deputy Premier John Barilaro also pointed the finger at the Greens and said: "We've got to do better and I know that we don't do enough hazard reduction ... because of the ideological position [of] the Greens."

That same day, he widened his attack in Parliament: "The truth of the matter is we still live with [former Labor premier] Bob Carr's legacy: lock up the forest and let it burn. That is Bob Carr's legacy for this state. This is the truth."

Federal Resources Minister Matthew Canavan, as recently as last week referred to the "bogey man of climate change" which he said was being used to distract from the failure of the states to manage fire risks.

"The Queensland Government taking powers off farmers, taking their rights off them to be able to manage their own land, put in fire breaks, do cool burns, and that has exposed us to much much higher risk than we should," he said.

So, how effective are hazard reduction burns and how are they managed?

RMIT ABC Fact Check considers the facts.

## What can affect the behaviour of fires?

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Fire behaviour refers to a variety of factors including the manner in which a fire burns, the speed at which it spreads, the amount of heat it gives off and the extent of vegetation it consumes.

The way a fire behaves and its severity is dependent on several elements, but can be narrowed down to three essentials: weather, fuel and topography.

The volume of fuel, or "surface fuel", in a fire's path — such as shrubbery, bark, dry leaves, twigs and so forth — is often the only component of fire behaviour that can be directly modified by people.

The rate at which organic materials burns is directly related to its moisture content; the drier the fuel, the more fiercely it burns and the more intense the fire.

The moisture of a particular fuel load depends not only on the type of vegetation, but also the humidity and temperature of its surroundings.

Eucalyptus forests and grasslands are typically drier fuels that burn hot and fast, while rain forests and irrigated crops burn slower and can potentially slow the pace of a fire.



**Photo:** Surface fuel is the only factor in fire behaviour that humans can control. (ABC Open contributor [mjdphotosdotcom](https://www.abc.net.au/abcopen/contributors/mjdphotosdotcom))

## What methods are used to reduce fire hazards?

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In a bid to reduce the intensity of unplanned fires, authorities carry out measures to "treat" the fuel and reduce the amount that is available to feed a fire.

"They are treating fuel to change its structure and to typically reduce the amount of fuel or fuel load," Ross Bradstock, as senior professor at Wollongong University's Centre for Environmental Risk Management of Bushfires, told Fact Check.

This fuel treating process is called hazard reduction.

Hazard reduction methods include the intentional burning of surface fuel loads, but other practical and "mechanical" methods are also deployed.

The latter include activities such as "thinning" bushland (by cutting down trees), clearing, slashing or mulching ground litter, ploughing fields, cleaning guttering on houses and other buildings, and through fire-resistant garden design and maintenance.

## Hazard reduction burns

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Bushfire management is divided into two categories: firefighting and fire prevention.

Planned and purposeful burning of excess ground litter and fuel hazards in a specific area is known by many names — a "hazard reduction burn", "controlled burn" or "prescribed burning" to name a few.

These types of burns are widely used in fire prevention and are carried out in winter or generally outside the fire season when conditions are less volatile.

They require careful consideration and planning to achieve maximum results and to minimise potential dangers to health and wildlife, and to avoid causing accidental bushfires.

Prescribed burns should not be confused with "back burning", a fire-fighting tool.



Watch Video At: <https://youtu.be/CQnveXfisiQ>

**YouTube:** [A mega fire recently destroyed homes north-west of Sydney after backburn got out of control.](#)

As explained by bushfire expert and University of Tasmania professor David Bowman in [The Conversation](#), back burning is "a last-resort measure" to stop a progressing bushfire from spreading to specific areas.

"The difference between fuel-reduction burning and back burning is effectively the same as the difference between elective and emergency surgery," Bowman wrote.

"Back burning ... works by [setting fires from containment lines](#) such as established fire breaks or hastily contrasted ones made with a bulldozer or cut by hand."

## Who is responsible?

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Bushfire management activities in Australia are conducted by state and territory governments and their relevant statutory authorities such as fire emergency services, including professional and volunteer firefighters, as well as by municipal councils and individual property owners.

At a federal level, bushfire management is regulated by the Environment Protection and Biodiversity Conservation Act 1999 ([EPBC Act](#)).

A national policy [fact sheet](#) outlines the circumstances where fire prevention activities require federal environmental approval.

Activities that are not covered by the national law include those approved or authorised under federal or state/territory laws before July 2000 (when the legislation took effect), as well as continued lawful land uses of the sort that were occurring before July 2000 (such as maintaining access to existing tracks and fire breaks, roadside weed control, and routine controlled burns of the type that occurred in the past).

Activities that require ministerial approval, according to the act, are those affecting nationally threatened species and their habitats, as well as Commonwealth land.

These include, for example, the construction of substantial new fire breaks, access roads or tracks on a significant scale in habitat for national threatened species; one-off fuel burns in remnant forest that is important habitat for nationally threatened species and had not been subject previously to a burning regime; and, proposed new burning regimes in world heritage sites among others.



**Photo:** Bushfire management in Australia is conducted by state and territory governments, municipal councils and property owners. (ABC News: Gregory Nelson)

## Queensland framework and operation

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Fact Check contacted the Queensland Fire and Emergency Services (QFES) and the Queensland Parks and Wildlife Services for information about the legal framework, as well as the processes and procedures, governing prescribed burning in that state.

Numerous agencies and government departments are responsible for planning, overseeing and conducting hazard reduction on both state-managed and private land.

Queensland fire management groups, including volunteer fire brigades, also participate in the yearly operation [Cool Burn](#) — a hazard reduction coordinating effort organised by QFES which generally operates from April 1 to August 31.

The goal of Cool Burn is to put in place a plan for hazard reduction and other mitigating activities across the landscape with a focus on protecting the community, and public and privately owned assets, as well as identifying areas at high risk of a fire, such as enclosed townships.

Space to play or pause, M to mute, left and right arrows to seek, up and down arrows for volume.

**Video: Acting Prime Minister Michael McCormack defends Prime Minister Scott Morrison's holiday amid the bushfire crisis. (ABC News)**

QFES Superintendent James Haig told Fact Check that authorisation under Queensland's Fire and Emergencies Act was necessary to conduct hazard reduction burns on private and state-managed lands. This would take the form of either a notification (in cases such as burning assignments for the sugarcane industry), or as a permit obtained from local fire wardens.

"We have a large number of fire wardens, many of whom are volunteers, so they come from the community and they are aware of the local conditions," Mr Haig said.

According to QFES records, approximately 28,000 permits a year were issued for controlled fires since 2015.

"In 2019, QFES and its partners completed 229 priority mitigation activities to reduce bushfire risk at high-risk sites," it said in a statement sent to Fact Check.

"This includes 108 of 175 planned hazard reduction burns, 83 targeted education activities and 38 fire line upgrades."

However, such activities were "highly dependent" on weather conditions, it added, with not all planned 2019 burns able to be completed.

"In some areas, it rapidly became too dry to burn safely," the QFES statement continued.



**Photo: Backburning efforts in the Blue Mountains are helping stabilise dangerous blazes. (Supplied: Horsley Park Rural Fire Brigade)**

"In other areas, it was too wet too early on and dried out rapidly, leaving a short window of opportunity to safely conduct mitigation activities."

Mr Haig elaborated: "The most common reason for a permit not being granted would be because the local conditions were too dry; that it was difficult to conduct safely and with the appropriate outcome."

He added that if moisture levels in the soil were too low, then farmers (especially graziers) often would want to hold onto the grass they had, so there were fewer applications for fire permits.

Queensland Parks and Wildlife Service, which manages primarily native forests and state-owned land, is exempt from obtaining a "permit to light fire".

It has its own procedures and burn targets, and collaborates with the QFES on initiatives such as operation Cool Burn.

"From 1 January [2019] to date, QPWS conducted 291 planned burns over 1,443,882 hectares — which is the largest area covered in the last six years," a statement provided to Fact Check said.

"QPWS's annual target for Protection Zones burns is 90 per cent (14,884 hectares). In 2018-19, QPWS achieved 118 per cent of this target."

## NSW framework and operation

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In NSW, the National Parks and Wildlife Service works with the NSW Rural Fire Service, Fire and Rescue NSW, Forestry Corporation and Sydney Catchment Authority to carry out hazard reduction burns and other hazard reduction activities such as mowing and building firebreaks.

According to the NSW Department of Environment, hazard reduction efforts in NSW have increased under the Enhanced Bushfire Management Program (EBMP), which came into effect in 2011.

The statewide program began with a five-year commitment to treat 135,000 hectares of bushland (on average) each year. In 2017, the NSW Government extended the program to 2022.

The NSW National Parks and Wildlife Service operates under the Rural Fires Act 1997 and under the National Parks and Wildlife Act 1974.

Over the last eight years, according to its website, the NPWS carried out hazard reduction burns in NSW parks and reserves covering more than 680,000 hectares — more than double that of the previous five-year period.

"NPWS has undertaken 80 per cent of the total hazard reduction burning effort recorded in NSW, despite managing less than 9 per cent of the state," its website states.



**Photo:** Firefighters carry out a hazard reduction burn in NSW (Supplied: NSW RFS)

## Conducting planned burns

The University of Wollongong's Professor Bradstock, who also heads the NSW Bushfire Risk Management Research Hub, told Fact Check: "In Australia, typically we do a lot of prescribed burning, perhaps more so than many other countries, but we are doing it with the intention of reducing the intensity of subsequent wildfires — unplanned fires — to a level where they are potentially controllable using suppression forces."

The threshold of safe and effective fire suppression is calculated by the McArthur Forest Fire Danger Meter, which Fact Check [has looked at previously](#).

Using measurements of air temperature, relative humidity, wind speed and fuel conditions, combined with a [formula](#) to account for the effect of drought, the meter creates the Forest Fire Danger Index (FFDI).

An index of 1 means that a fire will not burn, or will burn so slowly that control presents little difficulty, while anything above 100 is considered a catastrophic rating ("code red" in Victoria).

However, Professor Bradstock noted that the McArthur Meter and the FFDI were developed empirically through observations of small fires burning under mild conditions in the 1960s, and did not necessarily perform well in the extreme fire conditions prevailing in the current NSW bushfires.

"[W]e know that the McArthur FFD models underpredict the rate of spread and intensity under high forest fire danger index conditions; in other words, they don't fully capture all the things that are going on when it's really hot, really windy and the humidity is very low," he told Fact Check.



# Fire behaviour under extreme and catastrophic conditions

Experts emphasised that in extreme and catastrophic fire conditions, the surface fuel available for burning makes next to no difference to the level of a fire's intensity.

University of Melbourne associate professor Trent Penman, who studies bushfire behaviour, told Fact Check: "Prescribed burning effectiveness decreases with [increasing] FFDI; when you exceed an FFDI of about 50, you switch from fuel-dominated to a weather-dominated fire.

"At this point, while fuel has a small effect, it is overwhelmed by the weather."

Professor Bradstock agreed, pointing to the example of Victoria's Black Saturday bushfires in 2009 that claimed the lives of 173 people.

His team studied the aftermath of the fires which were associated with an FFDI of well above 100.

They found that even in the areas where fuel had been treated with planned burns less than five years prior, there was no measurable effect on the intensity of the fires.



**Photo:** Research has found that the intensity of the Black Saturday bushfires was not mitigated by hazard reduction burning. (AAP: Andrew Brownbill)

"At a level where we would have expected the fire intensity to be reduced to suppressible levels, we essentially found no effect," he told Fact Check.

"It's almost like a turbo-charging effect, when you have such incredibly high temperatures and very high winds that you only need a negligible amount of fuel to produce a fire intensity that is not suppressible."

The University of Tasmania's Professor Bowman said that in catastrophic conditions, such as those prevailing in the current Queensland and NSW bushfires, all "organic matter is going to burn".

"There's so much heat and strong winds that the fire is able to travel across landscapes regardless of whether they've been burnt previously. It doesn't affect the [fire] behaviour."

Professor Bowman described embers rushing ahead of the fire front, passing over cleared areas to find available fuel like a "heat gun blasting sparks at incredibly high speed".

"It's a wind-driven phenomenon," he said.

"[E]ven if you can treat everything at a maximum level, it's still not going to give you the benefit under catastrophic fire weather conditions."

Professor Bradstock likened the effect of prescribed burns on fire intensity to a sliding scale.

"The window of effectiveness essentially narrows down to a point where it essentially disappears," he told Fact Check.

## Some vegetation types cannot be treated with prescribed burning

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Experts also explained that some fuel types, particularly wet forest vegetation, were not treatable in the cooler months of the year, when prescribed burns can be safely carried out.

"Some fuel types are simply not dry enough to burn in the time, when it is safe to do so," Professor Penman said. "These include rainforests and wet forests."

He gave the example of a campfire: "[I]f you put green leaves on it to get it started; they won't work. There's too much moisture there to get the fire started. You can put green leaves on, once the fire is going and they'll burn, but if the fuel is too wet, the fire won't start in the first place."

However, these vegetation types would still burn under catastrophic conditions.

As Professor Bradstock explained, parts of the Victorian and NSW landscapes, such as the wet forests or alpine areas, were not treatable under normal conditions.

"It's a waste of time because they are usually too wet to burn.

"Because things are so critically dry at the moment, what typically would never burn, well, now it is burning," he said.

And Professor Bowman agreed that different fuel types affected fire intensity differently, but in catastrophic conditions, "the variability and fuel load becomes irrelevant".



**Photo:** Ferns grow in shaded environments in gullies of Victoria's ash forests, 2018. (Australian National University: David Blair)

## How effective are prescribed burns?

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A plethora of scientific papers describe hazard reduction burns as the easiest and most effective tool of bushfire management — more effective than slashing, weeding, herbicide use and so forth.

Professor Bradstock told Fact Check this was because of its wide reach and comparatively low cost.

"You can treat [through burning] relatively large areas with costs around \$100 a hectare in terms of operational costs; so you might be able to burn out 2000 hectares in a day or two, relatively cheaply," he said.

"If you were to go in there and try and mechanically treat that, you wouldn't be able to do it."

Burning has been found to be even more effective in areas adjacent to houses or within a so-called Bushland Urban Interface Zone, also known as the wildland-urban interface, despite the higher cost, which can range from \$1000 to \$10,000 per hectare.

"[E]ven then, it's still probably cheaper than mechanical work," Professor Bradstock told Fact Check.

A 2018 research article published by the CSIRO indicated that "intensifying prescribed burning treatments in public land in the [wild-urban interface] achieves a greater reduction in damages compared with applying the majority of the treatments in rural areas.

"However, prescribed burning in the WUI is significantly more expensive and, despite additional benefits gained from this strategy, in most cases it is not the most economically efficient strategy."



But research has also found that prescribed burning as a bushfire management tool is not a panacea.

A 2015 [research paper](#) exploring variations in the effectiveness of prescribed burns in south-eastern Australia found that the inconsistency was due to biogeographical variation in fuel types, climatic influences and fire regimes.

"Prescribed burning solutions that are effective in one particular region may not be effective elsewhere unless there is strong similarity in vegetation types, fire weather, fuel accumulation and ignition rates.

"The most efficient use of prescribed fire is applying it to the immediate proximity of assets, where a resultant reduction in fire intensity can be of immediate benefit in terms of impacts on structures and ease of suppression."

As an example of the futility of some prescribed burns, Dr Penman pointed to the forest around Port Macquarie in northern NSW, which has been widely studied and found to have fuel vegetation that regenerates every three to five years.

"Any burn you undertake in those areas has a longevity of about three to five years," he said.

"You have to be burning a huge amount before you are actually reducing the risk at all."

In other areas where fuels accumulated more slowly, planned burns had a greater impact, he added.

"But it's never going to stop wildfires."

## What does the future of bushfire management look like?

Professor Bradstock told Fact Check that scientists and agencies with more advanced and up-to-date modeling capabilities would need to better choose treatment areas with maximum cost effectiveness.

"We are going to have to get smarter about it," he told Fact Check.

"We are going to learn a lot from the current fire season.

"I know, anecdotally, there has been major property damage done in NSW in areas that have been recently treated."

Professor Penman told Fact Check that "chasing the hectares" in prescribed-burn targets was misguided.

Rather, states and statutory authorities were using a combination of hectares treated and risk approach in their bushfire management.

"What you're really trying to achieve is [to] reduce the risk to assets that you have of value in the landscape, so that might be ecological assets like at-risk forest types. It may be around cultural sites, and it might be Indigenous or European sites and then other things like power lines, water supply catchments, and then, of course, around houses," he said.

"[N]one of the agencies just invest entirely in prescribed burning or something else. They have a mixture of what they do.

"It should never be a debate about, 'Does one thing do everything for us', because everybody knows that's not the case. It's about getting that balance right, across the different approaches.

"So it's quite a challenging landscape to be working in, and you put that in the context of a changing climate and it becomes even harder."

## Barnaby Joyce elaborates

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When invited to expand on his media statements regarding prescribed burns and bushfire preparation, Nationals MP Mr Joyce sent Fact Check a list of grievances which focused on higher burn targets, a lack of dams and the imposition of bushfire permits, and pointed to a number of policies that in his view needed to be amended to allow better bushfire management.

These included the National Parks and Wildlife Act 1974, and land clearing laws (including the Native Vegetation Act 2003, the Local Land Services Act 2013 and the Biodiversity Conservation Act 2016.

Mr Joyce nominated the former, saying "the annual targets need to be dramatically increased" to allow for more hazard reduction burns.

He also pointed to the fact that Australia's National Parks and areas within state forests did not permit grazing, which "obviously affects fuel loads".

And he suggested that fire permit requirements (for firebreak provisions and mandatory monitoring throughout a burn), as well as the penalties for non-compliance, were stopping some farmers from conducting these all-important activities.

However, the bushfire experts Fact Check spoke to dismissed Mr Joyce's claims, saying they failed to address key issues.

They countered that reasonable safeguards ensuring landholders and neighbours were kept safe during prescribed burns were an important component of current fire management practices.

"There is a deliberate misinterpretation of the ecological thresholds and there is still the inherent assumption that a fuel reduction burn will reduce wildfires," said Melbourne University's Professor Penman.

Professor Bradstock said: "Prescribed burning is constrained by budgets, resources and weather conditions. Pretty simple really: essentially, what we pay for is what we get."

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## Sources

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**Topics:** [bushfire](#), [fires](#), [australia](#)

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