Royal Commission into National Natural Disaster Arrangements

# Submission Form

Please complete this form if you would like to provide input or comments about coordination, preparedness for, response to and recovery from the 2019-20 'Black Summer' bushfires.

## Personal and Background Information

1. **Full Name** **Robert John Raison, and Partap Kumar Khanna**
2. **Expertise - former Chief Research Scientist and Senior Principal Research Scientist, respectively, with CSIRO. We have many decades of research experience on the ecology of Australia's native forests, including impacts of fire on vegetation, soils, nutrient cycles and GHG balances. We have worked closely with the managers of forest lands, and some of Australia's leading fire behavior scientists and forest modellers.**
3. **Email** [redacted]
4. **Mobile/Telephone** [redacted]
5. **What is your preferred method of contact if we want to follow up with you?**

| |
|---|
| Either phone or email |

6. **The Commission would like to understand the views of community groups based on their respective experiences and background.**
    a. Please select Option 1 if you are providing input and comments primarily based on your personal situation.
    b. Please select Option 2 if you are providing input and comments primarily based on your professional knowledge, qualifications or experience, or on behalf of a group or organisation

**Option 1**: Based on your personal situation, please complete the following.

a. What was your personal situation in relation to the 2019-20 Bushfires? Please choose all that apply.

☐ I was not living in an area affected by bushfire

- ☐ I lived in an area affected by bushfires but was not evacuated, and didn't suffer personal or financial loss
- ☐ I lived in an area affected by bushfires and was evacuated, but didn't suffer personal or financial loss
- ☐ I lived in an area affected by bushfires and was evacuated, and I suffered personal or financial loss
- ☐ I was part of the emergency response as a fire fighter on the ground
- ☐ I was part of the emergency response as an aerial fire fighter
- ☐ I was part of the emergency response as health professional
- ☐ I was part of the emergency response as an Australian Defence Force member
- ☐ I was part of the emergency response as a Commonwealth or State government employee
- ☐ I assisted the emergency response as a community support volunteer
- ☐ I assisted the emergency recovery (i.e. after the fire event) as a community support volunteer
- ☐ Other

b. Where do you live? Please provide your Local Government Area, town name and post code.

Local Government Area Choose an item.
Town name
Post code

**Option 2**: Based on your knowledge, qualifications or experience, or your role representing a group or organisation, what is your area of expertise? Please choose all that apply.

- ☐ Emergency/disaster response and/or management
- ☒ Environment/land management
- ☒ Land use, planning, building standards
- ☒ Impacts of changes in climatic conditions
- ☒ Wildlife conservation
- ☒ Traditional land and fire management practices of Indigenous Australians
- ☒ Community welfare
- ☒ Other

## Input / Comments

**7. In your experience, what areas of the bushfire emergency response worked well?**

We brodly support the detailed submission to this enquiry made by the IFA/AFG ( ROYAL COMMISSION INTO NATIONAL NATURAL DISASTER ARRANGEMENTS Submission by THE INSTITUTE OF FORESTERS OF AUSTRALIA and AUSTRALIAN FOREST GROWERS, April 2020). Our comments below add our personal perspective to some of the issues raised in that subnission, as well as adding further points.

As decribed in the IFA/AFG submission, effective forest fire management must encompass the following seven components: 1. Research and its application – providing the scientific knowledge, developing aids for practical implementation, and providing the education to apply the knowledge and tools; 2. Prevention – reducing the incidence of fire through regulation, public warning, enforcement, and declaration of fire bans; 3. Preparedness – including prescribed burning for wildfire mitigation, firefighter training, operational and logistics planning, equipment procurement, and infrastructure development and maintenance (e.g. road/track network, helipads); 4. Detection - establishing and maintaining a fire detection network including firespotting towers, public reporting facilities, and remote sensing methods (e.g. satellites); 5. Emergency Response - to wildfires when they arise during the summer fire season; 6. Recovery – implementing systems and processes to reduce the impact of wildfires including provision of victim support services, and rapid environmental impact assessments and on-ground rehabilitation works; 7. Landscape Fire Regime Maintenance – including the use of prescribed burning to maintain biophysical and ecological processes to increase ecosystem resilience to events such as large, high intensity wildfires, and for the survival and productivity of many vegetation types.

We believe this is a comprenensive framework and an appropriate one for managing fire in a structured, balanced, and effective mannner. Fire management planning and implementation activities must address all of these components in an integrated and strategic way, and be focused at the local level to address specific local circumstances and to engage local communities and utilize their knowledge.

Unfortunately there has been progrssive loss of local focus and associated resourcing, a failure to take a holistic view, and too much focus on emergency response at the cost of good preparedness. The loss of local skills is crucial because they are vital for rapid early ground attack (during the initial hours after ignition) of remote area fires (ignitions from lightning, spot fires) when the chance of controlling them is greatest. Once fires become established, they become uncontrollable during severe fire weather conditions, as was often the case during the 2019-20 fire season.

The emergency response only relates to components 5 and 6 of the above framework. Whilst very important , there has been far too little attention paid to the first three components which can greatly mitigate the area and intensity of wildfires, and thus the magnitude of the emergency reponse that is needed.

In general, the public warning systems worked well and markedly helped reduce loss of life and property as fires moved across the landscape. Aerial (water bombing) resources were also effective in helping protect property and lives. Volunteer fire fighters did a great job, but there was too much reliance on them given the length of the crisis and spatial extent of the wildfires.

**8. In your experience, what areas of the bushfire emergency response didn't work well?**

1.Land management agencies did not prepare well (in terms of fuel reduction, forest access, human resource planning, acquisition of additional fire fighting hardware etc) for the forthcoming bushfire season despite repeated warnings from experts. In some cases resources were reduced, when the opposite was needed. As a consequence, the magnitude of the required emergency response overwhelmed supression capacity on many occasions. The area of forest (almost all of it native forest) burnt was enormous, and environmental impacts (although still not well quantified) on flora, fauna, soil and water were certainly of a frightening magnitude

2. There was over reliance on volunteer fire fighters. This highlights the need for governments to invest in more permanent professional staff working throughout the year on fire management activities in public parks and forests, and for maintaining a forest industry, so that a professional forest firefighting workforce with good local knowledge is available for rapid initial suppression of fires when they are small. This would lead to both better protection of communities and the environment.

3. The models used to estimate fire behaviour often underestimated rates of fire spread and intensity, and this would have impeded the emergency response. Landscapes were very dry following the long drought, and personal observations in dry forests showed much dead vegetation (up to 25% of trees) which provided a 'ladder' of fuels from the ground to the tops of tree canopies. Aridity and modified fuel structures contributed to the unprecedented fire behaviour observed. Some forests, such as rainforest on the NSW north coast, which had not burnt previously were destroyed.

4. The are many reports in the media of the recovery support processes being too slow and insufficient. This is not surprising given the overwhelming scale and impact of the fires. No doubt many of those directly affected by the fires will speak to the Commission on this topic.

**9. In your experience, what needs to change to improve arrangements for preparation, mitigation, response and recovery coordination for national natural disaster arrangements in Australia?**

There is no easy fix to these issues. A well co-ordinated respose (covering all components of fire management as described above) is needed, because many factors conribute to an overall effective reponse.

We must avoid single issue approaches and the pushing of 'agendas/campaigns', which unforunately (and disappointingly) often dominate discussion during the bushfire crisis and soon afterwards - some examples include irrational calls for blanket banning of prescribed burning, false claims that harvesting increases bushfire risks, calls for the blanket banning of any sort of harvesting (thinning, salvage logging, selection harvests), unrealistic requests for biodiversity to be given primacy over people and all other forest values, and unrealistic claims that native forests can be managed as 'C forests' without any realistic strategy for their protection from wildfire.

The root of many of the problems is inadeqate and declining funding by State governments. It is clear that several State goverments have lost control of fire management in native forests, with highly negative consequences for life and property, biodiversity protection (the conservation reserve system has been decimated), soil and water protection and the protection of carbon stocks and wood resources. This situation is well demostated in Victoria where very large areas of native forest have been burnt during the last 15-20 years, resulting in great damage to the CAR reserve system ([redacted]). Regional Forest Agreements Scientific Advisory Panel (SAP) - Scientific Advice to Support Regional Forest Agreement Negotiations. Pp.89. Accessible at[redacted] ).The situation will almost certainly worsen under a changing climate, and it is very clear the more public funding (not less) will be essential if Australia is to deal adequately with the situation and to effectively protect forest values that the community care deeply about. Resources also need to be better targeted as discussed above.

We make the following brief comments in the context of the sustainable management (which must integrate economy, people and the environment) of Australia's native forests:

1. Expanded use of strategic fuel reduction burning, based on unbiased consideration of the science and practical experience (see recent review paper by Morgan et.al., 2020). Prescribed burning can be useful in specific circumstances, but is not a panacea and requires good reourcing if it is to be done well at sufficient scale. Fine fuels (and fire risk) recover quickly after prescribed burns in eucalypt forests (Raison et. al., 1983), however benefits can still accrue due to the creation of a matix of fuel ages across the landscape (Raison et. al., 1986; Morgan et.al., 2020). Critically, suffient areas need to be treated (note WA experience), and adequate other supporting fire managent tools also need to be available. Indigenous burning practices are a form of 'cooler prescribed burning' for specific purposes of habitat management and should be applied where approppriate, although the area treated is likely to be modest.

[G. W. Morgan, K. G. Tolhurst, M. W. Poynter, N. Cooper, T. McGuffog, R. Ryan, M. A. Wouters, N. Stephens, P. Black, D. Sheehan, P. Leeson, S. Whight & S. M. Davey (2020). Prescribed burning in south-eastern Australia: history and future directions, Australian Forestry, 83:1, 4-28, DOI: 10.1080/00049158.2020.1739883]

[Raison, R.J., Woods, P.V., and Khanna, P.K. (1983). Dynamics of fine fuels in recurrently burnt eucalypt forests. Aust. For. 46, 294-302.]

[Raison R.J., Woods, P.V. and Khanna P.K. (1986).Decomposition and accumulation of litter after fire in sub-alpine eucalypt forests. Aust. J. Ecol. 11, 9-19.]

2. Lack of effective fire management probably poses the greatest threat to Australia's forest biodiversity, with major damage already done to the forest reserve system across several States. An indirect effect of worsening climate change is also greater risks of wildfire, with major consequences for most forest values. Future fire management will require a greater cross-tenure focus, and will need to be much more active (conservation reserves have often adopted a 'set and forget' approach over extensive areas).

3. Further exploration should be undertaken of the potential to use woody biomass for bioenergy as a way of reducing fuel loads and fire risk in selected locations such as areas already subjected to commercial harvesting, or in buffer zones at the urban interface. Both coarse woody biomass and fine fuels contribute to the intensity of wildfires - thus removal and productive use of the larger woody components will reduce fire risk. There are a range of technologies available for conversion of wood to bioelectricity and biofuels, and these can be

applied at a range of scales (for links to useful material see www.bioenergyaustralia.org.au; www.ieabioenergy.com). Multiple objectives of reducing fire risk and off-setting fossil GHG emissions can be achieved in selected areas.

4. Greater consideration of the need to protect soil and water resources during all forest fire management operations (see Attachment 1). Major damage to soil and water, with important flow on impacts to most processes in the forest ecosytem can result from management burns, fire supression activities and wildfires themselves. These impacts can be very long-lived (decadal), and extend beyond the forest in terms of water yield and quality.

**10. Is there anything else you would like to tell the Royal Commission?**

We would be pleased to speak to the commission to expand upon the points we have made.

**11. Do you intend to provide supporting material?**

☒ Yes
☐ No

If you are providing any supporting material, please include it with your Submission if possible. If you need to send it separately (e.g. if you make a Submission over the phone), please ensure supporting material can be clearly identified as relating to your Submission by including your name or other identifier so that it can be considered with your Submission.

**12. Do you agree to your submission being published? (Mandatory)**

☒ Yes, I agree to my submission being published in my name
☐ Yes I agree to my submission being published anonymously
☐ No I don't agree to my submission being published

Once you have completed this form, email it to rcnda.submissions@royalcommission.gov.au or print the form and post it to the Royal Commission at:

National Natural Disaster Royal Commission
Locked Bag 2000
Manuka ACT 2603

## Attachment 1.

# Natural and human disturbance can accelerate soil erosion and have highly negative impacts on forests: An example from Victoria

John Raison, 28 April 2020

Forest disturbance by wild or planned fire, harvesting, or grazing can increase rates of soil erosion which then negatively impact on a wide range of values, but especially soil fertility and vegetation growth, water quality, and aquatic and terrestrial habit and biodiversity.

**Timber harvesting**

Risks to soil and water values from timber harvesting are addressed in Victoria via a range of actions (e.g. slope limits, barring and drainage of snig tracks, cessation of operations in wet weather, use of filter and buffer strips along drainage features) under the Code of Practice for Timber Harvesting (2014). Detailed guidance is contained within the "Management Standards and Procedures", including region-specific instructions, but the Code does not specify how these can be sourced (but they are referenced in the Victorian State of the Forests report, 2014). The Management Standards and Procedures provide a very approximate (methods are not specified) scoring approach to assessing soil erosion hazard and risks to water values at the logging coupe-scale. Whilst a useful approach, currently only compliance with implementation of the Code is independently audited and reported, but outcomes are not systematically assessed (Victorian State of the Forests Report, 2018). The effectiveness of mitigation measures needs to be assessed visually on all logging coupes and on streams leaving the coupe. This will provide valuable information to inform the on-going improvement in implementing the Code to deal with local differences in erosion risk resulting from the interaction between degree of site disturbance and soil type/terrain/aspect/other environmental conditions.

**Fire**

Fire impacts forest ecosystems by changing many important soil and plant processes. In nutrient-poor systems such as most Australian native forests, effects on nutrient budgets and cycling processes are important, and soil erosion which is often increased by fire and which results in loss of nutrient-rich ash and surface soil, can be a rapid and major agent of change (e.g. Raison et.al., 2009).

Wildfire can cause catastrophic rates of soil erosion in Victorian forests (e.g. Dunkerley et.al., 2009; Nyman et.al., 2011), and have significant impacts on water yield and quality (Lane et.al., 2010; Smith et.al., 2011). Further, debris flows in the initial years following wildfire can threaten the water supply system (Nyman et.al., 2015) – such as occurred after the 2003 Canberra fires. After wildfire, sheet erosion can be high even under rainfall of moderate intensity, and hillslope sediment transport can continue for several years, especially after a subsequent fire or intense rainfall (Dunkerley et. al., 2009). Deposits of sediment either near to, or within, the stream network can also be re-immobilized over time. Efforts to control wildfires, such as construction of control lines, also render the

landscape more prone to erosion. During the 2003 wildfires, about 9000 km of control lines were constructed, many using heavy machinery and being up to 60 m wide. Much rehabilitation was undertaken, but this is very expensive and often only partly successful (Dunkerley, 2009).

Low-intensity (prescribed) burns used for purposes of fuel reduction and reducing the subsequent risk of wildfire can also increase soil erosion rates in Victoria (e.g. Cawson et.al., 2013). Potential increase in erosion from management burns is a significant issue because such burns are applied over large areas (often 100-250 thousand hectares per year), and over several months, thus increasing the chance that some burns will soon be followed by intense rainfall. Cawson et. al. (2013) suggested that in conducting such burns that streams need to be protected, and that a mosaic of unburnt patches creating strips > 10 m wide be created to reduce erosion connectivity. Victoria uses a Code of Practice for Bushfire Management on Public Land (2012) to guide prescribed burning activities. The Code itself does not contain guidance on how planning and implementation of management burns take erosion risk into account. The Code states that the operational detail for **how** bushfire goals are achieved 'will be specified in bushfire management manuals and guidelines, which will be publicly available and consistent with this Code'. We were informed by DELWP staff that guidance for how planners assess and mitigate soil erosion risk is currently not well developed. Thus, this is an area requiring significant improvement for the reasons outlined above. The Code also commits to developing a framework for monitoring, evaluating, and reporting on the environmental impacts of its bushfire management program. The SAP have not been able to evaluate progress in this area, but it clearly is an important area to progress as mentioned in other SAP chapters providing advice to the RFA negotiations.

Spatial variation in erosion is high (Dunkerley, 2009; Cawson et. a., 2012), but the reasons for this are becoming better understood (e.g. Noske et.al., 2016). Recent work has demonstrated a positive relationship between an Aridity Index (AI, a function of long-term rainfall and net radiation experienced at a site) and the rate of infiltration to the soil after fire (Sheridan et.al., 2016; Sant et.al., 2018). The AI can be mapped with high spatial resolution, and thus offers a way to assess erosion risk after fire.

**Conclusions**

Potential for accelerated soil erosion after forest disturbance poses a major risk to many important values in Victoria's native forests. A clearer description of how to determine erosion risk at the coupe-level, and to manage to mitigate it is needed in the Code of Practice for Timber Harvesting. The Code of Practice for Bushfire Fire Management needs to provide clear guidance on how to take soil erosion risk into account when planning and implementing broad-scale prescribed burning for fuel reduction.

Research that leads to better capacity to spatially predict soil erosion rates across forested landscapes following disturbance will be of great value to forest managers, and thus is of high priority. The practical application of site Aridity Index (Sant et.al., 2018) in planning to mitigate erosion after timber harvesting and fire should be further evaluated. Greater

emphasis is needed on monitoring the effectiveness of erosion mitigation activities as part of a broader adaptive forest management system.

**References**

J. G. Cawson , G. J. Sheridan , H. G. Smith and P. N. J. Lane (2012). Surface runoff and erosion after prescribed burning and the effect of different fire regimes in forests and shrublands: a review. *International Journal of Wildland Fire* 21, 857-872.

J.G. Cawson, G.J. Sheridan, H.G. Smith, P.N.J. Lane (2013). Effects of fire severity and burn patchiness on hillslope-scale surface runoff, erosion and hydrologic connectivity in a prescribed burn. Forest Ecology and Management, 310, 219-233.

Code of Practice for Bushfire Management on Public Land (2012). Department of Sustainability and Environment, Melbourne. 35pp.

Code of Practice for Timber Production (2014). Department of Environment and Primary Industries, Melbourne. 78pp.

Dunkerley, D., Martin, N., Berg, S. and R. Ferguson (2009). Fire, Catchment Runoff and Erosion Processes, and Post-fire rehabilitation Programs: Recent Australian Experience. Chapter 18 *In* **Fire effects on soils and restoration strategies.** (Ed. A. Cerda and P.R. Robichaud). Pp. 467-510. Science Publishers Incorporated, Enfield, New Hampshire.

P.N.J. Lane, P.M. Feikema, C.B. Sherwin, M.C. Peel, A.C. Freebairn (2010). Modelling the long term water yield impact of wildfire and other forest disturbance in Eucalypt forests. Environmental Modelling & Software, 25, Issue 4, 467-478.

Philip J. Noske, Petter Nyman, Patrick N. J. Lane and Gary J. Sheridan (2016). Effects of aridity in controlling the magnitude of runoff and erosion after wildfire. Water Resources Research 52, 4338-57.

Petter Nyman, Gary J. Sheridan, Hugh G. Smith, Patrick N.J. Lane (2011). Evidence of debris flow occurrence after wildfire in upland catchments of south-east Australia. Geomorphology, 125, 383-401.

Petter Nyman, Hugh G. Smith, Christopher B. Sherwin , Christoph Langhans , Patrick N.J. Lane and Gary J. Sheridan (2016). Predicting sediment delivery from debris flows after wildfire. Geomorphology 250 (2015) 173–186.

Raison, R.J., Khanna, P.K., Jacobsen, K.L.S., Romanya, J. and I. Serrasolses. Effects of fire on forest nutrient cycles. Chapter 8 *In* **Fire effects on soils and restoration strategies.** (Ed. A. Cerda and P.R. Robichaud). Pp. 225-256. Science Publishers Incorporated, Enfield, New Hampshire.

René E. Van der Sant, Petter Nyman, Philip J. Noske, Christoph Langhans, Patrick N.J. Lane and Gary J. Sheridan (2018). Quantifying relations between surface runoff and aridity after wildfire. EARTH SURFACE PROCESSES AND LANDFORMS, DOI: 10.1002/esp.4370

Gary J. Sheridan, Petter Nyman, Christoph Langhans, Jane Cawson, Philip J. Noske, Akiko Oono, Rene Van der Sant and Patrick N. J. Lane (2016). Is aridity a high-order control on the hydro–geomorphic response of burned landscapes? *International Journal of Wildland Fire* **2016**, *25*, 262–267 http://dx.doi.org/10.1071/WF14079

Hugh G. Smith, Gary J. Sheridan, Patrick N.J. Lane, Petter Nyman, Shane Haydon (2011). Wildfire effects on water quality in forest catchments: A review with implications for water supply. Journal of Hydrology, 396, 170-192.

Victorian State of the Forests Report (2018). Commissioner for Environmental Sustainability, Melbourne. 242 pp.