

Submission Number: NND.001.00872

Submission Of: vic jurskis

Your Details

Email address:

Phone:

Preferred means of contact: Email

What is your submission based on? I am making this submission based on my professional knowledge, qualifications or experience or on behalf of a group or organisation

What is your area of professional expertise?

If you are lodging your submission on behalf of a group or organisation, what is the name of the group or organisation?

Your Submission

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

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

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

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

Do you agree to your submission being published? Yes I agree to my submission being published in my name

Supporting material provided:

submission to royal commission latest.docx

Attachment.pdf

The Commissioners,
Royal Commission into National Natural Disaster Arrangements

Dear Commissioners,

I am an ecological historian and author. I graduated as B.Sc. (Forestry) from ANU in 1976 and worked for NSW Forestry Commission in the full range of positions from fieldworker to senior manager until 2012. I was a member of bushfire brigades at Urbenville and Cobar from 1980 until 1987. I was in charge of fire research in southern NSW from 1987 to 1996 and fire management planning in Eden Region from 1997-2002. During this time I was often the Forestry Commission's regional controller on wildfires. From 2003 to 2012, I was Silviculturist across NSW Native Forests Division, with broad oversight of forest management including burning. I have experience in all aspects of fire management from the ground up.

When I started as a forester on the north coast, we used commonsense and matches to burn the bush when conditions were right. It was open and healthy and safe. Bellbirds Picnic Area was a popular attraction on the Mt. Lindesay Highway. The birds were a pleasant feature rather than a noisy plague, and there was a plaque inscribed with Henry Kendall's famous poem. Burning was increasingly restricted from the 1980s. Trees got sick, scrub grew up, psyllids irrupted and bellbirds feasting on psyllids bred into plagues.

Now we're spending millions of dollars on research to find out why bellbirds are supposedly causing psyllid plagues. Worse still, we're wasting billions of dollars on fire engines and waterbombers in futile response to unstoppable firestorms that inevitably explode in the scrubs when there's extreme weather. People are dying needlessly or losing their homes, as are countless numbers of wildlife. The academics and bureaucrats who are advising governments have got everything exactly back to front. I've watched helplessly as our beautiful healthy open forests turned to sick explosive scrub.

Now I'm forced to listen to these experts with wilderness between the ears preach to us about climate change. The largest single contribution to our recent *greenhouse* emissions has come from megafires that are a consequence of human neglect, not human economy.

I live in Eden and I stayed to defend my home during recent evacuations. We were lucky with the weather, but the problem is still there and growing all the time. When we inevitably get a strong northwest to southwesterly change with dry storms or other ignitions, our community will be devastated like so many others. I participated in your community forum at Mallacoota on 19th March.

Thank you for the opportunity to make a submission. I will address items b, d, e, f i, f ii, f iii and g of the matters listed in the Letters Patent (as paraphrased hereunder in relation to bushfires). I have cited only a few key references in my submission, to keep it brief and readable. I'm able to support all my statements with extensive citations from the scientific literature, and I would welcome the opportunity to give evidence and be cross-examined before the Commission.

WHEREAS Australia is experiencing an extreme bushfire season in 2019-2020, resulting in devastating loss of life, property and wildlife, and environmental destruction across the nation. ...

- a. the responsibilities of, and coordination between, the Commonwealth and State, Territory and local Governments*
- b. Australia's arrangements for improving resilience and adapting to changing climatic conditions*
- c. whether changes are needed to Australia's legal framework for the involvement of the Commonwealth*
- d. any relevant matter reasonably incidental to a matter referred to in paragraphs (a) to (c).*
- e. the findings and recommendations (including any assessment of the adequacy and extent of their implementation) of other reports and inquiries*
- f. ways in which Australia could achieve greater national coordination and accountability — through common national standards, rule-making, reporting and data-sharing — with respect to key preparedness and resilience responsibilities, including for the following:*

- i. *land management, including hazard reduction measures;*
- ii. *wildlife management and species conservation, including biodiversity, habitat protection and restoration;*
- iii. *land-use planning, zoning and development approval*
- g. *any ways in which the traditional land and fire management practices of Indigenous Australians could improve Australia's resilience to natural disasters.*

I must firstly note an inherent contradiction within the Letters Patent: Extreme bushfires are not natural disasters. Prehistory, history and physical sciences all confirm that extreme bushfires are a consequence of unnatural accumulation of three-dimensionally continuous fuels in the landscape. Aborigines didn't suffer disastrous bushfires. They survived more than 40,000 years of sometimes extreme climate change. This was explained in my submission to the superseded Inquiry into *land management and bushfires*, which is included as an Appendix to this submission. Fortunately, the fact that megafires are not natural disasters means that is entirely within our capability to prevent them.

Specific comments

Item a

No comment

Item b Improving resilience and adapting to climate change

Australia currently does not have effective arrangements for improving resilience and adapting to climate change in respect of bushfires or environmental management in general. On the contrary, most environmental regulations and so-called safeguards at all levels of government result in perverse outcomes for resilience and fire safety. They are based on *Terra Nullius* or the Wilderness Myth – a concept that was rejected by the High Court nearly 30 years ago. Active human input, especially frequent mild burning, is essential to maintain healthy, safe and diverse landscapes.

In the absence of mild fire, soils change, eucalypt roots deteriorate, canopies thin, and a relatively small range but large numbers of native and exotic pests proliferate and choke out biodiversity. Accumulation of three-dimensionally continuous fuel makes burning difficult or impossible under mild conditions, whilst unstoppable firestorms and long distance ember showers produce death and destruction in extreme weather. Governments' reactions are typically to devote ever-increasing resources to inevitably ineffective emergency response at the expense of sustainable land management.

In NSW, and perhaps to a lesser extent in other jurisdictions, it is effectively illegal to manage land sustainably using mild fire. For example, health, safety and biodiversity can be maintained in eucalypt forests by mild burning every three to six years¹, whereas the NSW *Bush Fire Environmental Assessment Code* specifies minimum intervals of ten years between fires in dry shrubby forests and thirty years in moist shrubby forests.

Nearly all eucalypt forests on public lands are shrub-invaded because of lack of mild burning and/or grazing. Moist, shrub-invaded forests are wrongly classified as wet sclerophyll forests by NSW National Parks and Wildlife Service and Rural Fire Service, resulting in impossible restrictions on mild burning. The rules and procedures for prescribed burning in NSW now virtually ensure moderate to high intensity hazard **production** fires in most cases. Regulations and procedures for burning have been developed by academics, bureaucrats and emergency controllers who have little or no experience or understanding of the use of fire to manage land. Theory and modelling have replaced empirical science and experience. Unstoppable megafires are the result.

More than fifty years of empirical data from operational prescribed burning in southwestern Australia showed a strong inverse correlation between the area subsequently burnt by wildfires compared to area treated beforehand by mild burning, provided that, on average, at least 8-10% of the forests had been burnt in preceding years. The relationship held, despite great variability in climate and in the area treated each

year, through a period of warming and drying climate. Burning reduced the number and the extent of wildfires, especially megafires.

In NSW, burning and grazing were progressively reduced from the 1980s as environmental protection was supposedly increased along with the area of conservation reserves. During the decade around the turn of the Millennium, 0.4% of the area of National Parks in NSW was treated annually, as was the same proportion of forest on all tenures in the Sydney Basin. More than 10 times the area was burnt each year by wildfires². However, after Canberra was devastated in 2003, the Nairn Inquiry was told by ██████████ of Wollongong University that “*broad scale hazard reduction is threatening biodiversity conservation and must therefore be avoided by land managers and resisted at a political level*”.

██████████ succeeded Whelan as NSW’s fire expert in charge of the Wollongong University research facility. Bradstock and his colleagues have published a model which supposedly shows that mild burning doesn’t improve fire safety in southeastern Australia because our forests are *biogeographically* different to those in southwestern Australia. They’ve used similar modelling to argue that prescribed burning in southern Australia can’t reduce greenhouse emissions from wildfires. The peer-review systems of several major scientific journals apparently missed the critical point that treating a miniscule proportion of the landscape can’t make any difference to resilience and fire safety.

Item c

No comment

Item d Relevant matters incidental to Item b

Please refer to the Appendix.

Item e Other Inquiries

Recent bushfire inquiries

In 2003 a Parliamentary Select Committee inquired into megafires which severely affected our National Capital together with about four million hectares across the continent. The Inquiry sat in many regional centres, so that rural communities were well represented in evidence and in the report’s recommendations.

The ACT, NSW and VIC Governments effectively boycotted the Inquiry. Consequently it reported that “*some significant questions cannot be answered; such as why ... management of fuel loads ... were not implemented to more effective standards*”. ██████████ reported that “*The committee heard a consistent message right around Australia – there has been grossly inadequate hazard reduction burning on public lands for far too long; local knowledge and experience is being ignored by an increasingly top heavy bureaucracy*”.

A dissenting report by a city-based Green member relied heavily on a submission from ██████████. The Council of Australian Governments (COAG) receives advice directly from the top-heavy bureaucracy criticised by ██████████ and was therefore disinclined to adopt his recommendations. Instead they employed ██████████ together with Professor of Forestry ██████████ and former Special Forces Officer ██████████, none of whom seem to have experience in forest management and prescribed burning, to conduct another inquiry. These men decided that education – “*learning to live with bushfire*” – was more important than reducing fuels; they claimed that we don’t really know how prescribed burning affects biodiversity across the landscape; and they added insult to injury by questioning the effectiveness of hazard reduction burning.

The COAG Inquiry unaccountably reported that “*Every State and Territory, together with relevant Australian Government departments, have contributed to the Inquiry in a positive and constructive manner. ... We did not hold public hearings. This was partly because the Select Committee of the House of Representatives tabled its report in October 2003—when this Inquiry commenced—having received over 500 submissions and having completed a series of public hearings and meetings. This Inquiry was able to draw both on the Committee report and its submissions. Other recently completed reports in Victoria and the Australian Capital Territory included extensive consultations and we benefited from their deliberations*”.

██████ successor Professor ██████ was cited 16 times in the report of the COAG Inquiry. Since then, he has received millions of dollars in State Government funding and has used totally unrealistic modelling to support his ideologies. Worse still, he's been promoted as an expert in the media and has been asked to give *independent* advice to the closed-door NSW Bushfire Inquiry. Apart from his apparent lack of experience in land and fire management, there would seem to be a potential conflict of interest.

The COAG Report effectively buried the major findings and recommendations of the House of Reps Public Inquiry, and once again took the focus away from sustainable management. It disturbs me that House of Reps Standing Committee on Environment and Energy's Inquiry into *Land Management Factors Contributing to the Recent Bushfires* has been overtaken by this Royal Commission. I understand that the States and Territories are primarily responsible for land management. However, they (especially NSW and VIC) have for many decades been derelict in this responsibility with respect to ecological maintenance by mild burning.

In the decade after the COAG Report of 2004 a further 186 human lives were lost, 173 of these in Victoria's Black Saturday fires on 7th February 2009. The toll has now reached more than 200. We have endured 15 years of ongoing disasters and escalating expenditure on emergency response as well as research by green academics. Untold environmental damage has been caused by megafires that were a consequence of unscientific and antisocial green theories and philosophies. Despite overwhelming evidence that prescribed burning maintains ecosystem health, resilience and biodiversity as well as fire safety, academics and bureaucrats still don't 'get it'³.

The 2009 Victorian Bushfires Royal Commission recommended a target of 5% of forests to be treated by prescribed burning each year. This was lower than the proportion needed to effectively reduce the occurrence and extent of megafires, but has in any case not been achieved. Victoria has now abandoned this low target in favour of an approach based on modelled risk, that has been developed by an academic. This approach of targeting some limited burning near human populations is scientifically and logically flawed and has been falsified by empirical data on many occasions. NSW's zoning system for prescribed burning is similarly flawed.

Item f i

greater coordination and accountability — national standards, rule-making, reporting and data-sharing — with respect to land management, including hazard reduction measures

The Commonwealth, States and Territories are signatories to the National Forest Policy Statement of 1992/5. This policy, based on Terra Nullius and the Wilderness Myth is the root cause of Australia's major socioecological crisis of forest decline, scrub invasion, pestilence, loss of biodiversity and megafires. It must be made right. It should be the basis for reinstating active adaptive management of all native vegetation across the landscape. Commonwealth environmental funding should be contingent upon states/territories signing off a new and effective forest policy. Bureaucratic box-ticking in State of the Forests Reports (SOFRs) should be replaced by critical analyses of performance against Montreal Criteria, especially Criterion 3 Ecosystem Health and Vitality. States/Territories performance should have consequences in terms of Commonwealth Funding.

Australia is part of the international Montreal Process that is supposed to monitor, assess and report management outcomes against principles of sustainable forest management. Unfortunately, a disproportionate amount of effort and expenditure goes into almost totally ineffective monitoring and reporting. There is virtually no critical assessment of the data and no consequences or improvements coming from the ponderous system.

Montreal Criterion 1 is *Conservation of Biological Diversity* and Indicator 1.1c is *Area of forest in protected area categories*. The *Rationale* is "This indicator uses the area and proportion of forest ecosystems reserved through formal and informal processes as a measure of the emphasis placed by society on the preservation of representative ecosystems as a strategy to conserve biodiversity". However 'Lock it up and let it burn' is obviously not an effective conservation strategy. Despite ever-increasing areas protected in reserves, there is

currently an Inquiry into *Australia's Faunal Extinction Crisis*. Designated land tenure is irrelevant to conservation. Land management is the critical factor.

Criterion 3 is *Maintenance of Ecosystem Health and Vitality*.

Indicator 3.1a is *Scale and impact of agents and processes affecting forest health and vitality*.

Over the course of five five-yearly reports, the latest in 2018 covering the period 2011/12 – 2015/16, there has been no quantitative information about the ever-increasing area of chronically declining forest in the absence of frequent mild burning. Worse still, the reports have not even recognised the scientific advances that have identified the fundamental problems and the simple solution⁴.

For example, from SOFR 2018:

A wide range of chronic or episodic crown dieback syndromes occur to some degree in native forests in all states and territories, often causing significant tree mortality and consequential ecosystem impacts. These events are usually caused by combinations of factors such as climatic stresses, poor land management practices, defoliating insect outbreaks, and an imbalance in insect predator levels. Canker-causing fungi ... and stem-boring insects ... can have a secondary role. In most cases, there is considerable uncertainty as to the actual mechanism by which the various proposed causal factors combine to produce the dieback syndrome.

Indicator 3.1b is *Area of forest burnt by planned and unplanned fire*.

This indicator was first introduced in SOFR 2008. Prior to that, no meaningful statistics were reported in SOFRs. In fact the standard of reporting regressed with the first SOFR in 1998: *“There are no consistent continental-scale data on the amount of forest burned annually by either bushfire or prescribed burning: statistics for this were reported until recently, but their collection was discontinued because of problems with consistency and meaning.”*

The Commission will no doubt receive many submissions pointing to empirical data from more than half a century of fire management in southwestern Australia. These data unequivocally demonstrate a close inverse correlation between planned fire and subsequent wildfire, providing that at least 8% of the landscape is treated. Similar relationships were evident in parts of NSW before burning was reduced to insignificant levels across most of the State.

Historic data clearly show that Indicator 3.1b is potentially a critically important indicator of the success or otherwise of land and fire management. Unfortunately its potential is not being realised because it is not being appropriately reported and analysed. In any case, there are no consequences for land managers arising from reporting of this indicator. For example, SOFR 2018 reveals that 106 million hectares were burnt between 2011/12 and 2015/16, of which 73 million hectares were burnt by wildfire and 33 million by planned fire. Clearly, we are not managing fire successfully. There was apparently a larger proportion of planned fire in WA than other States, but the proportions by jurisdiction or tenure – a vital measure of performance – weren't given.

The trends between 2001/2-2005/6 and 2011/12-2015/16 support historical data on the effectiveness of prescribed burning. For example, in NSW, burning doubled from a very low base whilst wildfire halved from a very high base. However, the lack of data from previous reports hides a decline in burning prior to 2001. In southwestern Australia, burning was substantially reduced from a high base whilst wildfire more than doubled from a low base. The fact that there was still a higher proportion of planned burning in the southwest than in other parts of Australia and a lesser total area of wildfire, highlights the cause of recent catastrophes in the east.

There is no reason that the data can't be presented as the proportion of forest burnt by prescribed fire or wildfire in each jurisdiction/tenure/biogeographical region during each five year reporting period and critically analysed to assess the performance of various land management agencies. Similarly, the data could be used to compare the impacts of the regulatory framework on prescribed burning of private lands under

the various jurisdictions. There seems little doubt this is generally constrained by regulations rather than unwillingness. Certainly, in NSW it is illegal to manage land sustainably using mild fire.

All Commonwealth funding for environmental management and for emergency response to wildfires should be contingent upon States' and Territories' performance as assessed according to Indicator 3.1b - properly reported and analysed.

Item f ii

co-ordination and accountability –wildlife management and species conservation, including biodiversity, habitat protection and restoration

This is essentially inseparable from the previous item. Ironically, the dominance of academic ecologists in debates about land and fire management has obscured any holistic appreciation of fire ecology. They have promoted a totally irrational concept that there is inherent conflict between fire protection and environmental conservation. Land managers haven't helped by promoting what they call *hazard reduction burning*. In a healthy and safe landscape maintained by frequent mild burning, biodiversity does not decline and hazards do not accumulate. Sustainable use of fire for landscape management is actually *ecosystem maintenance*.

Half a century ago, foundation Professor of Zoology at *Monash University* ██████████ attempted to explain our mammal extinctions in the following terms: “*It was the emergent skin hunters and timber traders who would be the first to do real damage. ... Soon, however was to come the Great Extermination*” for which ██████████ blamed ringbarking by graziers. But the trade in koala fur developed after koalas irrupted into plagues and two centuries of timber getting hasn't extinguished a single species of plant or animal in this country.

In 1990, ██████████ of *Australian National Parks and Wildlife Service* seemingly embellished this fable, telling us that we'd removed nearly two thirds of our tree-cover, causing the extinction of 18 mammals. However, 24 mammals became extinct during the 19th Century in far western New South Wales where there was virtually no forest and no clearing. These were small and medium sized animals that relied on a diversity of groundcovers, herbs and grasses for their existence. When European pastoralists disrupted Aboriginal burning, dense growth of tussocks, shrubs and trees choked out their food plants. We still had 88% of the treecover that had greeted whitefellas' arrival⁵ when ██████████ wrote his book. Three decades later, SOFR 2018 showed that our forest area had increased by four million hectares during the previous five year reporting period.

██████████ and colleagues at *Australian National University* claim that timber harvesting causes megafires and threatens old-growth mountain ash trees as well as Leadbeater's possum. In fact, megafires unleashed by attempted fire exclusion have killed nearly all the old-growth mountain ash trees and countless possums, just as they have the old snow gums in Kosciuszko National Park where there is no timber harvesting. ██████████ and others in the *Fenner School* advocate fire exclusion. If they have ongoing success, the next alpine megafire will probably extinguish the mountain pygmy possum and the corroboree frog. These species are naturally rare because they live in restricted habitats – alpine boulder fields and bogs. They weren't endangered in the past, because these habitats were protected from wildfires by mild burning across the landscape – originally by Aborigines who visited the Alps in summer to feast on bogong moths, and later by seasonal alpine graziers.

Since green academics and bureaucrats have succeeded in protecting these habitats from grazing and burning, they have been incinerated by a succession of megafires. After the 2003 alpine megafires, a former CSIRO scientist estimated that 370 million birds, mammals and reptiles were killed. The estimates from recent holocausts are much larger. Antisocial green propaganda, based on the wilderness myth, attributes all our imagined environmental woes to human activity. But people have been in Australia for at least 65,000 years. Before European occupation, Aborigines maintained ecosystems and biodiversity across the country with mild fire for at least 40,000 years.

When whitefellas disrupted Aboriginal management, species such as koalas that live in dense bush prospered. Species that rely on open sunny, airy, grassy bush declined. These are the truly endangered species, and the major threat to their survival is lack of ongoing human management in the form of mild burning. Our rarest and most endangered snake is a good example. The broad-headed snake became extinct in Ku-Rin-Gai Chase National Park where there hasn't been any clearing or development, because we 'protected' the bush from mild fire and turned it into homogenous scrub. The snake is now disappearing from Moreton National Park where scrub is shading out its basking areas.

The eastern brown treecreeper disappeared along with its open grassy habitat, when two State Forests in northwestern NSW were converted to National Parks and protected from grazing and burning. Hastings River mice survive in grazed and burnt forest, but have been lost from protected areas in National Parks in northeastern NSW where their grassy habitat has been choked out by scrub and overrun by bush rats and antechinus.

Koalas are only one of a wide range of native species that irrupt when we exclude sustaining fire and/or sow pastures, and our trees get sick. These include root pathogens such as *Armillaria* and *Phytophthora*, root parasites such as native cherries; various borers that attack sapwood (e.g. longhorned beetles blamed for Tuart decline in Western Australia); leaf eaters, including weevils (blamed for Monaro Dieback) and Christmas beetles (blamed for New England Dieback); and parasitic mistletoes and vines such as devil's twine. Sap-sucking psyllids irrupt and sometimes attract plagues of bellbirds. Invasive understoreys such as wattles, casuarinas, ti trees and pittosporum respond to increasing light and moisture as the trees decline.

Three dimensionally continuous fuels build up and forests become ticking time-bombs ready to explode in dry storms. Grazing of native pastures by domestic stock can sometimes perform an ecologically analogous function to mild burning, by suppressing growth of woody seedlings and maintaining nutrient cycles that favour established trees, herbs and grasses. Exclusion of grazing from new reserves or rural residential developments has exacerbated problems created by suppression of mild fire across the landscape.

High intensity fire regimes further promote irruptive species. For example, koalas breed up very quickly. Supposedly the most important natural Victorian population, in the Strzelecki Ranges, has survived twenty megafires in 200 years including Black Thursday 1851, Red Tuesday 1898, Black Friday 1939 and Black Saturday 2009. Koalas are still there in plagues.

After the recent megafires, our Federal Environment Minister apparently held meetings about wildlife rescue and habitat restoration, announcing lots of funding. It would be far more productive of improved conservation outcomes if the Commonwealth environmental bureaucracy was directed to turn its attention to restoring a healthy, safe and diverse landscape by compelling the states and territories to reinstate sustainable fire regimes.

Item f iii ***co-ordination and accountability - land-use planning***

Like our National Forest Policy, standards and rule-making for land management, planning approvals and zoning are based on the wilderness myth. Consequently, they almost invariably lead to reduced resilience. For example there is a myriad of rules around protection of unnaturally dense, homogenous and unhealthy vegetation, which contribute to eucalypt decline, loss of biodiversity, megafires and huge emissions of greenhouse gases.

The situation with regard to National co-ordination, accountability and rule-making in respect of koala conservation makes an interesting case study⁶. Koalas are rare in healthy native forests. Where they are plentiful, their numbers must inevitably crash and fires will inevitably explode. In 1992, NSW listed the koala as a vulnerable species when it was actually irrupting throughout its range. In 2011 a Senate Inquiry reported: "*It is estimated that the koala population prior to European settlement was in the order of up to 10 million koalas*". (The estimates are based on records from the harvest period a century after European settlement, following massive irruptions of koalas.) Consequently, in 2012, the Commonwealth Scientific Committee listed the koala as a vulnerable species in ACT, NSW and QLD, but not in VIC or SA.

In 2016, NSW Chief Scientist conducted an *Independent Review into the Decline of Koala Populations in Key Areas of NSW*. The report merely parroted misinformation from academics and bureaucrats. (Ex-Chief [REDACTED] is now one of two heading the closed-door NSW Bushfire Inquiry). In 2018, NSW announced a \$45 million Koala Strategy with a major focus on reserving land. Koalas are actually irrupting in coastal and tablelands forests, and thousands were burnt in the recent megafires. There have already been calls to list them as endangered. On past performance it seems highly likely that this will happen at State and Federal level for NSW.

The problem is not lack of National co-ordination, but lack of accountability. There is too much co-ordination because the Commonwealth bureaucrats accept the advice of the state bureaucrats and academics without any independent scientific assessment. Thus we have the ridiculous situation where a single irruptive species is either listed as rare and endangered or not listed, in different jurisdictions.

Item g

ways in which the traditional land and fire management practices of Indigenous Australians could improve Australia's resilience to bushfires

Australia's foremost Traditional Burning expert, [REDACTED], understandably criticises what he calls *Western Science*, because academics have promoted the illusion of conflict between burning for property protection and sound environmental management. He explicitly promotes an holistic view⁷. Fairdinkum science fully supports Traditional Knowledge in this respect³. Steffensen talks of "*upside-down country – thin on top and thick underneath*" and "*damp soils, lazy roots and sick trees*". This has all been confirmed in numerous scientific studies of eucalypt decline in the absence of mild burning⁴.

[REDACTED] rightly criticises modern prescribed burning practices. He has probably not been exposed to skilful burning carried out by experienced *western* practitioners. As he says, they are mostly gone. Those who are left have been drowned out by academics, bureaucrats and emergency firefighters who mostly have no experience or understanding of fire as a friend in caring for country.

After European – trained foresters tried to suppress fires in the early 20th Century, highland forests of southeastern Australia were devastated by plagues of phasmids from the 1940s to the early 1960s. Thousands of hectares of hydroelectric catchments were aerielly sprayed with dangerous insecticides in diesel fuel. Psyllids plagued forests in coastal New South Wales, so bellbirds irrupted and extended their range. At the same time, koalas, thought to have become extinct in NSW by the 1920s, began to *reappear*, i.e. to irrupt. Disastrous megafires occurred.

Foresters belatedly realized the futility and destructiveness of attempted fire suppression. In 1951, The Hume-Snowy Bushfire Prevention Scheme was established to protect hydroelectric catchments, timber and pastures in New South Wales' Alps using prescribed burning. In 1961, the Dwellingup Megafire burnt hundreds of thousands of hectares of forest and destroyed four towns in Western Australia. Trials of aerial ignition were initiated in 1965 to improve the extent and efficiency of prescribed burning.

These trials extended to the Australian Alps and east coast hinterland by 1967/8. An aerial burn saved Bega from wildfire during the following fire season when over a million hectares were burnt, 14 people were killed, and more than 150 homes and buildings were lost in other parts of NSW. Forest health, structure and fire safety temporarily improved. No significant occurrences of chronic eucalypt decline or pest outbreaks were reported in New South Wales' State Forests for the next quarter of a century.

Aerial ignition was developed on sound scientific principles. These are the same principles that underpin Traditional Aboriginal Knowledge. Whether black, white or brindle, we all learn by observing, thinking, testing and modifying. Science is trial and error. Traditional knowledge is well-developed science. Fire science can only be done in the bush with hands-on experience. What [REDACTED] calls *Western Science* is rubbish produced by computer models based on false assumptions by academics with no experience and closed minds.

Aerial ignition is planned according to local knowledge of fuels (quantity, distribution, moisture content). Rate of spread can be confidently predicted. Spot ignition is prescribed at a spacing that will allow spots to coalesce as humidity increases and temperature declines at the end of the day. Exactly the same principles apply to ignition on the ground using the firestick. Steffensen points out that all manner of wildlife can escape the low, slow-moving flames and move back into mildly burnt or unburnt areas. Aborigines burnt without boots or overalls, let alone fire tankers.

Traditional knowledge and science inform us that the landscape should be gifted with fire progressively as fuels develop and cure, and the vegetation becomes receptive. Fire should be applied firstly in exposed areas, in spots lit progressively into the wind. Hilly country needs lighting from the top down, and fire should be extended to sheltered aspects and gullies as they warm and dry. Unfortunately, fire management is now regulated by emergency junkies who seem to prefer hugely expensive and ineffective water bombing operations during disasters, rather than cheap, efficient and safe aerial delivery of sustaining fire to maintain healthy landscapes and prevent disasters.

There is no real difference between traditional knowledge and science. When foresters worked in the bush, we knew when country was ready and safe to burn. Nowadays, large blocks are planned, from the office, for burning years later. Long lines of fire are lit around perimeters, attaining maximum rates of spread and intensities within minutes. They are often lit from the bottoms of slopes and across the wind, just wherever the boundary track happens to be. Canopies are scorched, trees are burnt down and understories are thickened by dense germination and resprouting. These dangerous and destructive practices are self-fulfilling green academics' prophecies that burning is bad for the environment.

I'm sick of hearing that we can no longer apply mild fire because climate change is closing the window of opportunity. When I started as a forester on NSW north coast, burning was easy and safe and enjoyable. We didn't have written plans and rules and regulations and perimeter tracks and drip torches and fire engines. We used commonsense, matches and suitable weather conditions in a healthy and safe landscape. It is the development of 3D continuous fuels with lack of burning that is closing the window, not climate change.

Dense scrubby forests won't burn under mild conditions, except in a drought. But they explode in severe conditions causing firestorms and ember showers that destroy lives and homes of people and animals, generating untold carbon emissions. The more mild fire we apply, the easier and safer and more environmentally friendly it gets. Foresters proved that fifty years ago, only forty thousand years after Aborigines established mild burning as the basis for their culture and economy.

These days, there are objections to burning because of dangerous smoke levels. I have no expertise in the composition or health impacts of smoke. I know that I never felt sick from breathing smoke from mild burns or even from wildfires in well managed forests. After scorched leaves rained on Eden recently and we were blanketed by smoke from distant fires for days on end, I felt constantly sick. Dirty fine particles covered everything outside and permeated through our closed house and sheds. Most prescribed burning these days is akin to wildfire – too hot and dirty, consuming green fuels including woody material.

█ talks of *white medicine smoke* from *the right fire*. Most people these days are familiar with Aboriginal *smoking ceremonies*. Aboriginal people burnt all year round, whilst modern prescribed burning mostly occurs when weather that produces inversion layers trapping smoke is highly probable. I'm sure that modern science would be able to confirm that smoke from moderate or high intensity fires in unnaturally heavy green fuels is much more dangerous than *medicine smoke* from *the right fire*. But first we need to reinstate *the right fire* across Australia.

It's a huge task but it has to be done. Thankfully, Traditional Knowledge and fairdinkum modern science are showing us the way. Ignition by helicopter and firestick has successfully reintroduced *the right fire* to nearly three million hectares of West Arnhem Land by progressive burning as fuels gradually dry across the landscape. Over seven years from 2005 traditional burning not only enhanced resilience, biodiversity and the regional Aboriginal socioeconomy, but also reduced emissions of greenhouse gases by a third compared to

the ten year baseline period of conflagrations late in the dry season. This modern traditional management is funded by ‘carbon credits’.⁸

The massive *greenhouse* emissions from our recent unnatural disasters are not counted in formal accounting because they are deemed to be natural, whereas prescribed burning is counted as unnatural. Modern traditional burning could be used in southern Australia in the same way as it is in the north. Experts such as Bradstock tell us it can’t work. Prehistory and history show us that it can and did work for a very long time.

When Aborigines were managing the Sydney Basin during the Settlement Drought in 1792, Europeans experienced bushfires under extreme weather conditions – low humidity, scorching northwesterly gales and mid-forties temperatures. They were able to control these fires with minimal losses using handtools and green branches because the bush was open and healthy and clean. There were no firestorms. It’s quite different there today, where we’ve recently had the world’s largest ever wildfire from a single (natural) ignition in the *Wilderness*. Our ecosystems need people.

The Commonwealth must recognise the Traditional Knowledge of all people having a genuine connection with the land and long experience in using fire to maintain the landscape – Aboriginal people, pastoralists and foresters. It is nearly too late.

Vic Jurskis
27 April 2020

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The efficacy of past and current land management in influencing wildfire regimes and consequent risks to people, the environment and the economy.

Palaeological Evidence

The earliest known evidence of human occupation in Australia dates to about 65,000 years ago (Clarkson *et al.* 2017). Sediment cores typically show peaks in charcoal and changes in vegetation, which cannot be explained by climate change, around 40,000 years ago, when substantial evidence of human occupation starts to appear in archaeological records (e.g. Sing *et al.* 1981; Kershaw *et al.* 2002, 2006; Prideaux *et al.* 2010). Recently, the authors of a synthesis of charcoal studies reported that there was no such peak coincident with human arrival at 50 +/- 10 ka, but that charcoal increased and decreased with cyclic global warming and cooling as evident in ice cores from Greenland (Mooney *et al.* 2011; p. 28, Fig. 3).

However, during the last 70,000 years, two peaks in charcoal deposition, suggestive of massive burning, did occur across Australia around 41,000 years ago on a geological time scale and around 38,000 years ago on a millennial time scale (Mooney *et al.* 2011, Fig. 2). Also, there was a trend of increasing charcoal deposition between about 50,000 years ago and 40,000 years ago that does not correspond with any trend in temperature indices from Greenland and runs counter to the trend of decreasing temperature indices from Antarctica (Mooney *et al.* 2011, Fig. 2, 3; Johnson 2016). Pertinent to discussion of cause and effect, there was an exceptional spike in biomass burning evident in charcoal deposition after European occupation of Australia, followed by a sharp decline from the mid Twentieth Century coincident with widespread use of prescribed burning (Mooney *et al.* 2011, Fig. 5).

Palaeoclimatic and palynological data from Tasmania and New Zealand show that vegetation changed differently during the last glaciation in Tasmania than it had during three prior glaciations, and during all four glacial cycles in New Zealand. Twice as much open vegetation developed under the influence of Aboriginal burning as would be expected based on climate alone (Jackson 1999). A comparison of soil development under the influence of Aboriginal burning against soil development in New Zealand where people had not yet arrived, showed that the firestick created infertile, poorly drained soils which supported a distinctive, hard-leaved pyrophilic woody flora (McIntosh *et al.* 2005).

On the Atherton Tableland in North Queensland, greatly increased fire activity relative to climate converted araucarian dry rainforest to grassy sclerophyll woodland between about 40,000 and 28,000 years ago. By the end of this period, charcoal deposition had declined to relatively low levels despite the dry climate. About 10,000 years ago, rainforest began to recolonize the Tableland as climate became warmer and wetter. Charcoal increased as rainforest reinvaded the sclerophyll woodland. When it became too wet to burn (> 2300mm annual rainfall), charcoal again declined to low levels (Singh *et al.* 1981, Kershaw *et al.* 2006, Jurskis 2015).

In this same area, from about 43,000 years ago, fungal spores, presumed to be from megafaunal dung, decreased in proportion as charcoal increased over about 3,000 years (Rule *et al.* 2012; Figs. 1, 2). Studies of the carbon isotopic composition of fossil eggshells and teeth indicate that emus and wombats adapted to a poorer diet after Aboriginal burning eliminated mesic vegetation, whereas another large bird, *Genyornis*, was unable to adapt (Miller *et al.* 2005). Megafaunal extinctions in southwestern Australia coincided with human arrival and with increased fire activity relative to climate (Prideaux *et al.* 2010).

There is virtually no evidence of Aborigines hunting megafauna, even though there is evidence of megacarnivores preying on megaherbivores where they coexisted with Aborigines (Prideaux *et al.* 2010). Eggshells apparently scorched in campfires suggest that Aborigines ate eggs of the extinct *Progura/Genyornis* as well as the extant emu (Miller *et al.* 2016). By contrast, in New Zealand, where Maori hunted another giant bird to extinction, there are hundreds of known cooking sites containing the remains of up to tens of thousands of moa (Flannery 1994).

After Kangaroo Island was separated from the mainland by rising seas, the last known date of Aboriginal occupation was about 4000 years ago. There was a spike in charcoal and an abrupt change in vegetation around this time, that was attributed to marginally drying climate. A large, sustained increase in charcoal from 2500 years ago indicated infrequent high intensity fires with considerable accumulation of fuel between them. This was attributed to cessation of Aboriginal burning (Singh *et al.* 1981). A more plausible scenario, in my opinion, is that high intensity fires initiated vegetation change after the demise of Aborigines about 4000 years ago, and dense eucalypt forest developed during the succeeding millennium (Jurskis 2015). In any case, Flinders (1814) saw dense forest and clear evidence of infrequent high-intensity lightning fires on this uninhabited island in 1802.

European explorers and naturalists found evidence of recent vegetation change where Aboriginal populations had been reduced or eliminated by diseases (Jurskis 2015). For example, G.A. Robinson wrote that many districts of northeastern Tasmania had been taken over by dense underwood after the demise of local Aborigines (Flood 2006). Strzelecki (1845) battled through 80 kilometres of almost impenetrable scrub in South Gippsland, where Aborigines had been eliminated by smallpox and tribal warfare before European settlement (Wesson 2000, Flood 2006). When settlers cleared the scrub, they found stone axes, grindstones, and clay cooking ovens indicating that it had grown up after the demise of the local tribes (Howitt 1891). The size of the largest young eucalypts in the scrub indicated that it dated from a megafire about 30 years after the smallpox epidemic of 1789 (Coverdale 1920).

E.M. Curr (1883) described some small scrubs that had grown up on Murray River floodplains after local tribes were scourged by smallpox, and he independently deduced the time of the epidemic from the size of trees growing in abandoned cooking ovens. Extensive dense scrubs observed by Mitchell (1848) in central Queensland apparently grew up after Aborigines were reduced by smallpox, because their distribution and extent cannot be explained by environmental factors (e.g. Pyne 1991 cf. Jurskis 2015). Traditional Aboriginal Knowledge indicates that current widespread eucalypt decline, shrub invasion and high intensity wildfire are consequences of lack of burning. Victor Steffensen (pers. comm. 2016) summarises the problem as “upside-down country – thin on top and thick underneath”.

Mild burning of open vegetation produces little charcoal and few fire scars because most seedlings are killed and relatively little woody material accumulates. Fire intensity and residence time are relatively low in light fuels composed of litter and grasses, so that heavy fuels, such as large fallen timber and standing green trees are not readily ignited (e.g. Burrows *et al.* 1995). Charcoal deposition indicates the quantity of biomass burnt (e.g. Mooney *et al.* 2011), not the extent or frequency of fire in the landscape.

Charcoal concentration in sediment cores provides a coarse surrogate for the prevalence of high intensity fires burning dense woody vegetation. The spikes in charcoal concentration

within numerous sediment cores around 40 thousand years ago suggest a widespread increase in burning of woody biomass. (Singh *et al.* 1981; Kershaw *et al.* 2002, 2006; Prideaux *et al.* 2010; Mooney *et al.* 2011, Fig. 2). It is likely that the original Australians occupied grassy areas and extended them by pushing fire into thick woody vegetation (Jurskis 2015).

Johnson (2016) attributed lack of spikes in charcoal concentration around the same time, at four dry and/or cold sites, to absence of burning by people. However, these sites were not dominated by woody vegetation, and were therefore relatively unproductive of charcoal, whatever the fire regime. One of these sites, showing no change in charcoal or vegetation (Turney *et al.* 2008), was in Tasmania, where widespread changes in fire regimes, vegetation and soils after human arrival have been well documented (Jackson 1999, McIntosh *et al.* 2005). Declines in charcoal concentration after spikes at other sites were associated with changes in vegetation such as increases of grasses or chenopods at the expense of woody vegetation (e.g. Singh *et al.* 1981, Rule *et al.* 2012, Johnson 2016).

Aborigines ate big birds' eggs, but there is no evidence that they killed or ate megafauna. Also, there is no evidence that vegetation changed as a consequence of megafaunal extinctions before biomass burning increased. Sediment cores indicate a continental increase in burning of woody vegetation around the time of Aboriginal influx/proliferation, followed by a widespread change from dense mesic vegetation to grassy ecosystems with sclerophyll trees and shrubs. Aboriginal occupation of the continent was neither instantaneous nor uniform. Nevertheless, widespread Aboriginal burning exterminated most of the megaherbivores by eliminating their browse or, possibly in some cases, their shelter. Megacarnivores disappeared with their prey. Open grassy ecosystems dependent on human input of mild fire became widely established. After this, less woody vegetation was burnt until Aboriginal burning was disrupted by European settlers.

European explorers and pioneering pastoralists described frequent mild burning of mostly open grassy ecosystems by Aboriginal people (e.g. Tench 1795, Flinders 1814, Darwin 1845, Mitchell 1848, Curr 1883, Howitt 1891, Pyne 1991, Gammage 2011, Jurskis 2015). On the other hand, Mooney *et al.* (2011) compared a rough index of human occupation from archaeological sites in the arid zone against charcoal in sediment cores mostly from the humid zone. They claimed a lack of correlation as proof that Aborigines did not influence fire regimes. Apart from the geographical separation of the independent and dependent variables, and the scarcity of dated Aboriginal sites 'prior to ca. 20 ka' (Mooney *et al.* 2011; p. 38, Fig. 7), the analysis was invalid because charcoal deposition cannot be used as a measure of Aboriginal burning in open grassy ecosystems.

Historical Evidence

An outstanding spike in biomass burning during 70,000 years of records occurred after European settlement. It is clear that woody thickening and intense fires consequent to disruption of Aboriginal burning fueled megafires that produced unprecedented amounts of charcoal (Mitchell 1848; Mooney *et al.* 2011, Fig. 5; Jurskis and Underwood 2013). For example, high intensity fires burnt 5 million hectares of Victoria in 1851 only two decades after Europeans began to disrupt Aboriginal management (Adams and Attiwill 2011, Jurskis 2015). After Europeans arrived, woody thickening, megafires and pestilence occurred firstly when Aboriginal burning was disrupted, and secondly when foresters attempted to suppress fire.

State forest services were established in the early 20th Century by European-trained foresters imbued with the principles of Colonial Forestry, especially fire suppression (Underwood 2013). Consequently, woody thickening and accumulation of three-dimensionally continuous fuels led to disastrous megafires, as well as to chronic decline of eucalypt forests and outbreaks of arbivores (Jurskis 2015). In 1939, the Black Friday megafires killed 77 people, burnt two million hectares of Victoria and southeast New South Wales, and destroyed 69 sawmills.

Despite the extreme weather conditions, many fires in far East Gippsland at the same time caused little damage. Forests east of the Snowy River were mostly controlled by the Lands Department and routinely burnt by graziers, keeping them open, healthy and safe (Attiwill *et al.* 2009). John Mulligan was there. His family wasn't worried, even when his uncle's car repeatedly stopped because of vapour locks in the fuel lines with the extreme heat (John Mulligan, East Gippsland Wildland Fire Taskforce pers. comm. 2018). A map of the fires in Victoria shows a striking contrast. A million hectares of unbroken fire extended from the Murray River north of Corryong and southwesterly along the Great Dividing Range to Melbourne. However the 14 'large' fires mapped in far East Gippsland were miniscule in proportion (Luke and McArthur 1978; p. 308, fig. 23.2).

In the absence of mild burning, highland forests of southeastern Australia were devastated by plagues of phasmids from the 1940s to the early 1960s (Campbell 1966). Thousands of hectares of hydroelectric catchments were aerially sprayed with dangerous insecticides in diesel fuel to control the stick insects (Campbell and Hadlington 1967, Jurskis and Turner 2002). At the same time, psyllids plagued forests in coastal New South Wales and bellbirds responded to the increased food resource by irrupting and extending their range (Moore 1961, Jurskis and Turner 2002). Foresters belatedly realised the futility and destructiveness of attempted fire suppression.

In 1951, The Hume-Snowy Bushfire Prevention Scheme was established to protect hydroelectric catchments, timber resources and pastures in New South Wales' Alps using prescribed burning (Jurskis *et al.* 2006). In 1961, the Dwellingup megafire burnt hundreds of thousands of hectares of forest and destroyed four towns in Western Australia. Trials of aerial ignition were initiated in 1965 to improve the extent and efficiency of prescribed burning in Western Australia. These trials extended to the Australian Alps and east coast hinterland by 1967/8 (Underwood 2015). An aerial burn in autumn 1968 saved Bega from wildfire during the following fire season (Cheney 2015) when over a million hectares were burnt, 14 people were killed, and more than 150 homes and buildings were lost in other parts of NSW (Adams and Attiwill 2011).

After foresters reinstated mild fire, forest health, structure and fire safety temporarily improved (Jurskis *et al.* 2003, 2006; Jurskis 2005; Sneeuwjagt 2011). No significant occurrences of chronic eucalypt decline or pest outbreaks were reported in New South Wales' State Forests for the next quarter of a century (Jurskis *et al.* 2003). In Western Australia, an outbreak of gum leaf skeletoniser across 90,000 hectares of southern jarrah forest in the 1980s had little or no impact on areas that had been deliberately burnt up to three years earlier. Burning didn't directly control the insects (Farr *et al.* 2004), rather it maintained resilience of trees (Jurskis 2005).

There was a pronounced general decline in charcoal deposition (Mooney *et al.* 2011, Fig. 5). Half a century of data on the efficacy of broadscale prescribed burning in southwestern Australia showed a strong inverse correlation ($R^2 = 0.77$) between area subsequently burnt by wildfires compared to area of prescribed burning, provided that, on average, more than 10% of

the forests had been burnt in a few preceding years. The relationship held, despite great variability in climate and in the area treated each year, through a period of warming and drying climate (Boer *et al.* 2009; Adams and Attiwill 2011, Fig. 7.1; Sneeuwjagt 2011; Burrows 2016).

Burning reduced the number and the extent of wildfires, especially megafires (Boer *et al.* 2009). From 1962-1990, the mean annual area burnt by prescribed fire and wildfire was 12.5% and 0.3% respectively. From 1991-2012, the mean treated area fell to 6.6% and, despite superior detection and suppression capability, the area burnt by wildfire increased almost four-fold to 1.1% (Burrows and McCaw 2013). From 2011- 2015, the annual area treated declined to ~3.5% whilst the area burnt by wildfire increased threefold to ~3.1% (Burrows 2016).

Three percent of State Forest in New South Wales was treated annually by prescribed burning in the decade to 2003 and a slightly smaller area was burnt by wildfires. Burning occurred mainly in coastal areas where a substantially higher proportional area was burnt. During the same period, 0.4% of National Park was treated each year whilst twelve times the area (2.5 million hectares) was burnt by wildfires (Jurskis *et al.* 2003). Between 1997 and 2006 an average of 0.4% of the Sydney Basin was treated by prescribed burning each year whilst 4.2% was burnt by wildfires (Penman *et al.* 2011).

From about 1980, ecologists with no experience of mild burning had raised concerns that it would eliminate plants and animals which had thrived during millennia of Aboriginal burning. The silly idea that life histories of supposedly fire-sensitive plants should be used to determine intervals between prescribed fires was readily accepted. NSW NPWS eventually produced *Guidelines for Ecologically Sustainable Fire Management* that specify “*acceptable fire intervals*” for all types of vegetation..

Prescribed burning was progressively reduced (Jurskis *et al.* 2003, Boer *et al.* 2009, Sneeuwjagt 2011, Burrows and McCaw 2013) and ecosystem health and safety declined as a consequence. For example, after strategic burning and fire suppression were introduced to National Parks around Sydney, biomass accumulated, biodiversity declined, disease flourished and a vicious circle of high intensity fire was initiated (Jurskis and Underwood 2013). Megafires now occur in southern Australia nearly every year and almost two hundred human lives have been lost in the new millennium (Adams and Attiwill 2011, Jurskis 2015). Chronic eucalypt decline is now widespread along with irruptions of arbivores including psyllids, beetles, weevils, caterpillars, fungi, koalas, possums, mistletoes and parasitic shrubs and vines (Jurskis and Turner 2002; Jurskis 2005, 2015).

About 20% of forests and woodlands on New South Wales’ coast were declining in health by 2010 (Jurskis and Walmsley 2011) and the proportion is increasing rapidly as frequent mild burning has disappeared in accordance with the *Guidelines* and the *Bush Fire Environmental Assessment Code*. Despite the Millennium Drought in the first decade, spotted gum and blackbutt forests on well drained sites were not declining. Now all types of forest are chronically declining. More than 50% of eucalypt ecosystems in Queensland’s Wet Tropics World Heritage Area were affected by 2014 (Stanton *et al.* 2014). Things are just as bad in NSW and VIC.

Over the past few years, yellowing of foliage of burrawangs and banksias became apparent in southern coastal NSW and East Gippsland. Recently, with another severe drought, these

normally extremely drought tolerant species are dying en masse whilst on the same sites invasive rainforest species such as figs, pittosporum, pencil cedars and blueberry ash remain healthy. It seems to me that Phytophthora is responding to deterioration of roots of the drought tolerant species consequent to soil changes in the absence of mild fire. Meanwhile NSW continues to spend millions of dollars on various investigations of various so-called diebacks which are simply variants of chronic decline consequent to lack of mild burning. Each individual symptomatic pest, parasite or disease attracts its own specialist researchers with their own extravagant and wasteful funding by taxpayers (Jurskis in press).

Planning, Approval and Operational Problems

The situation is much worse now than it was 50 years ago, when foresters applied real adaptive management. Well managed forests with healthy trees are very rare. In NSW, it is illegal, in practice, to manage forests sustainably using frequent mild fire. In the vast majority of eucalypt forests, health, safety and biodiversity can only be maintained by mild burning about every three to six years (Jurskis 2011). However, the *Bush Fire Environmental Assessment Code (BFEAC)* specifies minimum intervals of ten years between fires in dry shrubby forests and thirty years in moist shrubby forests (incorrectly described in the *Guidelines, Code* and related literature as wet sclerophyll forests (Jurskis 2015)). Virtually all eucalypt forests on public lands are shrub-invaded because of lack of mild burning and/or grazing. Recent LIDAR surveys on the north coast of NSW showed that a third of the State Forest area had impenetrable understoreys (J. Black, Forestry Corporation pers. comm. 2019).

The rules and procedures for burning in NSW now practically ensure moderate or high intensity burns in most cases. Fuel accumulates more rapidly after intense fires. Following the prescribed interval between burns, fuel and scrub development is such that mild burning according to regulations and routine practices is almost impossible. Nevertheless, large blocks are planned from the office for burning in later years. Long lines of fire are lit around perimeters, reaching maximum rates of spread almost instantaneously (Jurskis 2015, p. 190). Lines are often lit from the bottom of slopes and across the wind. Canopies are scorched, trees burn down and understories get thicker as a result of dense germination and resprouting.

Academics who have no experience and no idea how to use mild fire say that we can no longer apply it because climate change is closing the window of opportunity. When I started working in the bush on NSW north coast in the late 1970s, burning was easy and enjoyable. We used commonsense, matches and suitable weather conditions in a healthy and safe landscape. The development of 3D continuous fuels with lack of burning is closing the window. Dense scrubby forests won't easily burn under mild conditions, but they explode in severe conditions causing firestorms and ember showers that destroy lives and homes of people and animals, producing huge carbon emissions. The more mild fire we use, the easier and safer and more environmentally friendly it becomes.

Traditional knowledge and science both indicate that mild fire should be applied progressively as fuels develop and cure. In thick forests it should be applied firstly on high and dry sunny ridgetops, using spots that gradually coalesce whilst humidity increases as the sun goes down. Spots should be lit progressively into the wind (Jurskis 2015, Underwood 2015). Hilly country needs lighting from the top down, and fire should be extended to sheltered aspects and gullies as they warm and dry. However fire management is now over-regulated by emergency services, so we have hugely expensive and ineffective water bombing operations in response to disasters, rather than cheap, efficient and safe burning, including aerial delivery of fire, to sustain healthy and safe landscapes.

The Science

Physics

In 1968, Athol Hodgson who later became Chief Fire Officer in Victoria published an article in the *American Journal of Forestry* which explained the basis of *Control Burning in Eucalypt Forests*:

“Doubling the available fuel usually doubles the rate of spread of the fire and increases its intensity fourfold. Control is made extremely difficult by mass short-distance spotting from stringybark fuel and spectacular long-distance spotting from candlebark fuels. Control burning over large areas ... cheaply and effectively reduces the incidence of high intensity wildfires and minimizes damage”.

Firebreaks, so-called asset protection zones and waterbombers don't work because of long-distance delivery of ember showers by fire storms exploding in 3D fuels during extreme weather. Boer *et al.* (2009) reported that burning at a landscape scale effectively reduced risks for six years.

Ecology

Academics have promoted a concept that there is conflict between hazard reduction burning and nature conservation. In fact, ecosystem health and safety are two sides of a coin when there is mild burning throughout the landscape. In fire studies at Eden, groundcover species richness started to decline within 3 or 4 years of mild fire (Penman *et al.* 2008, Fig. 4c; Penman *et al.* 2009, Fig. 1a) and declined by 6 species over 20 years after wildfire (Penman *et al.* 2009 Fig. 1a). Shrub species richness increased by only 2 species over 15 years after wildfire (Penman *et al.* 2009, Fig. 1a), whilst shrub density increased by 1500 stems per hectare over 20 years (Penman *et al.* 2009, Fig. 2). In the same forests, substantial accumulation of soil nitrogen occurs after 10 years without mild fire and the carbon/nitrogen ratio is reduced causing increasing acidity and nutrient imbalances that are harmful to eucalypts and consequently promote shrub development (Turner *et al.* 2008).

These changes are exacerbated by microclimatic changes associated with shrub development such as increased shading and topsoil moisture (Jurksis *et al.* 2011) and by proliferation of N-fixing shrubs such as acacias and casuarinas (Turner *et al.* 2008). Fire ecologists typically report that burning depletes soil N because they compare levels in frequently burnt areas against long unburnt 'controls' where N has accumulated over several decades (Turner *et al.* 2008, Jurksis *et al.* 2011). Based on rates of N accumulation in the absence of fire, and N removal by prescribed burning, Turner *et al.* (2008) suggested that an interval of about 5 years between fires would maintain dynamically stable nutrient cycling processes and healthy forests. This is similar to the interval that would maintain competitive interactions supporting maximum plant diversity and minimum shrub cover according to the data of Penman *et al.* (2008, 2009).

Ecosystem Health and Safety

Since the three aspects of fuel/vegetation mass/structure, competition between plants, and nutrient cycling are inextricably linked, it is not surprising that they point to similar fire intervals (3-6 years) to maintain biodiversity, health and fire safety of eucalypt forests (Jurksis 2011).

Traditional Knowledge

The science is consistent with estimates of pre-European fire regimes derived from a combination of dendrochronology, sedimentary charcoal, grasstree records and historical accounts (e.g. Mitchell 1848, Curr 1883, Howitt 1891, Burrows *et al.* 1995, Ward *et al.* 2001, Abbott 2003, Hassell and Dodson 2003).

Politics, Policy and Legislation

Under New South Wales' *Bushfires Act* of 1949, as amended after each major fire event up to and including 1994, fire management on private, leasehold and vacant crown lands was the responsibility of volunteers under a very lean bureaucracy supported by local government. It was coordinated across the State by the Bush Fire Council in Sydney including ex-officio members from public land management and other agencies. Naturally, equipment, training, performance and coordination between agencies varied widely across the State. Assistant Forestry Commissioner [REDACTED] and Fire Management Officer [REDACTED] were ex-officio Councilors and had been working on thorough reform of the legislation to improve overall standards of fire management and hazard reduction. The Coalition Government was receptive and the 1994 disaster gave impetus to the process (Jurskis 2015).

Fahey's Coalition Government was defeated by Carr in 1995 and the proposed reforms were modified. The Rural Fires Act of 1997 came with a proviso that the objects relating to fire management were to be pursued "*having regard to the principles of ecologically sustainable development*". Nature Conservation Council (NCC), was given a privileged position on the Bush Fire Coordinating Committee, ensuring that these principles would be misconstrued to interfere with sustainable management. This was after the High Court's Mabo decision which, by rejecting *Terra Nullius*, should have set the scene for responsible land management. However our National Forest Policy promotes wilderness, and NSW Wilderness Act was not repealed as it should have been. In announcing the reforms, Rural Fire Service (RFS) Commissioner Philip Koperberg pledged that they would make it easier to carry out burns (Jurskis 2015).

In fact, burning became much more difficult because the untenable life cycles theory was insinuated into the planning and approvals process, and shrub-invaded vegetation was wrongly classified as (ill-defined) wet sclerophyll forest and 'protected' from mild fire by regulation (Jurskis 2015). Now "*acceptable*" intervals between prescribed burns are those that will ensure environmental degradation, explosive fuels and uncontrollable megafires (Jurskis and Underwood 2013). This suits cost-squeezed public land managers, because everyday costs of management are reduced and firefighting is externally funded as disaster response.

Former head of CSIRO bushfire research, Phil Cheney, said:

The irony is that in the process of cost saving on government land, they have shifted the costs to the suppression industry and created a monster that I fear, like in the USA, is unstoppable. Unless government land managers are made responsible for all suppression

costs on their land then there is absolutely no incentive to undertake management that will reduce the hazards and make suppression cheaper and easier. The volunteers are caught up in this mess and are quite cynically used to avoid criticism of government actions. As Phil Koperberg would often say to me “You may know about fires but I know about politics” (N.P. Cheney pers. comm. 2015).

Cheney was spot-on and the unstoppable monster is now in charge.

Our National Capital was partly incinerated in 2003 and our “*Nation Charred*” after fire spotted over many miles of bare paddocks. The House of Reps Inquiry received evidence from experienced land managers right across Australia, and rediscovered the simple answer that we need to restore mild fire across the landscape. However, the land management and emergency services bureaucracies in some eastern states boycotted the Inquiry, and the Green member put in a dissenting report. This set the scene for the COAG Inquiry whereby the paramilitary emergency services leaders and junk scientists swept traditional knowledge, history, commonsense and pragmatic science under the table. They put ‘education’, disaster warnings and evacuations in place of sensible management (Jurskis 2015). This paved the way for ongoing disasters and ever-increasing funding of their bailiwicks.

In the eastern states, governments on both sides of politics have continued to support the disaster industry and junk science at the expense of pragmatic, scientific and conservative land management. For example, in February 2018, NSW allocated four million dollars for new research to be conducted by Professor Ross Bradstock (NSW Government 2018). Three of the four priorities are:

impacts and management of hazard reduction burns
drivers of bushfire frequency and severity
impacts on the environment and endangered plants and animals

Bradstock previously co-authored a totally flawed model supposedly showing that prescribed burning mostly doesn’t work in southeastern Australia (Price *et al.* 2015, Figure 3). In fact, the perceived lack of efficacy of burning in the southeast compared to the southwest was almost entirely due to the miniscule amount that was done. Furthermore, the authors wrongly assumed that high intensity wildfires were equivalent to mild burning in controlling fuel accumulation. Their model of so-called leverage of burning included wildfires that promote rapid fuel accumulation. This grossly inflated the ‘treated’ areas. The model is worse than useless.

In March 2018, 60 homes were destroyed by wildfire at Tathra. Bradstock claimed that lack of burning wasn’t a factor in the disaster. RFS supported the claim, reporting that there were 93 hazard reduction “*activities*” in the previous 11 years across 517 hectares (Hannam 2018). That’s an average of 6 hectares per activity and 8 activities per year totalling 49 hectares. Bradstock says broadscale burning doesn’t work, but claims that narrow breaks around houses

can create “*defensible space*”. However he admitted that houses at Tathra were ignited by ember storms driven by high winds (Hannam 2018). The fire came from many kilometres away and jumped the Bega River because it was fed by embers from heavy, elevated fuels in long unburnt bush.

The Tathra fire burnt through part of a heavily scrubbed new reserve dedicated to protecting koalas. It probably killed or maimed any animals there. Megafires in spring/summer 2019 have undoubtedly incinerated thousands of koalas living at unsustainably high densities in chronically declining, densely scrubbed forests further north. Green groups have cynically taken advantage of this animal welfare catastrophe (not just for koalas) and stepped up their campaigns for more National Parks and moratoriums on sustainable industries such as carbon-sequestering, solar-powered timber production.

The large numbers of koalas and the uncontrollable fires are both symptoms of unhealthy forests. When I worked in the forests around Rappville, south of Casino in the late nineteen seventies, they were open and healthy and grassy and safe. Koalas were rare. When Wyan Creek sawmiller [REDACTED] saw a koala, he caught it and took it to the local primary school to show the kids. Now the forests are explosively dangerous and full of species that irrupt in unhealthy forests, including koalas, psyllids, bellbirds, mistletoes, native cherries and other invasive native and exotic shrubs.

Though an undeniable catastrophe for the current population of koalas, the fires do not pose a threat to conservation of the species, because it is very resilient. For example, during the Millennium Drought, low-density populations continued to irrupt in dense regrowth arising from high intensity fires in the Sydney Water catchments in 1977 and in Mumbulla State Forest near Bega in 1980. However, unsustainably dense populations on the Koala Coast and in the Pilliga Scrub crashed for a second time (Jurskis 2017). (The first time was respectively in the Federation and the Great War Droughts.)

The South Gippsland koala population, incorrectly reported to be the only natural population in Victoria, first irrupted after a megafire around 1820, before European occupation. It survived some of the most intense and extensive clearing ever done in Australia, from the 1870s to the early 1900s. The koalas bounced back from 20 severe fire events in 200 years, including Black Thursday 1851, Red Tuesday 1898, Black Friday 1939 and Black Saturday 2009. Less than eight years after Black Saturday, they had once again irrupted into high densities (Jurskis in press).

Our fire management policies promote all the irruptive species whether plant or animal, native or exotic. The truly endangered species in Australia are those such as Hastings River mouse, that depend on open, grassy, healthy and safe forests and woodlands. For example, 24 small

mammals became extinct in western NSW during the 19th Century after pastoralists disrupted Aboriginal burning and scrub choked out their habitat (Jurskis 2015).

The Way Forward

Environmental and fire control policies, legislation and practices must change to encourage reintroduction of mild fire regimes and restoration of healthy and safe landscapes. The paradigm must shift from exclusion of human activity to sustainable management.

Foresters accomplished this fifty years ago when they weren't hampered by red and green tape. Their efforts, ironically, later resulted in healthy, productive, managed forests being locked up in reserves to decline and face inevitable incineration in megafires. Now all tenures are mismanaged by dint of regulations. Peri-urban forests are arguably more difficult to manage now, because of the intricate mixture of people, tenures, infrastructure and bush. But it's certainly not impossible as demonstrated by ██████████ at Kurrajong Heights on the outskirts of Sydney where the major impediment has been regulations and *BFEAC*. It's absolutely critical to substitute land management for emergency response if we are to avoid further unnecessary loss of human lives and ongoing socioeconomic and environmental destruction.

The crux of the matter is the undue political influence of emergency services generalissimos and green academics on land management. Ironically, they are increasingly rewarded for failure with funding for incredibly expensive and ineffective fire suppression technology and unscientific research that constructs ridiculous models to support their delusions. This is all at the expense of relatively cheap, preventative and restorative management.

All it would take to restore a healthy, safe and sustainable landscape is for our elected representatives at all levels of government, to listen to and support fairdinkum scientists and land managers with real-world knowledge and experience. The huge scale of the problem across most of southeastern Australia dictates that governments reduce obstructive regulation and bureaucracy, and mandate a consistent approach of proactive management across all tenures.

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