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Nature Conservation Saves for Tomorrow

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NSW Independent Bushfire Inquiry,
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SUBMISSION TO THE NSW INDEPENDENT BUSHFIRE INQUIRY

The Blue Mountains Conservation Society is a community-based volunteer organisation with over 800 members. Our mission is to help conserve the natural environment of the Greater Blue Mountains and to increase awareness of the natural environment in general. Many of our members have professional expertise in ecology, land management and fire management. A number of them have contributed to this submission.

Greater Blue Mountains impacts of 2019-20 bushfires

Fire plays a major role in the Blue Mountains environment and community life. The area has experienced numerous destructive fires in historical times and has, therefore, been a centre of development for best practice fire management and fire suppression. Within the Blue Mountains we have seen some of both the best and the worst examples of fire management in NSW.

Three quarters of the Blue Mountains Local Government Area (over 140,377 hectares) is reserved as national park. About 80,000 people live in 27 towns and villages spread across 100 kilometres of mountainous terrain, predominantly along the Great Western Highway. The City of Blue Mountains is one of only two cities in the world to be surrounded by a national park (Blue Mountains National Park) which is in turn within a UNESCO declared World Heritage Area (the Greater Blue Mountains World Heritage Area).

The Blue Mountains' natural areas provide a significant recreation and tourism resource for local residents as well as visitors from Greater Sydney, across Australia and the world. Blue Mountains National Park is the most visited national park in Australia with 5.2 million visitors in 2016[1] and so makes a significant contribution to

[1] https://www.environment.nsw.gov.au/research-and-publications/our-science-and-research/our-research/social-and-economic/social/domestic-visitation

the NSW economy. The natural areas also play an important role in providing high quality drinking water to Sydney.

The 2019−20 bushfires across Australia were devastating. Their extent, duration, timing and ferocity was unprecedented. In the Blue Mountains the extent of the fires greatly exceeded that recorded in any previous fire seasons.

The Greater Blue Mountains World Heritage Area (GBMWHA) covers over one million hectares and amalgamates eight reserves including the Blue Mountains National Park. It stretches from the southern edge of the Hunter Valley to the southern highlands near Mittagong. Over 75% (806,351 ha) was fully or partly burnt during the 2019-20 fires. Areas of adjoining bushland on Crown land or private property were also burnt. An estimated 135 million mammals, birds and reptiles were impacted by the burning.[2]

Genetic diversity in the area will be greatly reduced, species may be lost from the area. Many species, and possibly ecological communities, will be locally threatened.

[2] Peter Smith, Impact of the 2019-20 Fires on the Greater Blue Mountains World Heritage Area: Update 7 March 2020. (attached as appendix one)

TOR 1

The causes of, and factors contributing to, the frequency, intensity, timing and location of, bushfires in NSW in the 2019-20 bushfire season, including consideration of any role of weather, drought, climate change, fuel loads and human activity.

The scale and intensity of the 2019-20 fires have been unprecedented. In particular, they are the largest fires recorded in temperate Australian forests since European settlement. These fires burnt 21 per cent of Australia's temperate forests. This is a globally unprecedented percentage by area of burning for any continental forest biome around the world. [Boer et al 2020] [3]

The scale of the fires is very much a consequence of conditions, with extreme drought and high temperatures drying out fire fuels to an extraordinary degree. Prolonged and extreme high temperatures coupled with greatly reduced rainfall, extraordinarily low humidity and periods of high winds, have produced fire conditions and behaviours not seen on such a wide scale before in the Blue Mountains or Australia. The prevailing conditions also compromised the usual role played by damp gullies and wetter vegetation types in acting as "fire breaks" and impeding the spread of fire across the landscape. [Nolan et al 2020][4] These extreme conditions exemplify the predictions of climate scientists about the impacts of global warming and rapid climate change. The consequences of rapid climate change are already being experienced in the greater Blue Mountains.

Our world-renowned biodiversity is at risk and it is imperative that we work to restore and protect it. It is most important that NSW and Australia take immediate action to address climate change

Recommendation

- The NSW and Australian government should take serious and immediate action to reduce greenhouse gas emissions and therefore climate change impacts.

[3] Matthias M. Boer, Víctor Resco de Dios and Ross A. Bradstock, Unprecedented burn area of Australian mega forest fires, *Nature Climate Change*, 24 February, 2020.

[4] Rachel H Nolan, Mattias M Boer, Luke Collins, Victor Resco de Dias, Hamish Clarke, Meaghan Jenkins and Ross A Bradstock, Causes and Consequences of eastern Australia's 2019-20 season of mega-fires, *Global Change Biology*, 2020.

TOR 2

The preparation and planning by agencies, government, other entities and the community for bushfires in NSW, including current laws, practices and strategies, and building standards and their application and effect.

Key Recommendations

- **Before the 2019-20 fires, protecting the globally significant environmental values of the GBMWHA was underfunded and climate change warming was already impacting. Increase National Parks and Wildlife Services' funding to help recovery and strengthen biodiversity protection before the next fires**
- **Refocus prescribed burning priorities to better protect communities**
- **Improve environmental protections in prescribed burning**

NPWS preparedness for recovery after fires

The GBMWHA was inscribed on the World Heritage List in 2000 in recognition of its globally significant natural values. GBMWHA contains

- an undetermined number of ecological communities,
- around 1500 plant species and
- around 450 vertebrate animal species and many thousands of invertebrate species, many of which are still undescribed.

The area provides important and significant natural habitats for the conservation of biological diversity, including threatened species of outstanding value. Over 100 plant species and over 70 animal species in the area are classified as threatened at the national or state level.

The GBMWHA was one of the worst-affected areas in south-eastern Australia with around 75 percent of its area burnt. The recovery of area's flora and fauna is likely to require more intervention than in previous fires. Unfortunately, state and federal governments did not ensure enough was done in the years before the fires to provide sufficiently detailed information as a baseline for understanding what has been lost and to assess the degree of recovery of natural values. As well, such a baseline would help assess the implementation of recovery plans for threatened species and communities. The 2019-20 fires have revealed the importance of having adequate baseline data.

The relict species, Wollemi pine, one of the world's oldest and rarest trees, was only discovered in 1994 and more rare and threatened species were still being identified in the GBMWHA at the time of the fires. One very specific example is *Eucalyptus* sp. 'Howes swamp creek'. This undescribed eucalypt occurs only in the Mellong swamp area. If it is formally described it would become the 99th eucalypt species for the GBMWHA. The fire maps indicate that the entire area of its distribution was burnt. There are many such examples for flora and fauna in the GBMWHA.

Before the fires, the need for threatened species protection had been clearly identified in the GBMWHA, particularly given the heightened risk of extinction from the effects of climate change. Australia is facing a wave of faunal extinctions due to global

warming. The decline of species due to warming was already being reported in the Greater Blue Mountains as shown by a recent study on the Greater Glider in the area.[5] What is happening with the Greater Glider is likely to be happening more widely with other species. As well, the invertebrate forest fauna is very poorly known but has apparently declined greatly in living memory. Bushfires have occurred on top of this, greatly increasing the risk of rapid species decline and extinctions.

The area's biodiversity values and hence world heritage listing are now under threat. UNESCO has already expressed to the Australian Government its concern about the bushfire's impacts on the internationally significant values of the GBMWHA.

To support recovery of biodiversity, National Parks and Wildlife Service (NPWS)' land management staff and resources need to be increased so that they can properly undertake both the immediate actions required and those in the medium to long term. A systematic, comprehensive, long-term biodiversity monitoring program is needed as a basis for effective adaptive management practices. The unburnt areas must be now protected, both within and near the GBMWHA. The unburnt 25 percent of these national parks are now even more precious as they are habitat for surviving fauna, a seed bank to restore plants and a refuge for wildlife. The extent of the decline of flora and fauna populations within GBMWHA needs to be documented. The concern is whether there is sufficient baseline data to do this, however, it must be done now for the future fire seasons that will occur.

The NSW Government must increase funding to NPWS. The huge visitation levels before the fires made a significant contribution to the NSW economy and can justify the added investment in protection. This role will again be important after the current health emergency has passed. Further, at the federal level, despite the world heritage status, the federal government has not provided dedicated funding to protect the values which underpin the listing of the GBMWHA. It has, however, provided significant funding to other World Heritage natural areas.

Recommendations

The NSW Government should

- Establish a systematic, comprehensive, long-term biodiversity monitoring program in the GBMWHA (with committed long-term funding and stable institutional arrangements) as a basis for effective adaptive management practices in the GBMWHA. Such monitoring should also cover adjacent natural areas;

- Increase funding to NPWS to enable it to increase its land management staff and resources to properly support the recovery of biodiversity;

- Seek funding assistance from the Federal government to allow comprehensive long-term research on, and monitoring of, the world heritage values of the GBMWHA.

[5] *Peter Smith and Judy Smith*, **Decline of the greater glider (*Petauroides volans*) in the lower Blue Mountains, New South Wales** *Australian Journal of Zoology 2018.*

Prescribed burning priorities to protect communities

Prescribed burning is just one valid tool amongst many available methods for managing fire risks to both human and ecological assets. However, experts and fire agencies emphasise that it is an option with limited benefits for the protection of human communities, especially if hectare-based targets are being pursued. Area targets do not focus on risk reduction and tend to encourage burning of large areas remote from habitation with minimal outcomes for protecting communities. A "5% of public lands every year" burning target was abandoned in Victoria as unachievable, ineffective and counter-productive.

NSW also reports on prescribed burning using the more valid measures of number and value of properties 'covered'[6]. Because most of the risk accrues in the bushland close to assets, it follows that this is where burning will be most effective. Even then, large areas are very difficult to treat and the effectiveness of fuel reduction by burning to reduce fire behaviour only lasts for one to five years, depending on subsequent wildfire behaviour. Hence there is a need to use other community protection strategies in a well-planned and coordinated program.

In most years there is a significant shortfall in prescribed burning targets close to assets. These burns are difficult to achieve. The Rural Fire Service (RFS) Commissioner has referred to obstacles including narrow (and diminishing) windows when burns can be safely conducted and air quality restrictions. Two other key impediments are securing the many permissions needed from private landholders for cross-tenure burns and a shortage of RFS crews mid-week. The RFS has powers to override private permissions but is not known to have used them.

Recommendations

The NSW government should

- Follow a risk-based approach to prescribed burning to protect communities by focussing on the bushland fringe and strengthen the capacity to undertake burning in these areas;

- Increase investment in community fire planning and non-burning methods of protecting communities, with the emphasis on fire resilience of private property and cross-tenure risk mitigation on the bushland interface.

Environmental impacts of prescribed burning for "hazard reduction"

The term "hazard reduction" is used widely for prescribed burning. The practice of undertaking hazard reductions needs a thorough revision of how it takes environmental factors into account.

A reconsideration of fire frequency for all ecological communities is needed. Ideally, no fire should occur more frequently than a keystone habitat plant takes to recover and produce viable seed for regeneration and is able to sustain food resources for birds, insects and other fauna. Climate change is having an impact on regrowth times

[6] RFS Annual Report 2018-19, Appendix 1).

and while some plants may be receiving more rainfall, others may not. They may also be subjected to higher temperatures and resulting increased water stress.

For instance, of particular concern is *Banksia ericifolia* which is a critical member of the Heathland community and of great significance for the annual honeyeater migration as well as for insect diversity. This fire sensitive obligate-seeding plant takes perhaps ten years or more to recover populations and re-establish a viable seed bank in the higher parts of the Blue Mountains. However, in some places fire is now affecting this community more frequently than is sustainable for the plant and the bird life it supports.

Every effort must be made to protect the more fire sensitive communities where dominant species are killed by fire and take a long time to recover, eg. Tall Open Forests of *eucalyptus oreades.* The concept of mosaic burning of smaller areas needs to be re-introduced, rather than the apparently efficient and quota-determined broad-scale blazes, for example. from creeks to ridges over many square kilometres.

It must also be acknowledged that the more frequent the fire the fewer the species that return, and the larger the proportion of those returning species that are fire-dependant. Hence the more fire-prone an affected area actually becomes. Research shows that through these changes and erosion of wet forest types, frequent burning can create a more flammable forest landscape[7].

Current practice in environmental assessments for hazard reduction burning

Current environmental assessments for hazard reduction burning operations, which follow the Bushfire Environmental Assessment Code (BEAC), are typically based solely on the response of limited plant species (representing a suite of life history types) in particular vegetation communities. Generally, there is no consideration of fauna, vertebrate or invertebrate. It is assumed, erroneously, that vegetation is always a suitable surrogate for fauna. While there are recommendations for minimum hazard reduction fire intervals etc for threatened fauna, this represents a small proportion of total species, especially if invertebrates are included.

A classic example of perverse conflict is that Blue Mountains Swamps can be burnt every 12 years according to the BEAC threatened species lists, but two iconic endangered species, the Blue Mountains swamp skink (an endemic Blue Mountains species) and giant dragonfly, obligate residents of such swamps, have a recommendation of no fire. Additionally, the effects of repeated high frequency fire on peat swamp ecosystems is inadequately considered or not at all. The international literature, however, provides much evidence of the cumulative degrading influence of more intense fire regimes on peat swamps.

NPWS' hazard reduction burning quotas also appear to completely disregard the responsibility.to preserve World Heritage natural values related to biodiversity in the GBMWHA. Current NPWS practice of broad-scale hazard reduction burning,

[7] Zylstra, P. J. (2018). Flammability dynamics in the Australian Alps. *Austral Ecology*, *43*(5), 578–591. doi:10.1111/aec.12594

apparently to fulfil quotas, also does not consider the long term impacts on these ecosystems in the GBMWHA and with limited evidence, is promoted as an effective tool to stop or slow wildfire in wilderness or other remote natural areas. As discussed above, these impacts could be lessened if prescribed burning focussed more on protecting higher risk areas which are typically on the bushland fringe.

Recommendations

The NSW government should

- Reconsider prescribed burning fire frequencies taking into account the role of keystone habitat plants in the recovery of plants and animals and impacts on a wide range of fauna species, both vertebrate and invertebrate.

- Ensure competent consultants or trained agency staff conduct biodiversity surveys for prescribed burning hazard. This could pinpoint critical species and change a fire regime to something more appropriate. How do you know what the impact of a particular blaze has on biodiversity if you didn't know what was there pre-fire?

- Apply special consideration to how hazard reductions or preparation for back burning are conducted on private properties with Conservation Agreements.

TOR 3

Responses to bushfires, particularly measures to control the spread of the fires and to protect life, property and the environment, including:

- ***immediate management, including the issuing of public warnings***
- ***resourcing, coordination and deployment***
- ***equipment and communication systems.***

Key Recommendations

- **Retain and strengthen the NPWS role in bush fire management and suppression as it is critical to both bushfire control and conservation/land management in NSW**
- **Greatly increase investment in remote area firefighting personnel and appropriate aircraft so as many remote fires as possible can be extinguished while small**
- **After fires, there needs to be a rapid response weed eradication program ready, immediate post-fire surveys of species populations and prioritised assessment of threatened species and communities**
- **Develop a mandatory, multi-level independent fire suppression debrief/review process that is blame-free, focused on strategies, committed to learning from actions undertaken**
- **Greatly expand research into bushfire suppression strategies such as backburning to assist decision-makers**

NPWS role in fire management

NPWS has an essential role in bushfire suppression and overall fire management in NSW. National parks and other conservation reserves under NPWS management cover more than 9% of NSW and most the state's fire-prone bushland. These areas are managed under legislation for conservation and appropriate recreation. Fire management is a fundamental aspect of managing landscapes for their biodiversity, ecology and other environmental values. The *Rural Fires Act 1997* (RF Act) and the State Bush Fire Plan (2017) identify NPWS as a 'fire-fighting authority'. In recognition of the NPWS role in bush fire, the *RF Act* also requires that NPWS be represented on the NSW Bush Fire Coordinating Committee as well as all district Bush Fire Management Committees across NSW.

Fire is a large part of the day-to-day work of NPWS staff throughout the year, as they engage with fire planning, liaising with other agencies and communities, undertaking prescribed burning for protection of both human communities and ecological values, other fire mitigation and preparedness work. In the fire season, NPWS staff attend and manage numerous fires on-park and assist with fires off-park. This ongoing fire work ensures that many NPWS firefighters and fire managers are very experienced and capable, with a detailed understanding of the role and behaviour of fire within the landscapes they manage. The NPWS role in fire is well explained in *Living with Fire in NSW National Parks*, *A strategy for managing bushfires in national parks and reserves 2012–2021*[8]:

[8] NPWS, reprinted 2013

"NPWS has statutory obligations for bushfire management. Under the RF Act, NPWS has responsibilities as both a public authority and a firefighting authority and has obligations for the responsible management of bushfires on parks and reserves and for cooperating with bushfire management on other lands in NSW. This includes the prevention of wildfires on NPWS reserves and minimisation of the danger of spread on or from NPWS land under Section 63 of the RF Act, the detection and suppression of wildfires on NPWS land and other tenures in conjunction with other agencies under Section 44 of the RF Act, and the implementation of risk management programs to protect life and property from wildfires."

The critical role of NPWS in bushfire suppression is not well recognised by the public, partly because much NPWS fire suppression occurs deep in the bush away from media and because other agencies have full control of public information during bushfire events. NPWS manages all on-park fires, often with the assistance of the Rural Fire Service, unless or until the fire grows to a scale where the RFS assumes control under section 44 of the *RF Act*. The success rate of NPWS suppression of on-park fires is illustrated by the pie-charts below (*Living with Fire in NSW National Parks*). They show that 89% of nearly 3000 on-park ignitions were controlled on-park and that 79% of them were contained to less than 100 hectares in size. This is despite the often remote and rugged terrain in which NPWS fights fires.

Figure 7: Origin of wildfire ignitions impacting parks and reserves 2000–10 (n=2964)

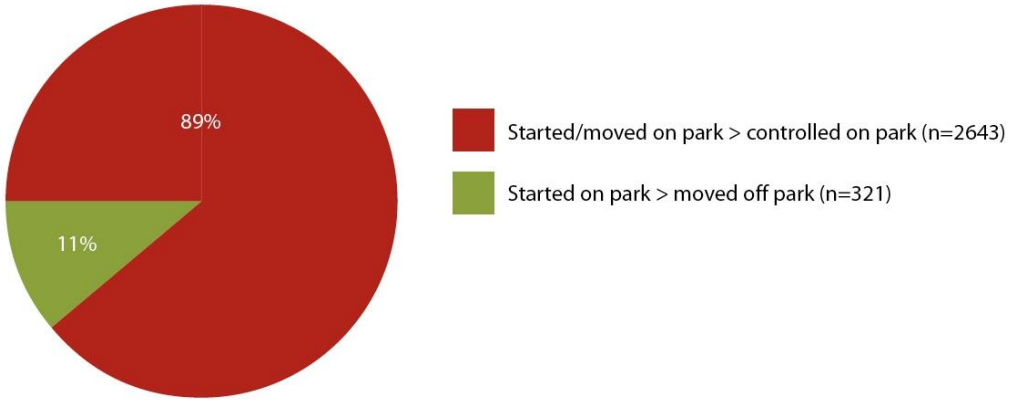
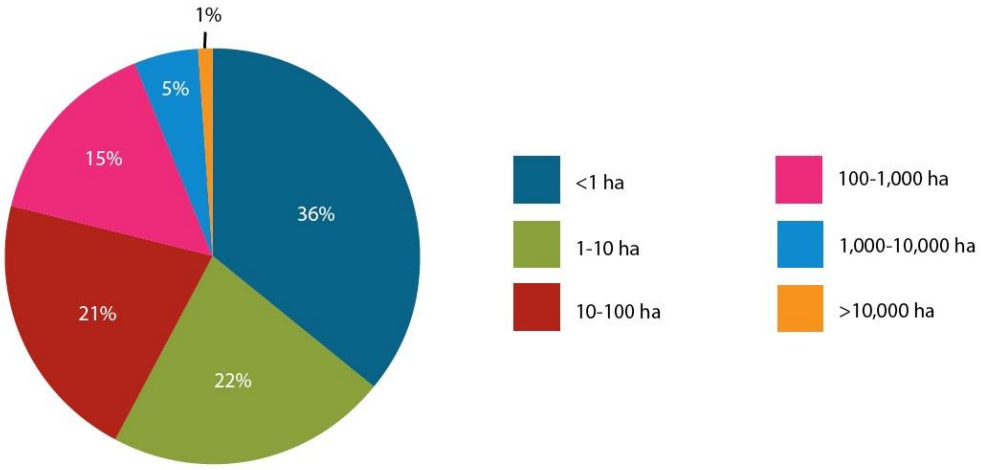


Figure 9: Size class distribution of park bushfires 2000–2010 (n=2964)



In Section 44 (emergency) fires, NPWS works with the RFS and other agencies in coordinated firefighting, as mandated by the *RF Act*. Under direction of the RFS Commissioner, NPWS staff fulfil many vital roles, in particular in Incident Management Teams (IMTs), air attack and on-ground.

During the 2019-2020 NSW fires, many senior NPWS officers were appointed as Deputy Incident Controllers, Planning Officers and Divisional Commanders. Many of the best air attack supervisors in NSW are from NPWS. Crews were deployed to many crucial on-ground operations across the state where high-level skills were required. This was especially true for remote area operations (away from fire trucks) where NPWS excels. The RFS Commissioner has often commended NPWS for the crucial skills and local knowledge NPWS brings to large fire operations.

In the Greater Blue Mountains, NPWS officers were appointed as Deputy Incident Controllers to IMTs in Wollondilly, Hawkesbury, Cudgegong and Blue Mountains. NPWS remote area teams extinguished many fires and were deployed to numerous difficult tasks on larger fires. These included remote operations on the Ruined Castle and Grose fires which prevented these fires from growing much bigger and threatening more townships.

Recommendation

The NSW government should

- Retain and strengthen the NPWS role in bush fire management and suppression as it is critical to both bushfire control and conservation/land management in NSW.

Initial attack on remote fires

Small fires are cheap fires and cause less damage. Nearly all the major NSW fires of 2019-2020 were caused by lightning in remote areas (away from easy vehicle access). The big fires were the ones that were not put out, including the Gospers Mountain, Green Wattle and Ruined Castle fires in the Greater Blue Mountains. At least some of these might have been put out while still small with a changed approach, thus greatly

reducing costs, impacts and danger to firefighters. Many other lightning fires were put out when small, as they have been in national parks over many previous fire seasons.

Blue Mountains Region NPWS data for the ten years from 1997 to 2007 show the following (NPWS pers. comm.):

Total number of ignitions	=	695
Number attributed to lightning	=	394 (56.7%)

Lightning fires extinguished at a range of sizes:

< 10 ha	=	256
10 -100 ha	=	63
100 -200 ha	=	10
200 - 500 ha	=	15
500 -1000 ha	=	12
1000 -5000 ha	=	11
5000 – 15000 ha	=	12
15000 -50000 ha	=	9
> 50 000 ha (campaign /S44 fires)	=	6

So just under 65% of lightning fires were kept to under 10 ha, and almost 90% were extinguished at less than 500 ha.

It was more difficult to put out fires in the 2019-2020 season, because of exceptionally dry fuels from the drought. Nevertheless, NPWS data (pers. comm.) shows that 20 ignitions between August 2019 and January 2020 were extinguished at a size of less than 4 ha. At least 14 of these were from lightning. A number of others were put out at larger sizes, while some were not extinguished early and went on to become major fires.

This record verifies NPWS' capacity for initial attack, especially in remote areas, and even in the challenging conditions of last summer. Remote area firefighting (RAF) involves using helicopters to fly in RAF teams (RAFT) to attack a fire while it is small. Water-bombing from aircraft is used in support. NPWS pioneered this type of firefighting in NSW in the 1970s and NPWS expertise in this field is widely recognised, especially in the Blue Mountains where so many lightning fires occur in rugged country.

RAFT techniques have limitations. The fire cannot be too big, or the fire behaviour too severe, the wind too strong, or the terrain and vegetation too difficult. Successful RAFT attack then depends on rapid detection of ignitions, swift attack and adequate resourcing (planes and people). The failures this season were caused by one or more of these factors.

The Victorian Royal Commission into the 2009 Victorian fires stated under the heading of *Fireground Response:* "the best opportunity to bring a bushfire under control is at or near the point of ignition, when the fire is small…Aircraft are an integral part of initial attack and together with ground crews, provide continuing support during an extended fire. Depending on where they are stationed and their despatch protocols aircraft can

often get to a fire and start the initial attack before ground crews arrive." [9] The weight of the first attack is (a) … factor " that determines the success of initial attack"[10] and "Aircraft are an integral part of initial attack…"[11]

For some remote fires in the 2019-2020 season, adequate RAF crews and aircraft were not available in time, often because other, bigger fires were already burning and drawing resources. Aircraft protecting houses would not be released for a small, remote fire. It is very difficult to transfer resources from a Section 44 fire to a small, non-emergency situation. Medium to large water-bombing helicopters are especially useful for 'knocking down' remote fires to allow direct attack. However, it can be argued that withholding resources is 'false economy' when such fires later grew into major disasters, causing extensive damage and requiring massive resources and expense to combat.

There was also a shortage of remote area firefighters. NPWS reportedly has about 600 trained and certified RAF firefighters, of which about 400 are of 'arduous' standard, the highest fitness classification (NPWS pers. comm.). RAF people have to pass a fitness test every year and be competent in many skills including helicopter operations and winching. RFS has another cohort of RAF firefighters, apparently also 600 in number (RFS Annual Report 2018-19). However, with rest periods and many other operations going, and RAF people deployed to other roles, there were sometimes not enough to attack multiple lightning strikes at once, as occurred several times across the NSW fires.

Lightning ignitions are usually detected by aerial patrol after electrical storms or by reports from distant locations. This is sometimes not quick enough, especially in conditions when fires are able to grow quickly. Sometimes fires do not appear for several days after rain. Once detected, speed of response and attack then becomes critical. This has also been lacking if aircraft and crews are not on standby to respond quickly. Night operations on the ground can be very important, but these are often not supported for various reasons.

A final point is that RAF techniques can be just as useful for parts of much larger fires. For example, in the recent Blue Mountains fires, RAF operations successfully contained several long fronts of the Grose and Ruined Castle fires, as well as the very long northern edge of the Kerry Ridge fire, and in spite of very challenging conditions.

There must be a dramatic increase in the aerial and human resources made permanently available to fight remote fires when they are first detected. A lightning strike fire must not be allowed to develop into an uncontrollable "megablaze" that has serious ecological consequences.

[9] 2009 Victorian Bushfires Royal commission Final report Summary July 2010 page 9.
[10] Ditto Vol 3 p.112
[11] Ditto p.113

Recommendations

The NSW government should

- Greatly increase investment in remote area firefighting personnel and appropriate aircraft so as many remote fires as possible can be extinguished while small;

- Review other operational constraints to quick detection, rapid attack and night operations and fix them.

Immediate response to fires

The 2019-20 fires have shown the need for more preparedness for recovery in future fires as well as the current recovery activity now underway. There needs to be a rapid response weed eradication program ready to go and immediate post-fire surveys of species populations conducted.

Since the fires, Broom and other weeds are growing faster than the natives in many places where these plants were nearly eradicated by years of volunteer work. Plants with large, long-lived seed banks which respond to fire as a germination cue (such as Broom or Gorse) are a significant threat. Immediate post-fire surveys could focus on populations of species identified as being at high risk of local extirpation or significant population decline as a result of the fires. Medium-term monitoring of population trends for species or communities at risk should be put in place. Such monitoring must also include evolutionarily/phylogenetically significant species.

Many species' ranges and populations have been, or probably have been, severely impacted by these fires and their status now needs to be assessed. There are likely to be a considerable number of species which were not previously listed under threatened species legislation which now satisfy listing criteria and need to either be nominated for listing or have relevant Threatened Species Scientific Committees make an emergency listing. Additionally, many already listed species are likely to have experienced dramatic reductions in geographic range, populations, or habitat availability, or been negatively impacted by other ecological factors associated with these widespread fires (e.g. reduction in pollinators or seed dispersers). These species are thus likely to have become more threatened and justify upgrading their listing, e.g. from Endangered to Critically Endangered or Vulnerable to Endangered

Impacted species need to be protected through a prioritised assessment and threatened species listing (if needed) under NSW and federal environmental law (*Biodiversity Conservation Act (NSW) 2016* and the *Environment Protection and Biodiversity Act (Cth) 1999 (EPBC Act).* It is understood that there have been no new listings of species under the EPBC Act since the bushfire crisis;

The impact of hazard reduction maintenance and actual bushfire areas on the environment should be reduced by improved practices after fires (as part of “make safe” operations). They would require minimal disturbance of burnt areas other than to the extent necessary to undertake best practice ecological restoration / rehabilitation and soil conservation. This should include cleaning and treating vehicles and equipment, better identification of habitat trees, reducing the physical impact of people

on fresh fire grounds, vehicles staying strictly on tracks and excluding bulldozers wherever possible.

There is also a need to avoid opportunistic burning of remnant green patches of vegetation where it is unnecessary. These areas are green refuges after a bushfire has moved through an area. Back burning them removes habitat needed for the remaining wildlife and seed storage for regrowth. It also extends the time people are impacted by fire and smoke.

Recovery after fire on the scale witnessed in 2019-20 requires a combined response at state and national level and strong national and international leadership across government portfolios to ensure an improving trajectory for biodiversity.

Recommendations

The NSW government should

- Carry out immediate post-fire surveys of populations of species identified as being at high risk of local extirpation or significant population decline as a result of these fires and medium-term monitoring of population trends for species or communities at risk;

- Institute and fund a rapid response weed eradication program and follow up maintenance (for years);

- Reduce the impact of bushfire on the environment after the fires has passed by improved maintenance and clean up practices. Clean-up activity would be require to make minimal disturbance of burnt areas other than to the extent necessary to undertake best practice ecological restoration / rehabilitation and soil conservation;

- Prioritise assessment and listing (if needed) of impacted species under the *Biodiversity Conservation Act (NSW) 2016* and *Environment Protection and Biodiversity Act 1999*;

- Deliver strong national and international leadership and coordination across government portfolios in bushfire disaster response to ensure an improving trajectory for biodiversity.

Bush fire suppression review, research and guidelines

There is very little research to support evidence-based decisions on how best to suppress large fires, so most decisions are based on experience. This is an inherently flawed situation because options then come down to the skill, knowledge and experience of those making decisions, whether in the IMT or lower down or higher up the bush fire hierarchy. In the absence of evidence, other factors also come into play, such as community pressure (and community understanding of fire suppression is generally poor), the culture, preferences and prejudices of firefighting agencies and the urge to use resources to do something when they are available.

It is a testament to decision-makers that many decisions prove to be good ones. However, there is ample evidence from the 2019-2020 fires that some decisions were not only inadvisable but counter-productive. Along with many successful backburns, some became problematic in the very dry fuels, especially when lit in the day or two before deteriorating weather. Examples from the Greater Blue Mountains include failed backburns near Mt Wilson and on Newnes Plateau to contain the Gospers Mountain fire and the backburn on the Green Wattle Fire that escaped and struck Balmoral. All these, and others, caused major fire expansion, loss of houses and substantial impacts and trauma to all involved, firefighters and communities alike.

At least some problems appear to have resulted from inadequate appraisal of risks versus threats. In several cases the perceived threat from the 'main fire' never eventuated because it was burning slowly through low fuels, while the escaped backburn entered heavy fuels with the wind behind it and became the major focus of suppression efforts. Ideally, decision-making would be supported with a large evidence base from well targeted research into past successes and failures.

The philosophy and practice of back-burning in particular needs revision. It appears to have never been researched, therefore the effectiveness of back-burning is scientifically unknown. This is a significant omission in understanding how to combat fires and should be a priority before future fire seasons. It may be difficult to research but lack of information on effectiveness means it is an important task. There have been some disastrous results at times, including in the 2019-20 fires in GBMWHA as noted above. This is a growing problem as climate change brings more hostile weather events and increasingly flammable vegetation. Lighting a fire can become a more serious threat than the fire it was supposed to stop. Back burning, especially when they fail, can damage the environment, assets, firefighters and other people.

A starting point would be systematic collection and analysis of the area and intensity of areas burnt by back-burns and wildfires followed by on the ground survey of the progress of recovery. The 2019-2020 fires offer an enormous research dataset. For more comprehensive future planning, this should also include areas which have had hazard reduction burns. Behaviour of wildfires in areas previously burnt by wildfires and by planned fires should be assessed, in particular to determine whether these burnt areas assisted control efforts and under what circumstances.

Back burning (and prescribed burning) should make every endeavour to avoid impacting wetter vegetation types, particularly rainforests which are critical natural barriers to the spread of wildfires. These areas take a long time to regenerate (perhaps 100 years) or may never manage to return fully to their pre-fire condition. In south-eastern Australia the increasingly warm and dry climate will hamper vegetation recovery after fire.

These strategy issues have occurred in many previous fires but there seems to have been a lack of review and learning. Fire agencies appear to lack a commitment to rigorous and structured post-fire review processes. There could be many reasons for this, but an effective system of review would need to be blame-free and focus not on 'who' but on 'what worked, what didn't, and why'. Every major field of human endeavour recognises this need and there is a large body of literature on effective review and "lessons learned" processes. This includes the excellent *Lessons*

Management Handbook from the Australian Department of Home Affairs[12] which is a comprehensive guide for emergency agencies. Independent review is essential and could be carried out by experts for instance from comparable interstate agencies. Then, lessons learned and other outcomes need to be clearly communicated through agencies and the community. In the interim, support from better decision guidelines could help minimise poor decisions.

An independent "no blame" review of fire suppression practices in the 2019 -20 fires in GBMWHA is very important because there were several serious back-burning escapes and we know that fires will become more extreme with advancing climate change. The impact of the 2019-20 fires should be analysed in hazard reduction areas, back burning as part of fire operations and wildfire to distinguish between impacts of these types of burning in relation to fire behaviours and best prospects of recovery.

Overseas firefighting assistance was used in the 20190-20 fires possibly to a greater degree than previous fire seasons. The experience and viewpoint of these personnel could be a useful perspective to the strategies applied.

We know that Firefighting is stressful and dangerous. In NSW firefighters are brought together from various organisations as described above. Each agency may have differing requirements and training. Larger fires included defence forces. Preparedness is very important and agencies need to understand what is needed to allow the firefighters to do their best.

Recommendations

The NSW government should

- Develop formal guidelines to assist better risk-based suppression decisions;

- Establish a mandatory, multi-level independent fire suppression debrief/review process that is blame-free, focused on strategies, committed to learning from actions undertaken and results in findings that are promulgated through fire agencies and to the community;

- Greatly expand research into bushfire suppression strategies such as backburning to assist decision-makers. This should include analysis of the intensity and extent of back-burnt areas and wildfire areas and the effectiveness of these interventions;

- Document or investigate the level of training and fitness of all personnel on the fireground, whether volunteer or paid, and make recommendations as to future training required so as to ensure the safety of all personnel on the fireground;

- The Independent Inquiry should ask overseas fire personnel involved in 2019-20 firefighting effort to comment on how fires might be better managed in the future, based on their experience of firefighting in other countries.

[12] Australian Institute for Disaster Resilience (2019). Australian Disaster Resilience Handbook Collection: Lessons Management, 2nd edition, Dept of Home Affairs, Australian Government

Yours sincerely

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Appendix 1 – RECOMMENDATIONS

- The NSW and Australian government should take serious and immediate action to reduce greenhouse gas emissions and therefore climate change impacts.

The NSW Government should

- Establish a systematic, comprehensive, long-term biodiversity monitoring program in the GBMWHA (with committed long-term funding and stable institutional arrangements) as a basis for effective adaptive management practices in the GBMWHA. Such monitoring should also cover adjacent natural areas;

- Increase funding to NPWS to enable it to increase its land management staff and resources to properly support the recovery of biodiversity;

- Seek funding assistance from the Federal government to allow comprehensive long-term research on, and monitoring of, the world heritage values of the GBMWHA.

- Follow a risk-based approach to prescribed burning to protect communities by focussing on the bushland fringe and strengthen the capacity to undertake burning in these areas;

- Increase investment in community fire planning and non-burning methods of protecting communities, with the emphasis on fire resilience of private property and cross-tenure risk mitigation on the bushland interface.

- Reconsider prescribed burning fire frequencies taking into account the role of keystone habitat plants in the recovery of plants and animals and impacts on a wide range of fauna species, both vertebrate and invertebrate.

- Ensure competent consultants or trained agency staff conduct biodiversity surveys for prescribed burning hazard. This could pinpoint critical species and change a fire regime to something more appropriate

- Apply special consideration to how hazard reductions or preparation for back burning are conducted on private properties with Conservation Agreements.

- Retain and strengthen the NPWS role in bush fire management and suppression as it is critical to both bushfire control and conservation/land management in NSW

- Greatly increase investment in remote area firefighting personnel and appropriate aircraft so as many remote fires as possible can be extinguished while small;

- Review other operational constraints to quick detection, rapid attack and night operations and fix them.

- Carry out immediate post-fire surveys of populations of species identified as being at high risk of local extirpation or significant population decline as a result of these fires and medium-term monitoring of population trends for species or communities at risk. Such monitoring must also include evolutionarily/phylogenetically significant species;

- Institute and fund a rapid response weed eradication program and follow up maintenance (for years). For instance, since the fires, Broom and other weeds are growing faster than the natives in many places where these plants were nearly eradicated by years of volunteer work. Plants with large, long-lived seed banks which respond to fire as a germination cue (such as Broom or Gorse) are a significant threat;

- Reduce the impact of bushfire on the environment after the fires has passed by improved maintenance and clean up practices. Clean-up activity would be require to make minimal disturbance of burnt areas other than to the extent necessary to undertake best practice ecological restoration / rehabilitation and soil conservation;

- Request the federal government to prioritise assessment and listing (if needed) of impacted species under the *Environment Protection and Biodiversity Act 1999*. There have been no new listings of species since the bushfire crisis;

- Deliver strong national and international leadership and coordination across government portfolios in bushfire disaster response to ensure an improving trajectory for biodiversity.

- Develop formal guidelines to assist better risk-based suppression decisions;

- Develop a mandatory, multi-level independent fire suppression debrief/review process that is blame-free, focused on strategies, committed to learning from actions undertaken and results in findings that are promulgated through fire agencies and to the community;

- Greatly expand research into bushfire suppression strategies such as backburning to assist decision-makers. This should include analysis of the intensity and extent of back-burnt areas and wildfire areas and the effectiveness of these interventions;

- Document or investigate the level of training and fitness of all personnel on the fireground, whether volunteer or paid, and make recommendations as to future training required so as to ensure the safety of all personnel on the fireground;

- The Independent Inquiry should ask overseas fire personnel involved in 2019-20 firefighting effort to comment on how fires might be better managed in the future, based on their experience of firefighting in other countries.

Appendix 2

Peter Smith, Impact of the 2019-20 Fires on the Greater Blue Mountains World Heritage Area: Update 7 March 2020. (separate file)