NATIONAL BURNING PROJECT

Australasian Fire and Emergency Service Authorities Council (AFAC)
***and* Forest Fire Management Group (FFMG)**

National Guidelines for Prescribed Burning Operations:

Case Study 9 – Burning for eucalypt forest health in Southeast Queensland/Northern NSW

National Burning Project: Sub-Project 4

afac

An Australian Government Initiative

FFMG

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This document is constructed by GHD from consultation and research between Forest Fire Management Group (FFMG) and AFAC, its member agencies and stakeholders. It is intended to address matters relevant to fire, land management and emergency services across Australia and New Zealand.

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Case study prepared by Mark Burnham and Dave Kington (Queensland Parks and Wildlife Service (QPWS)), and Dominic Adshead (GHD)

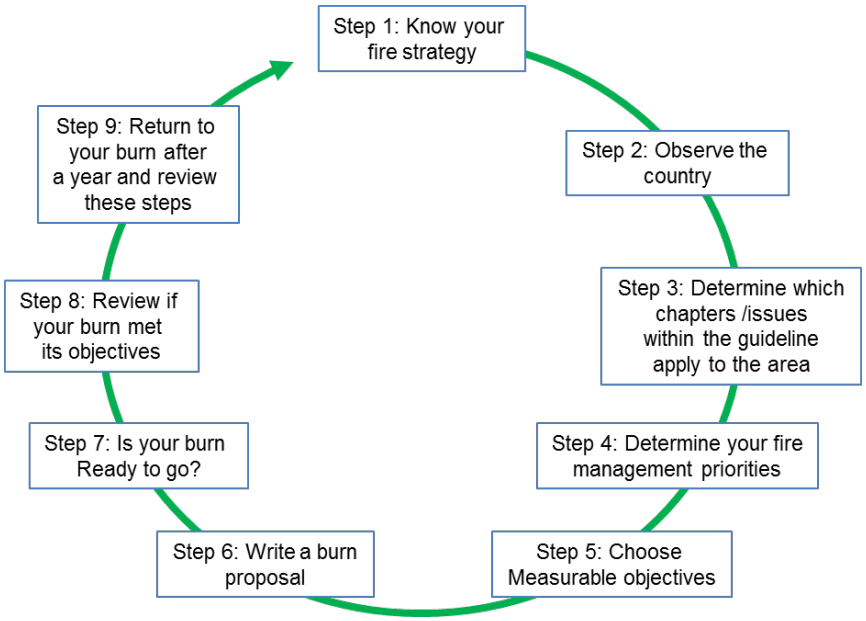
The principle objectives of the QPWS fire management system are mitigating, as far as possible, the risk to life and property as well as maintaining functioning and healthy ecosystems. Prescribed burning is a key tool for achieving both of these objectives. There is recognition that failure to apply low intensity fire regularly, coupled with an infrequent regime of high intensity bushfire often occurring during dry or drought periods when ecosystems are most stressed, is a worst case scenario for ecological outcomes.

To meet the objectives of the fire management system, QPWS uses a Vegetation Condition Assessment Framework (VCAF) to classify conservation reserves into ecosystem health classes, with the healthiest vegetation communities given the highest priority for low intensity prescribed burning. Treating the healthiest forests first provides the most cost effective means to retain forest values and keep the best ecosystems in peak condition. QPWS is the first state agency in Australia to formally apply this approach, and this case study summarises how it is applied as part of the Burning Block Analysis Phase (Principles 1 and 2) to south-east Queensland conservation reserves.

1 Operational Planning Context

QPWS burn planning is guided by bioregional planned burn guidelines such as the *Planned Burn Guidelines – Southeast Queensland Bioregion of Queensland* (State of Queensland 2013b) and relevant park-based fire management strategies with each reserve having a fire strategy including fire management zones. The steps identified to plan a prescribed burn as outlined in these guidelines are shown in the figure below.

Figure 1 Planned burning guideline steps



In accordance with the planned burn guidelines and the steps outlined above, a range of supporting documents have been developed to assist field practitioners to prepare and implement a planned burn, including:

- *QPWS Vegetation Condition Assessment Framework* (as outlined in section 3 below);
- *QPWS How to Assess if Your Burn is Ready to Go* (State of Queensland 2012b). This document supports the planned burn guidelines, and gives step-by-step guidance toward making decisions about when to burn, in making fire behaviour predictions and assessing likely fire behaviour against objectives of burning; and
- *QPWS Planned Burn Fire Behaviour Tables* (State of Queensland 2012a). This is a pocket version of the fire behaviour prediction tools described in the *How to Assess if Your Burn is Ready to Go* document.

The Vegetation Condition Assessment Framework is applied as part of *Step 2: Observe the country* (Figure 1 above) and can be used as a 'go/no-go' decision tool to confirm if a block selected at the strategic level is suitable for prescribed burning.

2 Background to implementing the vegetation condition framework in south-east Queensland

Conservation reserves in south-east Queensland contain important remnant intact grassland ridge ecosystems, geographically isolated from other similar vegetation communities, and that provide important habitat for threatened species such as the Eastern Bristlebird (*Dasyornis brachypterus*).

The loss of grassy tall open forests is identified as a significant issue impacting forest structure in south-east Queensland conservation reserves (State of Queensland 2013, Butler 2008) with very few intact areas remaining. The grassy open structure of these communities threatened by:

- Rainforest and weed incursion (through fire exclusion, infrequent prescribed burning or historically poorly planned prescribed burning) resulting in hoop pine, rainforest species and weeds (such as lantana) establishing upslope from wet gullies;
- Acacia and shrub thickening (through repeated high intensity fires); and
- Bell miner associated dieback of eucalypts.

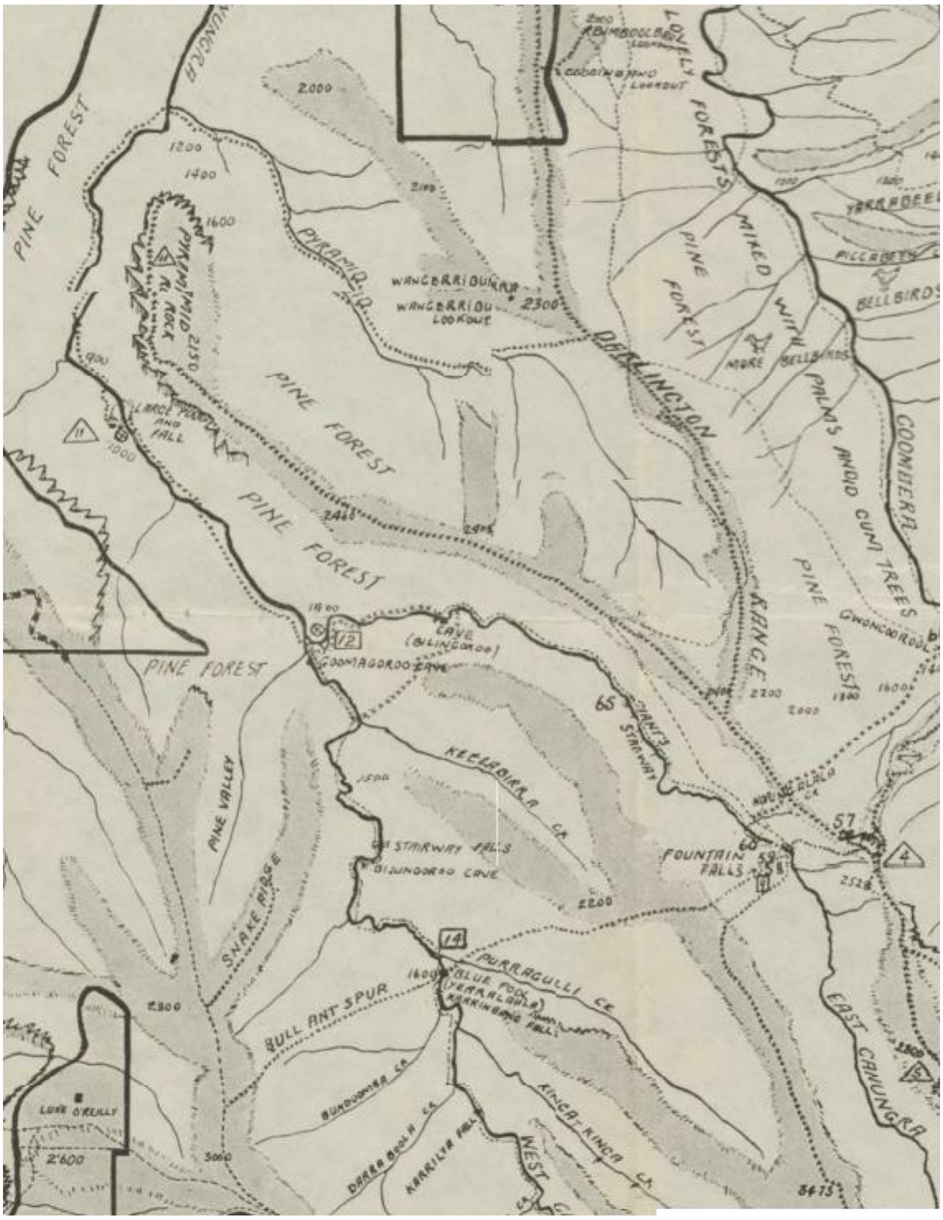
An absence of fire permits the incursion of hoop pine and lantana into grassy eucalypt forests, shading out *Themeda triandra* and other grasses and herbs. The resulting reduction in grass fuels constrains the opportunity for future low intensity burning (as fire will no longer easily carry) to restore grasses.

Historically open grassy eucalypt communities occurred on major ridgelines within reserves such as Lamington National Park, and it is postulated that such grassy open areas were maintained by Aboriginal family groups using fire (Fensham and Fairfax 1996, Watson 2006) for hunting, transport routes, maintenance, ceremonial and other purposes. A sketch map of Lamington National Park from the 1940s (Figure 2) shows some of these open grassy eucalypt ridgelines (shaded areas) and pathways in what is now rainforest. These links provide access within country to waterfalls, rock pools, caves and hunting grounds. Aerial imagery and current maps of these same areas now show

that many ridges have become closed forests, with others subject to significant dieback and the majority of former grassy ecosystems of regionally significant grass and forbs significantly reduced in extent.

To address this ongoing decline QPWS has identified the need to reintroduce fire into these fire maintained grassy vegetation types on a regular basis. It is acknowledged that *Themeda triandra* requires a return fire interval of between 3-6 years to maintain biodiversity in open grassy vegetation types (Watson 2006, Wong and Morgan 2007). The Vegetation Condition Assessment Framework provides a means to target prescribed burning activities to the healthiest stands at the required frequency.

Figure 2 Sketch map, Lamington National Park, c1940s



(Source: Queensland Historical Atlas (http://www.qhatlas.com.au/node/1281/zoomify))

3 Application of the vegetation management framework

The vegetation condition assessment framework is used to classify the health of ecosystems and map the extent through a combination of ground truthing and aerial surveys. The framework considers the structure, species richness and health or dieback of the lower stratum (0-2 m), mid-stratum (2-6 m) and canopy in order to allocate a triage classification for management as follows:

- **Category One:** Low to moderate severity planned burning is key management option for the prevention of threatening ecological processes;
- **Category Two:** Low to moderate severity planned burning is still a management option to prevent threatening process (even though health has declined); or
- **Category Three:** Low to moderate severity planned burning is unlikely to be an effective management option.

An adapted version of the assessment framework is shown in table 1 with examples of each type shown in the figure 3.

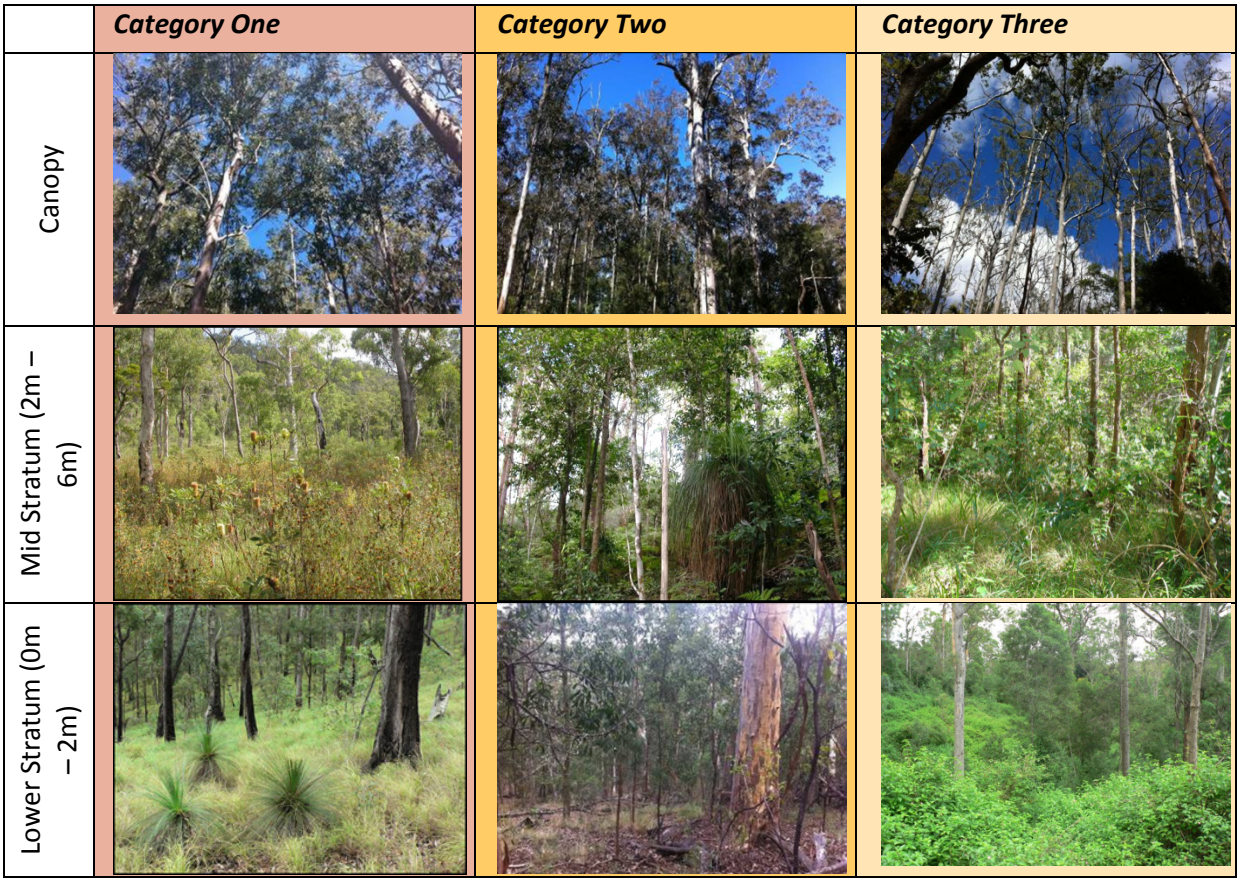
The framework provides a means to identify grassy forests in the most vigorous and healthiest condition (Category One) for which planned burning will provide the greatest benefit. Category Two areas are considered in a transition stage and intervention may assist in preventing them from further degradation. Vegetation classified as Category Three is so degraded that prescribed burning is not a cost effective means to assist in its recovery to a healthier category.

Table 1 Vegetation Condition Assessment Framework

	Category One	***Category Two***	***Category Three***
Canopy	*<25% slight dieback* Slight dieback = mostly full crown or slight contraction, very dense to dense leaf clumps, some small branchlets/branches dead, none to slight epicormic growth	*>25% slight dieback* ***To*** *<25% moderate dieback* Moderate dieback = moderate crown contraction, average leaf density, some main branches dead, up to a moderate amount of epicormic growth (approximately less than half of the crown)	*>25% moderate dieback* ***To*** *evidence of severe dieback* Severe dieback = crown contracted, sparse to very sparse leaf clumps, main branches (branching from trunk) dead, up to mostly epicormic growth **A.** >25% moderate dieback ***To*** <25% severe dieback **B.** >50% moderate dieback ***To*** 25 – 50% severe dieback **C.** >50% severe dieback
Mid Stratum (2m – 6m)	*<10% cover* Few trees in the mid stratum Clear and open with a clear delineation between ground stratum and canopy May contain small trees as isolated small groups or scattered individuals* except for lantana	*10% – 60% cover* Cover increased and starting to dominate* Light still reaches the ground stratum	*>60%* Established, dominant, and continuous This can be a mix of species or only one or two*
Lower Stratum (0m – 2m)	**A.** Native grasses/sedges/ferns and small shrubs *>50% cover and typically >80%* Continuous or near continuous cover Only interrupted by substantial changes in geology such as rock outcrops, or skeletal soil	**A.** Native grasses/sedges/ferns and small shrubs *25% – 50% cover* Continuous or near continuous	**A.** Native grasses/sedges/ferns and small shrubs Very sparse or absent
	B. Species with overabundance potential* or weed species *<5% cover or generally absent*	**B.** Species with overabundance potential* or weed species *5 – 50% cover*	**B.** Species with overabundance potential* or weed species *>50% cover*
Condition Category	**Category One –** Planned fire of low /moderate severity is the key management option for prevention of threatening processes such as BMAD***	**Category Two** – Planned fire of low to moderate severity is still a management option for prevention of threatening processes such as BMAD	**Category Three –** Planned fire of low to moderate severity is **unlikely** a management option for prevention of threatening processes such as BMAD

*Notes: *Typical occurrences are – but not restricted to – Allocasuarina spp, Acacia spp, Lophostemon spp, Eucalyptus, Corymbia, Mesic spp, Lantana. ** Be aware that individual dead or dying standing trees are not necessarily associated with dieback, rather look for a pattern of dieback over an area. *** BMAD: Bell miner associated dieback*

Figure 3 Examples of Vegetation Condition Types



(Photo source: Dave Kington and Mark Burnham)

4 Summary – key learning points in managing grassy open eucalypt forests using fire

- **Look at your country** – Regularly observe the country that you manage, and observe seasonal changes or issues that may be developing within the reserve and the surrounding landscape;

- **Look and assess forest health** – The vegetation condition assessment framework provides a means to treat the healthiest parts of the landscape in which management intervention will most cost effectively provide the greatest benefit. This classification system can be used to guide a whole range of other management activities within the reserve system, providing a transparent means to prioritise treatments and activities favouring healthiest parts of the landscape;

- **Burn with good soil moisture** – Good soil moisture is a critical component particularly in longer unburnt grassy forests where there is a greater level of thatch and biomass and the potential for a hotter burn. Physically checking surface fuel and soil layers is the best means to determine how dry soil and fuels are – if the site is remote, neighbours may be able to assist. Check the moisture differential in unbounded burns where a fire is being run into lower rainforest areas where it is intended to become patchy and burn out. Grass curing is almost irrelevant in south-east Queensland and it is more important to

take note of how much dead thatch is within grass fuels, and if it is sufficient to carry a fire;

- **Stage burns to look after ridges and spurlines** – multi-stage burns should be standard practice with single stage burns the exception. It is an unrealistic goal to complete most burns in a day, particularly where there are multiple fuel types present with different drying rates, fuel levels and structure. Mosaic burns are sought by burning at different times to encourage heterogeneity or establishing a burnt strip to enhance control options for subsequent burning phases. Multi-stage burns may be implemented within a single prescribed burning season (that in south-east Queensland is between January to as late as August, with a spike in temperatures in April) or across two years;

- **Use the burn guides** – Fire behaviour for a proposed burn should be predicted using the QPWS planned burn guideline (*QPWS How to Assess if Your Burn is Ready to Go*) or associated fire behaviour tables pocket guide (State of Queensland 2012a). These are calibrated for light fuels (8t/ha) and moderate to heavy fuels (12t/ha). The fire tables predict rate of spread, flame height and scorch height and indicate if conditions are optimal for burning. Fire intensity and fire severity can then be estimated using flame height and scorch height. An estimate of the treatment area can be made based on the time available and burn out predictions, and the spot ignition spacing to be applied; and

- **Look at your country** – following your burn look at your country using the South-east Queensland Planned Burn Guidelines (State of Queensland 2013) to review the success of the burn and whether the block requires subsequent treatment to create a suitable mosaic.

An example of a planned burn where objectives were met is shown in a progression of photos over four years (in Figure 4). These photos show a planned burn within Lamington National Park which was a successful burn, achieving the performance objectives identified, with low intensity planned burning maintaining a very healthy ecosystem. At four years since burning the site will be scheduled for low intensity burning again, to maintain the host of unique grass and forbs species that are present.

Figure 4 Snake Ridge Prescribed Burning Sequence

Maintenance of healthy habitat with appropriate fire management – open eucalypt ridgeline grassland communities to maintain local forbs and grass species, at Snake Ridge in Lamington National Park, QLD

QPWS planned burn May 2008 with low to moderate intensity with good soil moisture

Five months after planned burn – Snake Ridge, Lamington National Park QLD

Source: QPWS

11 months post planned burn showing healthy understorey and good ground cover recovery – Snake Ridge, Lamington National Park QLD

Source: QPWS

Four years after planned burn – Healthy open grassy eucalypt ridge communities and eastern bristlebird habitat – Snake Ridge, Lamington National Park QLD

Source: QPWS

(Photo source: Dave Kington and Mark Burnham QPWS)

5 Acknowledgements

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The report was prepared by Case study prepared by Mark Burnham and Dave Kington (QPWS), and Dominic Adshead (GHD). The report was edited by Wayne Kington.

6 References and further reading

Butler D (2008) Assessing native vegetation condition in Queensland: BioCondition and beyond, case study prepared for the National Land & Water Resources Audit (Canberra: ACT)

Fensham RJ and Fairfax RJ (1996) The disappearing grassy balds of the Bunya Mountains, south-eastern Queensland. *Australian Journal of Botany* **44**, pp. 543-558

QPWS produced 13 Planned Burn Guidelines (one for each terrestrial bioregion in QLD):

State of Queensland (2013) Planned Burn Guidelines. Department of National Parks, Sport and Racing (Queensland: Brisbane)

These were produced at a bioregional scale so that they could give sufficiently precise guidance to local fire management and ecological issues. Each guideline contains photographs and indicators to guide practitioners toward observing their country, to identify fire management issues, identify objectives and priorities and with this in mind; identify suitable fire behaviour parameters, weather conditions and tactics. It is supported by a guideline called *How to Assess if Your Burn is Ready to Go*:

State of Queensland (2012b) Planned Burn Guidelines: How to Assess if Your Burn is Ready to Go. Department of National Parks, Sport and Racing (Queensland: Brisbane)

Which also comes as a pocket guide:

State of Queensland (2012a) QPWS Planned Burn Fire Behaviour Tables. Department of National Parks, Sport and Racing (Queensland: Brisbane)

Watson P (2006) Fire Frequency Guidelines and the Vegetation of the Northern Rivers Region – Draft 2. Hot Spots Fire Project (Sydney)

Wong N and Morgan JW (2007) Review of grassland management in south-eastern Australia. Technical report No. 39. Parks Victoria (Melbourne)