Department of National Parks,
Recreation, Sport and Racing

# Planned Burn Guidelines

## Central Queensland Coast Bioregion of Queensland

Queensland Government

Prepared by: Queensland Parks and Wildlife Service (QPWS) Enhanced Fire Management Team, Queensland Department of National Parks, Recreation, Sport and Racing (NPRSR).



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**Front cover photograph:** Chance Bay, Whitsunday Island, Justin Heitman (Whitsunday Digital Pty Ltd, T/A Blue Turtle Digital) (2009).

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## Foreword

Comparatively small in area (some 1 800 000 hectares) this bioregion is centred on the high-rainfall coastal lowlands, ranges and islands of Central Queensland. Open forests and woodlands characterise the foothills and lowlands while rainforest and tall eucalypt forests are predominant in the ranges. The QPWS estate is comprised of a series of somewhat small isolated mountains and hills in the lowlands and larger contiguous areas in the ranges surrounded by intensive agriculture and a number of continental and coral islands off the coast. With the move towards green harvesting of cane and the subdivision of larger parcels of land into smaller 'lifestyle' sized blocks, fire management of this fragmented estate is becoming more challenging.

The use of fire on our estate and across the landscape will continue to be the single-most effective management tool to maintain and enhance the integrity for those fire-dependant ecosystems. I hope these guidelines will provide one of the tools that will assist in developing the most appropriate fire regimes to achieve this. I encourage you to take a proactive approach to fire management, use these guidelines as a basis, gather sound information through observations and monitoring and provide feedback on their application. It is through this adaptive management approach that we will be able to further develop our knowledge of fire in the landscape.

Michael Koch
Senior Ranger
Central Region
Queensland Parks and Wildlife Service.

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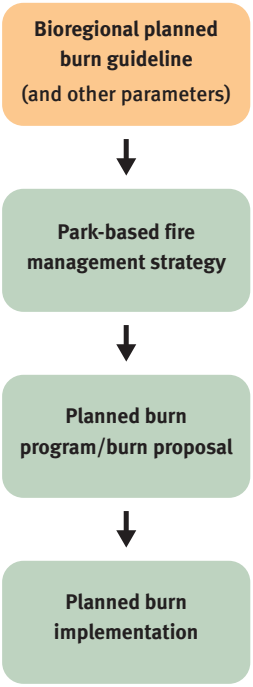



How the planned burn guideline fits into the QPWS Fire Management System.

## 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 Central Queensland Coast bioregion (refer to Figure 1) and covers fire vegetation groups including eucalypt forests and woodlands, tall open forests, grasslands and sedgelands, heath and shrublands, melaleuca, dune communities, rainforests, mangroves and saltmarshes (refer to Appendix 1 for regional ecosystems contained in each fire vegetation group).
- It covers the most common fire management issues arising in the Central Queensland Coast bioregion. 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.

Joy Brushe, QPWS, Mt Westall (1997).

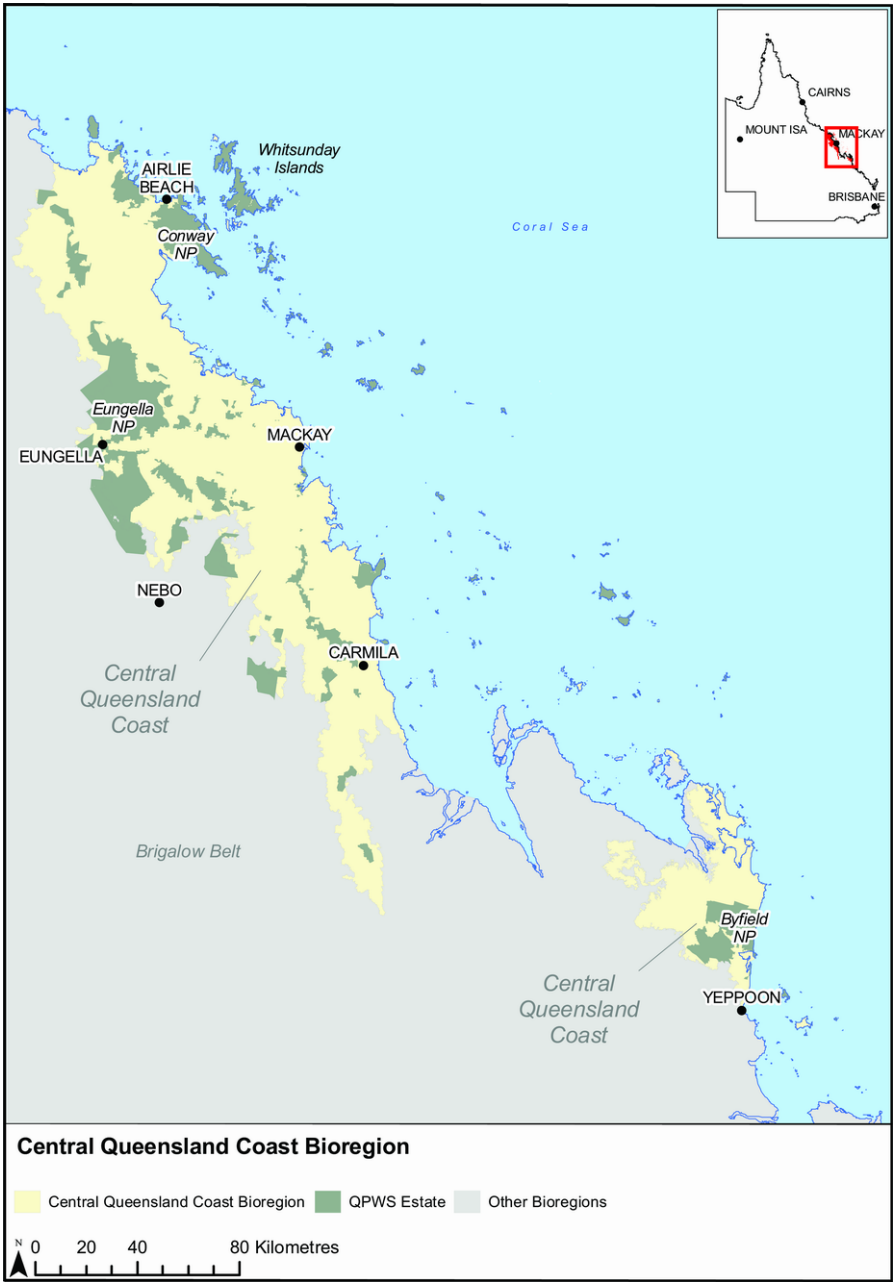



**Figure 1:** Map of the New England Tableland bioregion of Queensland.

# Fire and climate in the Central Queensland Coast bioregion

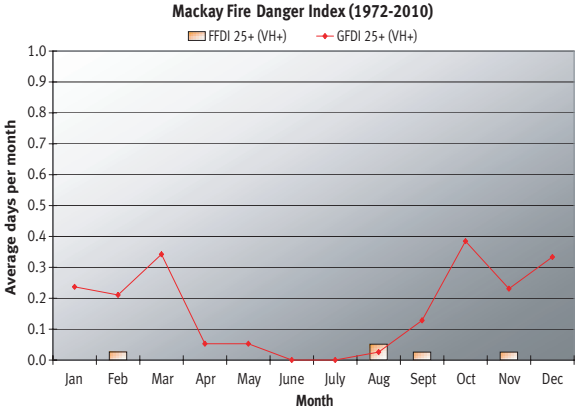
The Central Queensland Coast bioregion is characterised by high rainfall (1300–2000 mm per year) with ranges that surround lowlands adjacent to the coast. Distinct wet and dry seasons characterise the climate and the area is periodically affected by cyclones and flooding. The wet season (during which more than half the annual rainfall occurs) extends from about November to April with gradual drying of the land from about April until the start of the next wet season. The start or end of the wet season can vary by up to a few months in any year.

The ranges support areas of wet sclerophyll and rainforest vegetation while lower slopes and lowlands are predominantly eucalypt woodland and semi-deciduous vine forests.

Summers can be hot (up to 33°C) and humid, but temperatures are generally lower on the ranges and close to the coast. Winter days can be warm and dry, but evenings cool to cold (as low as 0°C) with frosts inland.

The 'fire' season normally begins around April as the wet season ends and fuels begin to cure. Nominally, April to mid-June is defined as the early dry, mid-June to early September as the mid dry and the late dry from then until the start of the wet season around November to December but which may be as late as January. Accelerated curing can occur in the winter (May/June) as early cold snaps quickly cure the fine fuels. Wildfires can occur at almost any time during the dry season but become more severe and difficult to control as fuels cure and are most severe in the late dry season.

Fire risk is linked to the occurrence of fire weather days or sequences of days (FDR very high+ / FDI 25+). In the Central Queensland Coast bioregion these days have an average temperature above 30°C, low humidity (less than 20 per cent) and sustained winds of more than 20 km/hr (refer to Figure 2).




A fire weather day or sequence of days (FDI 25+) rarely occurs in this bioregion. Data (Lucas 2010).

**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>.**

**Figure 2:** Fire weather risk in the Central Queensland Coast bioregion.

# 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: Eucalypt forest and woodland

Eucalypt forests and woodlands dominate the landscape in the Central Queensland Coast bioregion and fire management is critical to maintain their health. The canopy is usually dominated by a mix of eucalypt and corymbia species (such as Queensland blue gum *Eucalyptus tereticornis*, Moreton Bay ash *Corymbia tessellaris* or pink bloodwood *Corymbia intermedia*), but may also be dominated by a single species. The ground layer is generally dominated by a mix of grasses including kangaroo *Themeda triandra* , blady *Imperata cylindrica* and spear grasses *Aristida* spp., but may also contain lilies, sedges, legumes and scattered shrubs such as grasstrees, cycads and wattles. This fire vegetation group is found on the Clarke-Connors Ranges, Proserpine-Sarina lowlands and coastal ranges and islands (for fire management guidelines for eucalypt communities on dunes refer to Chapter 6).

## Fire management issues

A major fire management issue for eucalypt forest and woodland communities is lack of fire. A lack of fire promotes the overabundance of pioneer rainforest saplings/seedlings which can have undesirable impacts on diversity.

In other areas fires have been too frequent, severe or applied at the wrong time, leading to a change in vegetation structure or promotion of weeds (including some high biomass grasses). *Lantana camara* may be present, causing an increase in elevated fuel and therefore fire severity, or the inability to maintain fire due to a lack of ground layer fuels.

### Issues:

1. Maintain healthy eucalypt forests and woodlands.
2. Reduce overabundant saplings.
3. Manage high-biomass grasses.
4. Reduce *Lantana camara*.
5. Reduce rubber vine.

**Extent within bioregion:** 645 472 hectares (ha), 44 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** Byfield State Forest, 11 836 ha; Eungella National Park, 10 204 ha; Crediton State Forest, 8 747 ha; Mia Mia State Forest, 8 099 ha; Whitsunday Islands National Park, 8 034 ha; Proserpine State Forest, 7 424 ha; Epsom State Forest 2, 5 524 ha; West Hill State Forest, 5 337 ha; Cathu State Forest, 5 322 ha; Dryander National Park, 4 538 ha; Byfield National Park, 4 123 ha; West Hill Forest Reserve, 3 821 ha; Conway National Park, 3 590 ha; Crediton Forest Reserve, 3 585 ha; Epsom State Forest 3, 3 426 ha; Ben Mohr Forest Reserve, 2 980 ha.

# Issue 1: Maintain healthy eucalypt forests and woodlands

## Awareness of the environment

**Key indicators of healthy eucalypt forest or woodland:**

- Canopy species of variable sizes (enough to eventually replace the canopy) and a healthy canopy exist. Stags or live trees with hollows are present.
- Lower and mid stratum trees are scattered (e.g. eucalypts, wattles, rainforest species and she-oaks) but **are not** having any noticeable shading effects on the ground stratum plants.
- Native grasses appear upright and vigorous and may be interspersed with occasional legumes, lilies and sedges.
- Shrubs (where present) have healthy foliage.
- Lantana (where present), is limited to scattered individuals or occurs in isolated small clumps.
- Logs in various stages of decay are present.

This eucalypt woodland has a healthy mix of native grass species.
Kerensa McCallie, QPWS, Homevale National Park (2011).

This Eucalypt community has a mix of grasses and shrubs in the understorey.
Kerensa McCallie, QPWS, Homevale National Park (2011).

The presence of logs in various stages of decay can be a good indicator of a healthy eucalypt forest and woodland.
Joy Brushe, QPWS, Shoalwater Bay (1997).

Grasses are upright and vigorous in this open forest.

Jeanette Kemp, Queensland Herbarium (2002).

A mixture of grasses and grasstrees may dominate the ground stratum.

Jeanette Kemp, Queensland Herbarium (2002).

A mix of annual and perennial grasses is present in the ground layer of this eucalypt community.

Jeanette Kemp, Queensland Herbarium, near Clairview (2004).

**The following may indicate that fire is required to maintain a eucalypt forest or woodland:**

- Grasses are thinning, collapsing or appearing matted with a build-up of dead material.
- Pioneer rainforest species such as *Macaranga* spp., swizzle bush, *Larsenaikia jardinei, Alphitonia excelsa*, *Alyxia spicata*, or *Glochidion* spp. are beginning to emerge above the ground layer plants. Where this has progressed, and shading begins to impact on the diversity and health of understorey plants, refer to Issue 2 for guidelines.
- Grass trees where present, have accumulated brown skirts.
- There is a build-up of fine-fuels such as dead grass material, leaf litter, suspended leaf litter, bark and twigs. There is an accumulation of elevated fuels.
- The diversity of mid/ground stratum species (grasses, herbs, sedges and shrubs) has declined.
- Shrubs have sparse crowns and/or beginning to die. There is limited or no recruitment of new shrubs (lack of juvenile shrubs).
- Lantana may be becoming more frequent.

Brown skirts on *Xanthorrhoea* spp. provide habitat for invertebrates and skinks. However, as the skirts build-up they indicate the need for fire management to maintain a forest with an open structure. Microhabitat such as this, and also dead matted grass, dense pockets, fissured bark etc. develop again over time—although fire initially reduces them, it also maintains the forest that allows them to exist. In the absence of fire, such open forest habitat features would eventually perish. With appropriate planned burn conditions, unburnt patches and habitat features remain—in contrast to wildfires, which burn extensive areas.

Kerensa McCallie, QPWS, Byfield National Park (2011).

A build-up of fuel in eucalypt woodlands can indicate a need to consider planned burning. This grassy understory shows build-up of fine fuel and thinning of grasses, after eight years without fire.

Frank Mills, QPWS, Byfield State Forest (2010).

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.

## Discussion

- Fire generally keeps rainforest species low in the profile and forces them to resprout from the base (although in some cases they also germinate from seed) (Williams and Tran 2009). In the absence of fire, with suitable geological conditions, rainforests species can grow into the mid stratum and begin to shade-out grasses, herbs and seedlings of trees and shrubs. Eventually it is difficult to reintroduce fire and the ecosystem is likely to transition to a closed forest. System change to closed forest can be very rapid in this fire vegetation group.
- Although pockets of rainforest are desirable, there should not be an abundance of rainforest pioneers colonising beyond these pockets into the open forest generally.
- 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. Consider whether the area has naturally poor soil and therefore grasses may always appear less vigorous.
- Where relevant, grazing pressure may need to be alleviated in the year prior to burning to allow for the accumulation of fuel.
- The frequency and season of a burn can affect the species composition of grasses. Regular, late dry season fires may disadvantage kangaroo grass and favour black spear grass *Heteropogon contortus*. The reverse may occur with regular early dry season burns.
- The endangered northern quoll *Dasyurus hallucatus* (*Environment Protection and Biodiversity Conservation Act 1999*) is threatened by fires which are too extensive, severe or frequent. Ideally, planned burns should be conducted soon after the wet season to promote a patchy fire, avoid the reproductive period and maintain habitat (Lynn 2009).
- The glossy black cockatoo *Calyptorhynchus lathami* is considered vulnerable in Queensland and is found on the Clarke Range and at Shoalwater Bay / Byfield. This species has a very restricted diet, feeding only on the seeds of she-oaks (*Casuarina* and *Allocasuarina* spp.). Care should be taken to maintain food trees where they exist by ensuring some patches remain unburnt and are around the maximum end of the recommended fire frequency, allowing these species to mature and set-seed.

- Swamp rats *Rattus lutreolus* are found in only a few locations within the Clarke Ranges and are considered locally significant. In swamp rat habitat, longer fire frequencies allow grasses to develop a thatch layer in which swamp rats can establish a network of tunnels as protection from predators. Tactics such as ensuring high fuel moisture to encourage fine scale mosaics and using landscape features such as creeks to break up burnt and unburnt areas will assist in maintaining patches of long unburnt grasses.
- While the near-threatened Eungella honeyeater *Lichenostomus hindwoodi* predominantly inhabits rainforest, between July and September they are known to forage for insects in nearby woodlands which contain lemon-scented gum *Corymbia citriodora*, gum-topped box *Eucalyptus moluccana*, Queensland blue gum, ironbarks and/or pink bloodwood. If fire is required during this period, low-severity patchy burns will help retain food resources.

The endangered northern quoll.
Queensland Museum.

Lemon-scented gum woodland provides habitat for arboreal mammals such as the yellow-bellied glider and is a seasonal food source for the Eungella honeyeater.
Joy Brushe, QPWS, Shoalwater Bay (1997).

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **Very high** | Planned burn required to maintain areas of **special conservation significance.** |
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |
| **Medium** | Planned burn in areas where **ecosystem health** is **poor** but recoverable. |

## 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 to the site or burn outcomes:

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| > 75 per cent of saplings < 2 m are scorched to the tip. | After fire select three or more sites (taking into account the variability of landform and likely fire intensity) count the number of saplings scorched to the tip. | **Achieved:** > 75 %.<br>**Partially Achieved:** 25–75 %.<br>**Not Achieved:** < 25 %. |
| > 90 % of grass clumps remain as stubble. | **Before the burn:** select three sites (taking into account the variability of landform and likely fire intensity) and mark a central point.<br>**Before and after the burn** (immediately-very soon after): count the grass clumps in a radius of at least five metres around the central point. Determine the percentage retained after fire. | **Achieved:** > 90 % bases remain.<br>**Partially Achieved:** 75–90 % bases remain.<br>**Not Achieved:** < 75 % bases remain. |

| | | |
|---|---|---|
| > 95 % of standing dead trees and standing live hollow-bearing trees (habitat trees) retained. | Before and after fire*, select three or more sites (taking into account the variability of landform and likely fire intensity) and count the number of habitat trees. Determine the percentage retained after fire. | **Achieved:** > 95 % retained.<br><br>**Partially Achieved:** 9–95 % retained.<br><br>**Not Achieved:** <90 % retained. |
| > 95 % of fallen logs retained. | Select one or more sites or walk one or more transects* (taking into account the variability of landform and likely fire intensity) and count the number of logs before and after burn. Determine the percentage retained after fire. | **Achieved:** > 95 % logs retained.<br><br>**Partially Achieved:** 90–95 % retained.<br><br>**Not Achieved:** < 90 % logs retained. |
| Create a fine-scaled patchy burn (spatial mosaic) with multiple burn patches < 20 ha. | Choose one of these options:<br>a. Fire scar remote sensing data (e.g. using the North Australian Fire Information [NAFI] system).<br>b. Visual assessments from one or more vantage points, or from the air.<br>c. Where practical, map the boundaries of burnt areas with GPS, plot on GIS and thereby determine the range of patch sizes. | **Achieved:** fine scale mosaic produced with no burn patches > 20 ha in size.<br><br>**Partially Achieved:** Some (up to 10 %) burn patches > 20 ha in size.<br><br>**Not Achieved:** More than 10 % of burn patches are > 20 ha in size. |

***It is important to return to the same location before and after the fire.** If using a line transect, a peg and a compass bearing can assist in relocating the original count location.

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.

Retaining stags and logs is important to maintain habitat for many vertebrate and invertebrate species.

Kerensa McCallie, QPWS, Homevale National Park (2011).

Under the right conditions, patches of unburnt grasses are retained and burnt grass clumps remain as stubble.

Kerensa McCallie,QPWS, Homevale National Park (2011).

## 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.

**Suggested monitoring issues include:**

- Monitor the abundance of saplings and/or seedlings in the ground or mid stratum to ensure overabundance is managed.
- Monitoring the recruitment and establishment of young canopy trees to ensure future canopy tree replacement.

The Byfield fern *Bowenia serrulata*, like many other cycads, takes a long time to mature and set-seed. Monitoring the health of these species can be used as an indicator of appropriate fire regimes.

Frank Mills, QPWS, Byfield National Park (2007).

## Fire parameters

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

**Fire severity**

- **Low** to **high**. The majority **low**.

| Fire severity class | Fire intensity (during the fire) | | Fire severity (post-fire) | |
|---|---|---|---|---|
| | Fire intensity ($kWm^{-1}$) | Average flame height (m) | Average scorch height (m) | Description (loss of biomass) |
| **Low (L)** | < 150 | < 0.5 | < 2.5 | 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. |
| **Moderate (M)** | 150–500 | 0.5–1.5 | 2.5–7.5 | 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. |
| **High (H)** | 500–1000 | 1.5–3.0 | 7.5–15.0 | Some patchiness. Some humus remains. Some habitat trees and fallen logs affected. At least some canopy scorch in moderate < 20 metre height canopy, mid stratum burnt completely (or nearly so). |

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 mosaic planned burns across the landscape at a range of intervals 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 seven years. At least seven years should be allowed between burns in some areas to retain obligate seeder shrubs, habitat features such as black she-oak (for the glossy black cockatoo), areas of denser vegetation, areas of senescing grasses and grass skirts (good insect habitat), bark etc.
- Other areas, particularly near the coast, require longer fire frequencies of around seven to twelve years because they are drier, are on poor soils or are more exposed. These areas are more limited in extent (see 'eucalypt forest – poorer soils', on map).

**Mosaic** (area burnt within an individual planned burn)

- A mosaic is achieved with generally 30–50 per cent burnt within the target communities. Where possible, aim to create a fine-scaled patchy burn (spatial mosaic) with multiple burn patches < 20 ha.

**Landscape mosaic**

- Do not burn more than 20 per cent of Central Queensland Coast eucalypt communities within the same year.

**Other considerations**

- **Variability:** Ensure successive fires are somewhat variable in intensity, season, frequency (do not burn to a prescription of every 'x' years but vary the fire frequency), and spatially (each fire creating a slightly different mosaic of burnt and unburnt areas).
- Be aware that some years will be wetter or drier than normal and fuel accumulation will vary. Fire frequency is only a guide.
- Do not burn during or immediately following drought.

Showing the results of a patchy low-severity fire.
Frank Mills, QPWS, Five Rocks area, Byfield Conservation Park (2007).

In areas with a strong shrub influence, allow a longer fire frequency for the retention of obligate seeders.
Joy Brushe, QPWS, Shoalwater Bay (1997).

## What weather conditions should I consider?

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

**Season:**

- Burn during late wet to early dry season with occasional storm burns (around November to December). Winter burns are also acceptable in areas that remain uncured for longer and can not carry fire until winter.
- Be aware that winds may be unpredictable around September to October. Care should be taken anytime between August to December, as this is a period of increasing fire danger. If fire is required, use with caution and consideration of containment issues.

**FFDI:** < 11

**DI (KBDI):** 30–100 or up to 140 for storm burns

**Wind speed:** Beaufort scale 1–3, or < 15 km/hr

**Soil moisture:** The presence of good soil moisture is essential as it will assist in the rapid regeneration of native grasses post fire. Some indicators of good soil moisture include moist soil to a depth of greater than five centimetres, or at least 75 millimetres (mm) of combined rainfall over a two week period (ideally single falls should be of at least 15 mm) or seasonal creeks that are flowing in the area or water is pooled in creek beds and creeks are trickling.

## 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). 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.

- **Afternoon ignition**. Generally, ignition should occur after 2.00 pm when weather conditions have become more stable and are not prone to sudden weather changes (e.g. wind changes) often experienced during the day. This is particularly important late in the dry season where fire can be more prone to escape. Often this tactic will assist with creating a varied internal mosaic of burnt and unburnt patches. Under mild evening conditions the resulting fire may self-extinguish overnight. This tactic is useful when burning near cane areas as it helps ensure conditions of declining hazard. Carefully consider containment issues prior to ignition near cane areas.
- **Progressive burning** is an approach to planned burning where ignition is carried out throughout the year whenever conditions allow. Ignition can begin soon after the wet season (as soon as fuel has cured sufficiently to carry fire) with numerous small ignitions creating a fine-scale mosaic. Ideally, at least three periods of ignition should occur in each park, each year, but this depends on resource constraints. These burnt areas can provide opportunistic barriers to fire to support burning later in the year. Progressive burning helps create burnt and unburnt areas, a mosaic of severities and seasonal variability.
- Specific conditions are required for **storm burning**. Burn during the early wet season and ensure good soil moisture exists by burning after the second or third storm of the season Monitoring the weather for an impending cold front which may bring follow-up rain to assist in controlling the fire and prevent wildfire. A good indicator of an impending storm is rapidly increasing relative humidity.
- **Aerial ignition**. Used in tandem with good soil moisture and other landscape features such as drainage lines, moist gullies and vegetation communities including rainforests to reduce fire spread, this technique can assist in achieving a landscape mosaic.
- A **low intensity backing fire**. A slow-moving, low-intensity backing fire will generally result in a more complete coverage of an area and a better consumption of fuel. This tactic creates high residence time, useful for reducing overabundant saplings, while ensuring fire intensity and rate of spread are kept to a minimum.

- **Smoke issues**. Be aware of potential smoke impacts on urban settlements, mines and airports etc. Planned burns in adjoining areas should be undertaken when the prevailing weather conditions (in particular wind direction) will direct the resulting smoke away from settled areas. Standard neighbour notification protocols should be followed to ensure good neighbour relations.
- **Spot ignition** can be used to alter the desired intensity of a fire and create the desired mosaic of burnt and unburnt areas. This can be achieved using a range of methods including drip torches, matches and incendiaries (sling shots and power launchers). Spots closer together will result in a line of a greater intensity (as spots merge they create hot junction zones). Spots further apart or a single spot ignition in similar conditions will result in a lower-intensity fire and greatly 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.
- **Use of natural barriers**. Where natural barriers such as rock outcrops, creeks, rainforests and gullies are present they can be used to prevent large scale fires (except in very dry conditions). Natural barriers are useful in creating containment areas and landscape mosaics.

## Issue 2: Reduce overabundant saplings

Overabundance of rainforest pioneers may reduce the health of the ground layer through competition and shading, and may result in the system transitioning to a more closed forest in which planned burning can be difficult to reintroduce and in some cases is beyond recovery.

### Awareness of the environment

**Key indicators**

- The mid stratum is becoming dominated by young rainforest pioneers or other overabundant seedlings/saplings such as casuarinas.
- The understorey is difficult to see through or walk through.
- Grasses are scattered, poorly-formed and/or are collapsing. Other ground layer plants are reduced in abundance and health.
- Shrubs (where present) are declining in diversity and abundance.
- Mid stratum overabundance has reduced tree and shrub recruitment.

Rainforest pioneers in the mid stratum are becoming more abundant and grasses have become sparser in the ground layer. Fire is required to restore the health of grasses.

Dave Kington, QPWS, Lamington National Park (2007).

Shading impacts will eventually greatly reduce lower-layer diversity and reduce recruitment of canopy species.

Bill McDonald, Queensland Herbarium, Mid Molle Island (2010).

## Discussion

- An overabundance of saplings or seedlings in the understorey may be triggered in response to:
  - a lack of, or a long absence of fire
  - a high-severity fire event triggering a flush of new seedlings
  - heavy grazing
  - a high rainfall event which has exacerbated thickening (due to one of the above causes).
- Overabundant **saplings** are unlikely to be killed outright by fire—rather they will be reduced to below the grassy layer, enabling other species to compete. **Seedlings** are more vulnerable to fire and may be killed by fire. If **seedlings** are observed and appear to be thickening, a fire should be applied as soon as fuel and appropriate conditions allow (as within a very short time frame, sometimes only a single year, it may not be possible to kill them).
- Certain eucalypts, acacias and casuarinas can germinate en masse. In the absence of fire, seed stock can build up and lead to a mass germination event after a fire. Where this has occurred, it is likely that more than one fire will be required to address the issue. Post-fire observations are essential to monitor the kill rate and germination of these species—this will ascertain the need for subsequent fires.
- Woody thickening becomes much more severe where heavy stock grazing is combined with repeated early season burns or a lack of fire. Stock grazing reduces fuel loads, preventing fires of sufficient severity to manage overabundant seedlings/saplings. This is further compounded when cattle concentrate feeding efforts on regrowth grasses in the recently burnt areas (and avoid the 'toxic' plants such as some quinine trees) allowing woody species the competitive advantage. Spelling an area for a period of time before and after fire may assist in this issue.
- It is important to recognise that in some areas, an abundance of some shrubs and trees are a natural part of the ecosystem and do not necessarily require an altered fire management approach. Seek advice if you are unsure.

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |
| **Medium** | Planned burn in areas where **ecosystem health** is **poor** but recoverable. |

## 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.

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| > 75 % of mid stratum saplings are scorched to the tip. | After fire select three or more sites (taking into account the variability of landform and likely fire intensity) count the number of saplings scorched to the tip. | **Achieved:** > 75 %.<br>**Partially Achieved:** 25–75 %.<br>**Not Achieved:** < 25 %. |

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.

Often, this issue is not addressed by a single fire. It may be important to continue monitoring the abundance of saplings and/or seedlings in the ground or mid stratum to ensure overabundance is managed.

## Fire parameters

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

**Fire severity**

- **Moderate** to **High**. Aim for scorch height sufficient to scorch to the tip of overabundant saplings (see scorch heights in the table below).

| Fire severity class | Fire intensity (during the fire) | | Fire severity (post-fire) | |
|---|---|---|---|---|
| | Fire intensity ($kWm^{-1}$) | Average flame height (m) | Average scorch height (m) | Description (loss of biomass) |
| **Moderate (M)** | 150–500 | 0.5–1.5 | 2.5–7.5 | 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. |
| **High (H)** | 500–1000 | 1.5–3.0 | 7.5–15.0 | Some patchiness. Some humus remains. Some habitat trees and fallen logs affected. At least some canopy scorch in moderate < 20 m height canopy, mid stratum burnt completely (or nearly so). |

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

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

- In most cases, overabundant saplings and seedlings can be managed within an initial moderate to high-severity fire. An assessment should be made and consideration given to applying a second fire as soon as fuel build-up is sufficient to carry it.

**Mosaic** (area burnt within an individual planned burn)

- Greater than 75 per cent of the area dominated by understorey trees should be burnt.

**Repeated fires**

- Although **moderate** to **high**-severity fires may be necessary to control mid-stratum 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 mostly a **low** to **moderate**-severity fire regime (refer to Issue 1).

## What weather conditions should I consider?

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

**Season:** July to November (drier conditions).

**FFDI:** 8–18

**Wind speed:** < 23 km/hr. Winds greater than 15 km/hr can help carry where fuels are low.

**Other considerations:** Be aware of containment issues, and the potential for re-ignitions when using fire at drier times of the year.

An example of a successful fire to control overabundant saplings. The saplings are consistently scorched to the tip yet grass stubble and unburnt fuels remain to promote a quick recovery of grasses.

Mark Parsons, QPWS, Wallaman Falls (2011).

## 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). 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.

- **Progressive burning** is an approach to planned burning where ignition is carried out throughout the year whenever conditions allow. Ignition can begin soon after the wet season and as soon as fuel has cured sufficiently to carry fire (with numerous small ignitions creating a fine-scale mosaic). These burnt areas can provide opportunistic barriers to fire to support burning later in the year to assist in managing overabundant saplings/seedlings.
- **Commence lighting on the leeward (smoky) edge.** This can be a useful way to create a containment edge for a higher-severity fire ignited inside the burn area.
- **A backing fire with good residence time.** A slow-moving backing fire (lit against the wind on the smoky edge or lit from upslope) may result in a more complete coverage of an area. This tactic ensures the fire has a greater amount of residence time while fire intensity and rate of spread are kept to a minimum. Greater residence time is useful in reducing understorey density.
- While a moderate-severity fire is often sufficient to address this issue, it is dependent upon the height of the saplings. A **running fire** of a higher-intensity may be required initially where there is a lack of surface and near surface fuels (e.g. due to shading if the thicket is well developed). In this instance, a follow-up planned burn will likely be required in the two to three years after the initial fire to kill the surviving saplings and any new seedlings.
- **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).

## Issue 3: Manage high-biomass grasses

It is important to be aware of the presence of high biomass exotic grasses during planned burn operations as they can dramatically increase fire severity and are often promoted by fire. High-biomass grasses of concern in this fire vegetation group include guinea grass *Megathyrsus maximus*, molasses grass *Melinis minutiflora*, grader grass *Themeda quadrivalvis* and thatch grass *Hyparrhenia rufa*. In moister areas para grass *Urochloa mutica* may also be an issue.

Refer to Chapter 9 (Issue 3), for fire management guidelines.

## 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 eucalypt forest and woodland should be applied.

Refer to Chapter 9 (Issue 4), for fire management guidelines where *Lantana camara* has become an infestation.

Lantana occurring as a scattered understorey plant. Notice that grass fuels are still relatively continuous and therefore the standard fire regime for eucalypt forest could be applied to help control lantana.

Kerensa McCallie, QPWS, St. Bees Island (2009).

## Issue 5: Reduce rubber vine

The presence of rubber vine may require an altered approach to fire management.

Refer to Chapter 9 (Issue 6), for fire management guidelines.

# Chapter 2: Tall open forest

This fire vegetation group includes tall open eucalypt forests (generally up to 40 metres) dominated by rose gum *Eucalyptus grandis*, a combination of red mahogany *Eucalyptus resinifera*, yellow stringybark *Eucalyptus acmenoides* and/or *Eucalyptus portuensis*; or *Eucalyptus montivaga*. A secondary tree layer is sometimes present with she-oaks, grevilleas, brush box *Lophostemon confertus*, acacia and pink bloodwood *Corymbia intermedia*. The ground layer is usually dominated by grasses, sedges, ferns and herbs in various combinations. A shrub layer is occasionally present. Within the Central Queensland Coast bioregion, tall open forest is only found in the Clarke and Connors Ranges at higher altitudes.

## Fire management issues

The main fire management issue for tall open forests is the overabundance of rainforest saplings/seedlings due to a long fire absence. *Lantana camara* is also present in some areas and may contribute to an increase in fire severity and loss of ground layer diversity.

In forests dominated by *Eucalyptus montivaga*, low fuel accumulation in the ground stratum means that planned burns are generally not possible and fires will be infrequent. These communities will usually only burn with severe wildfire.

### Issues:

1. Maintain healthy tall open forests.
2. Reduce overabundant saplings.
3. Reduce *Lantana camara*.

**Extent within bioregion:** 32 024 ha, 2 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** Eungella National Park, 6 422 ha; Crediton Forest Reserve, 3 092 ha; Crediton State Forest, 2 626 ha; Ben Mohr Forest Reserve, 1 098 ha; Macartney State Forest, 888 ha; Collaroy State Forest, 444 ha; Homevale National Park, 435 ha; Epsom State Forest 3, 277 ha; Spencer Gap Forest Reserve, 259 ha; Pioneer Peaks National Park, 171 ha; Porphyry Hill State Forest, 133 ha; Kelvin Forest Reserve, 125 ha; Byfield State Forest, 111 ha; Connors Forest Reserve, 107 ha; West Hill State Forest, 76 ha; Pelion Forest Reserve, 57 ha; Kelvin State Forest 10 ha; Cathu State Forest, 8 ha; Pelion State Forest, 7 ha; Ben Mohr State Forest, 2 ha.

## Issue 1: Maintain healthy tall open forests

### Awareness of the environment

**Key indicators of health**

- Diversity in the understorey (of rose gum and red mahogany forests) across the landscape ranging from grassy through to shrubby or with a low tree layer including scattered rainforest species and pockets of rainforest (particularly within gullies).
- A diverse range of grasses, sedges, ferns and legumes should be present in grassy sites.
- Shrubs (where present) have healthy foliage.
- Some young canopy trees are present in the mid and lower stratums (enough to eventually replace the canopy), but **are not** having noticeable shading effects on ground layer plants.
- Bracken fern and blady grass are **not** dominant in the ground layer.

Tall open forest with a healthy and diverse understorey of grasses, sedges, bracken, legumes and she-oaks.

Bruce Higham, QPWS, Gamma National Park.

Young red mahogany trees are recruiting in the midstratum.

Joy Brushe, QPWS, Shoalwater Bay (1999).

In rose gum forests, areas with a rainforest understory often occur.

Jeanette Kemp, Queensland Herbarium, west of Crediton State Forest (2006).

Rose gum forest with a shrubby understorey.
Tina Ball, QPWS, Gamma National Park (2009).

Rose gum forest with an open and mixed understorey.
QPWS.

**The following may indicate that fire is required to maintain a tall open forest.**

- Rainforest pioneers are beginning to emerge above the ground-layer across large areas of community.
- The community is difficult to see through and walk through.
- Grasses are thinning, collapsing or appearing matted with a build-up of dead material.
- Shrubs have sparse crowns and/or beginning to die. There is limited or no recruitment of new shrubs (lack of juvenile shrubs).
- Bracken and blady grass are dominant in the ground layer.

## Discussion

- Fire plays a central role in the maintenance of grassy tall open forests. The absence of fire or the application of fire frequencies that are longer than recommended can lead to a transition from an open to a closed structure (Williams and Tran 2009). Transitioning is often irreversible. In areas where transitioning has begun, it can be compounded by the application of repeated low to moderate severity fires, as this exhaust fuel for higher severity fires severe enough to scorch rainforest pioneers (Russel-Smith and Stanton 2002).
- In managing these forests, it is important to understand the mechanism of transitioning. Most rainforest species re-sprout after fire, however unlike eucalypts they must re-sprout from the ground level and fire keeps them at this level allowing other species to compete.
- There are limited windows of opportunity to conduct planned burns in tall open forests (as they are generally moister). It is critical to respond to opportunities to burn these communities when suitable weather conditions allow.
- A number of fauna species rely on tree hollows in tall open forest. These include yellow-bellied gliders *Petaurus australis australis*, the powerful owl *Ninox strenua* (listed as vulnerable in Queensland) and the masked owl *Tyto novaehollandiae* found on the Clarke-Connors range. Tree hollows take many years to form and care should be taken when planning burns to protect the hollow-bearing trees.
- The glossy black cockatoo *Calyptorhynchus lathami* is considered vulnerable in Queensland and is found within tall open forest. This species has a very restricted diet—feeding only on the seeds of she-oaks. Care should be taken to maintain food trees (where they exist) by ensuring some patches remain unburnt at the maximum end of the fire frequency, allowing these species to mature and set-seed.
- Tall open forest is habitat for a number of plant species restricted to the narrow, high-altitude zone on the Clarke Range, which otherwise only occur in southeast Queensland and high altitudes of the wet tropics (Queensland Herbarium 2011).

Yellow-bellied gliders depend on tall open forest habitat as they feed on the sap of red stringybarks (Strahan 1983), lemon-scented gum *Corymbia citriodora*, rose gum, red mahogany and pink bloodwood.
QPWS.

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **Very high** | Planned burn required to maintain areas of **special conservation significance.** |
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |
| **Medium** | Planned burn in areas where **ecosystem health** is **poor** but recoverable. |

## 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 at least two of the following as most appropriate for the site:

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| > 50 % of rainforest saplings < 0.5 m reduced to the ground layer. | Before and after fire, select three or more sites (taking into account the variability of landform and likely fire intensity), and count the number of overabundant saplings (above ground components) reduced by fire. | **Achieved:** > 50 % reduced.<br>**Partially Achieved:** 25–50 % reduced.<br>**Not Achieved:** < 25 % reduced. |
| > 95 % of standing dead trees and standing live hollow-bearing trees (habitat trees) retained. | Before and after fire*, select three or more sites (taking into account the variability of landform and likely fire intensity) and count the number of habitat trees. Determine the percentage retained after fire. | **Achieved:** > 95 % retained.<br>**Partially Achieved:** 85–95 % retained.<br>**Not Achieved:** < 85 % retained. |

| | | |
|---|---|---|
| > 95 % fallen logs (with a diameter ≥ 10 cm) retained. | Before and after fire*, select three or more sites (taking into account the variability of landform and likely fire intensity) and count number of fallen logs retained after fire. Determine the percentage retained after fire. | **Achieved:** > 95 % retained.<br><br>**Partially Achieved:** 90–95 % retained.<br><br>**Not Achieved:** < 90 % retained. |
| > 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 grass bases remaining after fire. | **Achieved:** > 90 % bases remain.<br><br>**Partially Achieved:** 75–90 % bases remain.<br><br>**Not Achieved:** < 75 % bases remain. |

***It is important to return to the same location before and after the fire.** If using a line transect, a peg and a compass bearing can assist in relocating the original count location.

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.

Refer to Chapter 1 (Issue 1), for monitoring suggestions.

## Fire parameters

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

**Fire severity**

- **Low** to **Moderate**. An occasional high-severity fire helps manage emerging overabundant trees while low-severity fires help ensure enough canopy trees establish to eventually replace the canopy. It is important to strike a balance between sapling reduction and canopy tree recruitment.

| Fire severity class | Fire intensity (during the fire) | | Fire severity (post-fire) | |
|---|---|---|---|---|
| | Fire intensity ($kWm^{-1}$) | Average flame height (m) | Average scorch height (m) | Description (loss of biomass) |
| **Low (L)** | < 150 | < 0.5 | < 2.5 | 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. |
| **Moderate (M)** | 150–500 | 0.5–1.5 | 2.5–7.5 | 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. |
| **High (H)** | 500–1000 | 1.5–3.0 | 7.5–15.0 | Some patchiness. Some humus remains. Some habitat trees and fallen logs affected. At least some canopy scorch in moderate < 20 metre height canopy, mid stratum burnt completely (or nearly so). |

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 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 five to seven years for rose gum open forest.
- Consider a broad fire interval range of between five to twelve years for red mahogany, yellow stringybark and/or *Eucalyptus portuensis* closed-forest to low open-forest.
- Do not apply fire directly to *Eucalyptus montivaga* open forest.

**Mosaic** (area burnt within an individual planned burn)

- Within rose gum open forest leave approximately 20 per cent unburnt.
- Within red mahogany, yellow stringybark and/or Eucalyptus portuensis closed-forest to low open-forest a mosaic within an individual burn will be less likely as these forests burn with a higher severity. Rather, mosaics can be planned at a landscape level (see below).

**Landscape mosaic**

- Different localities containing these communities should be targeted in different years ensure a continuum of habitat availability across the broader landscape (Queensland Herbarium 2011).

**Other considerations**

- **Variability:** Ensure successive fires are somewhat variable in intensity, season, frequency (do not burn to a prescription of every 'x' years but vary the fire frequency) and size (each fire creating a slightly different mosaic of burnt and unburnt areas).

## What weather conditions should I consider?

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

**Season**

- Conduct burns when conditions are dry enough to carry a burn, but at the same time soil moisture is sufficient to encourage regeneration of grasses and a mixed ground stratum.
- Opportunities to burn these communities under suitable conditions can be rare. A high priority should be placed on conducting planned burns when conditions become available.

**FFDI:** 8–20 (moderate-high)

**DI (KBDI):** Ground ignition: 80–100 or up to 140 if the relative humidity, soil and fuel moisture conditions are appropriate.

**Wind speed:** < 23 km/hr

**Soil moisture:** The presence of good soil moisture is essential as it will assist in the rapid regeneration of native grasses post fire. Some indicators of good soil moisture include moist soil to a depth of greater than five centimetres, or at least 75 millimetres (mm) of combined rainfall over a two week period (ideally single falls should be of at least 15 mm) or seasonal creeks that are flowing in the area or water is pooled in creek beds and creeks are trickling.

**Other considerations:** Some years can be wetter or drier than normal and fuel accumulation will vary. Fire frequency is only a guide.

## What burn tactics should I consider?

Refer to Chapter 1 (Issue 1), for tactics to address this issue.

## Issue 2: Reduce overabundant saplings

Overabundance of rainforest pioneers, wattles or she-oaks may reduce the health of the ground layer through competition and shading.

Refer to Chapter 1 (Issue 2), for fire management guidelines.

## Issue 3: Reduce *Lantana camara*

*Lantana camara* is present in some tall open forest communities. Where conditions are very dry the presence of lantana can increase the severity of fire and alter the structure and composition of native plant communities.

Refer to Chapter 9 (Issue 4), for fire management guidelines.

# Chapter 3: Grasslands and sedgelands

This fire vegetation group includes grasslands and sedgelands in which trees and shrubs are absent or rare. Grasslands are generally dominated by one or a mix of grasses including kangaroo grass *Themeda triandra*, blady grass *Imperata cylindrica*, black and giant spear grass *Heteropogon* spp., and *Aristida* or *Eriachne* spp. with occasional sedges in the moister areas.

Freshwater sedgelands are rare within this bioregion and occupy very wet sites. They consist of sedges, forbs or (more rarely) grasses interspersed with rushes, ferns and herbs, but can also include areas of open water. Grasslands and sedgelands are found predominantly within lowland areas, on headlands and islands in patches no more than a few kilometres wide. However an extensive area also occurs at Goorganga plains, south of Proserpine. All of these communities are either of concern or endangered.

## Fire management issues

The main fire management issue for grasslands which have been previously grazed (or otherwise disturbed) is the presence of weeds, in particular *Lantana camara*. Some sedgelands and grasslands are also heavily impacted by high-biomass grasses. Grasslands on islands are sometimes threatened by the encroachment of native woody species from adjacent communities.

A number of grassland and sedgeland communities do not require fire or only require infrequent fire. These include grasslands on drainage depressions in the uplands, grasslands/dwarf shrublands on headlands, grasslands on dunes where erosion issues may be a concern and most sedgelands.

### Issues:

1. Maintain healthy fire-adapted grassland communities.
2. Limit fire encroachment into fire-sensitive grasslands and sedgelands.
3. Reduce *Lantana camara*.
4. Manage high-biomass grasses.
5. Reduce encroachment of woody species.

**Extent within bioregion:** 8 138 ha, 1 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** South Cumberland Islands National Park, 718 ha; Northumberland Islands National Park, 679 ha; Percy Isles National Park, 422 ha; Molle Islands National Park, 357 ha; Whitsunday Islands National Park, 278 ha; Smith Islands National Park, 182 ha; Gloucester Island National Park, 172 ha; Keppel Bay Islands National Park, 162 ha; Lindeman Islands National Park, 153 ha; Brampton Islands National Park, 137 ha; Broad Sound Islands National Park, 78 ha; Cape Palmerston National Park, 68 ha; Repulse Islands National Park, 49 ha; Slade Point Reserve, 42 ha; Dryander National Park, 35 ha; Byfield National Park, 31 ha; Byfield Conservation Park, 26 ha.

# Issue 1: Maintain healthy fire-adapted grassland communities

Use fire to maintain fire-adapted grasslands.

## Awareness of the environment

**Key indicators of healthy fire-adapted grassland:**

- There is a continuous or near-continuous layer of native grasses with a diversity of sedges, forbs, lilies and other ground-layer plants also present.
- Grasses appear upright and vigorous.
- Trees and shrubs are absent or only scattered.
- Grasslands are open and easy to walk through.
- Lantana (where present) is very scattered.

In healthy grasslands grasses are upright and vigorous and (more or less) continuous.
Jeanette Kemp, Queensland Herbarium, Slade Point (2006).

Grasslands are generally treeless or contain only very scattered trees and shrubs.
Jeanette Kemp, Queensland Herbarium, south of Quinns Gap (2003).

Healthy grasslands on coastal headlands require fire less frequently than inland grassland communities due to the harsh growing conditions.
Rosemary Lovatt, DSITIA, Shoalwater Bay (2007).

**The following may indicate that fire is required to maintain fire-adapted grasslands:**

- There is an accumulation of thatch (dead material), collapsing grass and poorly formed grass clumps.
- The grass layer is not continuous or is becoming sparse.
- Swizzle bush *Timonius timon*, *Acacia* spp., *Pittosporum ferrugineum* and macaranga *Macaranga involucrata* var. *mallotoides*. are beginning to emerge above the grasses.
- Lantana (where present) is scattered but increasing.

Grasses sometimes collapse as they cure.
Jeanette Kemp, Queensland Herbarium, Goorganga Plains (1999).

## Discussion

- It is thought that native woody species such as swizzle bush and macaranga (and perhaps *Pittosporum ferrugineum*) can become overabundant in island grasslands, and may cause them to transition to shrubland. Although in other areas, these species do not seem to be causing transitioning. More monitoring is required. Although this process is poorly understood, fire is likely to play a role in maintaining grasslands and controlling overabundance where it seems to be a problem (refer to Chapter 1 [Issue 2], for fire management guidelines).
- Endangered grasslands on dunes are vulnerable to erosion. Avoid burning (refer to Issue 2). If burning is occurring in nearby communities where there is a risk of fire encroachment, they should be conducted after rain when rapid regeneration of the grassy layer is expected. In addition, consideration should be given to the level of visitor impact these communities may be subjected to both before and after the fire.
- The frequency and season of a burn can affect the species composition of grasslands. Regular late dry-season fires may disadvantage kangaroo grass and favour black spear grass (the reverse may be true with regular early dry-season burns).
- Some areas of sedgelands are man-made (e.g. Goorganga Plains where bund walls have been built to prevent saltwater encroachment). Despite the man-made nature of these sedgelands, fire management guidelines remain the same.
- The vulnerable Byfield matchstick *Comesperma oblongatum* and the endangered headland commersonia *Commersonia perkinsiana* both have very limited distributions occurring in the Byfield area on headlands. Their fire requirements are poorly understood, but monitoring indicates both species regenerate after fire. When using fire in headland grasslands in this area, ensure it has a limited coverage, not burning all areas at once. Be guided by local monitoring programs.
- While the core habitat of the endangered Proserpine rock-wallaby is dry vineforest, they feed in adjacent grasslands during the dry season (Nolan and Johnson 2001). When burning grasslands adjacent to dry vineforest ensure good soil moisture is present and if possible burn away from the ecotone.

Fire ecology of the Byfield matchstick and headland commersonia *Commersonia perkinsiana* is poorly known. However, planned burns with good soil moisture and appropriate weather conditions are most likely to favour post-fire regeneration.
Kerensa McCallie, QPWS, Byfield National Park (2011).

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |
| **Medium** | Planned burn in areas where **ecosystem health** is **poor** but recoverable. |

## 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:

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| > 90 % of the grass clumps remain as stubble. | **Before the burn:** select three sites (taking into account the variability of landform and likely fire intensity) and mark a central point.<br><br>**Before and after the burn** (immediately-very soon): count the grass clumps in a radius of at least five metres around the central point. Determine the percentage retained after fire. | **Achieved:** > 90 % bases remain.<br><br>**Partially Achieved:** 75–90 % bases remain.<br><br>**Not Achieved:** < 75 % bases remain. |
| > 75 % of saplings < 2 metres are scorched to the tip. | After fire select three or more sites (taking into account the variability of landform and likely fire intensity) count the number of saplings scorched to the tip. | **Achieved:** > 75 %.<br><br>**Partially Achieved:** 25–75 %.<br><br>**Not Achieved:** < 25 %. |

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**. Use a **moderate**-severity fire if woody species are encroaching.

| Fire severity class | Fire intensity (during the fire) | | Fire severity (post-fire) | |
|---|---|---|---|---|
| | Fire intensity ($kWm^{-1}$) | Average flame height (m) | Average scorch height (m) | Description (loss of biomass) |
| **Low (L)** | 50–100 | 0.3–0.5 | ≤ 2.5 | Some patchiness. Most of the surface and near surface fuels have burnt. Stubble still evident. |
| **Moderate (M)** | 100–1500 | 0.5–1.5 | Complete standing biomass removed. | All surface and near surface fuels burnt. Stubble burnt to blackened remnants. |

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

**Mosaic** (area burnt within an individual planned burn)

- Due to the mostly continuous nature of grass fuels, a high level of mosaic can be difficult to achieve. As such, it may be more realistic to manage grasslands at a park or landscape level (ensuring not all areas of grasslands are targeted at once).
- However, patchiness within an individual fire may be achievable using early season, late afternoon burns (that extinguish in the cool of the evening).

**Landscape mosaic**

- Do not burn more than 30 per cent of grasslands in the Central Queensland Coast bioregion within 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 patchiness** and adjusted for wildfire risk and drought cycles.
- Apply mosaic planned burns across the landscape at a range of intervals 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 two to four years for alluvial areas.
- When burning grasslands on poorer/shallower soils (such as those on islands and headlands) consider a broad fire interval of between four to six years. It is usually sufficient to allow fire to trickle in from nearby areas. However, monitor these grasslands for woody species invasion and if necessary target more directly with fire.

## What weather conditions should I consider?

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

**Season:** Conduct burns at any time (but avoid late winter to spring) providing good soil moisture is present (to promote rapid regeneration). Use storm-burns in areas of woody thickening (storm burns will also improve regenerative conditions for grassland on headlands, in what are otherwise dry environments).

**GFDI:** 2–7

**DI (KBDI):** 40–80

**Wind speed:** Beaufort scale 1–3, or < 20 km/hr

**Soil moisture:**

- Good soil moisture is essential for the rapid regeneration of native grasses after fire. Some indicators include moist soil to a depth of greater than five centimetres, or at least approximately 75 mm of combined rainfall over a two week period (ideally, single falls should be of at least 15 mm) or seasonal creeks are flowing in the area or water is pooled in creek beds and the creeks are trickling.
- Grasslands on coastal headlands are heavily influenced by local weather conditions, exposure to strong winds and rapid drying after rain.

**Other considerations:** Some years will be wetter or drier than normal and fuel accumulation will vary. Fire frequency is only a guide.

Grasslands can be invaded by woody species if fires are too infrequent.
Dave Judd, QPWS, Prudhoe Island (2008).

Good soil moisture will favour the recovery of native grasses. Three months after fire this blady grass grassland is rapidly recovering.
Bill McDonald, Queensland Herbarium, North Molle Island (2011).

## 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). 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.** Can be used to effectively alter the desired intensity of a fire. Spots close together will result in a line of a greater intensity (as spots merge they create hot junction zones). Spots further apart will result in a lower-intensity fire. This may include aerial ignition.
- **Line or strip ignition** is used to create a fire of higher intensity or to help the fire carry through moist or inconsistent fuels. This is also useful to reduce overabundant trees (through scorching).
- Creating a **running** fire (through closely-spaced spot ignition or line ignition with the wind) may help carry the fire into areas that have been invaded by trees. Alternatively, widely-spaced spots in areas of low fuel (such as some headland grasslands) can assist in carrying the fire through these areas. Topography and wind can further assist in creating a running fire.
- **Limit fire encroachment into fire-sensitive communities.** Use appropriate lighting patterns along the margin of the non-target communities to promote a low-intensity backing fire that burns away from the non-target community.

## Issue 2: Limit fire encroachment into fire-sensitive grasslands and sedgelands

A number of grassland communities do not require fire. These include grasslands on drainage depressions in the uplands, grasslands/ dwarf shrublands on headlands and grasslands on coastal dunes. Active protection is generally not required, however good soil moisture should be present if planned burns in adjacent communities are allowed to trickle into these grasslands.

Refer to Chapter 9 (Issue 5), for fire management guidelines.

Grasslands on coastal dunes are prone to erosion. These areas are not usually directly targeted. Allow fire to trickle into these areas when suitable moisture conditions are available.

Jeanette Kemp, Queensland Herbarium (2002).

Sedgelands do not require fire; avoid burning these areas.
Rhonda Melzer, QPWS, Shoalwater Bay (1993).

Planned burns should be conducted in fire-adapted communities adjacent to sedgelands when sedgelands have standing water or are very moist.
Rhonda Melzer, QPWS Shoalwater Bay (1993).

## Issue 3: Reduce *Lantana camara*

The presence of lantana may require an altered approach to fire management or for well-established infestations the integrated use of both fire and other control methods.

Refer to Chapter 9 (Issue 4), for fire management guidelines.

## Issue 4: Manage high-biomass grasses

It is important to be aware of the presence of high-biomass exotic grasses during planned burn operations as they can dramatically increase fire severity and are often promoted by fire. High-biomass grasses of concern in grasslands include molasses grass *Melinis minutiflora*, thatch grass *Hyparrhenia rufa*, guinea grass *Megathyrsus maximus* and grader grass *Themeda quadrivalvis*. High-biomass grasses in sedgelands include para grass *Urochloa mutica*, hymenachne *Hymenachne amplexicaulis* and Aleman grass *Echinochloa polystachya*. Some species of high-biomass grasses can be reduced or eliminated using fire.

Refer to Chapter 9 (Issue 4), for fire management guidelines.

## Issue 5: Reduce encroachment of woody species

Grasslands on islands are sometimes threatened by the encroachment of woody species such as swizzle bush, acacia, *Pittosporum ferrugineum* and macaranga.

Refer to Chapter 1 (Issue 2), for fire management guidelines.

# Chapter 4: Heath and shrublands

This fire vegetation group includes open to closed heaths that are treeless or contain only scattered trees and dwarf to tall shrublands that vary in some areas to low woodland. They are often found on exposed hills, mountains and headlands, including islands throughout the bioregion; and at lower elevations on dunes, including the wet heaths found in swampy low-lying areas of Byfield National Park. The dominant species are often mixed and include tea-tree, *Leptospermum* spp., brush box, *Lophostemon confertus*, swamp mahogany, *Lophostemon suaveolens*, *Acacia* spp., *Banksia* spp. and black she-oak, *Allocasuarina littoralis*. Occasionally mixed *Corymbia* or *Eucalyptus* species may be emergent. A very sparse ground stratum may contain grasses and sedges.

## Fire management issues

It is important to apply fire in and around the heath, to break up fuel, so that too-frequent unplanned extensive fire (particularly in the late dry season) is avoided.

Some heaths and shrublands, particularly montane heaths, are essentially self-protecting as they are surrounded by rainforests or interspersed with bare rock. Fires should not be actively applied to these areas but allowed to trickle in infrequently, or will occur naturally (e.g. as a result of lightning strike).

Avoid burning peat in wet heaths and sedgelands. Peat is susceptible to fire when dry and may take many years to re-form.

### Issues:

1. Maintain healthy heath and shrublands.
2. Avoid peat fires.

**Extent within bioregion:** 16 799 ha, 1 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** Byfield National Park, 2 818 ha; Whitsunday Islands National Park, 1 831 ha; Gloucester Island National Park, 911 ha; Percy Isles National Park, 371 ha; Lindeman Islands National Park, 362 ha; Keppel Bay Islands National Park, 271 ha; Cape Hillsborough National Park, 210 ha; South Cumberland Islands National Park, 208 ha; Broad Sound Islands National Park, 175 ha; Byfield State Forest, 114 ha; Brampton Islands National Park, 88 ha; Homevale National Park, 84 ha; Pioneer Peaks National Park, 83 ha; Northumberland Islands National Park, 28 ha; Byfield Conservation Park, 19 ha; Newry Islands National Park, 15 ha; Repulse Islands National Park, 11 ha.

# Issue 1: Maintain healthy heath and shrublands

## Awareness of the environment

**Key indicators of health:**

- There is a diversity of shrub species that appear green and vigorous (these may include tea-trees, wattles and/or banksias).
- Obligate seed regenerating species (such as black she-oak) are present.
- There is generally a continuous cover of shrubs.
- On headlands and other exposed areas, shrubs are wind-sheared, sparse and interspersed by grasses.
- In swampy heath, shrubs are sparse and interspersed or dominated by sedges.
- Heaths are treeless or have only scattered trees.
- In montane heath, orchids and ferns are present.
- There is a variation in time-since-fire across the landscape.

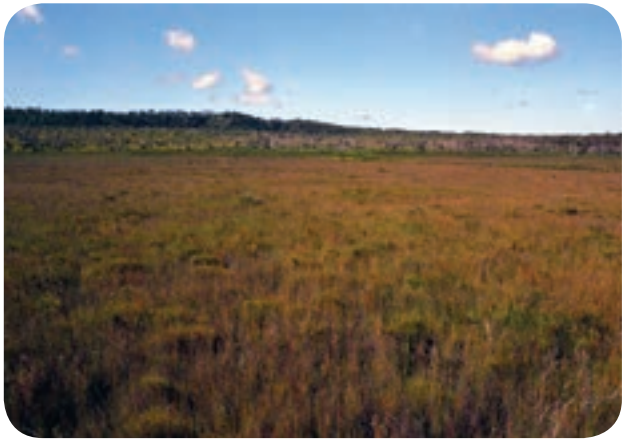
Healthy heaths are naturally diverse communities.
Kerensa McCallie, QPWS, Byfield National Park (2011).

A landscape mosaic of heath showing varying time-since-fire. The canopy of more recently burnt areas is lower and appears even in height.

Kerensa McCallie, QPWS, Byfield National Park (2011).

Healthy heaths have vigorous green growth and no or only a few emergent trees.

Kerensa McCallie, QPWS, Byfield National Park (2011).



Swamp sand plains are often dominated by sedges with low woody species interspersed.

Joy Brushe, QPWS Dismal Swamp (1997).

**Indicators that fire management may be required in heaths and shrublands:**

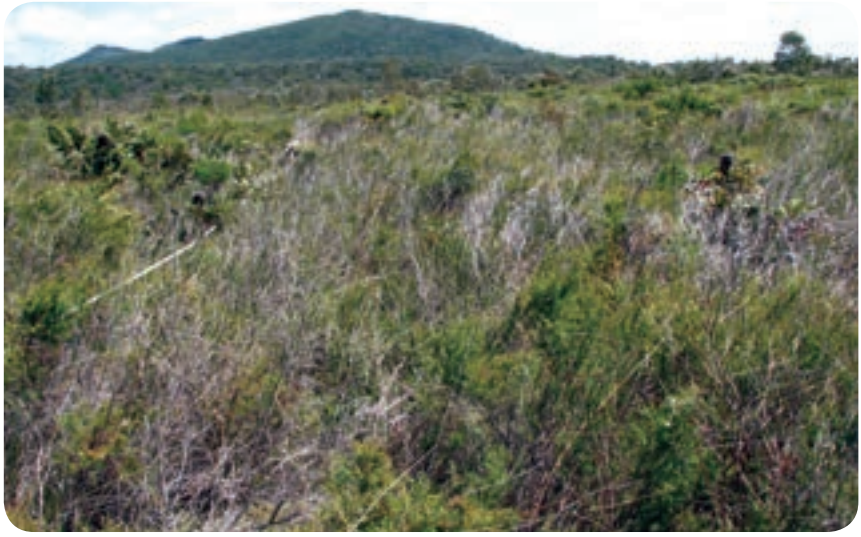
- There is a lack of variation in ages of heath across the landscape.
- The crowns or branches of shrubs are beginning to die or there is a significant loss of lower-level leaves.
- There is an abundance of dodder laurel *Cassytha pubescens* entangled in shrubs.
- Heath has returned to its pre-fire height.

**Ensure the regeneration of obligate seed species:**

- A build-up of seed capsules on tea-trees, *Lophostemon* spp. or black she-oaks, *Allocasuarina litoralis* (evidence of several years of seed production) can indicate that sufficient seed exists for post-fire regeneration.

Black she-oaks are fire-killed. Care should be taken to avoid too-frequent fire to allow she-oak communities to develop in some areas.

Joy Brushe, QPWS, Shoalwater Bay (1999).



The crowns of some plants in long-unburnt heath are beginning to die.
Rosemary Lovatt, QPWS, Shoalwater Bay (2007).

A build-up of dead and dying material may indicate the need for fire management.
Joy Brushe, QPWS, Shoalwater Bay (1997).

Dodder laurel, a parasitic vine, can entangle long-unburnt heath plants.

Kerensa McCallie, QPWS, Byfield National Park (2011).

Plants have lost their lower-level leaves. It is thought that this heath has not been burnt in over 30 years.

Rosemary Lovatt, QPWS, Shoalwater Bay (2007).

## Discussion

- Before being exposed to fires, it is important to allow the seedlings of obligate-seeders enough time to mature and set-seed more than once. Fires at intervals of more than seven years allow seed reserves of most obligate seeders to be replenished. Shorter fire intervals may lead to the gradual decline in extent and/or loss of local populations of these species, as they are killed by fire and only recover from seedlings (Williams et al. 2006).
- Mosaic planned burns conducted in fire-adapted communities on slopes below montane heath will help prevent frequent fire. They also assist in mitigating impacts on orchids and ferns growing on rock faces.
- Implementing fire during drought conditions is not recommended. In most instances plants will be drought-stressed which impacts post-fire plant recovery (and the community in general). The resulting fire can also be more damaging and extensive and may encourage the germination of undesirable species.
- Be aware that small pockets of heathland/shrubland can occur on islands, particularly as stunted rainforest or acacia communities. These small areas are often unmapped and should be assessed before exposure to planned burns within surrounding fire-adapted communities.

Some heath communities are essentially self-protecting, as they are broken up by bare, rocky areas.

Jeanette Kemp, Queensland Herbarium, Homevale National Park (2003).

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |
| **Medium** | Planned burn in areas where **ecosystem health** is **poor** but recoverable. |

## 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.

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| A mosaic pattern of burnt and unburnt areas is achieved, within the aerial ignition footprint or burn area reflecting topographical features that break up the burn. | Heath can be seen to be at various heights and stages of recovery from fire – from one or more vantage points, or from the air. Fire reports and fire history mapping, where available, can provide guidance. | **Achieved:** Mosaic achieved within planned burn area.<br><br>**Not Achieved:** Heath is all of a single age/ height or no mosaic was achieved. |

| | | |
|---|---|---|
| A diversity of healthy seedlings is present approximately one month following fire. | Immediately or very soon after the burn, walk in to three burnt sites (taking into account the variability of landform and likely fire intensity) and note the presence/absence of healthy seedlings within a 10 x 10 metre area. | **Achieved:**<br>> 50 healthy seedlings are present within most of the burn area.<br><br>**Partially Achieved:**<br>10–50 healthy seedlings are present within some of the burn area.<br><br>**Not Achieved:**<br>< 10 healthy seedlings are present. |

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**

- Heaths usually burn with **moderate** to **extreme** severity. However moisture and topography influence the severity and unburnt patches may occur within the burn area.

| Fire severity class | Fire intensity (during the fire) | Fire severity (post-fire) |
|---|---|---|
| | Average flame height (m) | Description (loss of biomass) |
| **Moderate (M) to Extreme (E)** | > 1.0 | Greater than 60 % vegetation burnt. Extensive to total foliage burnt. Minimal evidence of green vegetation remaining. Skeletal frames of shrubs. |

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 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). For coastal heath, consider a broad fire interval range of between seven to fifteen years.
- While fire should not be actively applied to montane heath and shrubland (and some shrubby headland areas), it should be prevented from occurring more frequently than every fifteen years. These areas are often self-protecting, but management of fire in surrounding fire-adapted areas will help to break-up fuel and create barriers to fire movement.

**Landscape mosaic**

- A landscape mosaic is achieved by targeting different sites in different years, usually with aerial ignition.

**Other considerations**

- An established mosaic of burnt and unburnt patches in coastal heath will protect the surrounding fire-adapted vegetation from too-severe fire entering from the heath community.
- Some years will be wetter or drier than normal and fuel accumulation will vary. Fire frequency is only a guide.

## What weather conditions should I consider?

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

**Season:** Late wet to early dry season with occasional storm burns

**FFDI:** 5–12

**DI (KBDI):** 80–120 or up to 140 for storm burns

**Relative humidity:** Less than 50 per cent (ideally 40 to 45 per cent). At higher relative humidity heath will probably not burn, however be aware that in relative humidity that is less than 40 per cent, heath is extremely volatile and spotting distance increases.

**Wind speed:** < 23 km/hr. 15–23 km/hr may be required to push fire through heath.

**Soil moisture:**

- These areas are heavily influenced by local weather conditions (e.g. mountain and coastal), drying and exposure.
- Be aware that although coastal heaths and shrublands on rocky outcrops can receive regular moisture or rain, they are also exposed to strong winds and can dry out very quickly, particularly where they occur on granitic soils.
- Banks of orchids and basket ferns are often common on rock faces and in rocky shelters within the montane heath communities. Ensure good soil moisture is present to avoid burning these plants.
- Peat fires can occur in wet heaths and sedgelands. Ensure the peat is saturated or standing water is present to avoid peat fires.

Do not be alarmed if heath burns with high severity, it will recover.
Frank Mills, QPWS, Byfield National Park (2008).

Variations in moisture and topography in health will vary the fire severity. Some areas may not burn at all.
Frank Mills, QPWS, Byfield National Park (2008).

Occasional fires (no more frequent than every 15 years) should be allowed to trickle into dwarf shrubland on mountain tops.

Joy Brushe, QPWS, Mt Westall (1997).

Fires may occur naturally in montane heaths (e.g. as a result of lightning strike).

Rhonda Melzer, QPWS, Shoalwater Bay (1993).

## 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). 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 the surrounding** landscape. Woodlands on dune crests that are upslope of heathlands should be burnt prior to lighting dune-swale heaths. Concurrent dune-swales should generally not be burnt in the same year. Burn these areas by ignition in every three or four adjacent swales. A number of ignition points may be required in each swale.
- **Multi-point aerial strip ignition using heli-torch:** After the first ignition, additional ignition points on (or very close to) the head of the fire may be required to increase the fire severity and allow the front to increase rate of spread. Without these additional ignition points, the fire will often self-extinguish within close proximity to the original incendiary.
- **Storm burning:** Conduct burning at the start of the wet season, after the second or third storm (to ensure sufficient soil moisture exists). Wind and low relative humidity will be required to carry the fire through the heath. Ensure adjacent ridge communities are burnt in the year (or two years) prior to igniting the heath communities to assist in minimising fire spread.

Refer to Chapter 1 (Issue 1), for additional tactics to address this issue.

A fire lit on the windward edge of this swamp provided a secured fire break. A running fire was then used to assist in carrying the fire across the standing water.

Frank Mills, QPWS, Byfield National Park (2008).

## Issue 2: Avoid peat fires

Wet heaths and swamps gradually accumulate partially decayed, densely-packed vegetation known as peat. In the absence of good soil moisture the peat is easily ignited and can result in a peat fire. Peat fires can burn for months and can have very negative impacts on the vegetation community. Peat takes many years to re-form.

Refer to Chapter 5 (Issue 2), for fire management guidelines.

Wet heaths may have peat soils and should only be burnt when standing water is present or the peat is waterlogged.

Rosemary Lovatt, QPWS, Shoalwater Bay (2007).

# Chapter 5: Melaleuca communities

This fire vegetation group consists of three broad melaleuca communities; woodlands, gallery forests and melaleuca swamps. Different melaleuca species are associated with each community and there are considerable differences in their understoreys and therefore fire management. Drier sites support a grassy understorey sometimes with sparse shrubs such as grass trees and banksias. Wetter sites, found in lower-lying areas across the bioregion, can support understorey sedges, ferns, palms and pandanus.

## Fire management issues

Because there are considerable differences in the understorey of melaleuca communities, different fire regimes are recommended. The main issue for drier woodlands is maintaining a landscape mosaic through broad-scale fire management which will limit the impacts of late-season wildfires. Gallery forests contain fire-sensitive species which require protection from fire. Some swamp communities are also generally fire-sensitive; however others can tolerate the occasional fire (e.g. some communities of swamp tea-tree and swamp paperbark/weeping paperbark open forest to woodland). The presence of high-biomass grasses, lantana, and rubber vine, can increase the fire severity and/or shade-out ground-layer plants making fire more difficult to apply.

### Issues:

1. Maintain healthy melaleuca forest and woodland communities.
2. Avoid peat fires.
3. Limit fire encroachment into melaleuca gallery forests and swamps.
4. Manage high-biomass grasses.
5. Reduce *Lantana camara*.
6. Reduce rubber vine.

**Extent within bioregion:** 40 268 ha, 3 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** Byfield State Forest, 2 713 ha; Byfield National Park, 1 662 ha; Cape Palmerston National Park, 1 561ha; Mia Mia State Forest, 244 ha; Sandringham Bay Conservation Park, 51 ha; West Hill State Forest, 25 ha; Percy Isles National Park, 21 ha; Ben Mohr State Forest 20 ha, Newry Islands National Park 18 ha, Whitsunday Islands National Park 18 ha, Bluff Hill National Park, 18 ha; Epsom State Forest 2, 17ha; Mount Buffalo State Forest, 16ha; Slade Point Reserve 14ha, West Hill Forest Reserve 12ha, Ben Mohr Forest Reserve 12ha, Conway National Park, 10ha; Collaroy State Forest, 8ha; West Hill National Park, 8ha; Additions to Byfield National Park, 6 ha; Skull Knob Conservation Park, 4 ha; Proserpine State Forest, 3 ha; Clairview Reserve, 2 ha; Eungella National Park, 2 ha; Byfield Conservation Park, 2 ha; Bakers Creek Conservation Park, 1 ha; Dryander National Park, 1 ha; Lindeman Islands National Park, 1 ha.

# Issue 1: Maintain healthy melaleuca forest and woodland communities

## Awareness of the environment

**Key indicators of health:**

- Healthy melaleuca forest and woodland has grasses, sedges, herbs, ferns (or any mix of these) in the understorey with a few canopy trees of variable sizes, enough to eventually replace the canopy; and a healthy canopy.
- Sparse shrubs (e.g. grass trees, banksias and grevilleas) may be present.
- Tea-tree orchids *Dendrobium canaliculatum* (where present) are found at varying heights (from low on tree trunks to the upper canopy).
- Swamp orchids Phaius australis (where present) are found with a build-up of pseudo bulbs.
- Weeds such as rubber vine, lantana and high-biomass grasses (if present) are only scattered.

Healthy melaleuca woodland with a mix of understorey plants including grasses and sedges.

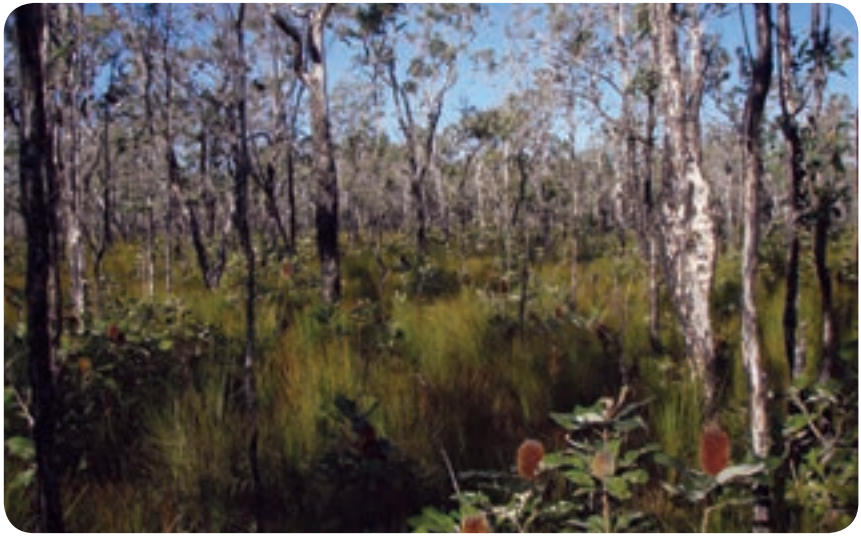
Jeanette Kemp, Queensland Herbarium (2002).

Some melaleuca communities have a naturally sparse ground stratum.
Rosemary Lovatt, QPWS (2007).

This melaleuca community has a healthy dense ground stratum with scattered shrubs.
Joy Brushe, QPWS, Shoalwater Bay (1997).

A range of trees of varying ages is present, and the ground stratum appears vigorous and healthy.

Kerensa McCallie, QPWS, Byfield National Park (2011).



In moister areas ferns may dominate the understorey.

Rosemary Lovatt, QPWS, Slade Point (1999).

**The following may indicate that fire is required to maintain melaleuca forests and woodlands:**

- Grasses, where they were once abundant, are becoming sparse or are poorly-formed. There is an accumulation of dead material and the grasses are beginning to collapse.
- Pandanus (where present) have a skirt of dead fronds.
- Ground-layer plants are declining in health and abundance and are becoming sparse due to shading.
- Where shrubs are present, there is a build-up of dead leaves and/or some dead or dying branches.
- Alyxia vine *Alyxia spicata* has become common as an understorey plant, or dodder laurel is entangled amongst the plants.
- An invasion of pine wildlings has begun to shade-out the ground layer.
- Blackened bark is absent from trees that are greater than 20 centimetres in diameter.
- An abundance of melaleuca seedlings are beginning to emerge above the grasses.

Melaleuca saplings and seedlings can become overabundant. They may eventually have shading impacts on the ground layer leading to a loss of diversity and fine fuels, and making fires difficult to apply.

Rosemary Lovatt, QPWS, Shoalwater Bay (2007).

Dodder laurel vine can entangle plants in areas which are long-unburnt.

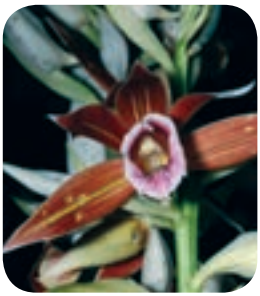
Kerensa McCallie, QPWS, Byfield National Park (2011).

Lower layer plant diversity decreases as time-since-fire increases.

Kerensa McCallie, QPWS, Byfield National Park (2011).

## Discussion

- Melaleuca communities that have a peat layer are vulnerable to peat fires in the drier months. Always burn when standing water is present or when the peat layer is waterlogged (refers to Issue 2, for fire management guidelines).
- The presence and condition of tea-tree orchids and endangered swamp orchids can be used as an indicator of appropriate fire. Tea-tree orchids are epiphytes that are capable of re-sprouting after fire (Bartareau and Skull 1994) but can be killed by repeated severe fires. They require four to five years of growth before flowering.
- These communities are habitat for numerous rare, threatened, endemic and poorly-known flora and fauna species (e.g. grey goshawk). However the general principles of mosaic burning should provide habitat for these species.



A build-up of pseudo-bulbs on swamp orchids indicate age. This tea-tree orchid is around six years old and has probably flowered twice. This indicates that fires have not been too frequent.

Michael Mathieson, Queensland Herbarium.

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **Very high** | Planned burn required to maintain areas of **special conservation significance.** |
| **High** | Planned burns to **maintain ecosystems** in areas where **ecosystem health** is **good**. |

## 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 at least two of the following as most appropriate for the site:

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| Burn 40–60 % spatial mosaic of burnt patches. | Choose one of these options:<br>a. Visual estimation of percentage of vegetation burnt – from one or more vantage points, or from the air;<br>b. Map the boundaries of burnt areas with GPS, plot on GIS and thereby determine the percentage of area burnt;<br>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:** 40–60 % burnt.<br>**Partially Achieved:** between 25–40 % or 60–75 % burnt.<br>**Not Achieved:** < 25 % or > 75 % burnt. |
| > 90 % of grass clumps remain as stubble. | **Before the burn:** select three sites (taking into account the variability of landform and likely fire intensity) and mark a central point.<br>**Before and after the burn** (immediately-very soon after): count the grass clumps in a radius of at least five metres around the central point. Determine the percentage retained after fire. | **Achieved:** > 90 % bases remain.<br>**Partially Achieved:** 75–90 % bases remain.<br>**Not Achieved:** < 75 % bases remain. |

***It is important to return to the same location before and after the fire.** If using a line transect, a peg and a compass bearing can assist in relocating the original count location.

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** with most burns **Moderate**.

| Fire severity class | Fire intensity (during the fire) | | Fire severity (post-fire) | |
|---|---|---|---|---|
| | Fire intensity ($kWm^{-1}$) | Average flame height (m) | Average scorch height (m) | Description (loss of biomass) |
| **Low (L)** | < 150 | < 0.5 | ≤ 2.5 (up to eight metres on melaleuca trees). | 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. |
| **Moderate (M)** | 150–500 | 0.5–1.5 | 2.5–7.5 (up to 20 metres on melaleuca trees) | 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. |

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 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 six to ten years.

**Mosaic** (area burnt within an individual planned burn)

- A mosaic is achieved with generally 40 to 60 per cent burnt within the target communities.

**Landscape mosaic**

- No more than 20 per cent of melaleuca communities within the bioregion should be burnt in any one year.

## What weather conditions should I consider?

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

**Season:**

- Conduct burns during late wet to early dry season. Conduct occasional storm burns.
- Winter burns are also acceptable in areas that tend to remain uncured for longer periods (providing good soil moisture is present).

**FFDI:** 9–11

**DI (KBDI):** 80–140 or up to 180 for storm burns

**Wind speed:** Beaufort scale 1–3, or < 23 km/hr

**Soil moisture:** The presence of good soil moisture is essential for the rapid regeneration of native grasses after fire. Some indicators of good soil moisture can include moist soil to a depth of greater than five centimetres, or at least approximately 75 mm of combined rainfall over a two week period (ideally single falls should be of at least 15 mm), or seasonal creeks are flowing in the area, or water is pooled in creek beds and creeks are trickling.

**Other considerations:**

- Care should be taken in spring and early summer (around August to December) as most wildfires occur during this period.
- Some years are wetter or drier than normal and fuel accumulation will vary. Fire frequency is only a guide.

## 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). 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.

- **Areas with standing water** can be used to create fires with a greater patchiness. These burns also protect fire-sensitive species including pandanus.
- Be aware that the **papery bark** of melaleuca is highly flammable. Often described as a 'ladder fuel' paperbark can cause fire to rapidly ascend from the base to the top of the tree. Be aware of wind conditions and ember spot.

Refer to Chapter 1 (Issue 1), for additional tactics to address this issue.

## Issue 2: Avoid peat fires

Moist low-lying melaleuca and wet heath communities contain a peat layer (an accumulation of partially decayed, densely-packed dead vegetation). In the absence of good soil moisture the peat is easily ignited and can result in a peat fire. Peat fires can burn for months, and can have very negative impacts on the vegetation community. If burnt, peat takes many years to re-form.

### Awareness of the environment

**Key indicators of suitable conditions to avoid peat fires:**

- The presence of standing water (visible water on the surface or surface water that covers the bases of sedges and grasses).
- In the absence of standing water, the peat should be water logged (it is possible to squeeze water out of it).

A melaleuca community with peat. These communities are sensitive to fire when dry.
Neil Kershaw, QPWS, Shoalwater Bay (1993).

Melaleuca community with an understorey of ferns and sedges.
Sylvia Millington, QPWS, Mt Coom (2010).

Post fire in a melaleuca community with standing water.
Mark Parsons, QPWS, Sunday Creek, Girringun National Park (2010).

If standing water is not present or peat is not waterlogged, it can burn even if moist—this fire carried through damp peat.

Frank Mills, QPWS, Byfield National Park (2009).

The results of peat fire can be disastrous and peat can take many years to re form.

Frank Mills, QPWS, Byfield National Park (2009).

## Discussion

- Due to its porous nature and high carbon content peat is easily ignited when dry and can burn / smoulder for an extended period of time, causing re-ignitions and long-term damage to ecosystems.
- Be aware of peat issues when burning in areas adjacent to melaleuca or wet heath communities. The condition of the peat should be checked prior to burning to ensure that if the fire encroaches, a peat fire will not result. If it is necessary to burn adjacent areas in less than ideal conditions, manage the fire carefully to minimise the risk of fire entering the peat areas (use suitable tactics such as burning away from wetland edges).
- When peat burns underground it can be smokeless, often remaining undetected for many months until above-ground plants are ignited (causing visible smoke). Peat fires can cause wildfires some distance away from the ignition point well after the initial peat fire commenced.

## What is the priority for this issue?

| Priority | Priority assessment |
|---|---|
| **Very high** | Where peat is present, it is important to consider the most appropriate management during burn planning and implementation. |

## Assessing outcomes

### Formulating objectives for burn proposals

It is recommended that you select at least three locations that will be good indicators for the whole burn area. At these locations, walk through and record the observations.

| Measurable objectives | How to be assessed | How to be reported (in fire report) |
|---|---|---|
| The planned burn does not result in a peat fire. | Ongoing visual assessment during and post burn to ensure the fire has not carried into peat layer and developed into a peat fire. | **Achieved:** Fire did not carry into peat layer and develop into a peat fire.<br><br>**Not Achieved:** Fire carried into peat layer and developed into a peat fire. |

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.

## Fire parameters

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

**Fire severity**

- **Low** to **moderate**.

A low-severity fire adjacent to a Melaleuca viridiflora community where ground saturation has been used to control fire encroachment.

Mark Parsons, QPWS, Sunday Creek, Girringun National Park (2010).

## What weather conditions should I consider?

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

**Season:** Avoid late dry season fires in the vicinity of peat

**FFDI:** < 7 low–moderate

**DI (KBDI):** < 120

**Wind speed:** < 23 km/hr

**Soil moisture:** Standing water or water logged peat is the critical factor that will avoid a peat fire.

**Other considerations:**

- Avoid burning areas adjacent to peat in years that are drier than normal.
- Continuous low relative humidity (e.g. less than 50 per cent for more than one week) may dry the peat surface more quickly making it more susceptible to ignition—avoid burning during these conditions.

## What burn tactics should I consider?

When burning adjacent fire-adapted areas where standing water or water logged peat is not present use tactics that limit fire encroachment.

- **Spot ignition** can be used to effectively alter the desired severity of a fire. Spots closer together will result in a line of a greater intensity (as spots merge they create hot junction zones). Spots further apart will result in a lower-severity fire.
- **A low intensity backing fire** ensures fire intensity and rate of spread are kept to a minimum. **Do not create a running fire**.

Limit fire encroachment into non-target communities (refer to tactics, Chapter 9, Issue 5).

Peat fires are an issue in some swamp paperbark communities. The key is to burn with standing water present or ensure the peat is water logged.

Rosemary Lovatt, QPWS, Shoalwater Bay (2007).

## Issue 3: Limit fire encroachment into melaleuca gallery forests and swamps

Gallery forests contain fire-sensitive species which can be damaged by fire and require protection.

Some melaleuca swamp systems are fire-tolerant; and seasonal flooding is likely to be a major component of the ecosystems function. The ground stratum of these communities is generally moist with high decomposition rates and consequently low fuel accumulation. If allowing fire to penetrate swamp communities from surrounding areas, ensure standing water is present or the peat is waterlogged. Fire should not be allowed to trickle in any more frequently than every five years.

In general, planned burns in surrounding fire-adapted communities should use tactics and weather conditions that limit fire encroachment into adjacent gallery forests and swamps. Mosaic burning of adjacent communities will also assist in mitigating the impacts of wildfire.

Refer to Chapter 9 (Issue 5), for fire management guidelines.

Melaleuca gallery forests can contain river she-oaks *Casuarina cunninghamiana*, and other fire-sensitive species.

Jeanette Kemp, Queensland Herbarium, 30 km south-west of Sarina (2010).

Swamp paperbark communities do not require fire. However occasional fires may be allowed to trickle in (providing standing water or water-logged peat is present).
Jeanette Kemp Queensland Herbarium (2002).

When burning fire-adapted communities adjacent to melaleuca swamps, use tactics and weather to prevent encroachment of fire. These areas may dry seasonally.
Joy Brushe, QPWS, Shoalwater Bay (1997).

## Issue 4: Manage high-biomass grasses

High-biomass grasses of concern in the Central Queensland Coast bioregion include para grass, Indian couch, hymenachne, molasses grass and guinea grass. Some of these species can be reduced or eliminated using fire.

Refer to Chapter 9 (Issue 3), for fire management guidelines.

## Issue 5: Reduce *Lantana camara*

The presence of *Lantana camara* may require an altered approach to fire management. For well-established infestations, the integrated use of fire and other control methods can be used.

Refer to Chapter 9 (Issue 4), for fire management guidelines.

## Issue 6: Reduce rubber vine

The presence of rubber vine may require an altered approach to fire management.

Refer to Chapter 9 (Issue 6), for fire management guidelines.

# Chapter 6: Dune communities

This fire vegetation group includes foredune communities such as beach she-oak forests, sand blows with either bare sand or sparse herbs/shrubs and a diverse range of open to closed forests and woodlands on dunes and beach ridges. Common canopy species include a mixture of *Corymbia* spp., *Melaleuca* spp., *Eucalyptus* spp., she-oak (*Casuarina* spp., or *Allocasuarina* spp.), brush box, tea-tree *Leptospermum* spp., *Acacia* spp. or coastal banksia *Banksia integrifolia*. A dense shrub layer (e.g. of *Leptospermum* spp.) may be present and a sparse to dense ground stratum is often dominated by sedges or grasses. Rainforest species are also found in some communities. Dune communities can be located on islands and up to around four kilometres inland from the coast.

## Fire management issues

Dune communities contain both fire-adapted and fire-sensitive ecosystems. The main issue for **fire-adapted** dune communities is maintaining longer fire intervals in areas adjacent to more frequently burnt fire vegetation groups (e.g. grassy eucalypt forest).

Communities dominated by Moreton Bay ash and coastal banksia or hickory wattle *Acacia disparrima* subsp. *Disparrima* that occur in association with rainforest species, do not require fire. However an occasional low-severity fire may be allowed to trickle in from surrounding areas, providing there is no potential for subsequent weed invasion. Foredune communities contain many **fire-sensitive** species including beach she-oak *Casuarina equisetifolia* which are killed by fire. Areas of bare sand with sparse herbaceous plants can become vulnerable to erosion if burnt.

### Issues:

1. Maintain healthy fire-adapted dune communities.
2. Limit fire encroachment into fire-sensitive communities.
3. Reduce *Lantana camara*.
4. Manage high-biomass grasses.

Dune and foredune communities closest to the coastline are exposed to very harsh growing conditions and are generally fire-sensitive.

Andrew McDougall, QPWS, Byfield National Park (2007).

**Extent within bioregion:** 25 556 ha, 2 per cent; **Regional ecosystems:** Refer to Appendix 1 for complete list.

**Examples of this FVG:** Byfield National Park, 5 472 ha; Whitsunday Islands National Park, 854 ha; Percy Isles National Park, 563 ha; Cape Palmerston National Park, 526 ha; West Hill National Park, 334 ha; Bakers Creek Conservation Park, 96 ha; Keppel Bay Islands National Park, 52 ha; Byfield Conservation Park, 44 ha; Broad Sound Islands National Park, 32 ha; Additions to Byfield National Park, 22 ha; Skull Knob Conservation Park, 21 ha; Cape Hillsborough National Park, 20 ha; Newry Islands National Park, 19 ha; Ext to Reliance Creek National Park, 17 ha; Clairview Reserve, 15 ha; Slade Point Reserve, 13 ha; Dryander National Park, 12 ha; Bloomsbury Conservation Park, 3 ha; South Cumberland Islands National Park, 2 ha; Byfield Base Reserve, 1 ha; Seaforth Base (Port Newry Road) 1 ha.

## Issue 1: Maintain healthy fire-adapted dune communities

Maintain healthy fire-adapted dune communities by conducting mosaic burns in association with the surrounding fire-adapted communities.

### Awareness of the environment

**Key indicators of health**

- Canopy trees (e.g. eucalypts, *Corymbia* spp., acacias, melaleuca) are of varying ages (and there are enough to eventually replace the canopy). There is a healthy canopy.
- There is a healthy low tree or shrub layer (e.g. tea-trees, acacias, banksias, grass trees or fan palms).
- The presence of occasional stags and live trees with hollows.
- A diverse and healthy ground layer exists and may include grasses, vines, sedges, lilies and ferns.
- Lantana where present, appears as scattered individuals or in small, isolated clumps.
- Herbaceous weeds (including grasses) are absent or rare.

This bloodwood and eucalypt open forest shows a healthy, diverse shrubby understorey.
Leanne Simpson, QPWS, Three Rivers Road, Byfield National Park (2011).

Fire-adapted forests on dunes will often adjoin fire-sensitive communities. Use of appropriate weather conditions combined with tactics to limit fire encroachment will minimise impacts on fire-sensitive areas.

QPWS, Keppel Bay Islands National Park (2008).

Dune woodlands with a dense shrubby understorey can burn with high severity. Ensure good soil moisture exists to limit the fire severity and improve post-fire regeneration.

Joy Brushe, QPWS, Shoalwater Bay Military Training Area (1999).

This dune forest has a dense mixed understorey of grasses, sedges and ferns.
Joy Brushe, QPWS, Shoalwater Bay Military Training Area (1997).

A healthy dense shrub layer in open woodland
Joy Brushe, QPWS, Shoalwater Bay Military Training Area (1999).