Planned Burn Guidelines – Southeast Queensland Bioregion of Queensland

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Disclaimer

This document has been prepared with all due diligence and care based on the best available information at the time of publication. The department holds no responsibility for any errors or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties. Information contained in this document is from a number of sources and as such, does not necessarily represent government or departmental policy. All Queensland Government planned burning should be done in accordance with government policies, procedures and protocols.

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Front cover photograph: Mt Greville: Moogerah Peaks National Park, QPWS (2008).
Foreword

Fire has long played an integral and essential role in the maintenance of the vegetation communities of Southeast Queensland. The considered application of fire as a tool to achieve a range of desired outcomes has been practiced for many centuries and has greatly influenced current biodiversity, vegetation type, distribution and extent.

As the most densely populated and rapidly growing region in Queensland, the interaction of urban and peri-urban development with management of fire both planned and unplanned, requires careful consideration to achieve a balance of risk management and conservation.

These guidelines grew from a recognition that the absence of appropriate fire has been and is continuing to cause structural change towards more closed forests, resulting in an increase in fuel/fire hazard, open forest decline and a loss of biodiversity.

The intent of these guidelines is to encourage land managers to critically observe their landscape to understand vegetation condition in light of appropriate fire management.

David Kington
Ranger in Charge
South East Region
Queensland Parks and Wildlife Service.
Table of contents

Foreword ......................................................................................................................... iii
Purpose of this guideline ............................................................................................. vi
Scope ............................................................................................................................... vii
Fire and climate in Southeast Queensland ................................................................. ix
How to use this guideline ......................................................................................... x

Chapter 1: Open forest and woodland ................................................................. 1
  Issue 1: Maintain healthy open forest and woodland ........................................... 2
  Issue 2: Reduce overabundant saplings ............................................................... 21
  Issue 3: Manage invasive grasses ........................................................................ 30
  Issue 4: Reduce Lantana camara ....................................................................... 39
  Issue 5: Manage bell miner associated dieback .............................................. 40
  Issue 6: Manage sustainable production ........................................................... 44

Chapter 2: Wet open forest ..................................................................................... 45
  Issue 1: Maintain wet open forest with a grassy or shrubby understorey .......... 46
  Issue 2: Maintain wet open forest with a rainforest understorey ......... 47

Chapter 3: Grasslands ............................................................................................. 48
  Issue 1: Maintain healthy grasslands and limit forest encroachment ........... 49
  Issue 2: Manage woody invasion ...................................................................... 56

Chapter 4: Heath communities ............................................................................. 61
  Issue 1: Maintain healthy coastal heath communities ................................... 62
  Issue 2: Maintain healthy montane heath communities ............................... 77
  Issue 3: Avoid peat fires ................................................................................... 82
  Issue 4: Manage exotic pine wildings ................................................................. 83

Chapter 5: Melaleuca communities ....................................................................... 84
  Issue 1: Maintain healthy melaleuca communities .......................................... 85
  Issue 2: Avoid peat fires .................................................................................... 96
  Issue 3: Manage exotic pine wildings ................................................................. 97
Chapter 6: Coastal fringing forests and headlands ......................... 98
  Issue 1: Maintain health of fringing swamp she-oak forests .......... 99
  Issue 2: Maintain health of rocky headlands ............................. 104

Chapter 7: Riparian, foredune, coral cay island and beach ridge communities ................................................................. 112
  Issue 1: Limit fire encroachment into healthy riparian, foredune, coral cay island and beach ridge communities .......... 113

Chapter 8: Rainforest, dry vine forest and brigalow ....................... 117
  Issue 1: Limit fire encroachment into dry vine forest, brigalow and rainforest margins .................................................... 119

Chapter 9: Mangroves and saltmarsh ......................................... 121
  Issue 1: Limit fire encroachment into mangroves and saltmarsh.. 122

Chapter 10: Common issues .................................................... 123
  Issue 1: Hazard reduction (fuel management) burns ............... 124
  Issue 2: Limit fire encroachment into non-target fire vegetation groups ................................................................. 133
  Issue 3: Planned burning near sensitive cultural heritage sites.... 139
  Issue 4: Avoid peat fires ......................................................... 148
  Issue 5: Reduce Lantana camara .............................................. 152
  Issue 6: Manage severe storm or flood disturbance................. 157
  Issue 7: Manage exotic pine wildings ..................................... 159
  Issue 8: Manage sustainable production ................................. 164

Glossary of fire terminology .................................................. 167

References ............................................................................. 175

Appendix 1: List of regional ecosystems .................................... 177

Appendix 2: Mosaic burning .................................................... 184
Purpose of this guideline

This guideline was developed as part of the Department of National Parks, Recreation, Sport and Racing’s (NPRSR) Queensland Parks and Wildlife Service (QPWS) Fire Management System to support the formation of fire strategies, burn proposals and on-ground planned burn implementation (supported by the Planned Burn Guidelines: How to Assess if Your Burn is Ready to Go). They assist rangers and other land managers to:

- protect life and property
- maintain healthy ecosystems
- promote awareness of fire management issues in the field
- identify clear fire management objectives to address those issues; and how to assess objectives to assist in adaptive management
- identify suitable fire behaviour, burn tactics and weather conditions to achieve objectives
- provide information and tools to assist in implementing planned burns.

Please note that this planned burn guideline uses ‘fire vegetation groups’ provided in ParkInfo that assist their integration into maps and fire strategies. A fire vegetation group is a group of related ecosystems that share common fire management requirements.
Scope

• This guideline applies to the Southeast Queensland (SEQ) bioregion (refer to Figure 1) and covers the following fire vegetation groups: open forests and woodlands; wet open forests; grasslands; heath communities; melaleuca communities; coastal fringing forests and headlands; riparian, foredune, coral cay island and beach ridge communities; rainforests, dry vine forests and brigalow communities; mangroves and saltmarsh (refer to Appendix 1 for regional ecosystems contained in each fire vegetation group).

• It covers the most common fire management issues arising in South East Queensland. In some cases there will be a need to include issues in fire strategies or burn proposals beyond the scope of this guideline (e.g. highly specific species management issues).

• This guideline recognises and respects Traditional Owner traditional ecological knowledge and the importance of collaborative fire management. Consultation and involvement should be sought from local Traditional Owners in the preparation and implementation of planned burns and specific guidelines incorporated into fire strategies where relevant.

• Development of the guideline has been by literature review and a knowledge-capturing exercise, using both scientific and practical sources. It will be reviewed as new information becomes available.

Adam Creed, QPWS, Toby’s Gap, Fraser Island.
Figure 1: Map of the Southeast Queensland bioregion of Queensland.
Fire and climate in Southeast Queensland

The Southeast Queensland (SEQ) bioregion fire season (when more severe wildfires normally occur) is generally recognised as September to December. In the southern part of SEQ, as indicated by analysis of fire weather data from Brisbane Airport and Amberley, August is also a period of elevated fire risk, and more significant than November which has a lower risk with the commencement of storm rains. September, the peak month for wildfires is characterised by frequent westerly winds, typically low rainfall, low humidity and increasing temperatures.

Fire risk is linked to the occurrence of fire weather days or sequences of days when the fire danger rating is ‘very high’ with a forest fire or grass fire danger index 25+ (refer to Figures 2a and b). Such conditions in SEQ tend to occur when deep low-pressure systems develop over southern Australia, bringing strong dry westerly winds from the continental interior to the coast. South-east trade winds and afternoon sea breezes become a frequent occurrence December through to March bringing higher humidity and increasing the manageability of fires.

While broad fire season patterns are a good guide, it is important to consider local seasonal conditions, current rainfall and geography of each management area.

Further information can be found in the QPWS Planned Burn Guidelines: How to Assess if Your Burn is Ready to Go and on the Bureau of Meteorology website at www.bom.gov.au.
How to use this guideline

**Step 1: Know your local fire strategy.** This planned burn guideline works with and supports your local fire strategy. While the guideline should address the majority of issues in your area, it is essential you also review your fire strategy before completing your planned burn proposal to ensure all ecological issues are considered (e.g. zoning plan, threatened species, fire histories, Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and other legislative requirements).

**Step 2: Observe the country.** It is essential to regularly observe the country that you manage (and the surrounding landscape). Familiarise yourself with this guideline so it becomes part of your observation of the environment as you go about your work. To assist you in observing the environment, undertake this simple exercise:

1. If a **canopy** is present (e.g. for open forests and woodlands) observe the following:
   a) Is tree branch foliage dying? Is there epicormic regrowth on branches? Are there any dead trees?
   b) Are there habitat trees (e.g. trees with hollows)?
   c) Are there rainforest, scrub or riparian ecosystems nearby?

2. For fire vegetation groups with a **mid-layer** (trees above the height of shrubs and grasses but not yet in the canopy) observe the following:
   a) What are the mid-layer trees (young canopy trees, wattles, casuarinas or rainforest species)? How open or dense is the mid-layer?
   b) Is there evidence of fire? What is the prevalence and height of blackened bark?

3. For fire vegetation groups with a **ground-layer** of grasses, sedges or shrubs, observe where relevant:
   a) The presence of grasses and grass clumps. Do the grasses look healthy and vigorous? Are there well-formed grass clumps?
   b) Is there a build-up of dead and decaying matter associated with grasses, shrubs, ferns or sedges?
   c) Are shrubs looking healthy and vigorous? Are there dying crowns on the shrubs?
   d) Does the ground-layer have a diversity of species or is it dominated by one or a few juvenile tree species? Are weeds dominating the understorey?
Step 3: Read the relevant chapters of this guideline and decide which issues apply to the area you are observing. It is common for burn proposals to address more than one issue—do not necessarily limit yourself to one issue per burn proposal.

Step 4: Consider your fire management priorities. Each chapter offers guidance for determining fire management priorities. The statements about priorities are based on a standard QPWS planned burn proposal prioritisation framework intended to guide both land managers and approval bodies.

Step 5: Choose measurable objectives. Each chapter of this guideline provides measurable objectives to include in your burn proposals (be guided also by the objectives in your fire strategy). Choose one or more objectives whilst observing the land. Do you need to adjust the objectives so they apply to your situation? Do you need to develop objectives not already included in these guidelines? If you find it difficult to identify your objectives, contact your natural resource management ranger or equivalent.

Step 6: Write a burn proposal. The measurable objectives, fire behaviour, tactics and weather conditions sections of each chapter can be copied directly into your burn proposals. Copy (ctrl+c) statements from a PDF version of this guideline and paste them (ctrl+v) into the burn proposal. Note that you may have to adjust the wording.

Step 7: Is your burn ready to go? Refer to the QPWS Planned Burn Guidelines: How to Assess if Your Burn is Ready to Go. Becoming familiar with the tools in this guideline will enable you to predict fire behaviour and achieve your burn proposal objectives.

Step 8: Review the measurable objectives in your burn proposal. After a fire, undertake the post-fire assessment recommended by this guideline (as defined in your burn proposal). This will indicate if you have achieved your planned burn objectives. This guideline provides information on how to report the results in your fire report.

Step 9: Review your fire management issue (re-apply this guideline to the burn area starting from Step 1). Return to the burn area after one year and then a few years after the original burn—once again applying this guideline. Many issues (such as weed control) are not resolved with a single burn and it is important to keep observing the land. If the results of fire management are unexpected or difficult to understand please seek further advice. If this process identifies shortfalls in your fire strategy, consider reviewing it. Step 9 can be implemented as part of a structured photo-monitoring process at various locations within the estate. Instructions can be obtained from the QPWS Fire Management System.
Chapter 1: Open forest and woodland

Open forests and woodlands dominate the landscape in the Southeast Queensland (SEQ) bioregion and fire management is critical to maintain their health. This fire vegetation group includes communities with a grassy, shrubby and mixed grassy/shrubby understorey, found on coastal lowlands, alluvial plains and inland hills and mountain ranges throughout the bioregion. They are typically dominated by one, or a mix of canopy species including eucalypts (e.g. gums, ironbarks and boxes), angophoras and bloodwoods.

Fire management issues

The main fire management issue in this vegetation group is the overabundance of saplings (e.g. wattles and rainforest pioneers) in the mid-stratum of open forest which reduces the health and diversity of shrubs and grasses in the ground layer through competition and shading. This issue is particularly significant for the maintenance of grassy tall open forests as there are very few areas remaining in SEQ. If left unmanaged, overabundant saplings as well as lantana infestations can threaten an open structure and in the southern half of the bioregion may also lead to bell miner associated dieback of eucalypts.

Issues:

1. Maintain healthy open forest and woodland
2. Reduce overabundant saplings
3. Manage invasive grasses
4. Reduce Lantana camara
5. Manage bell miner associated dieback
6. Manage sustainable production.

Extent within bioregion: 2 061 539 hectares (ha), 33 per cent; Regional ecosystems: Refer to Appendix 1.

Largest locations of this FVG: Great Sandy National Park, 89 790 ha; Wongi State Forest, 51 794 ha; Kroombit Tops National Park, 33 911 ha; Bania National Park, 27 638 ha; D’Aguilar National Park, 26 953 ha; Bulburin National Park, 22 581 ha; Conondale National Park, 21 695 ha; Main Range National Park, 18 100 ha; St Mary State Forest 1, 16 986 ha; Eurimbula National Park, 15 677 ha; Wrattens National Park, 14 736 ha; Cordalba State Forest, 13 460 ha; Yabba State Forest, 12 947 ha; Curtis Island State Forest, 12 881 ha; Grongah National Park, 11 563 ha; Wondai State Forest, 11 438 ha; Mount Barney National Park, 11 046 ha; Wongi National Park, 9 653 ha; Bauple State Forest, 8 146 ha; Castle Tower National Park, 8 011 ha; Mount Walsh National Park, 7 612 ha; Littabella National Park, 7 445 ha; Monduran State Forest 1, 6 901 ha; Lockyer National Park (Recovery), 6 883 ha; Glenbar State Forest 1, 6 503 ha; Bunya Mountains National Park, 6 480 ha; Moreton Island National Park, 6 415 ha; Dawes National Park, 6 150 ha; Warro National Park, 5 986 ha; Bellthorpe National Park, 5 587 ha; Imbil State Forest, 5 459 ha.
Issue 1: Maintain healthy open forest and woodland
Mosaic burning is critical to maintaining healthy open forests and woodlands.

Awareness of the environment

Key indicators of a healthy open forest or woodland (refer to the photos below):

- Healthy open forest has a grass; sedge; or shrub-dominated understorey (or various mixtures); with a few canopy species of variable sizes (to eventually replace the canopy) and a healthy canopy.
- Lower and mid stratum trees are scattered (e.g. eucalypts, wattles and she-oaks), but are not having any noticeable shading effects on ground stratum plants.
- Fallen logs and hollow bearing trees may be present.
- In shrubby open forest, shrub layer is dominated by sclerophyllous (hard-leaved) species (e.g. grass trees, banksia, pea-flowers) with healthy foliage.
- In grassy or mixed open forest, grass clumps and/or sedges are well formed.
- Grassy open forest is easy to walk through or see through.
- Generally few weeds present.

Layers used to describe open forest/woodlands

**Canopy:** tallest tree layer with an open structure

**Mid stratum:** (not always obvious) scattered shorter trees, canopy species saplings, tall shrubs and other plants over one metre.

**Lower stratum:** ground layer of grasses, sedges, herbs, small shrubs and seedlings up to one metre.

QPWS.
Open forest with a healthy grass ground layer. The tree recruitment is significant but not so abundant that it impacts on understorey health.

Mark Burnham, QPWS, Tamborine National Park.

Although there is limited tree recruitment or variation in age of eucalypts in this open woodland, the grassy understorey is healthy and there are sufficient young trees to replace the canopy in the long term.

Mark Daly, QPWS, Glenrock.
Open forest with a mix of canopy tree ages and healthy grass clumps.

The healthy dense grass cover indicates the sparse mid-stratum of she-oaks are having no shading effects on the ground stratum.
Rowena Thomas, QPWS, Glass House Mountains National Park (2010).
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 1 — Open forest and woodland

**Issue 1:** Maintain healthy open forest and woodland

*Sydney blue gum tall open eucalypt forest with a healthy ground stratum of native tussock grass, kangaroo and blady grass.*


The diversity of shrubs and grasses in the understorey will largely be determined by geology however fire regimes can alter the balance. In general, planned burning with good soil moisture at more frequent intervals will encourage grasses while longer intervals tend to favour shrubs.

David Kington, QPWS, Nerang National Park.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 1 — Open forest and woodland

**Issue 1: Maintain healthy open forest and woodland**

Open coastal woodland with a healthy mixed grassy / shrubby understorey.
Peter Leeson, QPWS, Teewah (2009).

Healthy shrubby open woodland.
Blackbutt open forest with mixed grass/fern/shrub understorey.

This shrubby understorey has a good diversity of species but is showing early signs of decline in health with some shrub crowns beginning to die off.
Indicators of declining health in open forest or woodland (observed across a broad area):

- Grasses overall appear sparse or clumps are poorly formed and collapsing. An accumulation of thatch (dead material) is present.
- Many shrubs have sparse crowns and/or beginning to die. There is limited or no recruitment of new shrubs (lack of juvenile shrubs).
- The diversity of mid/ground stratum species (grasses, herbs, sedges and shrubs) has declined from previous records or observations.
- In shrubby open forest, a loss or reduction of resprouters or obligate-seeders (shrub species that regenerate only from seed) has been observed and/or recorded over time.
- There is a significant build up of fine fuels such as dead grass material, leaf litter, suspended leaf litter, bark and twigs. Accumulation of elevated fuels is high or above (using the Overall fuel hazard assessment guide).
- Grass trees where present have dense brown skirts.
- There is an abundance of blady grass, bracken, dodder, one shrub species or a flush of trees or weeds all at the same age (be aware that some systems naturally have an understorey dominated by one or a few species).

Grass health is declining due to absence of fire. Note poor grass clump formation and accumulation of dead material.
A mixed grassy / shrubby understorey in decline due to absence of fire. Note drooping dead skirts on grass trees and sparse grass clumps.
Mark Burnham, QPWS, D’Aguilar National Park.

A sequence illustrating clumping grass decline in the absence of fire.
The bottom row indicates where fire has been absent too long.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 1 — Open forest and woodland

Issue 1: Maintain healthy open forest and woodland

A shrubby understorey in decline due to absence of fire. Note dead shrubs and shrub crowns beginning to die.
David Kington, QPWS, D'Aguilar National Park.

A sequence illustrating shrub decline.
The bottom row indicates where fire has been absent too long.
David Kington / Mark Burnham, QPWS, D'Aguilar National Park.
High severity wildfires or planned burns conducted without good soil moisture can favour regrowth and dominance of a single shrub (e.g. bush pea *Pultenaea* sp.) (above) or grass species (e.g. blady grass) (below).

Mark Daly, QPWS, Moogerah Peaks National Park (2008).

Mark Burnham, QPWS, Lamington National Park.
Discussion

- Open forest and woodland understorey is variable, (depending on rainfall, altitude, slope, aspect and geology) exhibiting a continuum from grass dominated through to shrub dominated. The mixture of grasses and shrubs is also greatly influenced by fire frequency and how fire is applied.

- It is important to recognise early signs of broad-scale mid-stratum thickening in open forest. These areas should be considered a priority for burning before thickening progresses to a point where planned fire is no longer viable.

- Retaining an ecosystem in a mosaic of different stages of response after fire promotes maximum diversity of plants and animal habitats.

- Within SEQ, many protected areas contain heavily disturbed or immature systems due to previous land use. In these systems, the canopy may be understocked, overstocked with regeneration or contain a more even-aged population. As long as the structure of the understorey appears healthy, implementing this guideline should assist a more varied and mature system to re-establish over time.

- Dominance of a single species in the ground stratum can result from fire during dry conditions, a recent high severity fire or too frequent fire.

- Some ecosystems are naturally less diverse but are nonetheless important to retain, as they increase overall diversity at a landscape level through the unique habitats they conserve.

- It is important to distinguish shrubs from small juvenile trees as a broad-scale overabundance of small trees in the understorey can be a health issue. With an absence of fire in some open forests, pioneer rainforest trees can shade out other ground layer plants, inhibit fire and create conditions favouring further rainforest recruitment, though this does not necessarily lead to a transition to rainforest.

- Rainforest species such as blueberry ash and laurels can naturally co-exist in the shrub layer of open forest with sclerophyll shrubs, grasses and sedges, however unlike eucalypts they will resprout from ground level after fire.

- Be aware that signs of poor health can also be a result of drought. Implementing fire during drought conditions is not recommended as this could compound health problems. Also consider whether the area has naturally poor soil, and therefore grasses may always appear less vigorous.

- Some open forests have a sedge dominated understorey (e.g. feather sedge), which appears grass-like but does not require fire for regeneration—seek advice if unsure.
What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Planned burn required to maintain areas of <strong>special conservation significance</strong>.</td>
</tr>
<tr>
<td>High</td>
<td>Planned burn to <strong>maintain ecosystems</strong> in areas where <strong>ecosystem health</strong> is good.</td>
</tr>
</tbody>
</table>

Assessing outcomes

**Formulating objectives for burn proposals**

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

Select from below as appropriate for the site:

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
</table>
| 40–80 % mosaic (adjust as appropriate) of burnt patches within open forest or woodland. | Choose one of these options:  
  a) Visual estimation of percentage of vegetation burnt—from one or more vantage points, or from the air.  
  b) Map the boundaries of burnt areas with GPS, plot on ParkInfo and thereby determine the percentage of area burnt.  
  c) In three locations (that take account of the variability of landform and ecosystems within burn area), walk 300 or more metres through planned burn area estimating the percentage of ground burnt within visual field. | **Achieved:**  
  40–80 % burnt.  
  **Not achieved:** < 40% consider follow-up planned burn.  
  **Or**  
  > 80 % burnt: need to assess results of other relevant objectives. |
<table>
<thead>
<tr>
<th>Objective</th>
<th>Description</th>
<th>Achieved</th>
<th>Partially achieved</th>
<th>Not achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 90% of clumping grass bases remain as stubble.</td>
<td>Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire intensity) and estimate percentage of clumping grass bases remaining after fire.</td>
<td>&gt; 90% bases remain.</td>
<td>75–90% bases remain.</td>
<td>&lt; 75% bases remain.</td>
</tr>
<tr>
<td>Approx. 80% of grass tree skirts burnt with living shoots emerging.</td>
<td>After the fire, select one or more sites or walk one or more transects and estimate the percentage of grass skirts removed after the fire.</td>
<td>Achieved: 80%.</td>
<td>Partially achieved: 40–80%.</td>
<td>Not achieved: &lt; 40%.</td>
</tr>
<tr>
<td>&gt; 75% of ‘resprouter’ shrubs resprout post-fire.</td>
<td>Approximately three months after the fire, select three or more sites (taking into account the variability of landform and fire intensity) and estimate the percentage of ‘resprouter’ shrubs resprouting.</td>
<td>Achieved: &gt; 75% resprout.</td>
<td>Not achieved: &lt; 75% resprout.</td>
<td></td>
</tr>
</tbody>
</table>

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.
Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this, it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.

It is desirable to retain the stubble base of clumping grasses during a planned burn to enable rapid regeneration. The humus layer is also retained with good soil moisture.

Mosaic burning results in patches of unburnt vegetation providing variation in the stages of response from fire and diversity of habitat.
Peter Cavendish, QPWS, Glen Rock State Forest (2008).
### Fire parameters

What fire characteristics will help address this issue?

**Fire severity**

- **Low to moderate** (small areas of **high** may occur)

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
<th>Description (loss of biomass)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low (L)</strong></td>
<td>&lt; 150</td>
<td>&lt; 0.5</td>
<td>&lt; 2.5</td>
</tr>
<tr>
<td><strong>Moderate (M)</strong></td>
<td>150–500</td>
<td>0.5–1.5</td>
<td>2.5–7.5</td>
</tr>
<tr>
<td><strong>High (H)</strong></td>
<td>500–1000</td>
<td>1.5–3.0</td>
<td>7.5–15.0</td>
</tr>
</tbody>
</table>

Note: Table assumes good soil moisture and optimal planned burn conditions. State-wide fire severity descriptions adjusted for SEQ conditions.
**Mosaic** (area burnt within an individual planned burn)
- A mosaic is achieved with generally 40–80 per cent burnt within the target communities (refer to Appendix 2, Mosaic burning).

**Landscape mosaic**
- Within some shrubby open forests, it may be difficult to achieve a mosaic within an individual planned burn. It is therefore important to create the mosaic at a landscape level by targeting different areas at different times. Aim to create a landscape mosaic of between 25–50 per cent of these communities burnt each year, to help create a varied age class structure that supports a diversity of habitats and species.

**Fire frequency / interval** (refer to Appendix 2 for a discussion)
- Fire frequency should primarily be determined through on-ground assessment of vegetation health, fuel accumulation and previous fire history and adjusted for wildfire risk and drought cycles.
- Apply mosaic planned burns across the landscape at a range of frequencies to create varying stages of post-fire response (i.e. recently burnt through to the maximum time frame). Consider a broad fire interval range of between three to six years for grassy understorey and seven to twenty-five years for shrubby understorey.
- It is a common mistake to interpret the fire frequency as a formula for applying fire to an area that has burnt only once within the suggested time frames, regardless of the internal patchiness of fire (e.g. 30 per cent burnt).

This planned burn in grassy open forest resulted in significant unburnt patches. With good rainfall, another planned burn could be considered in two years time, spotlighting some larger areas that did not burn on this occasion.

Peter Cavendish, QPWS, Mt Barney National Park (2009).

Across the landscape, burning some areas at shorter intervals and some areas at longer intervals will also add to diversity. Too frequent fire in shrubby communities can eliminate obligate seeder shrubs (species which regenerate only from seed and can take several years to reach maximum seed production). Similarly, when intervals between fires are too long, resprouters or annual species can be disadvantaged.
What weather conditions should I consider?

It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

**Season:** January to August (consider varying the season of burn)

**FFDI:** < 11 (7 is optimal to promote a grassy ground stratum)

**DI (KBDI):** < 120 (good soil moisture is the critical factor)

**DI (KBDI) Sand substrates:** < 100 (generally lower as a result of quicker drying times) good soil moisture is the critical factor

**Wind speed:** < 15 km/hr

**Soil moisture:** Good soil moisture conditions are important to reduce impacts of fire on clumping grass bases, resprouters, hollow trees and fallen logs; and to promote a rapid post-fire response.

**Other considerations:**
- For sand sites, drying times may vary significantly.
- Late summer and autumn will generally provide better regenerative conditions for plants and animals. Be aware of weather conditions leading up to this period as drought conditions might lead to poor results.
- Use caution if burning in August as strong dry westerly winds are common during this period, increasing the risk of re-ignition.
- Be aware that some years will be wetter or drier than normal, influencing post-fire recovery and rates of fuel accumulation.

What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). An initial test burn will help determine which tactics and ignition pattern will achieve the burn objectives on the day. Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Commence lighting on the leeward (smoky) edge** to establish the initial fireline, a safe perimeter and promote a low intensity backing fire. Depending on available fuels and the prevailing wind on the day, this may require either spot or strip lighting or a combination of both.
• **Progressive lighting** is a technique that can achieve good results for mosaic burning. An example is lighting over a period of time in order to safely burn fuels of varying flammability within different weather conditions. Another example is, in the early part of the year after rain, with good humidity and moisture, establish a patchy mosaic. Over the coming months repeat this exercise to establish a complex mosaic with highly variable season and flame characteristics.

• **Afternoon ignition:** Allowing the fire to burn into the night creates a greater mosaic than morning ignition. This is also a useful way to achieve the targeted weather conditions even when day time conditions are not ideal (but be aware of conditions on the days following).

• **Aerial ignition:** Use of aerial incendiaries is essential to cover large or inaccessible burn areas and to maximise efficiency of resources. Lighting along ridgelines will allow fire to trickle down slopes and extinguish in moister areas.

• **Timing and moisture** can be used tactically to burn adjoining vegetation with differing fire requirements (e.g. lighting grassy open forest ridgelines early in the season with good soil moisture when adjoining shrubby open forest is too moist to burn). Also, because it does not require fire as frequently.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 1 — Open forest and woodland

Issue 1: Maintain healthy open forest and woodland

Aerial ignition is essential for planned burning of inaccessible areas of open forest.

Ignition of grassy ridgelines in cooler weather but with good soil moisture can be used to encourage grass regeneration while limiting fire encroachment into adjoining communities that require fire less frequently.
David Kington, QPWS, Mt Barney National Park.
Issue 2: Reduce overabundant saplings

Isolated thickets of saplings can result from localised hot spots or normal variations of fire severity; however a broad-scale overabundance of saplings in the understorey of open forest or woodland can reduce the health of the ground stratum through competition and shading. To maintain an open structure, only a very small number of canopy and mid-stratum recruits are needed to provide variety in age and for eventual replacement of mature canopy species. Knowing the fire history of an area and the individual species response to fire is important in determining if overabundance is an issue.

Awareness of the environment

Key indicators of overabundant saplings:

• A broadscale mass germination of young wattles, she-oaks, eucalypts, rainforest pioneers or other saplings emerging in the ground stratum; or a broad-scale overabundance of these species in the mid-stratum.
• Presence of a monoculture of single species (e.g. brush box) in the understorey.
• Understorey or mid-stratum is difficult to see through or walk through.
• Grasses are continuous or near continuous but starting to collapse. Other ground layer plants are reduced in health and abundance.
• Shrubs where present, have dead or dying branches and are declining in diversity and abundance.

Without intervention, this mass germination of wattles will eventually shade out the ground stratum grasses making it difficult to reintroduce planned burns.

An over-abundance of she-oaks in the understorey has already led to a decline in the condition of grasses at this site.

Rainforest pioneers in the mid stratum are scattered but grasses have become sparser in the ground layer. Fire is required to restore the health of grasses.
Discussion

Why are saplings overabundant?

- An overabundance of saplings in the understorey may be triggered in response to:
- A high severity fire event with no subsequent fire to thin the resulting mass germination of tree saplings (refer to the photo below).
- A fire regime which has not been varied and has favoured one species.
- Prolonged absence of fire leading to a gradual increase in woody species.
- Removal of many overstorey trees due to a past natural disaster (drought or severe storm).

Potential impacts of overabundant saplings

- A thickening of trees will result in a lower diversity in the ground stratum due to shading and less fine fuel to carry future fires.
- Once thickets have developed it may be difficult to re-introduce fire into that area if left too long.
- The fire intensity will often be higher and reach into the canopy when the community does burn. This may promote the regeneration of woody species rather than grasses and herbs.
Other considerations

- Small isolated flushes of saplings can result from localised hot spots or normal variations of fire severity and should not be confused with the broad-scale issue.
- Certain wattles and other tree species build up large seed banks in the absence of fire, which is likely to lead to a mass germination event after wildfire (which tends to be a higher severity fire). Post-fire observations and monitoring will help determine whether this is a broad-scale issue which requires follow-up fire.
- An abundance of some shrubs and trees can be part of a natural cycle. Fire management appropriate to the fire vegetation group in which they occur will maintain these areas—seek advice if unsure.
- Be aware that some overabundant rainforest and eucalypt species will re-sprout from bases and while fire will not kill them, it will keep them low in profile, so that other species can compete.
- In parts of the southeast, there is a group of rainforest pioneers that tend to colonise the ground layer and can grow into the mid stratum quickly in the absence of fire. It may be difficult to re-introduce fire into that area if left too long.

Tall open blackbutt forest with a well developed rainforest understory. It is no longer possible or desirable to introduce fire under planned burn conditions.
Rowena Thomas, QPWS, Mapleton National Park (2012).
• A thickening of trees may result in a lower diversity in the understorey due to shading and potentially less ground fuels to carry future fires.
• Where grasses are scattered, poorly formed and collapsing, forest health will be more difficult to recover and becomes a lower priority for planned burning.

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Planned burns to maintain ecosystems in areas where ecosystem health is good (recoverable with one burn).</td>
</tr>
<tr>
<td>Medium</td>
<td>Planned burn in areas where ecosystem health is poor (recoverable with two or more burns).</td>
</tr>
<tr>
<td>Low</td>
<td>Planned burn in areas where ecosystem structure and function has been significantly disrupted. Ground stratum is absent or sparse and fire is no longer viable.</td>
</tr>
</tbody>
</table>

Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.
Select from below as appropriate for the site:

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
</table>
| > 75% of overabundant saplings are scorched.               | Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire intensity), estimate the percentage of overabundant saplings (above ground components) scorched. | Achieved: > 75%.  
Partially achieved: 25–75%.  
Not achieved: < 25%.                                                                                     |
| > 90% of the clumping grass bases remain as stubble.       | Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire intensity) and estimate clumping grass bases remaining after fire. | Achieved: > 90% bases remain.  
Partially achieved: 75–90% bases remain.  
Not achieved: < 75% bases remain.                                                                           |

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.

**Monitoring the issue over time**

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this, it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.
Fire parameters

What fire characteristics will help address this issue?

Fire severity

- **Low** to **moderate** (small areas of **high** may occur)

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fire intensity (kWm(^{-1}))</td>
<td>Average flame height (m)</td>
</tr>
<tr>
<td>Low (L)</td>
<td>&lt; 150</td>
<td>&lt; 0.5</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>150–500</td>
<td>0.5–1.5</td>
</tr>
<tr>
<td>High (H)</td>
<td>500–1000</td>
<td>1.5–3.0</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions.
Scorch height:
- Scorch height required to reduce overabundant saplings will be variable depending on target species (e.g. green wattles require only lower branches scorched whereas brush box saplings should be scorched to the tip), seek advice for other species.

Other considerations:
- It is possible that more than one planned burn will be required to manage this issue. If the initial fire triggers a flush of new seedlings, follow-up planned burn as fuel allows for low to moderate severity fire.
- Try to carry out planned burns before significant seeding of overabundant saplings occurs. This may require a shorter fire frequency than normally recommended for this community.
- For medium priority planned burns, be aware that a low severity fire may do more harm than good, by reducing available ground fuel but not scorching the targeted saplings.
- Once the area has recovered, the recommended regime for healthy open forest and woodland should be resumed.

What weather conditions should I consider?
It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

Season: Depends on accumulation of fuel and sufficient moisture to favour regeneration of grasses. In general late summer burning is preferable to provide higher scorch and better conditions for grass recovery.

FFDI: < 11

Wind speed: < 15 km/hr
What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics. Refer to Issue 1 for tactics.

- While a **low to moderate-severity** fire is recommended to address this issue, the scorch height required to achieve burn objectives is dependent on the target species and their height.

- A **backing fire** with good residence time. A slow moving backing fire lit against the wind on the smoky edge or fire running down-slope, will ensure the fire has a greater amount of residence time, while ensuring fire severity and rate of spread are kept to a minimum. Greater residence time is useful in reducing overabundant seedlings/saplings.

- A **running fire** of a higher severity (e.g. a fire lit along the mid-ridge running uphill), may be required initially where there is a lack of surface and near surface fuels due to shading-out or the thicket is well developed. In this instance a follow-up planned burn will be required to thin surviving saplings and any new seedlings.

Overabundant eucalypts in the understorey have been scorched however the site will need to be monitored to ensure the fire has not triggered another flush of seedlings. QPWS (2009).
**Issue 3: Manage invasive grasses**

It is important to be aware of the presence of invasive exotic grasses during planned burn operations and the maintenance of firelines. They are generally taller and produce significantly more dry matter than native species; increasing fuel loads, fire intensity, spotting and flame height which leads to increased fire severity and spread. Some invasive grasses of concern in SEQ bioregion are guinea, thatch, signal, molasses, giant rat’s tail and whiskey grass.

**Awareness of the environment**

**Key indicators of invasive grass issue:**

- Tall, dense stands of grasses (often single-species dominated) are present.
- Invasive grasses may be located along firelines, access roads and historically cleared areas.
- There may be dead trees (within infestation) with charring high up the trunk.

A monoculture of thatch grass has replaced native pasture and begun to encroach into adjoining communities.

Dan Beard, QPWS, Gladstone (2009).
Discussion

• In many cases it is desirable to avoid burning invasive grasses, due to the likelihood of increased fire severity and further promotion of these grasses. However, planned burning of invasive grasses in good soil moisture conditions may be preferable in some situations, when there is a heightened risk of them burning with wildfire and producing an even higher-severity fire during hot, dry conditions.

• Some invasive grasses have short seed viability, and withholding fire for a period may favour native grasses and assist in control, therefore it is important to know the biology and current treatment recommendations for each species.

• Fire may be useful as part of an integrated weed control program to reduce dead biomass and promote mass germination of the seed bank in preparation for herbicide control.

• Be aware of weed hygiene issues when maintaining firelines or planned burning in areas with invasive grasses (refer to the QPWS Pest plant and pathogen spread prevention guideline).

Some species-specific information is offered in the following pages:
Guinea grass *Megathyrsus maximus*

- Fire is generally not effective in controlling Guinea grass but if the infested area must be burnt, the timing and follow-up treatment with herbicide will be critical factors. Avoid burning late in the season as this will increase the risk of high severity fire and potential damage to riparian and other sensitive areas.
- Guinea grass remains greener longer than native grasses and will burn with a higher intensity due to the increased biomass when it is sufficiently cured.
- Maintaining canopy cover (and therefore shade) will assist in the management of this grass.

Close up of Guinea grass.

Molasses grass *Melinis minutiflora*

- Molasses grass is killed by fire but regenerates rapidly post-fire from large seed banks. Observation of seedlings post-burn in North Queensland showed that seed production did not occur until the second year (Williams and Bulley 2003).
- Short fire intervals i.e. planned burning before seedlings have matured to seed production, has been trialed with success in north Queensland and has led to recovery of native clumping grasses such as giant spear grass and kangaroo grass (Williams and Bulley 2003).
- Assessment of similar trials in SEQ will determine if short fire intervals are a useful method for reducing molasses grass. Some caution is required with the use of this method over a long time-frame as it may be damaging to populations of native perennials through seedling death (Williams 2002).
Signal grass *Urochloa decumbens*

- Signal grass is not as tall as other invasive grasses but can form a dense monoculture in disturbed areas and infestations have become more common in the southern part of the bioregion.
- This invasive grass recovers rapidly after fire from stolons and seed with the onset of rains. Little is known about how signal grass responds to different fire regimes. Monitoring and more observation is required.

![Signal grass forms a dense monoculture outcompeting native grasses in open forest.](image1)

John McQueeney, QPWS (2012).

![Distinctive flowers of signal grass.](image2)

Donovan Sharp, Queensland Herbarium (2012).
Whiskey grass *Andropogon virginicus*

- Whiskey grass is a tall tussock-grass which grows up to one metre with a distinctive erect, column-like habit, appearing orange-brown during the warmer months and fading to a straw colour during winter.
- This species invades disturbed areas along tracks and like other exotic grasses can increase the fire hazard.

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
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</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Planned burns to maintain ecosystems in areas where ecosystem health is good.</td>
</tr>
</tbody>
</table>

It is important to be aware of the presence of invasive grasses (particularly where it is a new infestation) so that their negative effects can be managed and the potential of control can be considered.

Whiskey grass is very distinctive in colour and appearance during warmer months.
Assessing outcomes

Formulating objectives

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

Select from below as appropriate for the site:

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<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promote mass germination of invasive grass seeds in preparation for control with herbicide.</td>
<td>Assess the site after the burn (preferably after rain) for germination of invasive grass seeds.</td>
<td>Achieved: mass germination of weed seeds. Partially achieved: moderate germination of weed seeds (sufficient to warrant follow-up spraying). Not achieved: Insufficient germination to warrant follow-up spraying.</td>
</tr>
<tr>
<td>Reduce fuel hazard to low to limit impacts of wildfire.</td>
<td>Post fire: use the Overall Fuel Hazard Guide (Hines et al. 2010b), or Step 5 of the QPWS Planned Burn Guidelines: How to Assess if Your Burn is Ready to Go, to visually assess the remaining fuel in at least three locations.</td>
<td>Achieved: Fuel hazard has been reduced to low Not achieved: Fuel hazard has not been reduced to low.</td>
</tr>
</tbody>
</table>

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.
Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.

- Fire management techniques for most species of invasive grasses in the SEQ bioregion are not yet established and will be subject to experimentation. Recording fire details and results will help to refine the most appropriate objectives, timing and conditions.

Fire parameters

What fire characteristics will help address this issue?

Fire severity

- This will depend on the species of invasive grass being targeted but in general aim to minimise fire severity.

What weather conditions should I consider?

It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

Season: Late wet season to early dry season (February–April) is preferable

FFDI: < 7

DI (KBDI): < 100

Wind speed: < 10 km/hr

Soil moisture: Ensure good soil moisture to retain a duff layer and limit the opening of bare ground and further encroachment of weeds.
What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **As part of a control program.** The initial over-spraying of invasive grasses with herbicide, followed by a low to moderate severity planned burn about a month after herbicide treatment, has been used as an effective control method. The successful treatment of these grasses will require monitoring the site and follow up treatments either by fire or herbicide of any remaining plants and new seedlings.

- **Spot ignition.** Can be used effectively to alter the desired intensity of a fire particularly where there is an invasive grass infestation. Increased spacing between spots will result in a lower intensity. The spacing of the spots may vary throughout the burn due to changes in weather conditions, topography and fuel loads.

- **Backing fire** (lit against the wind or slope) will help to minimise the fire intensity when burning invasive grass infestations and reduce the risk of encroachment into non-target communities.

- **Running fire.** For many invasive grasses it is recommended to burn early in the season. A running fire will help carry the fire though the infestation if weather conditions are too mild or grasses are not sufficiently cured. This can be achieved by shortening the spacing of lit spots or alternatively using line or strip ignition.

- **Limit fire encroachment into non-target communities.** Use appropriate lighting patterns (e.g. spot lighting with matches) in combination with favourable weather conditions along the margin of the community to promote a lower intensity backing fire that burns away from the non-target community. Undertake burning in areas adjacent to invasive grass infestations while the grass is green and not cured, under mild conditions, early morning or late afternoon/evening will assist in creating a low severity fire that burns away from the non-target community. Where the non-target community is present in low lying areas (e.g. drainage lines utilise the surrounding topography to create a low intensity backing fire that travels down slope towards the non-target community). In both instances ensure good soil moisture is present within the non-target community.
**Issue 4: Reduce *Lantana camara***

Where *Lantana camara* occurs as a scattered understorey plant and grass fuels are still continuous, the recommended fire regime for healthy open forests should be applied.

Where lantana camara has become an infestation; refer to Chapter 10 (Issue 5) for fire management guidelines.

Scattered lantana in the understorey. Notice that grass fuels are still continuous and therefore the standard fire regime for open forests could be applied to control lantana.

**Issue 5: Manage bell miner associated dieback**

Bell miner associated die-back (BMAD) of eucalypts is a significant issue in the southern half of the bioregion which appears to be associated with overabundant woody species in the mid-stratum and the consequent loss of open structure between the ground layer and canopy of open forests. A **high priority** should be placed on maintaining ecosystem health in fire vegetation groups **adjacent to BMAD** affected areas to prevent the expansion of dieback.

**Awareness of the environment**

**Key indicators of BMAD** (Look for a combination of the indicators below)

- Presence of bell miner birds (bellbirds) in the local area— calls are heard (a high pitched ‘tink’).
- Presence of a dense mid-stratum.
- Foliage of canopy tree upper branches is dying in a number of trees.
- Epicormic regrowth on branches is common within an area.
- Numerous trees are dead or dying.

Numerous dead and dying trees combined with a dense mid-stratum of mainly wattles and she-oaks can be indicators of BMAD affected open forest.

Mark Burnham, QPWS, Mt Barney National Park.
Areas such as this where dieback is well established will be difficult to recover and are therefore a very low priority for planned burning.

Mark Burnham, QPWS, Main Range National Park.

Planned burning in adjacent grassy open forest should be a high priority to prevent the expansion of dieback and reduce the impact of potential high severity wildfire.

Dave Kington, QPWS, Main Range National Park.
Epicormic regrowth on branches may be common in a BMAD area.  
Discussion

- Areas adjacent to BMAD which are healthy or are showing early signs of decline are the highest priority for planned burning as it also reduces the impact of potential wildfire in BMAD affected areas.

- Eucalypt dieback, strongly linked with sap feeding insects called psyllids, is sometimes associated with the native bell miner or bellbird and has become common in some parts of the bird’s range. Psyllid dieback can occur without the presence of bell miners, but management will be the same as for BMAD.

- There are various theories on the cause of bell miner associated dieback and how it can be addressed. Not all dieback is due to BMAD - drought and Phytophthora can also cause dieback and fire will not necessarily help in these cases (though there is some evidence that fire is an element in Phytophthora dieback). Seek assistance if unsure.

- Areas where dieback is well established will be difficult to recover and are therefore a very low priority for planned burning.

- A single dead tree or dead tree branch is not necessarily associated with BMAD.

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Planned burns to maintain ecosystems in areas where ecosystem health is good.</td>
</tr>
<tr>
<td>Medium</td>
<td>Planned burn in areas where ecosystem health is poor but recoverable.</td>
</tr>
<tr>
<td>Very low</td>
<td>Ecosystem is extremely difficult to recover.</td>
</tr>
</tbody>
</table>

Refer to Issue 2 ‘Reduce overabundant saplings’ or Chapter 10 (Issue 5) ‘Reduce Lantana camara’ where relevant, for fire management guidelines.
Issue 6: Manage sustainable production

Refer to Chapter 10 (Issue 8) for fire management guidelines.

Grazing can impact on planned burning operations by reducing the fuel hazard (amount of surface and near-surface fuels available). Although grass appears similar on both sides of the fence, the right side was previously grazed by cattle and had only one year of growth, compared to the left side which had three years growth and thatch (dead grass) underneath. Under ideal planned burn conditions, this fire self-extinguished exactly on the edge of the fuel hazard change.

David Kington, QPWS, Glen Rock State Forest (2010).
Chapter 2: Wet open forest

This fire vegetation group includes open forests in wetter areas of SEQ, generally surrounding rainforests on elevated slopes, mountain ranges and gullies as well as wetter lowland areas. They are typically dominated by one or a mix of canopy species including flooded gum, tallowwood, Sydney blue gum, turpentine and brush box. These communities generally have a rainforest-dominated but mixed species understorey, though small remnants of grassy or shrubby understorey may occur, particularly within Sydney blue gum forests.

Fire management issues

In most parts of SEQ, wet open forest communities form a moving ecotone between closed rainforest communities and open forest and woodland and the composition of the understorey varies with rainfall, altitude, slope, aspect, geology and fire frequency. Most of these forests have a rainforest dominated understorey which will only burn during wildfire in prolonged dry conditions; however there may be small areas with a grassy or shrubby understorey which should be a high priority to maintain with planned burning.

Issues:
1. Maintain wet open forest with a grassy or shrubby understorey
2. Maintain wet open forest with a rainforest understorey.

Extent within bioregion: 50 629 ha, 1 per cent; Regional ecosystems: 12.2.4, 12.3.2, 12.5.6a, 12.8.8, 12.8.9, 12.11.2, 12.12.15a, 12.12.15b.

Largest locations of this FVG: Great Sandy National Park, 9 868 ha; Conondale National Park, 4 817 ha; D'Aguilar National Park, 3 019 ha; Lamington National Park, 1 856 ha; Main Range National Park, 1 827 ha; Woondum National Park, 1 087 ha; Springbrook National Park, 853 ha; Mount Barney National Park, 683 ha; Glen Rock State Forest, 623 ha; Imbil State Forest 1, 495 ha; Deongwar State Forest, 364 ha; Ravensbourne National Park, 293 ha; Bellthorpe National Park, 250 ha; Kondalilla National Park, 240 ha; Tamborine National Park, 199 ha; Yuroabl State Forest, 187 ha; Lockyer National Park (Recovery), 182 ha; Tewantin National Park, 177 ha; Marys Creek State Forest, 128 ha; Neerdie State Forest 2, 123 ha; Peachester State Forest, 104 ha; Mapleton National Park, 103 ha; West Cooroy State Forest, 100 ha; Ringtail State Forest, 96 ha; Maleny National Park, 71 ha; Toolara State Forest, 67 ha; Mapleton National Park (Recovery), 55 ha; Eumundi Conservation Park, 49 ha; Ferntree Creek National Park, 48 ha; Beerwah State Forest, 38 ha.
**Issue 1: Maintain wet open forest with a grassy or shrubby understorey**

Planned burning is critical to maintain small remaining areas of wet open forest with a grassy or shrubby understorey. More frequent fire is required to maintain grasses, keeping more mesic (rainforest) species low in the profile of the understorey so that other species can compete (Campbell and Clarke 2006).

Refer to Chapter 1 (Issue 1) for fire management guidelines.
Issue 2: Maintain wet open forest with a rainforest understorey

Most wet open forest communities have a rainforest dominated ground stratum while others, in the absence of fire, develop a closed subcanopy of mature rainforest under tall eucalypt emergent’s (e.g. Fraser Island, Lamington and Springbrook national parks). It is not possible or desirable to introduce fire into these communities under planned burn conditions and it is likely that fire will only ever penetrate under extreme or catastrophic conditions (e.g. severe wildfire following drought and / or cyclone damage).

In some areas it may be necessary or desirable to prevent fire encroachment into these communities. Refer to Chapter 10 (Issue 2), for fire management guidelines.
Chapter 3: Grasslands

In SEQ, grasslands have a very restricted distribution in the Bunya Mountains. Known locally as grassy balds, these areas are mostly dominated by tussock grasses (e.g. *Poa labillardieri* and *Sorghum leiocladum*) and are generally treeless and shrubless. In the Bunya Mountains they exist mostly as small pockets surrounded by either eucalypt forest or rainforest at both high and low altitudes. Past indigenous burning regimes are attributed to maintenance of the grassy balds prior to European influence (Fensham and Fairfax 2006a). The biodiversity status of this regional ecosystem is **endangered** (Queensland Herbarium 2011a).

**Fire management issues**

The main issue for these communities is encroachment of surrounding rainforest and eucalypt forest. Regular burning is required to maintain grassy balds surrounded entirely by rainforest; and to restrict the expansion of adjoining eucalypt forest.

**Issues:**

1. Maintain healthy grasslands and limit forest encroachment
2. Manage woody invasion.

**Extent within bioregion:** 669 ha, < 1 per cent; **Regional ecosystem:** 12.8.15

**Locations of this FVG:** Bunya Mountains National Park, 455 ha; Bunya Mountains National Park (Recovery), 1 ha.
**Issue 1: Maintain healthy grasslands and limit forest encroachment**

To maintain healthy grasslands and limit forest encroachment by rainforest and eucalypt forest species, it is critical to conduct planned burns with good soil moisture.

**Awareness of the environment**

**Key indicators of healthy grasslands:**

- Grass clumps are well formed.
- Trees and shrubs absent or mostly absent.
- Few weeds present.

Grasslands in good health with only a few weeds (balloon cotton) present.

QPWS, Bunya Mountains National Park.
The following may indicate that fire is required to maintain grasslands:

- Grass clumps poorly formed; an accumulation of thatch (dead material) and collapsing grass clumps.
- A flush of eucalypt or wattle saplings/seedlings emerging amongst the grass clumps.
- Rainforest pioneers emerging amongst the grass clumps.

Grass clumps are collapsing with an accumulation of thatch (dead material)
Peter Cavendish, QPWS (2007).
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 3—Grasslands

Issue 1: Maintain healthy grasslands and limit forest encroachment

Discussion

• Balloon cotton is a widespread weed on the grassy balds and is reported to increase in abundance soon after fire, however it decreases with grass regrowth (Fensham and Fairfax 1996a).

• Exotic kikuyu grass is a major threat to grasslands in the Bunya Mountains as it has the capacity to almost completely replace native species (Fensham and Fairfax 1996b).

• Burning with good soil moisture to maintain grass bases will promote faster grass regeneration and limit opportunity for balloon cotton and exotic grasses to germinate or spread.

• Be aware that signs of poor health can also be a result of drought. Implementing fire during drought conditions is not recommended as this could compound health problems.

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Planned burn required to maintain areas of special conservation significance.</td>
</tr>
</tbody>
</table>
Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

Select from below as most appropriate for the site:

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 90% of the clumping grass bases remain as stubble.</td>
<td>Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire intensity) and estimate grass bases remaining after fire.</td>
<td>Achieved: &gt; 90% bases remain. Partially achieved: 75–90% bases remain. Not achieved: &lt; 75% bases remain.</td>
</tr>
<tr>
<td>&gt; 75% of woody saplings / seedlings &lt; one metre in height are scorched to the tip.</td>
<td>Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire severity); estimate the percentage of saplings/seedlings scorched.</td>
<td>Achieved: &gt; 75%. Partially achieved: 25–75%. Not achieved: &lt; 25%.</td>
</tr>
</tbody>
</table>

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.
Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.

There is a need for monitoring the extent of these grassy areas with respect to the encroachment of rainforest and eucalypt forest; however this is difficult due to the inaccessibility of many sites.

Fire parameters

What fire characteristics will help address this issue?

Fire severity

- **Low** with the occasional **moderate** severity fire.

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fire intensity (kWm$^{-1}$)</td>
<td>Average flame height (m)</td>
</tr>
<tr>
<td><strong>Low (L)</strong></td>
<td>50–100</td>
<td>0.3–0.5</td>
</tr>
<tr>
<td><strong>Moderate (M)</strong></td>
<td>100–1500</td>
<td>0.5–1.5</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions.

Fire frequency / interval (refer to Appendix 2 for a discussion)

- Fire frequency should primarily be determined through **on-ground assessment of vegetation health**, **fuel accumulation** and **previous fire patchiness** and adjusted for wildfire risk and drought cycles.
- Apply planned burns across the landscape at a range of frequencies to create varying stages of post-fire response (i.e. recently burnt through to the maximum time frame). Consider a broad fire interval range of between three to six years.
Mosaic (area burnt within an individual planned burn)
The entire area is likely to burn because of mostly continuous, evenly
distributed fuel, so aim for a landscape level mosaic.

Landscape mosaic
Generally, avoid burning more than 50 per cent of grasslands in any one year.

Other issues
A moderate severity fire may be required when targeting woody species that are
starting to become abundant. Good soil moisture at the time of burning is vital
so as not to exacerbate the issue and to favour grass regeneration.

Grasslands will dry out more quickly after rain than surrounding forest so
consider this when planning and prioritising burns.

What weather conditions should I consider?
It is important to be aware of conditions prior to and following burns so that
undesirable conditions and weather changes can be avoided, or to help with
burn planning.

Season:
• Concentrate efforts during years of good rainfall.
• Avoid burning following frosts.
• Be aware that grass growth and recovery post fire is slower in winter which
  may result in patches of bare ground for longer periods and provide the
  opportunity for encroachment of weeds.

GFDI: < 7

DI (KBDI): < 100

Wind speed: < 15 km/hr

Soil moisture: Good soil moisture is critical when burning grasslands to assist
retention of grass bases and encourage grass regeneration. Timing burns in
the days following rain (and before adjoining forests will burn) will improve
regeneration and limit promotion of weeds such as balloon cotton.
What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Spot ignition** applies to aerial and ground ignition and can be used to alter the desired intensity of a fire. Spots closer together will result in a line of a greater intensity (as spots merge and create high intensity junction zones) while increased spacing between spots or alternatively a single spot ignition will result in a lower intensity fire and more varied mosaic of unburnt and burnt patches. The spacing of the spots may vary throughout the burn due to changes in weather conditions, topography and fuel loads.

- **A low intensity backing fire.** A slow moving, low intensity backing fire (lit on the leeward or smoky edge) will generally result in a more complete coverage of an area and a better consumption of fuel. This tactic creates high residence time useful to reduce overabundant seedlings, while ensuring fire intensity and rate of spread are kept to a minimum.

- **Aerial ignition** is essential for planned burning inaccessible grassy pockets and to maximise efficiency of resources. Consider burning soon after rain and/or lighting these areas later in the day to limit intensity.

Spot ignition on the smoky edge can be useful to minimise intensity which in turn helps to retain grass clump bases, and improve post-fire regeneration to out-compete weeds such as balloon cotton.

Mark Cant, QPWS, Bunya Mountains National Parks (2004).
**Issue 2: Manage woody invasion**

Encroachment of eucalypt, wattle or rainforest saplings from surrounding communities reduces the health of grasses and will eventually lead to forest transition.

**Awareness of the environment**

**Key indicators of where fire can still be introduced:**

- Eucalypt, wattle or rainforest species are beginning to colonise, emerging above the grass layer.
- Grasses are scattered, poorly formed and collapsing. Other ground layer plants are reduced in health and abundance.
- Grass layer is starting to become less continuous.
Discussion

Why are woody species invading?

- Prolonged absence of fire can lead to gradual colonisation of woody species from surrounding rainforest and eucalypt forest.

- Where woody species have started to colonise and fire has been absent for several years, a wildfire or high-severity fire can trigger certain wattles and other tree species to mass-germinate creating thickets.

- An altered regime of higher-intensity fires with low soil moisture can promote woody species over grasses.

Potential impacts of woody invasion:

- Shading by woody species will lead to a decline in grass health and abundance, reducing the amount of ground fuel to carry low intensity fires in the future.

- Once a thicket has developed it may be difficult to re-introduce fire into the area if left too long.

- The fire intensity will often be higher when the community does burn which promotes further regeneration of woody species rather than grasses and herbs.

- Eventually the grassland may transition into an open woodland community or rainforest.

Other considerations

- It is likely that more than one planned burn will be required to manage this issue.

- If the initial fire triggers a flush of new seedlings, follow-up planned burn when sufficient fuel allows for a low to moderate severity fire.

- Once the area has recovered, the recommended regime for healthy grassland should be resumed (refer to Issue 1).

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Planned burn required to maintain areas of special conservation significance.</td>
</tr>
</tbody>
</table>
Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

Select from below as most appropriate for the site:

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
</table>
| > 75 % of saplings are scorched to the tip. | Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire severity); estimate the percentage of saplings scorched. | Achieved: > 75 %.
Partially achieved: 50-75 %.
Not achieved: < 50 %.
|
| > 75 % of grasses recover after fire. | Before and after fire, select three or more sites (taking into account the variability of landform and likely fire intensity) and estimate cover of grasses that recover one to three months after fire. | Achieved: > 75 % of grasses recover.
Partially achieved: 50–75 % recover.
Not achieved: < 50 % recover. |

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.

Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.
Fire parameters

What fire characteristics will help address this issue?

Fire severity

- **Moderate** severity fire.

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fire intensity (kWm⁻¹)</td>
<td>Average flame height (m)</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>150–500</td>
<td>0.5–1.5</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions.

Scorch height

- Scorch height required to reduce overabundant saplings will be variable depending on target species (e.g. green wattles requires only lower branches scorched whereas brush box saplings should be scorched to the tip), seek advice for other species.

Fire frequency / interval (refer to Appendix 2 for a discussion)

- Ensure sufficient fuel has built up to carry a **moderate** severity fire depending on species.

Mosaic (area burnt within an individual planned burn)

- Burn as much of the area dominated by saplings as possible.

Other considerations:

- Be aware that a low severity fire may do more harm than good by reducing available ground fuel but not reducing the targeted saplings.
- It is probable that more than one planned burn will be required to manage this issue. If the initial fire triggers a flush of new seedlings, follow-up planned burn as fuel allows for **low** to **moderate** severity fire.
What weather conditions should I consider?

It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

**Season:** Depends on accumulation of fuel and sufficient moisture to favour regeneration of grasses

**GFDI:** < 10

**Wind speed:** < 15 km/hr

What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Commence lighting on the leeward (smoky) edge** to create a safe edge to support a subsequent higher severity fire internally. Depending on available fuels and the prevailing wind on the day, either spot or strip lighting may be required or a combination of both.

- **Creating a running fire** (through closely spaced spot ignition or line ignition with the wind) may help in addressing the issue of encroachment of woody species.

- **Line ignition** is used to create a fire of higher intensity or to help fire carry through moist or inconsistent fuels. This is also useful to reduce overabundant trees (through scorching).
Chapter 4: Heath communities

In SEQ this fire vegetation group contains wet and dry coastal heaths, sedgelands and treeless vegetated swamps, wallum banksia and low mallee woodland communities on dunes and sand plains. It also includes montane heath and rock pavement, generally located on rocky mountain peaks, exposed ridges and plateaus on poorer soils.

Fire management issues

The main issue for many coastal heath communities is the recurrence of broad-scale (sometimes frequent) high intensity wildfires in dry conditions, which can reduce plant health and lead to long term loss of diversity. In more isolated areas of montane heath and some coastal, prolonged absence of fire can also lead to a decline in plant health and diversity.

Peat fires can be an issue in wet heaths and sedgelands, particularly during prolonged drought. If ignited, peat can smoulder for long periods and will take many years to re-form.

Maintaining appropriate mosaic burning in surrounding fire-adapted areas, combined with landscape mosaic burning of heath with good soil moisture, is the best strategy to mitigate the extent of unplanned fire and maintain healthy heath communities.

Issues:
1. Maintain healthy coastal heath communities
2. Maintain healthy montane heath communities
3. Avoid peat fires
4. Manage exotic pine wildings.

Extent within bioregion: 145 914 ha; 2 per cent; Regional ecosystems: Refer to Appendix 1.

Largest locations of this FVG: Great Sandy National Park, 75 291 ha; Burrum Coast National Park, 18 474 ha; Moreton Island National Park, 6 260 ha; Naree Budjong Djara National Park, 4 193 ha; Tuan State Forest, 2 757 ha; Bribie Island National Park, 1 999 ha; Poona National Park, 1 539 ha; Deepwater National Park, 1 215 ha; Noosa National Park, 1 196 ha; Mount Walsh National Park, 1 154 ha; Bingera National Park, 986 ha; Naree Budjong Djara National Park (Recovery), 906 ha; Toolara State Forest, 901 ha; Eurimbula National Park, 880 ha; Glass House Mountains National Park, 514 ha; Mooloolah River National Park, 447 ha; Littabella National Park, 398 ha; Land adjacent to Tuan SF, 350 ha; Mount Barney National Park, 339 ha; Lamington National Park, 333 ha; Proposed Miara National Park (Yandaran Land), 244 ha; Mount Coolum National Park, 228 ha; Eurimbula Resources Reserve, 179 ha; Moogerah Peaks National Park, 158 ha; Main Range National Park, 143 ha.
**Issue 1: Maintain healthy coastal heath communities**

Maintain heath communities by mosaic burning on a landscape level and burning in association with the surrounding fire-adapted communities.

**Awareness of the environment**

**Key indicators of healthy coastal heath communities (refer to photos below):**

- There is a diversity of shrub species that appear green and vigorous including banksias, hakeas, pea flowers, tea-trees *Leptospermum* spp. and grass trees.
- Presence of obligate seeders such as small-leaved geebung *Persoonia virgata*, *Hakea actites* and wedding bush *Ricinocarpos pinifolius*.
- Rushes, sedges, lilies and herbs are present in the ground layer of wet heath.
- Trees are absent or occasional emergents; or a low tree layer dominated by wallum banksia or stunted or mallee-form trees is present.
- Low lying areas may be seasonally waterlogged.

![Healthy wet heath community](image)

Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 1: Maintain healthy coastal heath communities

Healthy coastal open heath with emergent melaleucas

Healthy open sedgelands.
QPWS, Bribie Island National Park (2005).
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 1: Maintain healthy coastal heath communities

Healthy wet coastal heath
Adam Creed, QPWS, Toby’s Gap, Fraser Island.

Healthy high dune heath. Note the presence of dead woody material from previous fire with healthy new foliage.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 1: Maintain healthy coastal heath communities

Healthy wallum banksia heath

Healthy low mallee heath woodland
Paul Horton, QPWS, Burrum Coast National Park (2012).
Signs of where fire management is required:

- Shrubs have lost a significant amount of lower level leaves, or crowns of shrubs are dying. Dead material is accumulating on shrubs.
- There is a noticeable loss of diversity in the shrub layer.
- Dense matting of dead vegetation appears under banksias.
- Grass trees have accumulated dense brown skirts.
- Dodder is starting to smother the shrub layer.
- Substantial dead material is accumulating amongst sedges and rushes or dense matting of dry material is present in wet heath.
- Encroachment of melaleuca saplings in wet heath or increasing abundance of saplings in dry heath.

Dead branches, spindly growth and loss of diversity in the understorey indicate fire has been absent too long from this wallum banksia woodland.

Shrubs are losing lower leaves and grass trees accumulating dead skirts in this open heath.

Sedges and rushes are starting to accumulate dead material in this wet heath.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 1: Maintain healthy coastal heath communities

Dodder is smothering the shrub layer in this long unburnt heath.
Paul Horton, QPWS, Burrum Coast National Park (2012).

Hakea actites shrubs are abundant in some wet heath communities and can become structurally dominant when fully grown (2-3m). Combined with the weight of large woody seed clusters (inset) mature plants may fall over, impacting on ground layer plants.
Discussion

- Many coastal heath communities are located within the urban interface or high-use recreation areas making them more susceptible to arson and wildfire. The issue is that these areas may only experience broad-scale (sometimes frequent) high intensity wildfires in dry conditions, with subsequent long-term impacts on plant diversity and health.

- Conversely, some heath communities experience too infrequent fire which also results in decline in plant health and diversity. It is important to burn the landscape in a mosaic to provide a range of vegetation age classes and reduce the extent of future wildfires.

- Coastal heath communities feature a relatively high proportion of obligate seeder species (i.e. regenerating only from seed) which can take several years to reach reproductive maturity. It is important to allow some plants sufficient time to mature and set seed over several years to build an adequate seed supply between fires.

- Some obligate seeders such as hakea can become overabundant as a result of mass germination following fire, particularly in low soil moisture. If this occurs across a broad area, consider reintroducing fire before reseeding occurs.

- Low-lying wet heaths gradually accumulate peat (partially decayed, densely packed vegetation). Due to its porous nature and high carbon content, peat is highly flammable when dry and can continue to smoulder for weeks or months after the fire has occurred. Peat takes many years to re-form.

- Peat fires are extremely difficult to extinguish and may travel underground beneath firelines with a high risk of re-ignition elsewhere.

- In wet heath communities with a peat layer, planned burn with standing water to help protect the peat layer.

- Implementing fire during drought conditions is not recommended as in most instances plants will be drought ‘stressed’ and this will impact upon post fire recovery of the plants and community generally. The resulting fire can also be expected to be more damaging and extensive.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 1: Maintain healthy coastal heath communities

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Planned burns to maintain ecosystems in areas where ecosystem health is good.</td>
</tr>
</tbody>
</table>

Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create age class diversity within heath community by mosaic burning across the landscape (e.g. mosaic burn approx 30% every three years)</td>
<td>Choose one of these options: Visual estimation of percentage of vegetation burnt—from one or more vantage points, or from the air. Map the boundaries of burnt areas with GPS, plot on ParkInfo and thereby determine the percentage of area burnt. In three locations (that take account of the variability of landform and ecosystems within burn area), walk 300 or more metres through planned burn area estimating the percentage of ground burnt within visual field.</td>
<td>Achieved: 25–50 % burnt. Partially achieved: 0–25 % or 50–75 % burnt. (Adjust future planned burn objectives depending on result) Not Achieved: &gt; 75 % burnt.</td>
</tr>
</tbody>
</table>

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.
A successful mosaic burn in open heath—this can be difficult to achieve within small areas, so generally aim for a landscape level mosaic.
Rowena Thomas, QPWS, Currimundi Lake Conservation Park (2009).

Mosaic planned burning coastal heath at a landscape level using aerial incendiaries.
Galen Matthews, QPWS, Moreton Island National Park (2009).
Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.

Monitoring the presence of common obligate seeders such as wedding bush may be useful as an indicator of appropriate fire regimes in some heath communities.

Fire parameters

What fire characteristics will help address this issue?

Fire severity

- Coastal heath and sedgelands: Moderate (small pockets of extreme can be expected).

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (L)</td>
<td>&lt; 2.0</td>
<td>Substantial unburnt vegetation (green patches) in the shrub layer. Does not remove all the surface fuels (litter) and near surface fuels. Can create distinct ‘holes’ in closed heath. Some scorching of shrubs and small trees.</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>2.0–4.0</td>
<td>Most vegetation burnt. Skeletal frames of shrubs remain. Trunks of grass trees intact. Charred duff layer remains.</td>
</tr>
<tr>
<td>Extreme (E)</td>
<td>&gt; 4.0</td>
<td>Extensive to total biomass burnt. Burnt to mineral earth.</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions. State-wide fire severity descriptions adjusted for SEQ conditions.

Skeletal frames of shrubs remaining intact after a moderate severity fire is important to provide regeneration for many species and maintain structure of the heath community.

Jenise Blaik, QPWS, Teerk Roo Ra National Park (2002).
• Wallum banksia and low mallee woodland < 10m: **Moderate** (small pockets of **extreme** can be expected)

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
<th>Description (loss of biomass)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patchy (P) to Low (L)</td>
<td>&lt; 1.0</td>
<td>&lt; 5.0</td>
<td>40–60 % vegetation burnt. Unburnt vegetation (green patches) in the ground and shrub layer. Does not remove all the surface fuels (litter) and near surface fuels. Can create distinct ‘holes’ in closed heath. Overall little canopy scorch. Some scorching of shrubs and small trees.</td>
</tr>
<tr>
<td>Moderate (M) to Extreme (E)</td>
<td>&gt; 1.0</td>
<td>&gt; 5.0</td>
<td>Understorey burnt to mineral earth. Greater than 60 % vegetation burnt. Extensive to total foliage burnt. Minimal evidence of green vegetation remaining. Largely only skeletal frames of shrubs and small trees remain.</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions.

**Landscape mosaic**

• Because most of these communities tend to burn all at once or not at all, it may be difficult to achieve a mosaic within a small individual planned burn area. It is therefore important to create the mosaic at a landscape level. Do not burn more than 30 per cent of these heath communities within a management area in the same year.
Fire frequency / interval (refer to Appendix 2 for a discussion)

- Fire frequency should primarily be determined through on-ground assessment of vegetation health, fuel accumulation and previous fire history and adjusted for wildfire risk and drought cycles.
- Apply mosaic planned burns across the landscape at a range of frequencies to create varying stages of post-fire response (i.e. recently burnt through to the maximum time frame). Consider a broad fire interval range of between eight and twenty years with an emphasis on eight to twelve years.

Other considerations

- Generally it is not possible to planned burn coastal heath at low severity.
- It is important to ensure that individual areas are not always burnt with the same interval between fires or at the same time of year. Some hard seeded species (e.g. pea flowers require more heat to germinate).
- Consider progressive burning to treat more volatile fuel types early in the season (e.g. swamp or wet heath).
What weather conditions should I consider?

It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

**Season:** January to August (southern bay islands May to August)

**FFDI:** < 11.

**DI (KBDI):** < 120 (< 80 southern bay islands).

**Relative Humidity:** > 50 per cent (only relevant to southern bay islands)

**Wind speed:** < 15 km/hr

**Soil moisture:**
- Ensure good soil moisture is present. Be aware that although coastal heaths can receive regular moisture or rain, they are also exposed to strong winds and can dry out very quickly, particularly where they occur on sandy soils.
- Standing water or waterlogged peat is the critical factor that will help to minimise risk of re-ignition in wet heath.

What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Aerial incendiary** with planned spot ignition, using topography and weather conditions on the day, is useful for mosaic burning of large areas. Pre-planning is required using GIS mapping to show previously burnt areas and determine appropriate ignition points. It may be useful to record ignition points as GPS coordinates. Post-burn aerial observation is required to accurately record percentage burnt.

- **Burning in high humidity** conditions (such as in the advent of rain, during low cloud cover or the evening) is a useful tactic to help limit spread of fire into these communities and ensure the resulting fire is of a lower severity that preferably extinguishes overnight.
Issue 2: Maintain healthy montane heath communities

Maintain healthy montane heath communities by mosaic burning on a landscape level and burning in association with the surrounding fire-adapted communities.

Awareness of the environment

Key indicators of healthy montane heath communities:

- A diversity of shrub species that appear green and vigorous including banksias, hakeas, pea flowers, tea-trees *Leptospermum* spp., she oaks and grass trees.
- Presence of obligate seeder shrubs such as Allocasuarina rigida, steelhead *Callitris monticola* and narrow-leaved boronia *Boronia anethifolia*.

Montane heath is often fragmented by rock pavement which can be used to help maintain variation in time since fire.

Justin O’Connell, QPWS, Mt Maroon (2009).
Signs of where fire management is required:

- Shrubs have lost a significant amount of lower level leaves, or crowns of shrubs are dying. Substantial dead material is accumulating on shrubs.
- Loss of diversity is observed in the shrub layer.
- Increasing abundance or dominance of a single species (e.g. hakea, she-oaks or tea-trees) is observed.
- Grass trees are accumulating dense brown skirts.
- Banksias appear spindly with a lack of leaves.

This montane heath has been unburnt for 20 years. Notice lower level leaves are dying and there is a dominance of she oaks Allocasuarina spp.

Discussion

- Montane heath communities typically require longer fire frequency than the communities that surround them and are often self protecting due to fragmentation by rock pavement.
- Plant health and diversity can be reduced by extended absence of fire as well as too frequent broad-scale high-intensity wildfires in dry conditions.
- An imbalance of hakea, she oaks or tea trees may often result from a single or series of dry, high-severity fires or where fire has been absent for an extended period.
- For obligate seeders it is important to allow some plants sufficient time to mature and set seed over several years to build an adequate seed supply between fires. In conjunction it is important to burn the landscape in a mosaic to provide a range of vegetation age classes and reduce the extent of future wildfires.
**Fire parameters**

**What fire characteristics will help address this issue?**

**Fire severity**
- **Low to moderate**

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Fire severity (post-fire)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (L)</td>
<td>&lt; 2.0</td>
<td>Substantial unburnt vegetation (green patches) in the shrub layer. Does not remove all the surface fuels (litter) and near surface fuels. Can create distinct ‘holes’ in closed heath. Some scorching of shrubs and small trees.</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>2.0–4.0</td>
<td>Most vegetation burnt. Skeletal frames of shrubs remain. Trunks of grass trees intact. Charred duff layer remains.</td>
</tr>
</tbody>
</table>

Notes:  

a) This table assumes good soil moisture and optimal planned burn conditions.  

b) State-wide fire severity descriptions adjusted for SEQ conditions.

**Fire frequency / interval** (refer to Appendix 2 for a discussion)
- Fire frequency should primarily be determined through on-ground **assessment of vegetation health, fuel accumulation and previous fire patchiness** and adjusted for wildfire risk and drought cycles.
- Apply mosaic planned burns across the landscape at a range of frequencies to create varying stages of post-fire response (i.e. recently burnt through to the maximum time frame). Consider a broad fire interval range of between fifteen to fifty years.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 4—Heath communities

Issue 2: Maintain healthy montane heath communities

What weather conditions should I consider?
It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

Season: Late wet season to early dry season (e.g. February to August)

FFDI: < 11

DI (KBDI): < 120

Wind speed: < 15 km/hr

Soil moisture: The presence of good soil moisture is crucial for good regeneration. These communities are heavily influenced by local weather conditions, drying and exposure due to topography and shallow soils.

What burn tactics should I consider?
Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Burn in association with surrounding landscape.** Allow fire to penetrate naturally into heath when burning surrounding areas but do not attempt to re-ignite unburnt areas.

- **Aerial or manual spot ignition of heath** along spurs and ridgelines may be useful to encourage variability or to introduce fire into long unburnt areas when burning in association with the surrounding landscape.

Spot lighting montane heath in the late afternoon will help reduce the fire severity and promote mosaics.

QPWS, Moogerah Peaks National Park (2008).
Issue 3: Avoid peat fires

Planned burn with standing water in wet coastal heath and sedgelands to avoid peat fires.

Refer to Chapter 10 (Issue 4), for fire management guidelines.
**Issue 4: Manage exotic pine wildings**

Germination of exotic pine wildings is an issue in areas of heath adjacent to pine plantations.

Refer to Chapter 10 (Issue 7), for fire management guidelines.

Exotic pine wildings in regenerating heath community.
Graeme Bulley, QPWS, Bribie Island National Park (2011).
Chapter 5: Melaleuca communities

This fire vegetation group includes melaleuca swamps, melaleuca woodlands and open forests commonly dominated by *Melaleuca quinquenervia* (swamp paperbark). The understorey is variable with wetter sites supporting sedges, ferns and other wet heath species, while drier sites may have a grassy and/or shrubby understorey. The endangered swamp tea-tree *Melaleuca irbyana* forests restricted to SEQ are also included in this group.

**Fire management issues**

There are considerable differences in how melaleuca communities occur in the landscape which present different fire management issues. Where they occur as isolated stands within a broader fire-adapted community, the focus is on mosaic burning in surrounding areas, allowing fire to penetrate into melaleuca communities on some occasions. Where they occur as an extensive forest, a more direct approach to fire management may be required.

**Issues:**

1. Maintain healthy melaleuca communities
2. Avoid peat fires
3. Manage exotic pine wildings.

**Extent within bioregion:** 80 673 ha; 1 per cent; **Regional ecosystems:** Refer to Appendix 1.

**Largest locations of this FVG:**
- Great Sandy National Park, 12 338 ha; Bribie Island National Park, 4 725 ha; Tuan State Forest, 3 237 ha; Poona National Park, 2 919 ha; Deepwater National Park, 2 043 ha; Eurimbuла National Park, 1 916 ha; Toolara State Forest, 1 667 ha; Burrum Coast National Park, 1 274 ha; Beerburrum East State Forest, 988 ha; Curtis Island National Park, 704 ha; Naree Budjung Djarra National Park, 657 ha; Noosa National Park, 552 ha; Wongi State Forest, 547 ha; Littabella National Park, 505 ha; Southern Moreton Bay Islands National Park, 501 ha; Moreton Island National Park, 371 ha; Mooloolah River National Park, 323 ha; Beerwah State Forest, 297 ha; Wongi Forest Reserve, 296 ha; Eurimbuла Resources Reserve, 295 ha; Curtis Island Conservation Park, 278 ha; Proposed Miara National Park (Yandaran Land), 261 ha; Coolum Creek Conservation Park, 260 ha; Great Sandy Conservation Park, 150 ha; Naree Budjung Djarra National Park (Recovery), 124 ha; Bingera National Park, 122 ha; Maroochy River Conservation Park, 118 ha; Carbrook Wetlands Conservation Park 1, 117 ha; Elliott River State Forest, 116 ha; Land adjacent to Poona NP, 112 ha; Pumicestone National Park, 110 ha; Vernon Conservation Park, 108 ha; Mount Coolum National Park, 105 ha; USL Central Great Sandy Strait, 100 ha; Ext to Poona National Park, 94 ha; South Stradbroke Island Conservation Park, 90 ha; Beerburrum West State Forest, 79 ha; Neerdie State Forest 2, 78 ha; Ext to Bribie Island National Park, 71 ha; Venman Bushland National Park, 68 ha; Glass House Mountains National Park, 67 ha; Teerk Roo Ra National Park, 60 ha.
**Issue 1: Maintain healthy melaleuca communities**

Maintain healthy melaleuca communities with planned burning.

**Awareness of the environment**

**Key indicators of a healthy melaleuca community**

- Understorey may contain a sparse to dense ground layer of grasses, sedges, forbs, ferns, orchids, shrubs, or any mix of these in the understorey, with melaleuca species of variable sizes and a healthy canopy.
- Cabbage tree palms may be present in the mid stratum or sub-canopy of some coastal communities.
- Permanent or seasonal standing water may be present.

Melaleuca community with a healthy grass/sedge understorey.
Rowena Thomas, QPWS, Caloundra Conservation Park (2011).
Issue 1: Maintain healthy melaleuca communities

Melaleuca swamp with wet heath understorey
Rowena Thomas, QPWS (2011).

Melaleuca forest with fern/sedge understorey, subject to seasonal inundation.
Southeast Queensland Bioregion Planned Burn Guidelines: Chapter 5—Melaleuca communities

Issue 1: Maintain healthy melaleuca communities

Melaleuca swamp with a mid stratum of cabbage tree palms and sedge understorey.
Jenise Blaik, QPWS, South Stradbroke Island Conservation Park (2011).

Melaleuca communities can occur in narrow strips along drainage channels. Burning adjacent fire adapted communities when standing water is present will limit impacts on melaleuca from more frequent regimes.
Jenise Blaik, QPWS Teerk Roo Ra National Park (2011).
Some of the following may indicate that fire is required to maintain a melaleuca community:

- There is a dense accumulation of dead material (grasses/sedges/ferns) and grasses are beginning to collapse (no longer erect).
- Increasing density of monkey vine *Parsonsia* spp., in the mid stratum
- Surface and near-surface fine fuels such as leaf litter, bark and twigs have accumulated to High hazard (using the Overall Fuel Hazard Assessment Guide).
- There has been a mass germination of melaleuca in amongst or just above the ground layer.
- There has been a flush of pine wildlings or groundsel which have grown up and begun to shade out ground layer. Sometimes these form a whipstick stand of many closely spaced narrow trees.

Dead material is accumulating in the fern / sedge ground stratum. Note the presence of monkey vine in the mid stratum which can also become dense in the absence of fire.

Rowena Thomas, QPWS, Glass House Mountains National Park (2009).
Discussion

- The thick papery bark of some melaleucas promotes ladder fires which will quickly run from the base of the tree to the top. Often these fires will self extinguish without causing any damage particularly to mature trees (depending upon weather conditions at the time and fire severity). Younger melaleuca trees will often respond post fire with a flush of regrowth from epicormic buds.

- Where a thicket of young melaleucas has developed, the resulting fire can be of a much greater severity due to the closeness of saplings and fuel arrangement which can result in a much greater mortality of melaleuca.

- The endangered swamp tea-tree communities occur as low forests with an open eucalypt overstorey. Regeneration of these melaleucas may be disrupted by too frequent high severity fires in dry conditions or too infrequent fires.

What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Planned burn required to maintain areas of special conservation significance.</td>
</tr>
<tr>
<td>High</td>
<td>Planned burn to maintain ecosystems in areas where ecosystem health is good.</td>
</tr>
</tbody>
</table>

Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.
Select from below as appropriate for the site:

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5 % mortality of mature melaleuca.</td>
<td>Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire severity); estimate the percentage of mature dead trees (approximately six months after the fire).</td>
<td>Achieved: &lt; 5 %. Not achieved: &gt; 5 %.</td>
</tr>
<tr>
<td>&gt; 90 % of clumping grass or sedge bases remain as stubble.</td>
<td>Select one or more sites or walk one or more transects (taking into account the variability of landform and likely fire intensity) and estimate percentage of clumping grass bases remaining after fire.</td>
<td>Achieved: &gt; 90 % bases remain. Partially achieved: 75–90 % bases remain. Not achieved: &lt; 75 % bases remain.</td>
</tr>
<tr>
<td>The planned burn does not result in a peat fire.</td>
<td>Ongoing visual assessment during and post burn to ensure the fire has not carried into peat layer and developed into a peat fire.</td>
<td>Achieved: Fire did not carry into peat layer and develop into a peat fire. Not achieved: Fire carried into peat layer and developed into a peat fire.</td>
</tr>
</tbody>
</table>

If the above objectives are not suitable refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.
Monitoring the issue over time

Many issues are not resolved with a single planned burn and it is important to keep observing the land. To support this it is recommended that observation points be established. Observation points are usually supported by photographs and by recording observations. Instructions for establishing observation points can be obtained from the monitoring section of the QPWS Fire Management System.

Monitoring the presence and condition of specific species such as the endangered swamp orchid Phaius australis can be used as an indicator of appropriate fire.

Sylvia Millington, QPWS (2005).
**Fire parameters**

**What fire characteristics will help address this issue?**

**Fire severity**
- **Low** to **moderate** (Melaleuca open grassy/ferny woodland).
- **Moderate** with small areas of **high** (other melaleuca communities)

<table>
<thead>
<tr>
<th>Fire severity class</th>
<th>Fire intensity (during the fire)</th>
<th>Average flame height (m)</th>
<th>Fire severity (post-fire)</th>
<th>Description (loss of biomass)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low (L)</td>
<td>&lt; 150</td>
<td>&lt; 0.5</td>
<td>&lt; 2.5</td>
<td>Significant patchiness. Litter retained but charred. Humus layer retained. Nearly all habitat trees, fallen logs, and grass stubble retained. Some scorching of elevated fuels. Little or no canopy scorch.</td>
</tr>
<tr>
<td>Moderate (M)</td>
<td>150–500</td>
<td>0.5–1.5</td>
<td>2.5–7.5</td>
<td>Moderate patchiness. Some scorched litter remains. About half the humus layer and grass stubble remain. Most habitat trees and fallen logs retained. Some scorch of elevated fuels. Little or no canopy scorch.</td>
</tr>
<tr>
<td>High (H)</td>
<td>500–1000</td>
<td>1.5–3.0</td>
<td>7.5–15.0</td>
<td>Some patchiness. Some humus remains. Some habitat trees and fallen logs affected. At least some canopy scorch in moderate &lt; 20 m height canopy, mid stratum burnt completely (or nearly so).</td>
</tr>
</tbody>
</table>

Note: This table assumes good soil moisture and optimal planned burn conditions.
**Specific guidelines for melaleuca communities**

Where they are not directly targeted as part of fuel management burns, the main fire management approach for melaleuca communities is burning surrounding fire-adapted areas with a good awareness of moisture conditions within the melaleuca community. Fire penetration into melaleuca (from surrounding areas) can be planned to achieve the recommended fire frequency. Direct targeting of melaleuca areas with fire management may be required depending on on-ground assessment.

**Fire frequency / interval** (refer to Appendix 2 for a discussion)

- Fire frequency should primarily be determined through **on-ground assessment of vegetation health, fuel accumulation** and **previous fire patchiness** and adjusted for wildfire risk and drought cycles.
- Apply mosaic planned burns across the landscape at a range of frequencies to create varying stages of post-fire response (i.e. recently burnt through to the maximum time frame).
- Consider the needs of melaleuca communities based on understorey and moisture with a broad fire interval range for **mixed grass/shrub** understorey of six to twenty years; **heath** understorey eight to twelve years; and **sedge/fern** understorey twelve to twenty years.

**What weather conditions should I consider?**

It is important to be aware of conditions prior to and following burns so that undesirable conditions and weather changes can be avoided, or to help with burn planning.

**Season:** January to July (consider varying the season of burn)

**FFDI:** < 11

**DI (KBDI):** Ideally 60–80, but < 100

**Wind speed:** < 15 km/hr

**Soil moisture:** Burn with good soil moisture in melaleuca woodlands. Melaleuca communities seasonally inundated or where a peat layer has formed are vulnerable to peat fire in the drier months and should always be burnt with standing water or when the peat layer is water logged (refer to Chapter 10 Issue 4, for guidelines).
Other considerations

Be aware that the papery bark and leaves of melaleuca are volatile and highly flammable. Planned burns following rain will help protect melaleuca trees and reduce ember spotting (due to moisture being retained in bark).

The papery bark of Melaleuca draws fire up the tree trunk. Planned burning soon after rain will help the fire to self-extinguish and improve post-fire regrowth.

Jenise Blaik, QPWS, South Stradbroke Island Conservation Park (2011).

- For melaleuca and pine wilding overabundance, it is particularly important to observe post fire germination and kill rates to ascertain the need for subsequent fires. It is likely that more than one planned burn will be required to manage this issue. Although moderate severity fires may be necessary to control sapling overabundance, it may also have an impact on canopy species recruitment. Therefore once mid stratum overabundance is controlled, it is important to return to a predominantly low severity fire regime.
What burn tactics should I consider?

Tactics will be site-specific and different burn tactics may need to be employed at the same location (e.g. due to topographical variation). Also, during the burn tactics should be reviewed and adjusted as required to achieve the burn objectives. What is offered below is not prescriptive, rather a toolkit of suggested tactics.

- **Spot ignition.** Useful to alter the desired severity of a fire. Well spaced spot lighting adjacent to melaleuca stands is preferred to limit the chance of hot damaging junction zones forming within this community.

- **A backing fire with good residence time** - A slow moving backing fire (lit against the wind on the smoky edge or down-slope) will generally result in a more complete coverage of an area and ensures the fire has a greater amount of residence time, while ensuring fire intensity and rate of spread are kept to a minimum. Greater residence time is useful in reducing overabundant trees.

- **Commence lighting on the leeward (smoky) edge** to establish the initial fire-line, a safe perimeter and promote a low severity backing fire. Depending on available fuels and the prevailing wind on the day this may require either spot or strip lighting or a combination of both.

- **Areas with standing water** can be used to protect peat and create fires with a greater mosaic and variability of time since fire.

- **Line or strip ignition** is used to create a fire of higher intensity or to help fire carry through moist or inconsistent fuels. This is also useful to reduce overabundant trees (through scorching).

- **Limit fire encroachment into non-target communities.** When burning in surrounding fire-adapted areas where you do not want fire to penetrate into melaleuca, appropriate lighting patterns along the margin of the melaleuca community may assist in creating a low intensity backing fire that burns away from the non-target area. Or, where the melaleuca is low-lying (e.g. drainage lines), utilise the surrounding topography to create a low intensity backing fire that travels down slope towards the melaleuca community. In both instances ensure good soil moisture is present within the melaleuca community.
Issue 2: Avoid peat fires

Refer to Chapter 10 (Issue 4), for fire management guidelines.

Standing water will prevent peat fires and reduce likelihood of ignition during planned burning in adjacent communities.
Troy Spinks, QPWS, South Stradbroke Island Conservation Park (2005).
**Issue 3: Manage exotic pine wildings**

Refer to Chapter 10 (Issue 7), for fire management guidelines.

A flush of pine wildings has formed a dense thicket in the understorey of this melaleuca community.

Graeme Bulley, QPWS, Bribie Island National Park (2008).
Chapter 6: Coastal fringing forests and headlands

This fire vegetation group includes coastal fringing forests of swamp she-oak and exposed rocky headlands (grassy or wind-sheared shrub).

Fire management issues

Issues:
1. Maintain health of fringing swamp she-oak forests

Extent within bioregion 4 259 ha; < 1 per cent; Regional ecosystems: Refer to Appendix 1.

Largest locations of this FVG: Eurimbula National Park, 406 ha; Southern Moreton Bay Islands National Park, 215 ha; Curtis Island National Park, 203 ha; Great Sandy National Park, 148 ha; Great Sandy Conservation Park, 115 ha; Bribie Island National Park, 110 ha; Burrum Coast National Park, 68 ha; Pumicestone National Park, 45 ha; Beerburrum East State Forest, 42 ha; Noosa National Park, 37 ha; Eurimbula Resources Reserve, 30 ha; Southend Conservation Park, 21 ha; Eudlo Creek Conservation Park, 21 ha; Ext to Poona National Park, 18 ha; Barubbra Island - Proposed Addition To Conservation Park, 18 ha; Coombabah Lake Conservation Park, 17 ha; + Naree Budjong Djara National Park, 16 ha.
**Issue 1: Maintain health of fringing swamp she-oak forests**

Fringing swamp she-oak forests are fire-adapted communities which should be burnt in association with surrounding fire-adapted communities. These communities have an **endangered** biodiversity status (Queensland Herbarium 2011a).

**Awareness of the environment**

**Key indicators of health in fringing swamp she-oak forest:**

- Open to dense canopy of swamp she-oaks.
- Melaleuca and/or mangroves may be intermingled on the margins.
- The ground stratum may be present as a sparse cover of salt-tolerant plants (e.g. marine couch); a cover of fallen she oak ‘leaves’ (cladodes) and devoid of ground plants or with reeds, sedges and/or ferns.
- Few or no weeds e.g. groundsel are present.
- These areas may be subject to tidal inundation.

![Swamp she-oak forest with a sedge understorey. Rowena Thomas, QPWS (2011).](image)

**Signs of where fire management is required in fringing swamp she-oak forest:**

- It is difficult to see through or walk into the forest.
- Increasing infestation of weeds, particularly groundsel.
- Accumulation of dead material in sedge/fern understorey where present.
- Build up of fine fuels such as dead grass material, leaf litter, suspended leaf litter, bark and twigs. Accumulation of elevated fuels is high or above.
What is the priority for this issue?

<table>
<thead>
<tr>
<th>Priority</th>
<th>Priority assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Planned burn required to maintain areas of <em>special conservation significance</em>.</td>
</tr>
<tr>
<td>High</td>
<td>Planned burn to <em>maintain ecosystems</em> in areas where <em>ecosystem health</em> is <em>good</em>.</td>
</tr>
</tbody>
</table>

Assessing outcomes

Formulating objectives for burn proposals

Every proposed burn area contains natural variations in topography, understorey or vegetation type. It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations walk around and if visibility is good look about and average the results. Estimations can be improved by returning to the same locations before and after fire, and by using counts where relevant.

<table>
<thead>
<tr>
<th>Measurable objectives</th>
<th>How to be assessed</th>
<th>How to be reported (in fire report)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosaic burn in association with surrounding fire-adapted communities</td>
<td>Choose one of these options: Visual estimation of percentage of vegetation burnt—from one or more vantage points, or from the air. Map the boundaries of burnt areas with GPS, plot on ParkInfo and thereby determine the percentage of area burnt. In three locations (that take account of the variability of landform and ecosystems within burn area), walk 300 or more metres through planned burn area estimating the percentage of ground burnt within visual field.</td>
<td>Achieved: 40–70 % burnt. Partially achieved: between 15–40 %. Or 70–85 % burnt. Not achieved: &lt; 15 % or &gt; 85 % burnt.</td>
</tr>
</tbody>
</table>

If the above objectives are not suitable, refer to the compendium of planned burn objectives found in the monitoring section of the QPWS Fire Management System or consider formulating your own.