The Integration of Prescribed Burning with Traditional and Cultural burning by Aboriginal Australians

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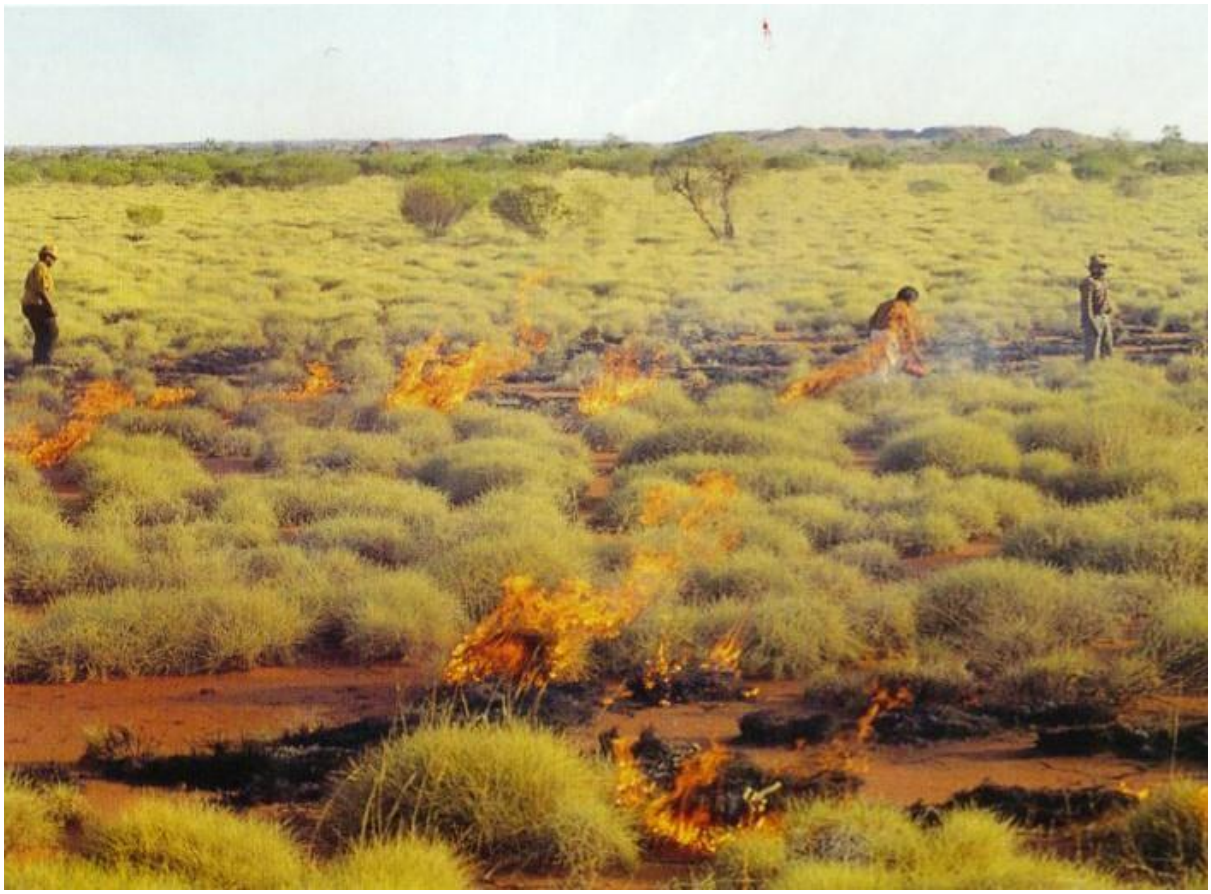

Introduction

There is an increasing call for the practice of Indigenous traditional and cultural burning to be integrated into fire management in Victoria, where very few examples currently exist. One such one is the Gunditjmara People, who are working with the forest fire management section of the Department of Environment, Land, Water and Planning to undertake cultural fire management in south western Victoria[1]. It is understood traditional owners in Victoria are keen to introduce cultural burning in other areas, and so it is important to understand what this means, and examine how such burning can be incorporated into fire management of Victorian forests.

One definition of cultural burning is: “Indigenous modern-day culture practice with both traditional and contemporary dimension”. This means low-intensity burns that do not affect the tree canopy and are done in a patchwork of burnt and unburnt ground fuels[2].

[1] Royal commission into national natural disasters arrangements 2020, p9.

[2] S. Feary (2019) Indigenous Australians and fire in South Eastern Australia. *In* Prescribed Burning in Australasia, AFAC 2019.

Historical Context

It is now accepted that prior to European settlement the Indigenous people burnt extensively and frequently. The result for most of the dry forest and woodlands in Australia was a reduced tree cover with an understory of fine grasses, herbs and sedges. The evidence for the tall wet forests of Victoria is not so clear. By the time of exploration of south-eastern Victoria, local Aboriginal populations had been decimated with diseases such as smallpox and measles, and were then further subjected to dispossession as well as deliberate killing by European settlers. The practice of Indigenous traditional and cultural burning disappeared, along with their knowledge. When Strzelecki travelled to South Gippsland in 1840 he was confronted by a dense and almost impenetrable regrowth forest of Mountain Ash and dense understory as a result of extensive bushfires 10 years earlier. He had to abandon his horses near Morwell and took several weeks to reach Western Port.

We have no doubt whatsoever that Indigenous Australians had a very good understanding of fire behaviour and how it was affected by the composition and structure of the vegetation, fuel, the seasons and weather. For example in the Cape York region burning was highly targeted as shown by Steffensen[3]. There is good evidence from burning in the central desert that Indigenous Australians burnt under conditions where they had accurately estimated the maximum wind speed of the day[4]. (For years Mariners used the Beaufort scale, based on the behaviour of waves, trees and flags to estimate wind speed). We also consider that Indigenous Australians could accurately estimate fuel moisture and relative humidity either by feel, the length of their hair, (we used a hair hygrometer for years to measure relative humidity) or by the crispness of the fuel. The depth of knowledge by Indigenous Australians on fire before European settlement was immeasurable.

Sadly the passing of traditional knowledge by elders on burning is under threat in northern Australia and has in practice completely disappeared in southern Australia, though people such as Steffensen are trying to redress this. The knowledge and practices about cultural burning in northern Australia may provide a way forward in southern Australia, though this is a matter for the Indigenous people in southern Australia. A general consensus, drawn mostly from the practices in northern Australia, is that cultural burning involves frequent ignition tailored to the different vegetation types and their drying cycles moving from the wet to dry season. Also, fire is generally of low intensity and contained using the differing fuel moistures between the vegetation types. Steffensen goes into quite some detail on how this is put into practice on Cape York.

Before we can undertake cultural or traditional burning we need to recognise that the forests and landscapes of Victoria, particularly the dry forests and woodlands, are now quite changed from those that evolved prior to European settlement. They are landscapes that have been subjected to up to 200 years of disrupted fire regimes, selectively harvested for timber and firewood (impacts species composition and structure), and invaded by weeds and

[3] V. Steffensen (2020) Fire Country – How Indigenous Fire Management could help save Australia. Hardie Grant Travel.

[4] P. Cheney & A. Sullivan (2008) Grassfires: Fuel, weather and fire behaviour (see Figure 1.2). CSIRO.

feral animals. Also they are fragmented and intermixed with private property, particularly the drier forests and woodlands, which limits the use of natural boundaries when burning.

Despite these challenges, it is considered that cultural burning can be introduced and integrated within a prescribed burning program in dry forests and woodlands in Victoria, to better protect these forests and the community from the spread and damage of high-intensity wildfires.

The Challenge

The criteria for a successful prescribed burning program was mapped out by an Expert Panel[5] to the 2009 Royal Commission in Victoria:

- Treated areas need to be large and around 3 km deep to absorb spot fires from high-intensity forest fires.
- Burning must extend over 80% of the treated area to reduce the overall fuel load that will be effective in stopping fires for 1-2 years, and reduce fire intensity that will make fire suppression easier for up to 5 years.
- The program needs to treat between 8-10% of the burnable area per annum.
- Individual burns need to be burned out to a defined trafficable boundary and mopped-up before the onset of severe weather to prevent escapes and to protect neighbouring properties.

In spring, dry forests with a litter and shrub understory can be burnt whilst grassy fuel in open areas is still green. However, burning in spring can be difficult because of the very high fire dangers associated with the weekly passage of cold fronts across the State, as well as the risk of smouldering roots and logs reigniting during the summer months. By the time grassy fuels are fully cured there is a strong likelihood of dangerous and extreme fire weather and the possibility of wide-spread ignition. This means that the window of opportunity to burn in spring in southern Australia is small, and most likely exacerbated by the change in structure and composition of the dry forests and woodlands. Cultural and traditional burning potentially provide an answer, which is likely to involve smaller areas but has to be integrated with a more extensive prescribed burning program designed to limit the extent and intensity of summer wildfires.

Most broad-area prescribed burning in south-east Australia is currently carried out in the autumn months. Generally there needs to be some rain, and then a drying cycle to safely conduct autumn burns. The rain is required to minimise crown scorch and create fuel moisture differentials so that the burn results in a mosaic of burnt and unburnt areas. Too much rain can however finish the burning season particularly on southern and south-eastern aspects where insolation levels in late autumn and winter are very low. Significant areas on the northern and western aspects can generally still be burnt, and later into autumn.

[5] Exhibit 739 – Fuel Management Topic – Facilitated Expert Conference, Expert Panel Summary (TEN.227.001.0001).

Figure 1. *Aerial burn Bemboka, May 1968 on uniformly dry fuels under a strong inversion. More than 80% of the block was burnt with an average scorch height of 2 metres. The impact of smoke on towns and residents under the inversion has to be carefully managed and would not be accepted in many areas.*

One of the biggest challenges in translating northern Australian burning regimes to southern Australia is the vastly different nature of the seasons. In northern Australia most burning is done coming out of the wet season into the dry season, whereas in southern Australia most burning (non-indigenous) is done coming out of the dry season into the wet season. Burning on a southerly aspect without fire getting into the northerly aspects is nigh on impossible when coming out of summer, and could result in significant damage to the forest and potential impact on private property. Using previous burn history to create fuel breaks is one possible solution.

If as it appears we are largely locked into autumn burning in southern Australia for broadscale burning, the challenge then is how this can be done on the scale that is required. A study in Western Australia found that *"patch distribution and patch connectedness can be managed to a large extent by ignition frequency and the timing of the introduction of fire with respect to season and surface burning conditions as reflected by the FFDI"*[6]. An operational trial using a similar approach was started in north-east Victoria around a decade ago. The strategy involved burning annually in autumn using aerial ignition over a 20,000 ha burn unit, with the aim of treating around 15% each year. The plan was that burn history would determine which areas burnt in successive years, with less dependency on the need for fuel moisture differentials. As the area treated increased over successive years, burning could be brought forward where ultimately some of the southerly aspects, particularly on the upper slopes, could be burnt.

[6] N. Burrows, C. Stephens, A. Wills & V. Densmore (2021) Fire mosaics in south-west Australian forest landscapes. Int. J. Wildland Fire.

As noted previously cultural and traditional burning may have best effect on smaller areas such as fragmented blocks of dry forest and woodlands. Here the primary objective should be to produce an open forest with a grassy understory, and so the initial burn may need to be in summer to achieve a high level of fuel consumption and kill or severely damage shrubs and smaller regenerating eucalypts. In the following years, spring burning should become more feasible with the intent of maintaining the grassy understory.

Burn Objectives

A primary objective of cool or cultural burning is to retain an intact green canopy. When fuels are long-unburned this can only be achieved under the relatively infrequent conditions illustrated in Figure1. However, if ignitions are carried out in the evening during summer and spacing calculated so that fires coalesce in the cool of the early morning the degree of scorch can be reduced (refer *Prescribed fire for safely securing a wildfire*, which can be found elsewhere on the site or at this **link**). Properly done there need be no defoliation with a high degree of fuel removal.

Although the litter from the scorched canopies has the potential to add up to 3 t/ha in the first year, it is usually far less than this. Because eucalypts naturally translocate nutrients before they shed leaves and twigs, the fallen litter is not attractive to insects and fungi and decay slowly (compared for example to the nutrient rich leaves of deciduous hardwoods). Scorched leaves retain nutrients and are attractive to insects such as skeletonisers which remove most of the leaf leaving only the skeleton of the leaf structure.

Alternatively, if grass is regenerated after an intense wildfire burning can be undertaken to maintain this grassy understory.

The forest of the black cypress pine shown in Figure 2 was killed in the 2003 fires, and did not regenerate. It could be maintained as an open grassland by regular burning rather than allowing it to revert to a eucalyptus and wattle woodland. The grass has a sparse distribution and cultural burning under moist calm conditions would require considerable effort and manpower to achieve significant coverage.

In taller dry forests grasses may regenerate the year immediately following the fire but are quickly suppressed by the regeneration of the overstory trees and understory shrubs in the following year. Again, ignition to maintain a grassy understory needs to be immediate, closely spaced and maintained on an annual or biennial basis.

The Way Forward

As a first step, targeting the dry forest and woodland fragmented areas is a possible focus for cultural and traditional burning. These areas are likely to be quite manageable because of their size and they are likely to be closer to populated areas and hence resources. There is an opportunity for Indigenous people to work collaboratively with public land management agencies and landholders to achieve multiple objectives of traditional burning and protection of surrounding private property, and importantly share knowledge.

Figure 2. *Fire killed Black Cypress Pine near Suggan Buggan.*

It is unlikely that we will ever be able to replicate the burning practices of Indigenous people prior to European settlement, or return all dry forests to a grassy understory. Widespread ignition by lightning will still occur across the mountain country and potentially result in vast areas of severely burnt country, and very little unburned country within the overall fire perimeter. Landscape burns are essential to start protecting these areas and reduce the severity and extent of wildfires. Also as Steffensen states *"To look after any ecosystem, you need to manage all the different country around it. If you don't manage the places that need fire, then the no-fire systems come under threat."*

Victoria will not be able to protect the resources of our forests and landscape unless there is more investment into the management of prescribed fire and its application to achieve multiple objectives. Cultural burning has the potential to play an important part, and needs to be integrated within a wider prescribed burning program to protect the forest and neighbouring properties.