a program of Healthy land & water

Living with fire

INFORMATION BOOKLET 2

RECOMMENDED FIRE REGIMES

Queensland Parks and Wildlife Service officers undertaking a planned burn along a roadside at Samford.

Fire and the Australian landscape

Fire has been part of the Australian landscape through traditional Aboriginal burning practices for tens of thousands of years, and lightning strikes for millions of years (Bradstock *et al*. 2012). European settlement has seen the acceleration of human-induced fire in many landscapes and a decrease in others.

In modern society, we face many additional challenges managing fire, including increased urban expansion, changing land uses, vegetation removal, weeds, arson, health issues associated with smoke, awareness of cultural heritage values, and the impact of climate change on fire weather and fuel accumulation.

Appropriate fire has a significant and positive role to play in maintaining the diversity of native plants, animals and fungi species in fire-adapted communities.

The outcomes of appropriate fire may include:

- Opening up the foliage canopy, allowing sunlight to reach the ground, and creating an ash bed rich in nutrients for germinating seedlings.
- Creating hollows in trees and logs.
- Triggering seed release, germination and flowering.
- Assisting in the contol of weeds and fungal diseases.

Whilst some species have mechanisms that enable them to survive or replenish after fire, all plants, animals and fungi have limits to their tolerance, which may include no tolerance to fire at all. Both too frequent and infrequent fire can lead to species decline and eventual local extinction. For example, most rainforest vegetation is not tolerant of fire, and should be protected from fire.

However, open forests and woodlands with a grassy understorey require more frequent fire to maintain grass species (i.e. infrequent fire supports a shrubby understorey). A lack of fire in grassy understorey open forests and woodlands in the Border Ranges area of South East Queensland (SEQ) is believed to have contributed to the decline of the endangered eastern bristlebird in this area.

The relationship between fire and the landscape is extremely complex and it is always best to be as informed and prepared as possible. The challenge for people living in bushland areas prone to fire is incorporating sound fire, environmental and property planning initiatives into their overall property management. This will help to facilitate effective life and property protection, whilst supporting improved agricultural and biodiversity benefits. For more information on fire management planning visit **www.fireandbiodiversity.org.au**.

Christmas bells (Blandfordia grandiflora) are an example of a fire-adapted species. Endangered in Queensland, Christmas bells only flower after fire, with research showing a peak in flowering 1 - 2 years post fire and declining flowering to negligible rates 4 - 5 years post fire (Ramsey 1997; Vaughton and Ramsey 1996). This plant is flowering after a fire at Beerwah on the Sunshine Coast.

Grass trees post-burn, Main Range National Park, Goomburra Section.

What does fire-adapted mean?

The term **'fire-adapted'** generally refers to species or vegetation communities that have evolved to survive and/or thrive with a certain regime of fire. It does not mean an entire vegetation type (or the species within it) is 'adapted' to fire per se, but rather some species will survive or respond favourably to an appropriate **fire regime**, characterised by upper and lower limits of fire frequency, extent, intensity, and season.

Fire-adapted plants respond to fire in many ways. Some species tolerate fire but do not rely on it for germination, while other species rely on fire to trigger one or more aspects of reproduction (e.g. flowering, seed release and germination). As such, it is important to note that deliberately excluding fire from vegetation types prone to fire may have serious impacts for species that rely on fire for reproduction (e.g. banksia species).

Animals in fire-adapted communities utilise a variety of strategies to increase their chances of survival. Some species are avoiders (e.g. wallabies and some invertebrates) and try to stay alive by moving out of the area of the fire, or sheltering underground, in hollow logs or large hollow-bearing trees. Other species lose individuals in a fire and rely on recolonisation by populations from outside the burnt area.

Variability in fire frequency, extent, and in some vegetation communities, season, is important in conserving habitat for fire-adapted animals. This variability will also ideally allow the greatest variety of fauna species to survive a fire. For more information on plant and animal responses to fire, see *Information Booklet 1: An Introduction to Fire Ecology*.

The ground parrot (Pezoporus wallicus wallicus) is listed as vulnerable in Queensland. Research has found that nests were only detected under heathland vegetation that was unburnt for 3 - 4 years. Bird numbers peaked at 5 - 8 years post fire, thereafter decreasing to zero by 12 - 14 years post fire (McFarlane 1991).

The fire regime

The term **'fire regime'** is used to describe the general pattern and intensity of fires occurring in a particular ecosystem or vegetation type over an extended period of time. The fire regime is shaped by the history of fire, including Aboriginal burning practices and key life characteristics (e.g. age to flowering) of the plants and animals that make up the community. A fire regime is described in terms of four parts, namely fire frequency, fire extent, fire season and fire intensity.

Fire frequency: defined as the years between fire, or the number of fires in a given time. Fire frequency guidelines aim to ensure fire intervals are sufficiently long enough for obligate seeding plants (i.e. plants generally killed by the passage of a fire, but for whom heat and/or smoke triggers seed release from woody seed capsules or stimulates germination of seed stored in the soil) to grow to reproductive maturity (i.e. plants producing flowers and seeds), whilst also maintaining fire for short-lived species. Both too frequent and too infrequent burning can cause problems and it is best to aim for a range of different intervals (dependent upon vegetation type) between burning. Frequent fire tends to reduce shrub cover and encourage grass species (e.g. blady grass) in some vegetation types. Longer periods between fires may encourage greater understorey density.

Fire extent: defined as the area covered or 'patchiness' of a fire. To avoid the same plant and animal populations from being continually burnt during fires, it is recommended to apply patchy or 'mosaic' burning techniques when planning fire. Whilst mosaics can occur naturally with wildfire, hotter and larger fires will often cover a greater area, leaving fewer unburnt patches. Unburnt areas provide important refuges for animals during fire and a base from which they can recolonise following fire. Unburnt patches also provide vital food resources for animals and seed sources for plant regeneration following fire. In a fragmented landscape, fire can result in local animal extinctions if there is not a viable nearby animal population that can recolonise burnt areas.

Fire season: defined as the time of year. It is generally accepted that vegetation type, burn objective, weather and associated environmental variables (e.g. soil moisture) most strongly influence recommended burn season. It is also recommended that animal breeding cycles (including invertebrates) are considered. For example, spring fires can have a detrimental impact on mammals and birds rearing their young by removing vital summer food resources and should generally be avoided. Fire ecology research generally recommends some variability in fire season, as it is highly unlikely that burning in any one season will benefit a whole community of animals and plants. However, planned burns (e.g. hazard reduction burning) and ecological burning must also consider safety and fire threat to life and property.

Fire intensity: defined as the temperature of a fire. Fire intensity will vary depending on factors such as wind speed, temperature, humidity, slope, fuel load, soil moisture and vegetation structure. The most intense fires tend to occur with high temperatures, low humidity, strong winds and greater amounts of 'fine fuels' (materials less than a pencil width). The intensity of a fire is a measure of the amount of energy released and is measured in kilowatts per metre. Cool to moderate fires (the majority of planned burns) are generally patchy, leaving unburnt areas, removing less ground litter and limiting post-fire soil erosion. Hotter fires are more destructive and will kill more plants and animals, but can be important to some plant communities requiring higher temperatures to stimulate seed release (e.g. hakea species), flowering or soil-stored seed germination. Variation in fire intensity plays an important role in maintaining the greatest diversity of species.

Recommended fire regimes for South East Queensland

The following pages include information on recommended fire regimes for broad vegetation groups within SEQ. This information has largely been sourced from the publication *Planned Burn Guidelines - Southeast Queensland Bioregion of Queensland,* produced by the Queensland Parks and Wildlife Service (QPWS Enhanced Fire Management Team 2012) and from the Regional Ecosystem Description Database.

The QPWS *Planned Burn Guidelines* has been designed for use by public land managers, but contains extensive information on fire management issues (e.g. weeds) and fire regimes, ensuring they are also very useful for private landowners. It is available for download at www.parks.des.qld.gov.au/management/programs/fire-management/guidelines.

The Department of Environment and Science maintains a database of recommended fire regimes for different vegetation types, known as the Regional Ecosystem Description Database (REDD). 'Regional Ecosystem' is a term used to describe different vegetation communities (e.g. open woodland, dry rainforest) and each Regional Ecosystem is assigned a number that helps in identifying key features. The REDD is free and can be accessed at www.apps.des.qld.gov.au/regional-ecosystems.

Planned burn undertaken by Queensland Parks & Wildlife Service officers at Glastonbury Creek, near Gympie.

Recommended fire regime guidelines for broad vegetation groups in SEQ

Please note: this is not a definitive list, but rather representative of the most common broad vegetation types in the SEQ region. The following information has been adapted from the QPWS *Planned Burn Guidelines - Southeast Queensland Bioregion of Queensland* and the REDD.

Tall open forest

The canopy is typically dominated by flooded gum, tallowwood, Sydney blue gum, brush box and turpentine. The understorey is often dominated by rainforest species, but also includes grassy or shrubby remnants. Communities are found in wetter parts of SEQ, on elevated slopes, ranges and gullies, often surrounding rainforest and/or with vine understorey.

Frequency: Minimum 20 years for tall open forest dominated by brush box (*Lophostemon confertus*) or flooded gum (*Eucalyptus grandis*), or for forest with vine forest or mixed rainforest understorey. For tall open Sydney blue gum (*E. saligna*) forest, vary intervals between 3 - 6 years for grassy understorey and 7 - 25 years for shrubby understorey.

Extent: For *E. saligna* 40 - 60%.

Season: Late summer to autumn.

Intensity: Moderate to high.

NB: Planned burning is necessary to maintain tall open *E. saligna* forest with a grassy or shrubby understorey. If you wish to maintain a rainforest understorey or sub-canopy, fire is not recommended.

Tall open forest, Bellthorpe National Park.

Open forest and woodland

The canopy is generally dominated by eucalypts, angophoras and bloodwoods. The understorey may be grassy, shrubby or mixed. Communities are found on coastal lowlands, alluvial plains and inland hills and mountain ranges.

Frequency: Vary intervals between 3 - 6 years for grassy understorey and 7 - 25 years for shrubby understorey.

Extent: 40 - 80%.

Season: January to August (with good soil moisture).

Intensity: Low to moderate.

Open forest, Sunshine Coast.

Grassland

Treeless and shrubless areas dominated by tussock grasses (e.g. *Poa labillardieri*), restricted to the Bunya Mountains and known as '*grassy balds*'.

Frequency: Intervals between 2 - 3 years where woody weeds are an issue, longer intervals for a healthy system free from forest encroachment.

Extent: Avoid burning more than 50% in any one year.

Season: Spring to autumn following good rain.

Intensity: Low to high.

Grassy bald, Bunya Mountain.

Wet and dry coastal heath

Sedgelands, wallum banksia and low mallee woodlands.

Frequency: Vary intervals between 7 - 20 years, with an emphasis on 8 - 12 years for dry coastal heath.

Extent: 40 - 80% (40 - 60% for dry coastal heath).

Season: January to August.

Intensity: Moderate.

Coastal heath, Beerwah Scientific Area, Sunshine Coast.

Montane heath

Heathland located on rocky mountain peaks, exposed ridges and on poor soils.

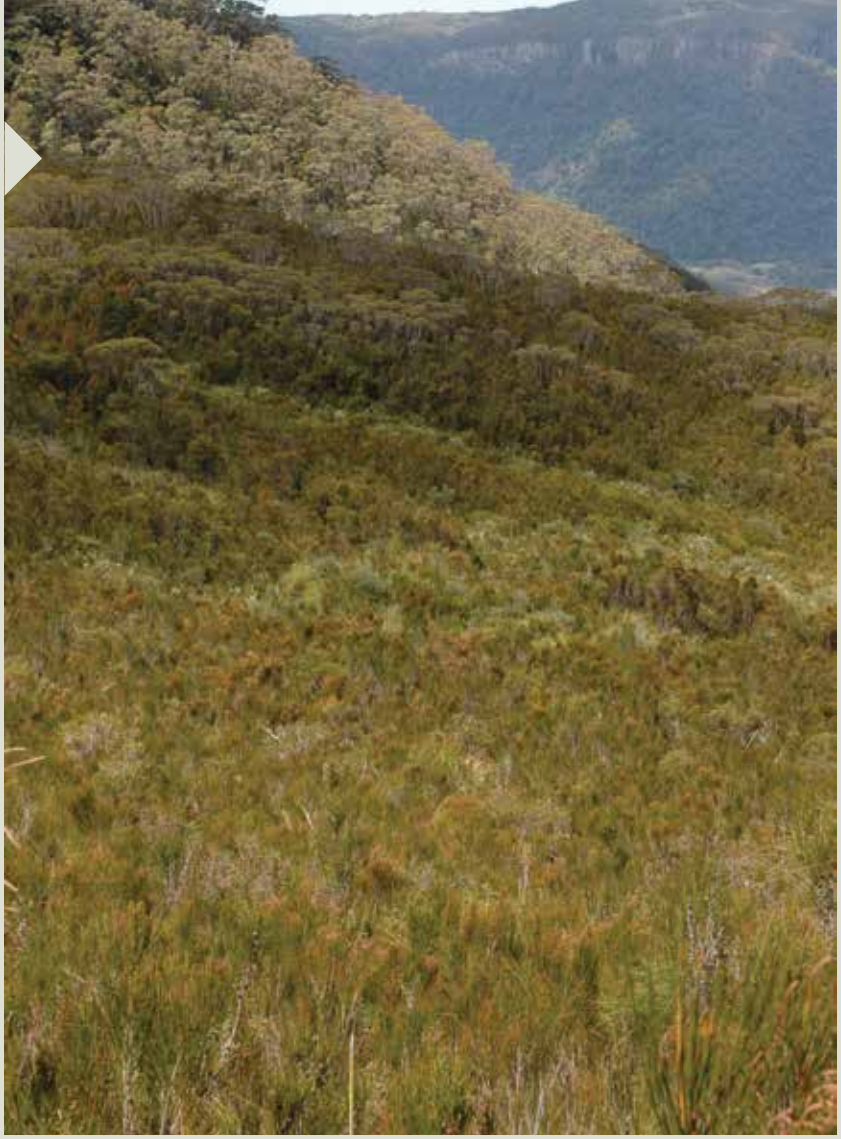
Frequency: Depends on the relationship with surrounding vegetation, but intervals of 15 - 50 years are recommended.

Extent: Burn in association with surrounding vegetation.

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

Intensity: Low to moderate.

Montane heath, Daves Creek, Natural Bridge.



Coastal fringing forest

Forest dominated by swamp she-oak (*Casuarina glauca*).

Frequency: Vary intervals between 6 - 7 years.

Extent: Avoid burning more than 50% in any one year.

Season: January to August, ideally in association with surrounding vegetation.

Intensity: Low.

Coastal fringing forest (Casuarina glauca), Boondall Wetlands.

Mangrove and saltmarsh

Mangroves do not require fire and generally do not burn. Saltmarshes are potentially flammable, but do not require fire and should not be deliberately burnt. Burn out *from the edge* to surrounding vegetation where necessary to minimise fire incursion.

Saltmarsh and mangrove, Minjerribah (North Stradbroke Island).

Melaleuca (paperbark) communities

Melaleuca swamps, melaleuca woodlands and open forest dominated by *Melaleuca quinquenervia* (swamp paperbark).

Frequency: Vary between 6 - 20 years for mixed grass/shrub understorey, 8 - 12 years for heath understorey and 12 - 20 years for sedge/fern understorey.

Extent: 25 - 70% in association with surrounding vegetation.

Season: January to July following rain.

Intensity: Low to moderate.

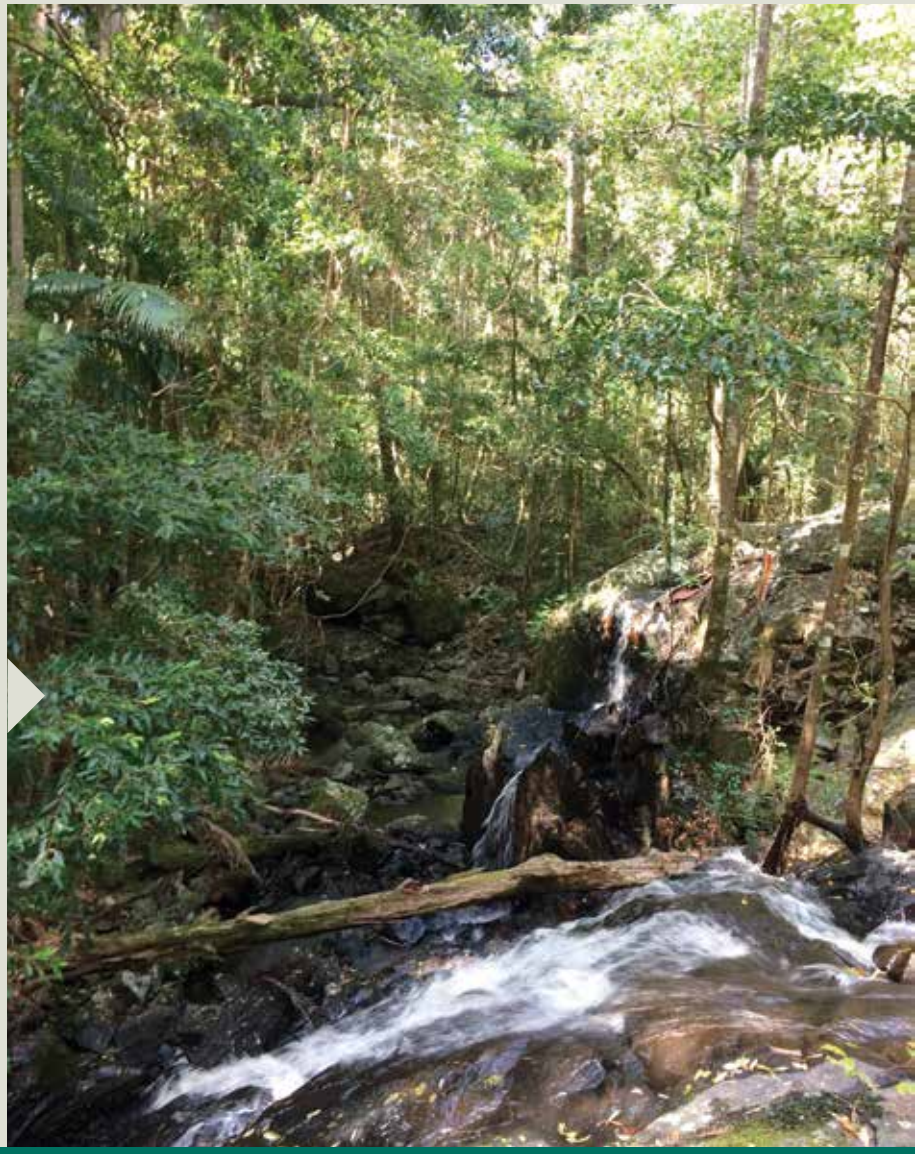
Melaleuca (paperbark) woodland, Deagon Wetlands, Bracken Ridge.

Riparian (creekside) vegetation

Creekside vegetation including blue gum, river oak and weeping bottlebrush and foredune communities (including casuarina and spinifex grasses).

Do not burn – fire sensitive. Burn out *from the edge* to surrounding vegetation where necessary to minimise fire incursion.

Riparian vegetation, Upper Nerang River, Numinbah



Rainforest, dry vine forest and brigalow

Do not burn – fire sensitive. Burn out *from the edge* to surrounding vegetation where necessary to minimise fire incursion.

Rainforest, Bellthorpe.

Fire management planning

Fire management planning is an integral part of any property management plan and should be undertaken prior to any planned burn. By preparing a fire management plan you will be best placed to meet the ecological requirements of the vegetation communities on your property, whilst achieving your burn objectives and protecting life and property.

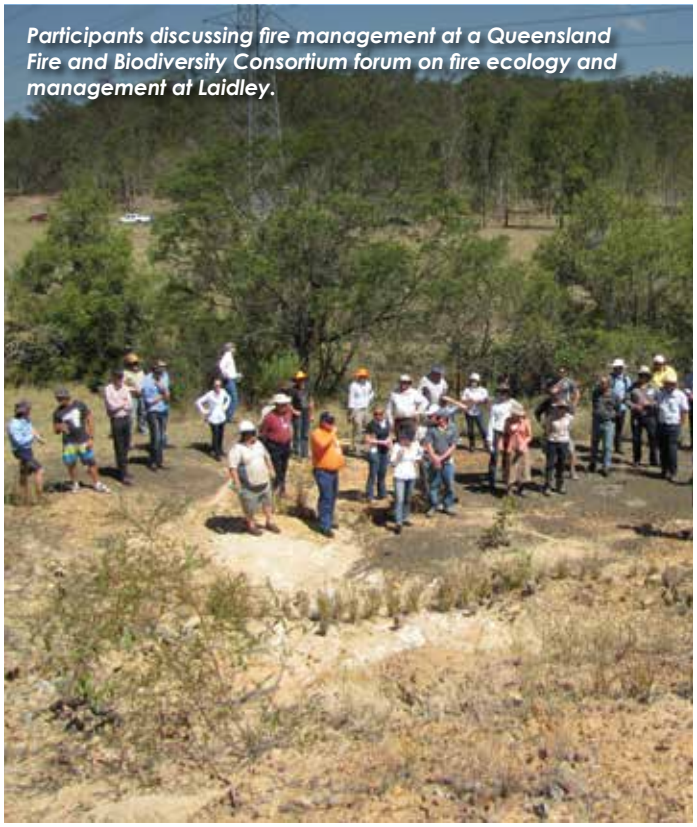
Prior to conducting a planned burn you are required to obtain a *Permit to Light Fire* from your local fire warden (contact your rural fire brigade) and talk to your neighbours. Ultimately, good preparation and planning before undertaking a planned burn will increase the likelihood of success.

Prior to planning a burn it is also essential to consider your obligations (some of which will be outlined with your *Permit to Light Fire*), including state and Commonwealth legislation. Whilst some fire mitigation activities are exempt from approval requirements, burning within areas of protected remnant vegetation can only be undertaken in limited circumstances and generally requires a permit. To do so without a permit is in breach of the *Queensland Vegetation Management Act 1999* and may result in fines or legal action.

For further information on fire management planning and what you can do, refer to the Department of Resources or visit www.qld.gov.au/environment/land/management/vegetation/exemptions.

The Queensland Fire and Biodiversity Consortium offers workshops on fire management planning for private landholders. Workshops are coordinated in partnership with local government and the Queensland Fire and Emergency Services or local Rural Fire Brigade. Landholders are provided with the opportunity to develop a fire management plan (including maps) for their property. For further information on fire management planning workshops visit www.fireandbiodiversity.org.au.

Participants at a Queensland Fire and Biodiversity Consortium Fire Management Planning workshop at Emu Creek.



Participants discussing fire management at a Queensland Fire and Biodiversity Consortium forum on fire ecology and management at Laidley.

Bibliography

Williams, J. E., Gill, A. M. and Bradstock, R. A. (eds.) (2012) *Flammable Australia: Fire Regimes, Biodiversity and Ecosystems in a Changing World*. CSIRO Publishing.

Hotspots Fire Project (2012) *Managing Fire on your Property: A Booklet for Landholders in the Lachlan*. Nature Conservation Council of NSW and the NSW Rural Fire Service.

McFarland, D. C. (1991) The Biology of the Ground Parrot, *Pezoporus wallicus,* in Queensland. I. Microhabitat Use, Activity Cycle and Diet. *Wildlife Research* **18**, 169 - 184.

Queensland Parks and Wildlife Service Enhanced Fire Management Team (2012) *Planned Burn Guidelines: Southeast Queensland Bioregion of Queensland*. The Department of Environment and Science, Brisbane.

Ramsey M. and Vaughton G. (1996) Inbreeding depression and pollinator availability in a partially self-fertile perennial herb *Blandforia grandiflora (Liliaceae)*. *Oikos* **76**, 465 - 474.

Ramsey M (1997) No Evidence for Demographic Costs of Seed Production in the Pollen-Limited Perennial Herb *Blandfordia grandiflora (Liliaceae)*. *International Journal of Plant Sciences* **158**, 785 - 793.

Queensland Fire and Biodiversity Consortium (2018) *Property Fire Management Planning Kit - Part A User Manual*. South East Queensland Fire and Biodiversity Consortium.

Somerset Regional Council and SEQ Catchments (2013) *Living in Somerset: A Booklet for Landholders.* Somerset Regional Council and SEQ Catchments.

Whelan, R.J. (1995) *The Ecology of Fire*. Cambridge University Press.

About the Queensland Fire and Biodiversity Consortium

Established in 1998, the Queensland Fire and Biodiversity Consortium is a network of land managers and stakeholders committed to improving fire and biodiversity management, supporting applied fire research, facilitating partnerships, and building land manager and landholder capacity.

The Queensland Fire and Biodiversity Consortium offers a range of resources and services, including fire management planning workshops, training and practical information. For more information, visit **www.fireandbiodiversity.org.au**.

The Queensland Fire and Biodiversity Consortium is a program of Healthy Land & Water. Healthy Land and Water is the **peak environmental group** for South East Queensland. For over 20 years it has been dedicated to investing in and leading initiatives to **build the prosperity, liveability, and sustainability of our 'future region'**. Working in partnership with Traditional Owners, government, private industry, utilities and the community, Healthy Land and Water delivers innovative and science-based solutions to challenges affecting the environment. The combination of scientific expertise and on-ground management works to deliver Healthy Land and Water's mission to **lead and connect through science and actions that will preserve and enhance our natural assets and support resilient regions long into the future**. For more information, please visit **www.hlw.org.au**, email info@hlw.org.au, or telephone (07) 3177 9100.

We acknowledge that the place we now live in has been nurtured by Australia's First Peoples for tens of thousands of years. We believe the spiritual, cultural and physical consciousness gained through this custodianship is vital to maintaining the future of our region.

The Queensland Fire and Biodiversity Consortium gratefully acknowledges the following partners:

Authorship and acknowledgments

This publication has been authored by Dr Samantha Lloyd and Craig Welden (Queensland Fire and Biodiversity Consortium), in collaboration with Annie Keys (Keys Consulting). The authors gratefully acknowledge the images supplied by Paul Donatiu, Samantha Lloyd, David Gilmour, Deborah Metters, Angus McNab, Peter Leeson, Healthy Land & Water and image 'Grassy Bald at Bunya Mountain' by Tatters (www.flickr.com/photos/tgerus/24057530901/in/photolist-CDT8Mx-BPN2TP-MtBQox/), acquired under Creative Commons Attribution-Share Alike 2.0 Generic (CC BY-SA 2.0) license.

Printed on environmentally responsible stock that is certified CarbonNeutral, chlorine free, manufactured under ISO 14001 EMS accreditation and consists of 60% FSC post consumer waste fibre, 40% FSC certified virgin fibre.