Submission by Charles Mackowski to the NSW Independent Expert Inquiry into the 2019-2010 bushfires.

Foreword & Self History:

Personal particulars:
My name is Charles Mackowski. I am 70yo and live in [redacted] NSW. I hold a bachelor degree in Science, Forestry (ANU 1973) and masters in Resource Science (UNE 1987).
My work career was entirely in NSW, as a forest manager, researcher and environment officer with NSW State Forests and in assessing departmental performance for NSW Premiers Department, plus some short term employment with the CFMEU and with Dept Primary Industry. I retired in 2008.

Bushfire experience:
Starting November 1968 (Cowarra fire SW of Port Macquarie), 1969 assessing bushfire damage Banyabba pine plantation, 1970 student at ANU fire lectures and pracs (including aerial fire-retardant spread studies, Kowen forest), 1973-78 Kendall (thinning bushfire regeneration at Broken Bago [1968 fire] and neighbour fire problems at Johns River, Crowdy Bay, Laurieton and Lake Cathie), 1978-87 in Coffs Harbour research assisting weekend and campaign fires (particularly 1982/83 fires upper Clarence River and Richmond Range), 1987-90 Wyong district (hazard reduction, coastal and Wollemi wildfires, several section 41F emergencies, plus organising (RFS/SF/NPWS) rural-dwellings & bushfire danger seminar for NW Sydney, Central Coast and Hunter local government planners), in 1993/94 I was "Comptroller - Liaison" for Wyong/Lake Macquarie/Cessnock/Lower Hunter emergency areas over Christmas/New Year.
I have not taken part in bushfire activity since 93/94 but I have observed from the sidelines. Thus this submission is based on a quarter of a century of experience with bushfires in north-coastal NSW and an ensuing quarter of a century of observation from outside.

Structure of this submission:
First I want to acknowledge tragic loss of life, the sweat and tears and the anxiety of persons who lived and fought through this catastrophic time. I acknowledge the extensive costs to communities in loss of business, loss of animal life (wild and rural), impact on agriculture, loss of buildings and machinery, and the damage to parklands, native forest and pine plantation (particularly considerable in NSW this season).
My submission is to five matters that are pertinent to the Terms of Reference of this inquiry. These matters relate to (1) suggestion on public education about **ember attack and spotting**, (2) comment on **causal factors** of **climate change and drought**, (3) comment on **causal factors** of **fuel loads and hazard reduction** and how best to improve this, (4) comment on **aircraft use**, and (5) comment on **land management** .

1. Suggested public education explanation of difference between Ember Attack and Spotting

My comments here refer to a situation I came across. It is a safety issue relevant to improving the knowledge of bushfire behaviour for the non-firefighting public who take it upon themselves to protect their property. This may appear a humdrum matter to experienced personnel but it needs explaining to the general public as its mechanism of occurrence in apparent calm air, if not appreciated by a person feeling safe while defending their property, could result in loss of life.

The incident: My friend owns property west of the lagoon at Bawley Point, south coast. The Currowan fire (early days) had reached the powerline east of Princes Hwy south of Termeil on the weekend before and was still burning on Thursday 5th December 2019. Catastrophic winds were forecast for Thursday and my friend went to his property that morning and was clearing and widening fire trails with his bulldozer. He could see the smoke column billowing in the west but there was no wind and there were **no embers** and he could not see flames so he continued widening the trail toward the winery until he was aware of an RFS

vehicle coming at him telling him to get out. As he was driving his dozer out, he could see no flames to the west and a breeze was wafting through from the east. He then came upon the flames of a **spot fire**, that was not apparent 15 minutes previously, about 5m square burning east of his fire trail. He attempted to put that fire out as it flared larger but scalded both hands and burnt his shin in the process; so he turned tail and cantered his dozer to a clearing, parked the dozer and moved in an excavator in as well, and drove out by car. This was "shortly after 11am". When he returned the following day the area had been burned out with scorched tree crowns.

Over the spring of 2019 the general public had been conditioned by news footage of north coast and Blue Mountain bushfires to seeing fire fronts that came through apparently with ember attacks blowing across at ground level at a fire front with a strong following wind. This is the ember attack you get during "pyroclastic front" phase of a bushfire and is spectacular footage if taken during nighttime or deep-in smoke shots. This "pyroclastic front" ember attack type situation is what my friend expected to happen when the bushfire front got to him and he would then escape through the unburned forest, he did not expect spot fires to develop behind in calm air to surround him before the main front arrived with the wind.

Flames and large embers in bushfire storms with a following strong wind may appear to run at near parallel to ground level, but eventually so much heat is generated that the airflow will lift to vertical. The strong wind has not stopped but is deflected and generates the backdraft or the calm before the fire front that can be used for backburning. This local calm disguises the lifting airflow that carries burning materials at elevation across substantial distances and deposits them behind firefighting lines to start "spot fires". In a normally organised bushfire control operation the firefighting group arranges to have striker units hang back and watch for and put out such spot fires. **A person working alone who is unaware of this mechanism of "spot fire" behavior, <u>because they have been conditioned by news/publicity footage to only expect "pyroclastic" ember attack</u>, can be endangered by being encircled by spot fires from behind while preparing for a dramatic ember attack from in front.**

I recommend the RFS to include this matter in their public education processes.

The bushfires resulted in personal loss, stress and concern in NSW society and there was insecurity that lead to divisive ideas and opinions of blame being aired. The bushfires occurred in a circumstance of prolonged drought. In cities and larger towns there was public resentment that these bushfires and smoke (and this drought) were severe and prolonged due to climate change. In more rural communities there was resentment that "green tape" had disallowed hazard reduction burning operations and this lead to increased fuel loads thereby increasing fire intensity when fires did eventuate. In the next two sections I comment on climate change and then on improving hazard reduction operations.

2. Causal factors: climate change and drought

Climate change is assumed by the general public to be a perceived change in weather patterns brought about by "greenhouse warming" of the atmosphere. Generally it is thought of as an increase in temperature and the term is used disparagingly about the impact of modern society and economy on the atmosphere. Greenhouse warming relates to the effect of human produced elevated atmospheric CO2 concentration (plus other larger molecule gases) on increasing global atmospheric temperature. This greenhouse effect is not a theory but a consequence of physics: it just must happen! However CO2 greenhouse effect is but one component of earth climate.

The full range of components of climate, and their changes, are complex and difficult to measure and interpret meaningfully. The atmosphere's flood-to-drought-and-back-again componentry depends on change in patterns of airflow and this depends on prevailing differences in adjacent regional temperature (and hence pressure) rather than an averaged global heat level. To this idea: NASA maps for recent decades show annual surface

temperatures in that half of the world further than 30 degrees from the equator have increased more than in that half that is closer than 30 degrees latitude (why is moot for me). So we can expect there is some change to wind patterns, and hence climate, at least between these two divisions of the globe. However there are too many other factors in play in the east coast forests of Australia to simply blame one factor as the cause of the drought and the 2019-20 bushfires. To me, **climate change as a compelling cause of the drought or the bushfires is uncertain** but the fire season did occur during a **prolonged drought** (hopefully at its end).

Moreover, **the 2019-20 season was not unprecedented** as there were too many resemblances to other fire seasons, particularly the 1982-83 season. Four decades is a long time in human memory and there have been many changes in the landscape over that time! **The prolonged drought is also not unprecedented** - as a kid the 1958 drought and fires made an impression on me, and droughts have been reappearing in my life with shorter than decadal regularity ever since. Six decades is a long time in human memory!

This is not a place to argue about climate change but to firstly recognise the selfless work of firefighters and then to take note that the bushfires occurred during a time of prolonged drought and perhaps some exceptional combinations of, **but not unprecedented, fire weather** conditions. Drought and climate change are the background to this tragedy.

"I did not understand the nature of the ecological disaster which had transformed my world, or that we ourselves had been agents as well as participants in our own catastrophe. I just knew that we had been defeated by the fury of the elements, …"
Jill K Conway (1989) *The Road From Coorain*, Reed Books, p 82, on the **1939-46 drought** in NSW.

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3. Causal factors: Fuel Loads and how best to Manage their Hazard

As far as the fuel load condition of the immediate surrounds of individual rural houses is concerned: I comment firstly that these fuel conditions reflect the occupier's comprehension of what the bushfire hazard is - and secondly, if the occupier is not demonstrably naïve, then the fuel condition also reflects the respect that the occupier has for firefighters who come to assist. Yes this is judgmental.

In many rural communities there is resentment that "green tape" had disallowed hazard reduction burning operations and this had lead to increased fuel loads thereby increasing fire intensity when fires did eventuate.

Whether "**green tape**" had stopped hazard reduction burning operations to lessen fuel loads in the forest and that bushfires were consequently uncontrollable is controversial. Hazard reduction is about removing some or all of the fuel load where bushfires could occur - usually by means of burning-off of the fuel (fallen leaf, grass, shrubs and other forest floor litter) before the fire season starts. Land management agencies (**paid staff**) commonly plan and burn off strategic patches successively as weather allows and as they conveniently organize these operations to be done as, say, the last item of work in the afternoon on a weekday so the overnight result can be inspected the following morning. Burning-off operations by RFS brigades **rely on volunteers** who generally have to commit the whole day to a job that is most effectively done in the late afternoon, and they have to find personnel to return to check results the following day (there are joint inter-group ops also). Some burning operations are called off because of impact of smoke on persons in poor respiratory health in nearby communities; others do not occur because of weather at the time (perhaps too windy or raining on a particular weekend), or because personnel are not available (school holidays, other commitments).

Other reasons for either limiting, or for calling off, burning operations can be complex - where bushfire brigades are unwilling; local government permission is rejected; land management agencies refuse; access is locked out; neighboring land owners object. This group of reasons may be real or may be mistakes or confusions however they often lead to long term hostilities and lack of willingness to understand and cooperate. But this situation is

quickly known and recognised in the community, and considered in the media, as **"green tape"**. The elephant in the room here is that an overriding "other reason" for limiting or calling off burning operations is **lack of personnel**.

The **prolonged drought** preceding and during the 2019-20 bushfires **dried out the ground litter fuel layer in depth**. Fuel reduction by prior burning off would have reduced the speed (by reducing spotting) and intensity of a travelling fire (by removing more easily flammable fuel and exposing less flammable fuel (nitrogenous and decaying)). Such a hazard reduction programme would need to have been massively larger and better strategically placed statewide to have worked in the conflagrations that occurred in the recent spring and summer bushfire season.

Short term changes of bushfire occurrence and severity because of reduction of **fuel loads** through prior burning off is a difficult matter to comment about because of variability from year to year. However: because there has been profound land use change from utilitarian to preservation over recent past decades, and because there has been much sub-division and new settlement of rural properties over recent past decades, **there has been a reduction in the amount of burning off** over recent past decades. Partly in response to landscape wide land use changes but also because of a **doctrinaire approach to land control by local government** there has also been **an increase in "green tape"** over recent past decades.

The removal of "green tape" (by reevaluation of inappropriate constraints, better communication of objectives or more flexible cooperation between landowners) would have helped in reducing fuel loads. But **the fuel load reduction program itself would have needed to be far larger** than what was apparent around Sydney last winter (and many more seasons previously) to have had a better containment effect on the bushfires that did occur.

How do we get better fuel load reduction in place before future bushfire seasons?

Firstly: we accept that more hazard reduction to burning off should be done to reduce fuel loads. Secondly: we act to review and remove the inappropriate impositions of green tape. Thirdly: the practice of **payment of a retainer** to RFS volunteers for them to be available to specifically take on flexible timetables for hazard reduction (similar but different to F&R retainer), plus the **hiring of part-time seasonal staff** by RFS for such work, should be objectively thought through and designed so as to increase work output toward reducing fuel loads in bushfire areas. Fourthly we should organise to **bring Fire & Rescue NSW into burning off operations**. This would provide extra personnel for burning off and instruct F&R staff in various burning techniques including greater familiarity with how a backburn fire assists in bushfire control.

The above four actions would reduce green tape constraints and increase the availability of personnel for burning off operations. Controversy around permission to access and operate may still continue to be problematic. This is best handled by **decentralising operational control**, of the now larger personnel force, to negotiate at the local level. Because there are more personnel (trained and professional from RFS and F&R) taking part in larger burning off operations, such operations are of greater stature. With greater local standing more flexible options open up for negotiation and cooperation with councils, with landowners and with land management agencies. This will reduce green tape holdups (or at least succinctly identify them) and increase the extent of burning off done and reduce fuel load.

So: Increase availability of personnel while decentralising control and fix up green tape.

Suggestion: The nature of fuel that was burned by bushfire may be objectively quantifiable by measuring the amount of nitrile/cyanide components in its smoke. I do not know whether such work has been done. There is no nitrogen in cellulose and lignin while their decomposition incorporates fungal and invertebrate chitin that contains nitrogen. My expectation is a four fold increase in nitrogen from about C:N ratio of 200ish at the top of the litter to 50ish at the bottom. There should be more nitrogen products the deeper that bushfires burn into litter.

4. Aircraft Use

I wish to comment about the use of increasingly larger aircraft for water bombing in bushfire fighting.

The use of aircraft in control of bushfires has about a century of history and ranges from use as observation and mapping platforms through to personnel transport, to dropping incendiaries for burning off and through to the direct attack on fire with water and retardant. This latter **water-bombing** role is the aspect most known to the general public.

The usefulness of aircraft for water bombing is usually considered in comparison with its cost relative to general land practices in bushfire management. How useful is aircraft use in comparison to the utility/cost of constructing and maintaining useful firetrails and roads, the utility/cost of early detection and adequate attack, and particularly the utility/cost of comprehensive and strategic ground based burning off?

Water bombing using aircraft has increased markedly over the past 30-40yrs particularly with helicopters in near urban situations and particularly with the coming of the Erickson Air Crane. To me there is a problem with the inability of aerial water bombing to accurately target and to adequately cover sufficient of a running fire in harsher than quite moderate fire conditions.

I have a bias against the use of large aircraft for water bombing. I have flown in fixed wing and helicopters to observe fires, and I have dropped incendiaries from helicopters. I have never directly hired a water bomber for fire fighting. I admire the effectiveness of the Erickson near built up areas and over less broken topography and over shorter vegetation.

During the 1993/94 emergency I used a Navy Sea King helicopter as an observation platform into the northern Watagan forests where the helicopter pilot flew me in close to observe a fire situation and the Sea King just dropped quite a number of metres. The pilot apologised for having ventured into the convection column. He then explained that while the smoke cloud in the column was billowing savagely upwards it was doing so because it was less dense than the surrounding air, especially at low elevation. The convection column was so much less dense that it could not provide lift to the helicopters rotary wings on the way through. This event lives with me whenever I see aircraft travelling low near fire convection columns and particularly when I see large fixed wing bombers operating low along wildfire fronts.

I recognise that fire fighting personnel may be enamoured with the decisive nature of a large load of retardant dropped onto a fire in a community setting. The fire fighters job is to put fires out and a large retardant drop does just that with gusto! There have been calls for more and bigger aircraft to be brought to Australia for water bombing purposes. No. Please recognise that this is an expensive bit of work for which in most cases there is the far cheaper, more useful in difficult conditions, and predominantly more effective option of removing the hazard to begin with, or of providing useful access for ground based suppression.
The tragic water bomber crash near Cooma this year is also pertinent.

There is a role for water bombing in specific, and convenient, high value situations and they should continue to be used there (particularly helicopters). **There is no need to import very large water bombing aircraft** - and particularly so when fuel loads are managed effectively.

5. Land Management

This section gets a bit aphoristic/epigramatic and callous.

The landscape in which bushfires occur in NSW is defined both by nature and by human activity. Human activity in the landscape is commonly described as "**land management**". As humans we manage land according to what is lawfully allowed and what is common sense response to situational factors of society, economic demand and environment.

Over recent past decades there has been profound land use change from utilitarian to preservation in rural and peri-urban lands (there are more National Parks than before) and there has been much sub-division and new settlement of rural properties, plus an increasingly inflexible approach to land control by local government. Much of this has followed the Anglo-Euro-American assertiveness of "ecological imperialism" (A W Crosby, D Garden) whereby we have neatly demarcated cities and townships and utilitarian gardens and green fields, and we have neatly demarcated and revered untouched wilderness. Forests can only be green, red if deciduous, and never black. We should plant ten million trees wherever.

We are not an English woodland! We are a land system and an ecology that evolved with drought, flooding rain and bushfires.

Most of the 2019-20 bushfires burned in eucalypt forest. Most of the bushland that burned did not disappear, it is either gradually growing back or there is young regeneration from ground level, as habitat returns wildlife will disperse in/ migrate, if populations are sufficiently expansive and nearby - that's the rub.

Eucalyptus forest generally requires significant disturbance to regenerate young trees - mostly this is caused by severe bushfire. *Eucalyptus* trees, in the quality of forest burned, mostly have a life span of about 300yrs. They are most useful to hollow dwelling wildlife from about half age and do not have large internal hollows used by larger fauna, owls and parrots until about three quarter life span age - the final 70-80yrs of life.

To maintain eucalypt forest in perpetuity there must be a severe bushfire at least every 300yrs throughout the landscape. To maintain eucalypt forest with hollows suitable for smaller arboreal wildlife in perpetuity there must be a severe bushfire at least every 150yrs in at least half the landscape. To maintain eucalypt forest in perpetuity for large hollow dependent fauna there must be a severe bushfire at least every 70-80yrs in at least a quarter of the landscape.
To maintain eucalypt forest in the landscapes burned by bushfires in 2019-20 there must be a return cycle of severe bushfire that is only decades long. This happened in many places this year - and also there are many places in the landscape still not burned - just waiting?

This is a difficult situation for a society to comprehend that has developed under Ecological Imperialist mores. How do we manage a landscape that should consistently turn charcoal black in significant parts at least every few decades?

The big answer for human safety is proper burning off for hazard reduction as outlined in section 3 above.

But we still also have to accommodate natural fauna populations including their social behaviour structures. This will require an acceptance that there will be losses of large population groupings in severe bushfires. It will require a strategic approach to ensure that the landscape and its burning off regimes are being managed to maintain suitable habitat refugia and viable populations across the landscape so that losses can be readily restored. I am sure there are sufficient personnel with the right skill sets and understanding to undertake this task in the various agencies, organisations and academia that feed this State. But they have to be willing to take on this type of management.

Thank you for the opportunity to make this submission.

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Charles Mackowski, [redacted] NSW, 17th April 2020.