BURNETT MARY

Fire management guidelines

Appropriate fire management practices to help land managers plan hazard reduction burning and undertake planned burns to improve production and conservation outcomes

Queensland Fire & Biodiversity Consortium

a program of Healthy land & water

Australian Government

National Landcare Programme

Queensland Fire and Emergency Services

Queensland Government

Burnett Mary Regional Group

Practical Solutions for Natural Resource Management

FLS Fire & Landscape Strategies

Table of contents

Introduction

There have been significant land use changes in the Burnett Mary region in recent years with gas production, mining and rural residential expansion and decline in some rural industries such as forestry and dairying. Volunteer rural fire brigades, fire wardens and Queensland Fire and Emergency Services (QFES) are concerned with an increase in inappropriate fires and a lack of community understanding regarding fire management. The Burnett Mary Regional Group as part of their natural resource management planning has identified inappropriate fire regimes as a threatening process to biodiversity for the region and the threat of increased bushfire activity due to future climate variability.

The Burnett Mary Regional Group (BMRG) is one of 12 regional groups for Natural Resource Management (NRM) in Queensland, working with communities to protect and enhance our precious natural assets. BMRG has delivered practical solutions for sustainable environmental management since 2001 through investing in on-ground works with the region's producers on projects that are targeted to achieve the best possible environmental outcomes and a balance between resource use and sustainability. For more information visit bmrg.org.au.

The Queensland Fire and Biodiversity Consortium (QFBC) is a collaborative network of land managers and stakeholders who are committed to improving fire and biodiversity management, supporting applied fire research, facilitating partnerships and building land manager and landholder capacity. Through education, community engagement and applied research, the QFBC builds the capacity of land managers and private landholders across Queensland.

The QFBC is a program of Healthy Land & Water, the peak environmental group for South East Queensland. For more information visit www.fireandbiodiversity.org.au.

The original fire management guidelines for Burnett Mary were developed by Fire & Landscape Strategies. They have been updated by the QFBC, in partnership with QFES, volunteer rural fire brigades and fire wardens. Together, these groups have taken up the challenge of providing the best information available on fire management and planning in the region. These fire management guidelines are the culmination of extensive discussions with experienced fire wardens, members of volunteer rural fire brigades and other respected fire managers and fire scientists.

These guidelines are intended to be used by volunteer rural fire brigades and landholders, who are the front line fire managers in rural communities. They are intended to be used to help land managers plan hazard reduction burning and undertake planned burns for improved production and conservation outcomes.

Using these guidelines

The purpose of these guidelines is to support fire management decisions in the Burnett Mary region. Information about why and how to burn is presented for the 20 landscapes across the region. These landscapes are based on vegetation that require similar fire prescriptions. It is important to note that the information provided is simply a guide for typical situations, and there will be circumstances where a different approach is appropriate.

Five important factors to consider when planning for fire management are:

- **Fire frequency** – how often should an area be burnt?
- **Fire intensity** – how hot does the fire need to be?
- **Fire season** – what time of year will usually provide the desired conditions for a planned burn?
- **Burning mosaic** – the pattern and percentage of ground fuel remaining unburnt after a fire.
- **Ignition technique** – how a fire can be implemented to achieve its purpose.

Other important factors to consider are fuel loads, wind speed, temperature, humidity, fuel curing, slope and aspect.

These guidelines are not intended to account for all circumstances. Annual, seasonal and even daily conditions can vary dramatically. Plan ahead and carry out burns when conditions are suitable. Often, it is preferable to begin burning in the mid afternoon, when the temperature will soon drop and humidity is increasing, so that conditions will become milder as the fire spreads. Always obtain and adhere to conditions of a permit from your fire warden.

Each landscape has a dashboard with recommendations for each fire factor.

Fire frequency describes how often a fire burns through an area. An 'area' could be a paddock, a block contained between tracks, a hill or a catchment between creeks.

A large area may receive annual or biennial fires that burn different patches.

It is important to note that a fire frequency of every two years does not automatically mean the entire block is completely consumed every two years. It means that some fire is implemented biennially within an area.

GREEN Under most circumstances the number of years between burns should fall within the GREEN range indicated on the dashboard for each landscape. This range is generally considered appropriate for hazard management, production and conservation outcomes.

ORANGE Under some circumstances there may be a need for more or less frequent fire, but this should fall within the ORANGE range. Generally, this would occur as a 'one off' (e.g. two fires in three years to reduce a lantana infestation or to thin excessive wattle saplings that germinated after a wildfire).

RED Generally, it would be considered undesirable for fire frequency to fall within the RED range. For example, long periods of time between fires would result in undesired vegetation thickening and loss of pasture productivity.

NOTE: Frequency is defined by 'typical years' and can be misleading (e.g. in times of drought or particularly high rainfall). A typical year would be defined by having received ± 20% of the local average annual rainfall.

This symbol indicates landscapes where burning is generally not recommended.

Fire season describes times of the year with particular weather conditions that impact fire, including rainfall, temperature, wind patterns and humidity.

Burning operations need to take into account annual variations in weather, however general seasonal patterns are useful for planning fires.

GREEN Under most circumstances the desired conditions will be available within the GREEN season/s.

ORANGE Desired fire conditions will sometimes fall within the ORANGE season/s. Specific requirements for a particular burn will vary under different circumstances (e.g. storm burning requires relatively high soil moisture).

RED Under most circumstances, conditions within the RED range of seasons will result in damaging fire and/or fire that is difficult to control.

Fire intensity describes the rate of heat released by a fire. This increases with the amount of fuel consumed and the speed of the fire front (i.e. a fast moving fire with a high fuel load will create a high intensity fire). Flame height also gives a rough indication of intensity. Fire severity is a related concept which takes into account impacts on vegetation, such as canopy damage.

LOW intensity fire has a flame height of typically < 1 m, with a fire front moving slower than walking speed.

MODERATE intensity fire has a flame height of typically 1 m to < 3 m, with a fire front moving at around walking speed.

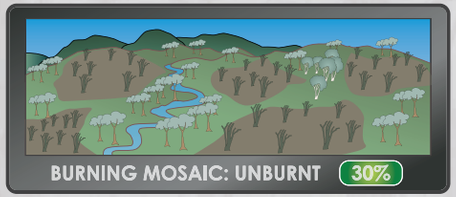
HIGH intensity fire has a flame height of typically > 3 m in height, with a fire front moving faster than walking speed.

GREEN Under most circumstances the fire intensity should fall within the GREEN range.

ORANGE Under some circumstances there may be a need for more or less intense fire, but this should fall within the ORANGE range.

RED Under most circumstances, fire intensities in the RED range will result in damaging fire and/or fire that is difficult to control.

Burning mosaic describes the pattern and proportion of burnt and unburnt fuels produced by a fire. A patchy, mosaic burn can be very effective in reducing the intensity and spread of future wildfire, without risking the complete loss of pasture grasses, soils, nutrients and unburnt habitat.



Unburnt patches retain mature plants which provide continuous seed supply, allowing seedlings to recruit in burnt areas. Patchily burnt mosaics will also protect the land from weed infestations or environmental damage that sometimes results from complete removal of the ground layer across large areas.

The intended burn mosaic often differs between fires for hazard reduction and conservation burning. For example, hazard reduction burns near infrastructure typically aim for a higher proportion of ground fuel consumed versus burns for conservation purposes.

Ignition technique describes the way a fire is ignited, which has a considerable effect on fire behaviour.

A fire lit from a continuous drip torch line rapidly reaches its maximum rate of spread and can produce a high intensity fire with a thoroughly burnt ground layer and canopy scorch. In contrast, a fire lit from several well-spaced spot ignitions is much slower to reach its maximum rate of spread and generally produces fingers of less intense fire with more unburnt patches.

Different ignition techniques are required for different circumstances. Multiple spot ignitions are typically used for conservation purposes, whereas drip torch lines produce a more thorough burn for hazard reduction purposes adjacent to infrastructure. When backburning in advance of a wildfire under high fire danger conditions, a fire line produced by spaced spots of ignitions can be easier to contain than a solid drip torch line. However, the spots will not create a burnt-out firebreak as quickly.

Where a fire is initially ignited is particularly important. For example, lighting from the top of a ridge to burn downslope, or from against the edge of a watercourse or scrub, may be necessary to protect fire sensitive vegetation from an intense fire. Multiple

Thank you to the review team: Dr Paul Williams (Vegetation Management Science), Neil Kelso (QFES) and Dr Diana Virkki (Healthy Land & Water).

The Burnett Mary region

The Burnett Mary region is a large area covering 70,000 square kilometres. It has a population of approximately 300,000 people and is recognised as one of the fastest growing regions in the country

The Burnett Mary region is the southernmost of the Great Barrier Reef catchments with many of the rivers and streams flowing directly into the Great Barrier Reef.

On the coast the area starts just north of Seventeen Seventy and continues south to Rainbow Beach, including World Heritage listed K'gari (Fraser Island) and the Great Sandy Strait – a Ramsar listed wetland of international importance. Inland, the region includes the Mary Valley, Bunya Mountains and regional townships of Kingaroy, Gayndah, Mundubbera, Eidsvold and Monto.

The inland area includes part of the Brigalow Belt South bioregion and the coastal area forms part of the South East Queensland (SEQ) bioregion, which causes some overlap and variations in landforms, soils, plants and fauna.

Parts of the area have been cleared for agriculture, forestry plantations and improved pastures for grazing. The coastal residential and rural residential areas have also expanded in recent years. The variation in land use reflects the diversity of the natural landscapes and increased complexity of managing fire in the landscape.

The aim of these guidelines is to provide fire regimes for different landscapes that address three primary rationales for fire management: hazard reduction, primary production and conservation outcomes.

Not all landscapes require fire and these fire-sensitive landscapes are identified, with strategies to protect them from fire.

For example, burning next to a township or rural residential area to reduce the fuel load will require a different fire than a fire lit for sugarcane harvesting, beef cattle or native hardwood timber production, as the intended outcomes are different.

The use of fire for conservation outcomes is also discussed. The appropriate use of fire in the landscape can lead to improved outcomes for diversity and natural processes.

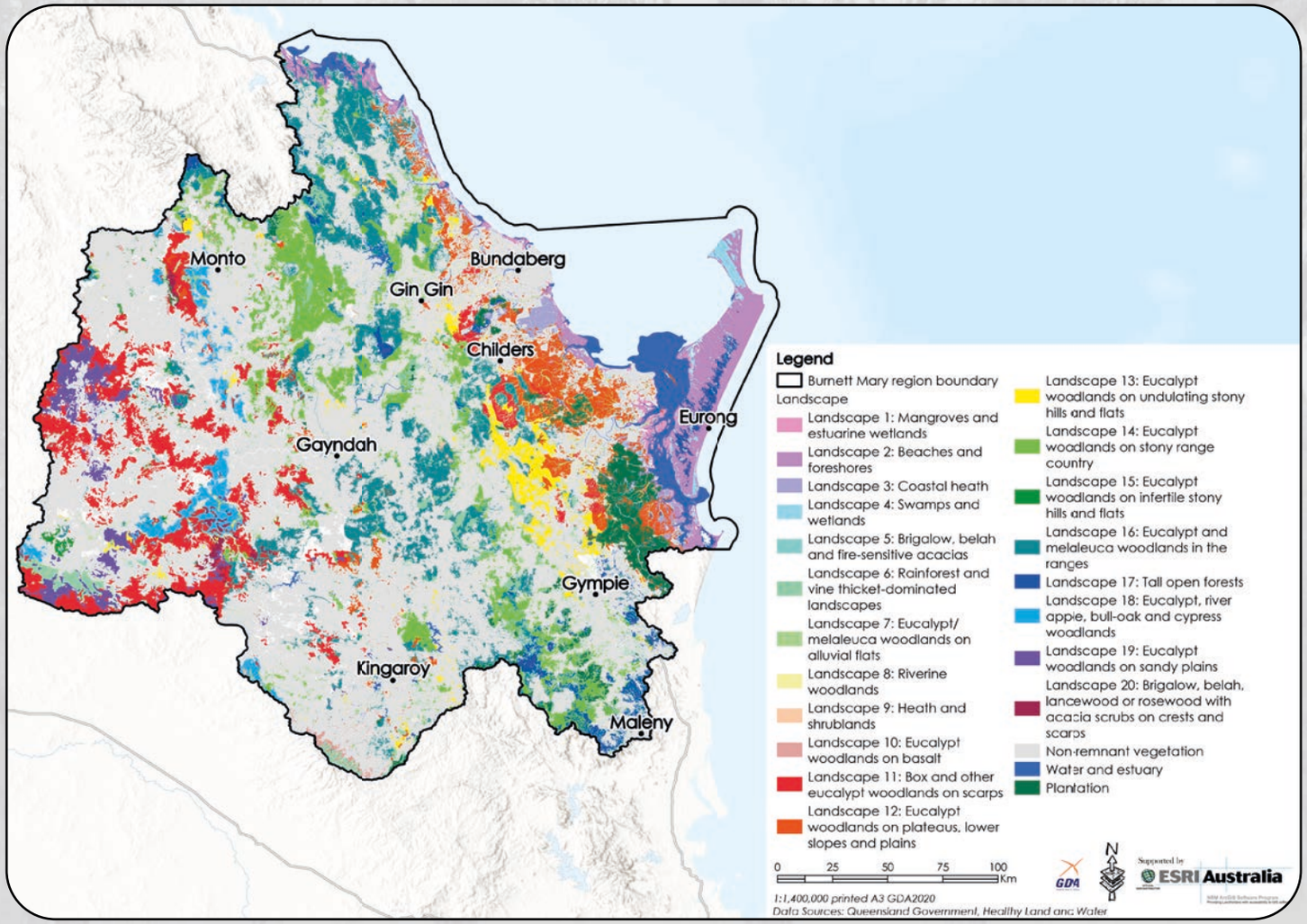
It is hoped that the guidelines will provide the stimulus for conversation amongst neighbours on the timing and use of fire in their landscapes and lead to better fire management outcomes for the Burnett Mary Region.

Some useful websites for more information on Rural Fire Service Queensland and plants and animals in the Burnett Mary Region are:

www.qfes.qld.gov.au

www.nrmplan2015.bmrg.org.au/plants-and-animals/

Landscapes of the Burnett Mary



Landscapes are groupings of vegetation types within the Burnett Mary. The above photograph has four main landscapes:

- The dark green 'V' below the cliffs is *Landscape 6: Rainforest and vine thicket-dominated landscapes*.
- The country above the cliffs is *Landscape 11: Box and other eucalypt woodlands on scarps*.
- The silver-leaved ironbark up against the vine thicket is *Landscape 14: Eucalypt woodlands on stony range country*.
- The grass in the foreground is modified/cleared country. The grass is black speargrass, a native grass in a modified landscape, with the old dead trees showing that fire is regularly used to keep regrowth at bay.

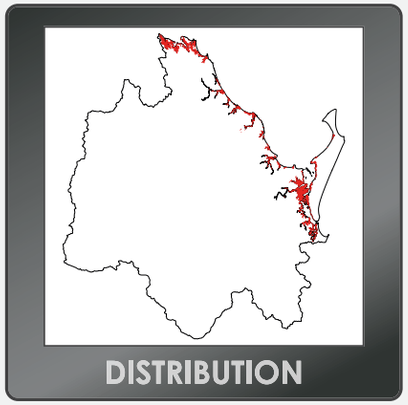
These fire guidelines are intended to be viewed at the landscape scale rather than a single, small property view. Similarly, a fire regime is a sequence of fires over time rather than a single event.

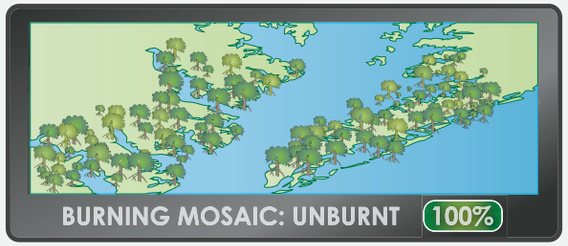
Mangroves and estuarine wetlands

including saltwater couch and saltmarsh flats

Landscape 1

Mangroves, saltmarsh, saltwater couch, saltpan vegetation, and fringing melaleuca forests and pandanus.





Mangroves and estuarine wetlands

including saltwater couch and saltmarsh flats

Barramundi (*Lates calcarifer*).

Beach stone-curlew or thick-knee (*Burhinus neglegtus*) (© Rosanne Houley, Fire & Landscape Strategies).

Regional Ecosystems

12.1.1 12.1.2 12.1.3

Hazard reduction

Saltmarsh and saltwater couch grasslands are regularly inundated by high tides which maintain high soil moisture and ensure continual green growth throughout the year. As a result, these areas rarely represent a fire hazard risk.

Risk is further minimised by the fact that the grasslands rarely accumulate large amounts of fuels and tend to be broken up by patches of saline clay and sparse saltmarsh. As the native groundcover within fringing melaleuca woodlands and forests is also saltwater couch, fire hazard in these areas is low. However, areas infested with Guinea grass and other exotic grasses can accumulate high fuel loads that pose a fire risk in the dry season.

Guinea grass and many other exotic grasses tend to quickly increase their biomass after fire, often reaching a similar fuel load in as little as one season.

The most effective long-term fire hazard reduction strategy is to remove these grasses using herbicide such as glyphosate.

Production

Mangroves are well known habitat and nurseries for fish and crustaceans. More recently it has become clear that saltwater grassland and saltmarsh are also critical feeding areas for many fish and crustacean species during high tide periods. A decrease in pasture biomass through fire or overgrazing will reduce the habitat value and therefore fisheries production of these areas.

Saltwater couch can be highly productive as cattle fodder, being high in protein and digestible. However, if grazed, care should be taken to manage stock during periods of higher tides as the wet soil will easily become rutted, which can result in increased salt retention after high tides and eventual scalding.

This can result in increased areas of bare soil, limiting the production value for both fisheries and stock.

Conservation

Apart from their value to coastal fisheries, mangroves, saltmarsh and saltwater couch grasslands provide essential habitat for a range of threatened species such as the water mouse (*Xeromys myoides*).

The water mouse lives and hunts in this landscape zone. It builds a mud nest and eats a range of small crabs and crustaceans.

Maintaining these areas in a healthy condition (by carefully managing grazing and avoiding fire) assists in filtering excess nutrients and sediment from water runoff, which benefits the water mouse and many other species that rely on these areas.

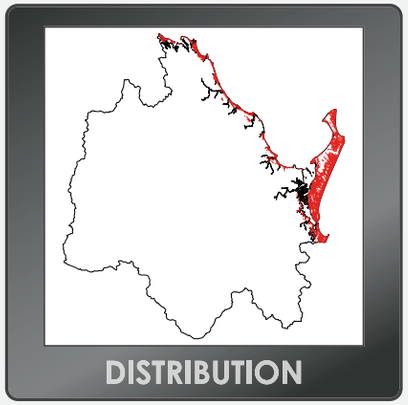
Water mouse or 'false water rat' (*Xeromys myoides*) (© Derek Ball, Wildmob).

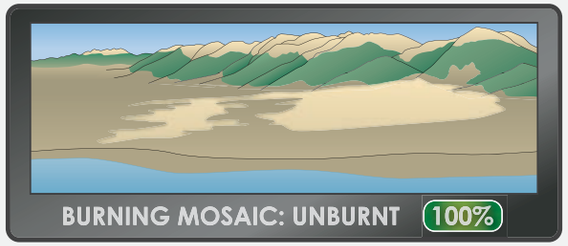
Beaches and foreshores

including ‘beach scrub’

Landscape 2

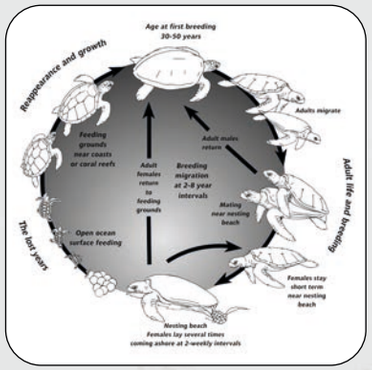
Coastal she-oak and beach scrub (rainforest) in protected areas.





Beaches and foreshores

including ‘beach scrub’



Turtle life cycle.

Bush stone-curlew (*Burhinus magnirostris*) (© Rosanne Houley, Fire & Landscape Strategies).

Regional Ecosystems

12.2.1	12.2.2	12.2.3
12.2.5	12.2.6	12.2.11
12.2.14	12.2.16	

Hazard reduction

Coastal she-oak and beach scrub (rainforest on sand dunes) are fire sensitive and will be killed or severely degraded by even a low intensity fire. Fuel reduction burns are better conducted within adjacent eucalypt and melaleuca woodlands. In some cases, exotic grasses and weeds can increase fuel loads significantly. Control of invasive species is best done by herbicide application due to fire sensitivity in this landscape.

Death of these trees results in reduced canopy shading which allows even more exotic species to establish and accumulate fuels. In addition, the loss of these trees reduces the capacity of beach vegetation to capture windborne sand and thus the capacity of the beach to recover from periodic storm-driven erosion events.

Production

Many remaining areas of beach scrub are islands surrounded by cleared land. Remaining foreshore vegetation is the only buffer between the land and the sea. Undisturbed foreshores and beach scrubs are fairly resistant to weed invasions, however smaller patches and disturbed areas are more prone to weed invasions and associated fire risk.

Disturbance by 4WD access, stock trampling and the presence of feral pigs can encourage the spread of lantana and other weeds into otherwise intact areas. Management of stock access and provision of shade and watering points away from beach scrub and foreshores will reduce the impacts of disturbance in the long term.

Reducing weed impacts by means other than fire around buffers and in degraded areas will protect and facilitate recovery of these sensitive coastal areas.

Conservation

Beach vegetation such as she-oak woodlands has the ability to effectively bind dune sands, reducing erosion. Grasses and shrubs disrupt wind, reducing its speed at ground level and causing windborne sand to fall and replenish dunes. Beach vegetation and she-oaks in particular are highly sensitive to fire and low intensity events will cause death and consequent beach erosion.

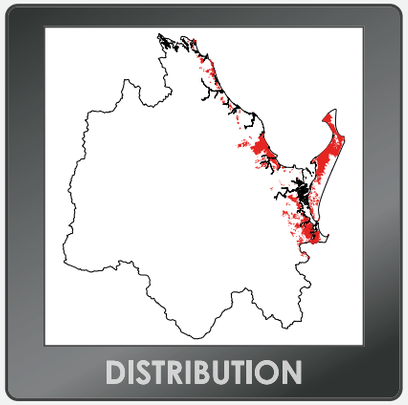
The loss of these trees reduces shading and causes dune sand to become hotter. The sex of marine turtles is dependent on nest temperature and thus these changes can alter the sex ratio in turtle populations.

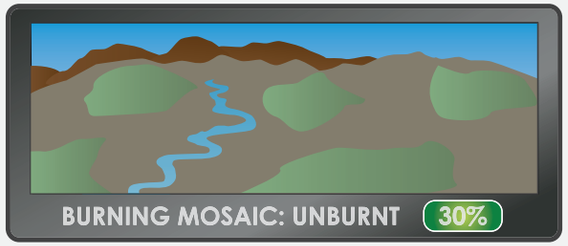
Beach scrub are key habitats for many rare and threatened plants and shorebirds. Reducing disturbance and managing weeds rather than using fire will protect coastal habitats and wildlife such as the bush stone-curlew (*Burhinus magnirostris*).

Coastal heath

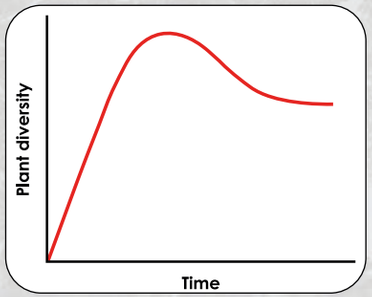
Landscape 3

Mixed vegetation of tea trees, brush box and swamp mahogany, banksias, hakeas, black she-oak, grass trees to open sedge and grass lands. Coastal heath can be wet and swampy or dry in the sand dune system.





Coastal heath



Plant diversity over time.

Ground parrot (*Pezoporus wallicus*) (© B.G. Thomson).

Regional Ecosystems

12.2.9	12.2.12	12.3.13
12.3.14	12.3.14a	12.5.9
12.5.9a	12.5.10	12.9-
10.22	12.12.19	

Hazard reduction

Coastal heaths are highly flammable due to the density of surface and elevated fuels and the abundance of oil glands in plant leaves. Soils can dry out rapidly after the wet season due to the sandy profile and strong coastal winds. Wet heaths can be swampy, often with standing water present and a peat layer underneath. The peat layer is old plant material and when dry it will readily combust and smoulder for weeks. Long unburnt coastal heath can burn with high fire intensities and be very difficult to suppress. In the Burnett Mary region, heath grows adjacent to some residential areas.

Hazard reduction activities should be planned around the heath fuel load, time since last fire, soil moisture and wind. Indications of the time since last fire include the development of old dead plants in the canopy, abundant seed on plants and a thick layer of dead material within the heath. The frequency of burning should generally not be less than three years to allow the seed-bearing plants to mature and set seed prior to the next fire event.

Plan to burn from the wet season through until the mid dry season. Do not burn wet heath unless there is standing water present, as a peat layer fire could result. Peat can smoulder for long periods, spreading fires by burning under breaks. A series of ignitions may be required to get the heath burning, but be aware that once heath starts to burn it will burn with moderate to high intensity.

Production

Heath does not offer any opportunity for broad scale production of horticulture or grazing. There are small apiary and wildflower assets in some areas which benefit from regular burning but would not generally override or oppose hazard reduction or conservation priorities.

Conservation

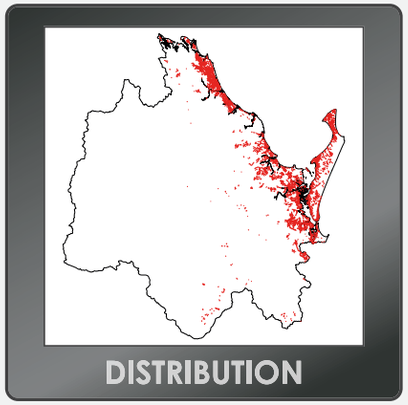
Regular fire is necessary for maintaining a diverse heath in good condition. Large shrubs and dense sedges and ferns smother small heath plants in the absence of fire for a decade. Burning removes old dormant growth and stimulates fresh shoots, flowering and seed germination of a wide range of plants. Fire is important for releasing seeds from capsules and breaking seed dormancy. Examples of plants of the Burnett Mary region that require regularly burnt heath (e.g. every 3 – 5 years) are Christmas bells and tiny wattle. Flowering of heath plants provides food for birds and is most abundant around 3 – 8 years after fire.

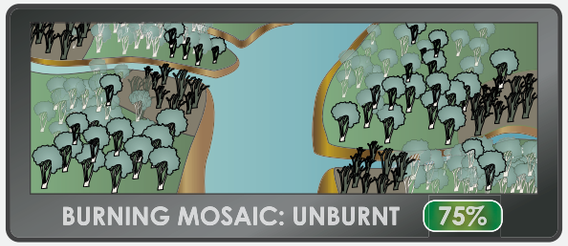
The rare ground parrot (*Pezoporus wallicus*) inhabits heaths in the Burnett Mary region. This bird nests on the ground and feeds mainly on seeds from grasses, sedges and herbaceous plants, as well as some small flowers and fruits. Ground parrots forage for seeds in sedgelands and heath soon after fire and up to at least 13 years post fire but are most abundant in heaths 5 – 8 years after fire. Burning to provide a mix of sedgeland and heath patches at different ages since fire (up to around 12 years) across a landscape is likely best for maintaining populations of ground parrots and other heath fauna.

It is critical to ensure the soil is moist when burning to promote rapid plant regrowth and prevent excessive fire intensity. Dry coastal heath will be best burnt during the wet season through to early dry because the sand mass does not retain high moisture levels. Plan to burn wet coastal heath from the early to mid dry season when it still has standing water present to prevent a peat fire in the ground layer. Take into consideration likely changes in wind speed and direction, which is common in coastal environments. Implementing burns that retain significant unburnt patches is tricky in heath due to its flammability. Start lighting fires near the end of the wet season when the fire will not travel extensively and continue ignitions weeks later.

Swamps and wetlands

Swamps and wetlands in low lying coastal areas.





Swamps and wetlands

Regional Ecosystems

12.2.9	12.2.12	12.3.13
12.3.14	12.3.14a	12.5.9
12.5.9a	12.5.10	12.9-10.22
12.12.19		

Hazard reduction

Paperbark swamps represent a very high fire hazard and grow adjacent to residential areas. While swamps and wetlands can act as a natural firebreak in the landscape in the wet and very early dry season while standing water remains, they will carry a fire of very high intensity in the mid to late dry season. Spotting embers from paperbark trees can cause a fire to jump breaks or land on rooves, igniting buildings.

Disturbance may result in the invasion of exotic grasses and weeds around the wetland fringes and where water flow has been altered. Ponded pasture grasses can dominate wetter areas. Guinea grass, olive hymenachne and para grass can fuel intense, damaging fires. In residential areas that adjoin these wetlands areas (interface-zone), the increased fuel load of exotic grasses in combination with paperbark can cause intense flare-ups as the fire burns to the tops of the trees. Interface-zone areas need separation between the vegetation and housing such as roads or fire lines and fire protection zones where the edge fuels are reduced more regularly than the rest of the swamp or wetland area.

Regular burning for property protection or weed control is necessary but needs to be carefully managed. Protection zones should be burnt every 3 – 6 years. It is important to keep fire intensity as low as possible because high intensity fires in paperbark forests during dry conditions will promote a dense thicket of paperbark saplings, increasing the subsequent fire hazard. Night burning is a useful way to minimise fire intensity in swamps. Fire can reduce weed infestations temporarily, but it is essential to burn whilst moist to reduce fire intensity and risk of canopy tree death. Weed control using an approved herbicide is effective both post fire and instead of fire. Planned burns are generally best in the early dry season when soil moisture is high, but standing water is reduced. Some standing water is important to prevent a peat layer fire in the vegetation base of the swamp. Be aware that in very dry conditions the peat layer can become combustible, causing great fire suppression difficulty and significant negative impact on the swamp by burning the roots under the trees.

Production

Many areas of coastal paperbark swamps are grazed, although pasture development is limited as they may be inundated for 3 – 6 months of the year. Some coastal areas with swamps and wetlands have been modified to establish ponded pastures.

Heavy dry season grazing can reduce weed extent and density when fire risk is the greatest. Burning to reduce infestations can be effective and is best done in conjunction with grazing to reduce fuels and damage to wetlands.

Burning undertaken in land adjacent to paperbark swamps should ensure hot fires do not scorch edges or intrude into the wetlands.

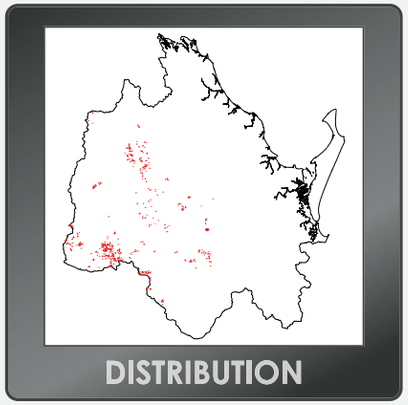
Conservation

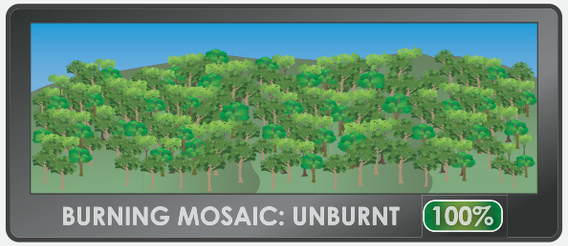
Swamps and wetlands play key roles in water filtration, feeding nectivores with seasonal nectar and providing shaded roosts in the daytime. Sedgelands are diverse and provide an open wetland ecosystem. Sedgelands and paperbark (i.e. melaleuca) swamps often intermix but areas of open sedgeland are disappearing due to invasion and thickening by paperbarks. This reduces sedge diversity, alters hydrology and increases fire hazard. Regular burning under moist conditions with some standing water is important for maintaining open sedgelands. Fire is useful for reducing the density of ponded pastures such as para grass, with post-fire herbicide spraying a good way to reduce para grass and olive hymenachne.

Paperbark swamps are dynamic ecosystems and the timing of fire and wet and dry seasons play a key role in these dynamics. Paperbark germination is enhanced by fire and occasional fires will maintain recruitment of trees into the canopy. Paperbark saplings regrow from the base of stems after fire and trees reshoot from the stem and branches when the fire is not too intense. To maintain the integrity of paperbark wetlands, a fire every 5 – 10 years is recommended. Fire intensity should be low to moderate, and patchy. Fire retardants (foams and powders) should not be used as they damage the ecology of these sensitive areas.

Brigalow, belah and fire-sensitive acacias

Brigalow, belah, lancewood, blackwood and rosewood and other associated shrublands.





Brigalow, belah and fire-sensitive acacias

Low intensity fire damage to brigalow stand.

Dead leaves still attached to trees indicates a low intensity fire.

Regional Ecosystems

11.3.1	11.4.3	11.9.5
11.9.5a	11.9.10	11.11.1
11.11.14	12.8.23	12.12.26

Hazard reduction

Brigalow, belah and the other fire-sensitive acacias in this landscape do not present a fire threat because they do not develop a significant fuel load. They have minimal leaf drop and fuel accumulation, so fire is not encouraged into the stand. In a typical season they can form part of a natural firebreak system that can be used in property fire management planning. Late dry season wildfires in drier years can damage this vegetation type. Protection of these fire-sensitive communities requires fuel reduction burning in the adjacent eucalypt communities.

Reducing the fuel hazard in adjacent vegetation should be done when soil moisture is high. Use natural features or wind direction to burn away from the edge of the brigalow to ensure minimal damage from planned fires. Creating a mosaic fire pattern as the adjacent country dries out will improve the protection from late season wildfires and retain patches of pasture for grazing.

Production

These vegetation communities offer little production value. They generally have sparse groundcover and provide minimal pasture for grazing. The acacias return nitrogen to soil and therefore some regrowth can be retained for a couple of years to help soils recover their nitrogen content. Cattle often ‘camp’ within these systems which can cause a direct loss of the shrub layer through trampling.

The risk is that exotic grasses such as buffel grass will invade the edge causing fire to encroach and damage the acacias. A low intensity fire will still cause significant damage and death in adult stands of these acacia species. Watering points should be placed outside this vegetation type.

Conservation

These vegetation communities are fire sensitive so fire should be excluded. The drawing of fire into these acacia communities by exotic grasses (primarily buffel grass) is the biggest fire-related threat. Reducing the abundance of buffel grass and ensuring any fires are low intensity and preferably kept outside acacia communities is a priority. Brigalow and associated acacias are soft-seeded so do not require fire for germination. Brigalow and associated trees and shrubs have well established roots and will sucker from these after damage from low to moderate fire events. High intensity fire events will kill the entire plant.

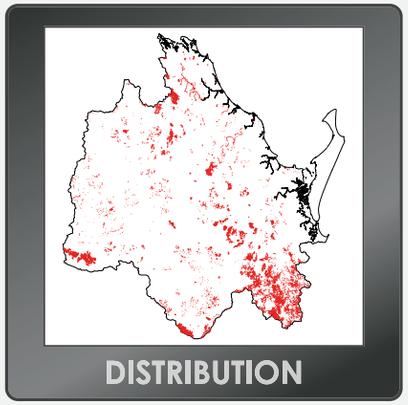
Larger species such as brigalow, blackwood, and belah, can all be killed by even a low intensity fire. These species are long lived and soft-seeded and rely on high rainfall years for their germination. Seeds of some species such as lancewood can tolerate a low intensity fire, however these trees can take up to 20 years to fully mature. Therefore if a fire does go through a lancewood area, ensure the landscape remains fire free for at least 20 years.

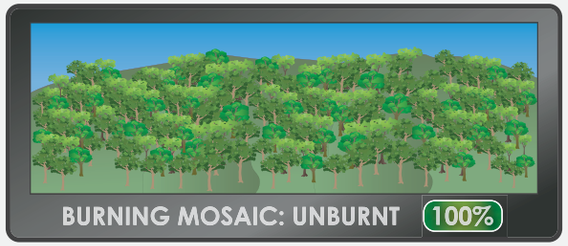
Fire protection for these areas should be provided by fuel reduction burns early in the dry season in the adjoining eucalypt communities. This will often require several attempts over several weeks as the country dries out, creating a fine-scale mosaic. Use wind direction, topography and time of day to light away from the Brigalow rather than burn up to it. Mechanical breaks can also be used.

Rainforest and vine thicket-dominated landscapes

Landscape 6

A variety of rainforests and vine thickets from drier vine scrubs and rainforest in lower altitudes and exposed coastal hills to complex vine forests on high mountain plateaus.





Rainforest and vine thicket-dominated landscapes

Landscape 6

Bottle tree with recovering scrubs.

Edge of brigalow scrub showing dead trees from fire damage.

Regional Ecosystems

11.4.1	11.5.4	11.5.15
11.8.3	11.8.13	11.9.4a
11.9.4c	11.11.5	11.11.5a
11.11.18	11.12.4	11.12.21
12.3.1	12.5.13a	12.5.13b
12.5.13c	12.8.3	12.8.4
12.8.7	12.8.13	12.8.21
12.8.22	12.9-10.15	2.9-10.16
12.11.1	12.11.10	12.11.11
12.11.12	12.11.13	12.12.1
12.12.13	12.12.16	12.12.17
12.12.18		

Hazard reduction

Rainforests and vine thickets will generally not burn unless exotic grasses draw fire into a thicket or in drought conditions. Rainforest and vine thicket edges provide persistent, effective firebreaks and are highly valued in wildfire situations. It is important to burn surrounding fire-prone landscapes in a mosaic patch style to break up fuels and wildfire front to protect rainforest and vine thickets. Avoid exposing to fire when conditions are hot and dry, as fire scorch can cause weed infestations on the edge, increasing fire risk and reducing integrity of rainforest and vine thickets edges.

Some lantana and grass burning may be justified along margins to gain initial control of weeds, but follow up control is essential to effectively reduce fuel loads over time. Burn with good soil moisture to ensure burning does not intrude into rainforest or vine thickets. Burn with no or very low wind in areas of high fuel load. Burning small patches is less hazardous than a continuous line. Good practice is to ignite from rainforest edge at the top of ridges and allow fire to burn downhill to reduce fire intensity.

Production

Rainforest and vine thickets support little to no grassy understorey, so there is no viable grazing production. Disturbance facilitates weed invasions, so it is preferable to restrict access to stock into the closed rainforest. Lack of fire allows rainforest species to spread out into adjacent areas of open forest and woodland if not regularly burnt back. Burn surrounding fire-prone communities to maintain species and canopy composition with an open understorey to reduce rainforest invasion.

Conservation

Rainforests and vine scrubs in this landscape contain areas of significant ecological value. Many rare plant species exist on edge of rainforest or vine thickets, and many are susceptible to repeated fires. Fires damage the edge by scorching, and this scorching opens the canopy and allows exotic grasses to invade, making the edge more susceptible to future fires.

This damaging cycle of exotic grass invasion, followed by fire, followed by further grass invasion, requires intervention. In small areas herbicide can be used to treat the grasses. In larger areas grazing is an option, reducing the grass and therefore the fuel load. Once grazed, maintain the edges with herbicide and promote natural regeneration.

The vulnerable black-breasted button quail (*Turnix melanogaster*) rely on foraging for invertebrates in the leaf litter from the closed rainforest and vine scrubs. Even a low intensity fire trickling into the scrub edge will cause loss of leaf litter and death of the edge trees. A reduction in the area of vine thickets and scrubs will reduce the habitat of the black-breasted button quail in the region.

Protection burns should be undertaken in adjacent fire-adapted vegetation, with care to direct fire away from the scrub edge rather than letting the fire burn up into the scrub. In wildfire situations, try to allow the fire to come down the slope rather than light from the bottom.

Male black-breasted button quail and chick (© Luke Hogan, Queensland Herbarium).

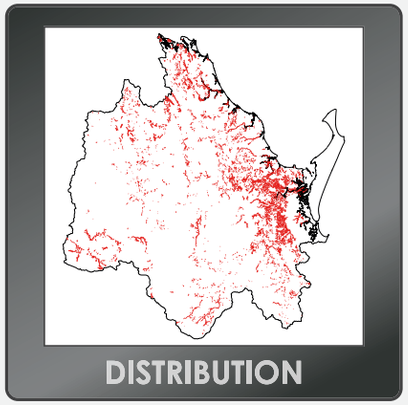
Black-breasted button quail chicks (© Luke Hogan, Queensland Herbarium).

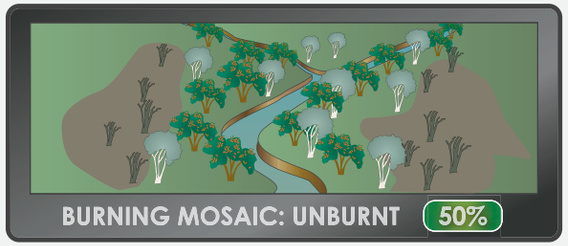
Eucalypt/melaleuca woodlands on alluvial flats

including grassy flats

Landscape 7

Variable woodlands to grassy woodlands with poplar box, bloodwood, blue gum, tea tree and gum topped box. Native pastures are predominately blue grass, black speargrass or pitted blue grass.





Eucalypt/melaleuca woodlands on alluvial flats

Landscape 7

including grassy flats

Greater glider (*Petauroides* spp.) (© Luke Hogan, Queensland Herbarium).

Regional Ecosystems

11.3.2	11.3.4	11.3.26
12.3.3	12.3.3d	12.3.10
12.3.11	12.3.11a	

Hazard reduction

This is an important landscape for undertaking planned burns to broaden the firebreak potential of watercourses and protect adjacent fire-sensitive vegetation such as 'in channel' riverine woodlands. Therefore, at the start of each fire season these alluvial flats can be one of the first landscapes to initiate burn programs within.

Burning for production and conservation outcomes is expected to also achieve property protection goals for this landscape by breaking the area up progressively into a mosaic of burnt and unburnt areas when fuels have cured sufficiently after the wet season. Secure boundaries early after the wet season and then continue a series of smaller fires rather than broadscale burning.

Topography and prevailing winds can be used to conduct smaller burns over several months within the secured boundaries. Aim to burn no more than 50% of a paddock or property in one year. Coordinate boundary burns with neighbours to prevent frequent low intensity fires and the associated risks of woody thickening and weed infestations.

Production

This landscape is productive country where the fire frequency will be directly related to grazing pressure. A good balance of trees and grass in more heavily grazed areas is achieved by applying a moderate intensity fire every 4 – 6 years.

Destocking for a period prior to the planned burn will assist in increasing fuel loads in more heavily grazed paddocks to achieve the moderate intensity required to kill tree suckers. Lighter grazed areas benefit from a low to moderate intensity fire every 2 – 4 years to remove old grass.

Restrict grazing post fire when pastures are in the early stage of growth to enable them to achieve vigour. Soil moisture is a critical factor for planned burning in this landscape. Wet season and spring storm burns will give the best results for promoting grasses.

Conservation

This landscape is prime glider habitat. The key habitat features that help protect gliders are mature, hollow bearing trees and open woodlands not impacted by thickening. The vulnerable greater glider (*Petauroides volans*) relies on a range of tree hollows over the year for shelter and nesting because it cannot carry nest linings in its tail like other glider and possum species. It can take up to 60 years to produce a tree hollow that may form a suitable glider nest, so it is crucial that these older trees with hollows are protected in planned burning.

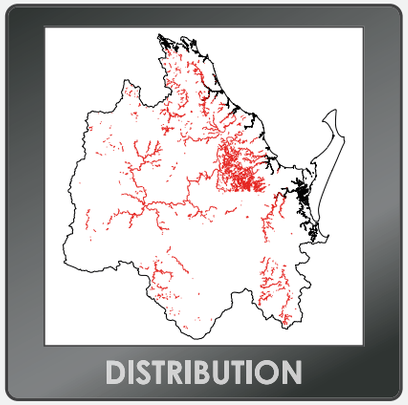
Retaining habitat trees such as mature blue gums will help conserve significant species like gliders and provide seed trees for future regeneration. Raking or applying foam pre fire, in addition to burning early while good soil moisture remains, can help prevent damage to these old trees. Start ignitions against mature trees or stands to reduce the fire intensity.

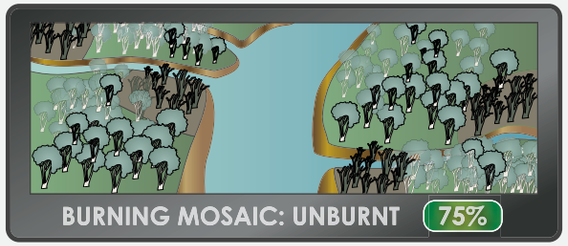
Burn only when there is good soil moisture and aim to vary the time of burning from early dry to storm season (as conditions allow). Indicators of successful fire management include a diverse grass layer, standing hollow bearing trees and an open woodland vegetation structure.

The grass layer of alluvial woodlands often contains exotic grasses and herbaceous weeds. Prioritise burning for conservation purposes in alluvial woodlands with native grasses such as kangaroo and reed grasses.

Riverine woodlands
including freshwater wetlands

Woodlands of forest red gum/blue gum, river red gum with a shrubby to grassy understorey.





Riverine woodlands

including freshwater wetlands

Old trees have hollows which provide homes for many species, including possums, gliders, owls, parrots and lorikeets. It takes many years to replace a tree with hollows.

Flooding can deposit debris increasing the fuel load and potential threat to old habitat trees.

Regional Ecosystems

11.3.25	11.3.27b	12.3.7
12.3.7a	12.3.7b	12.3.7c
12.3.7d	12.3.15	

Hazard reduction

Hazard reduction burning within the broader landscape is important to protect pastures from late dry season fires. It also assists in protecting adjacent fire-sensitive vegetation. Hazard reduction burning in alluvial woodlands adjacent to watercourses should begin as soon as the country will carry a fire after the wet season or the first storm

Progressive burning as the grasses cure will result in a good mosaic of burnt and unburnt areas that will provide protection from late season wildfires. Ideally, vegetation within and directly adjacent to riverine channels should not be burnt as this will form a 'green break' which will prevent passage of all but high intensity wildfire.

Dry soil conditions do not allow pastures to compete effectively against weeds. Where practical use local topography and prevailing winds to put in burnt firebreaks that can be used later. Storm burning along access tracks will assist pastures to compete effectively against weeds, reducing the likelihood of weeds taking hold.

Production

These woodlands can carry a good pasture, as do freshwater wetlands which provide a range of grasses and forbs. The wetter nature of these areas means they can offer a late dry season grazing opportunity.

A low intensity fire after the first storm can be used to remove rank grass and freshen the pasture. Late dry season grazing will generally keep fuels low, so the frequency of fire should usually be within a range of 6 – 7 years along riverine terraces and alluvial flats and up to ten years around wetland areas. Burning with good soil moisture is important to prevent weed invasion, so late dry season burning should be avoided.

Flooding can carry weed seeds onto these flats. A slower moving, low to moderate intensity fire may be useful in weed control. Plan to burn after spring rain when the grasses will recover quickly and outcompete the weeds.

Conservation

Riverine woodlands provide habitat and corridors for a diverse range of fauna in the landscape, including frogs, birds, mammals, reptiles and insects. Planned burning in this landscape should aim to promote patchy fires to ensure a broad range of understorey species and habitat conditions (i.e. age after fire) in the landscape. Ideally, vegetation within and directly adjacent to riverine channels should not be burnt. Burn the adjacent alluvial eucalypts woodlands from riparian edges, so that only small fires of low intensity enter the riparian zone.

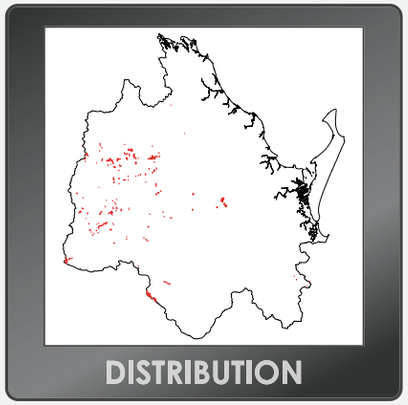
Avoid burning this landscape for approximately three years after a major flood, as flooding produces a similar disturbance to burning by providing a seed bed and reducing fuel loads. The three year minimum after flooding provides time for recruitment and allows smaller flood debris to mulch down, reducing overall fuel loads.

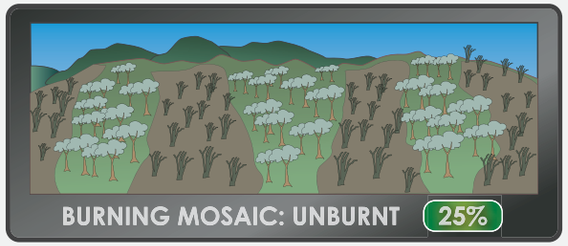
A good indicator of fire frequency is that the saplings recruited from the previous fire or flood should be of sufficient size to regrow from their tops after a fire of low to moderate intensity (e.g. 1.5 m tall).

This landscape should always be burnt with good soil moisture to minimise the loss of habitats such as tree hollows and hollow logs. Flood debris can increase fuel loads against habitat trees, so remove accumulated debris from against older trees before burning.

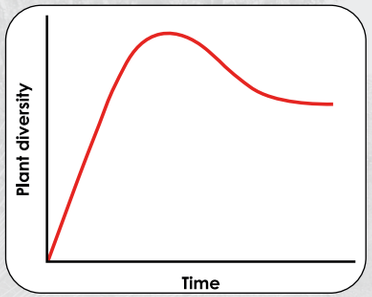
Heath and shrublands

Shrublands to heath of mixed tea tree, acacia, Queensland peppermint and other shrubs may be on scarps, plateaus, ridges or mountain tops.





Heath and shrublands



Plant diversity over time.

Montane heath with stone separation.

Late dry season wildfire damage of heath and surrounding eucalypts.

Regional Ecosystems

11.7.5 11.7.5a 12.8.19
12.12.10

Hazard reduction

Heath is a diverse vegetation type that will usually burn completely or not at all at any given point in time. Burning heath for hazard reduction should commence in the mid dry season as these areas often retain moisture for longer and may not be capable of carrying fire until this time.

Planned burns should target small sections where possible, using natural features such as rocky outcrops, depressions, drainage lines or less flammable vegetation to break the country up into small burnt areas. Hazard reduction maybe achieved in neighbouring landscapes to assist in the longer fire intervals heath and shrublands generally require.

Production

Heath and shrublands do not offer any opportunity for production in horticulture, apiary or grazing. They generally grow on rocky scarps in the mountains, so access is also limited for the commercial harvest of foliage and flowers.

Lantana infestations can occur on outcrops, and a slow-moving, moderate intensity fire will aid in the control of this invasive species. Ensure there is soil moisture and a suitable fuel load (3 t/ha) and be prepared to undertake a second, follow up burn to manage lantana. Low intensity fires do little to promote regeneration and are generally unachievable in heath because of its uniform fuel characteristics.

Conservation

The location of the various heaths will dictate the best fire management approach. In the Burnett Mary area, inland heaths tend to be self-protecting with stone, cliffs, scree slopes and the top of the mountain providing separation to other vegetation types. A number of the heaths and shrublands in the Burnett Mary area are on scarps or form a low shrub layer surrounded by eucalypts. These heaths are at greater risk from late season wildfires than the montane areas.

It is essential that fires only occur with good soil moisture in the landscape, which typically means the end of wet season and storm burning. Burning downhill will help ensure a moderate fire intensity to promote plant recruitment. For best results, light small, scattered fires form the tops of slopes in vegetation adjacent to rocky outcrops.

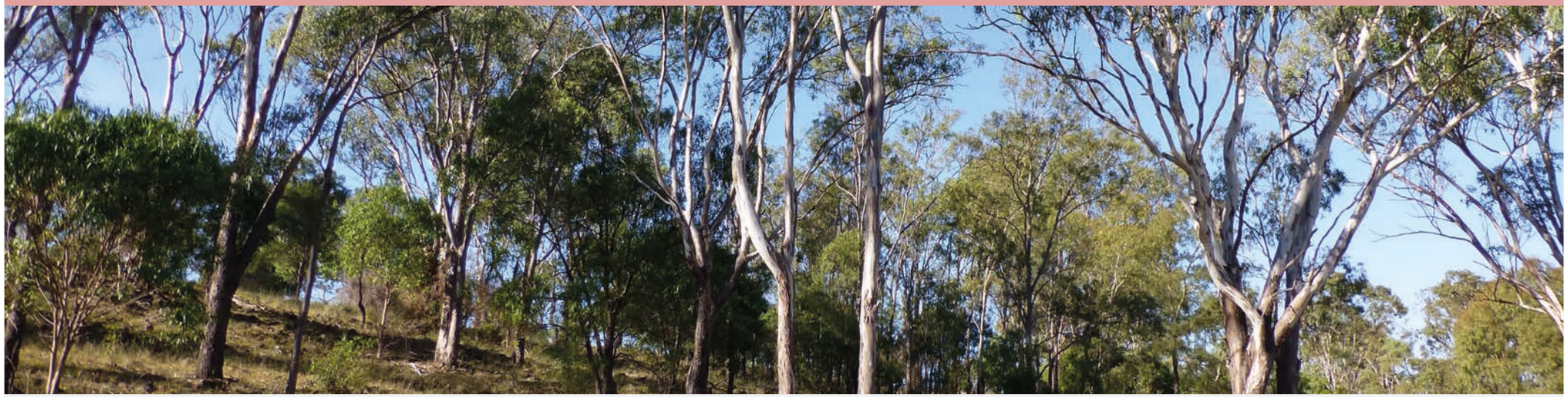
Heath diversity reduces over time after fire because many species are relatively short lived. In the absence of fire for a long time, one species tends to dominate. The aim of fire management for heath is to release dormant seeds to promote regeneration of a diverse range of species. However, too frequent fire will reduce the opportunity for plants to mature and develop seed.

A range of smaller burns in a mosaic pattern with intervals of around 5 – 12 years should help maintain heath communities. Topographic and landscape features such as rocky outcrops (and the associated changes in soil moisture) can be used to divide the area to achieve a mosaic range of fire intervals.

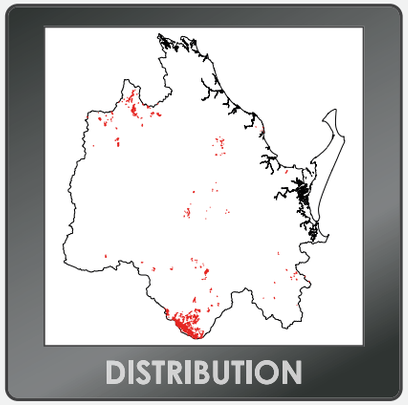
Eucalypt woodlands on basalt

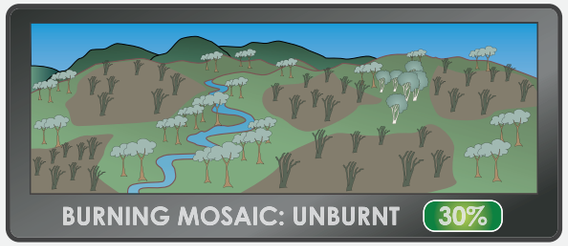
including associated grasslands

Landscape 10



Grassy open woodlands of mountain coolibah, ironbark, yellow and white stringybark and poplar box. Grasslands contain a mix of Queensland blue grass, forest blue grass and black speargrass.





Eucalypt woodlands on basalt

including associated grasslands

Hazard reduction fires should be low intensity.

Thickening due to uphill fires.

Regional Ecosystems

11.8.2a	11.8.4	11.8.5
12.8.14	12.8.14a	12.8.16
12.8.17	12.8.20	12.8.24
12.8.25		

Hazard reduction

Hazard reduction is important in this landscape, particularly in the wetter years as the grasses can create heavy fuel loads even with grazing. Soil moisture is important for recovery of the grasses after fire so burn in the early dry or after the first rains of the wet season.

An observation of grasses having set seed would be a suitable indicator of appropriate timing for fire in the early dry. Hazard reduction in this landscape should be as low a fire intensity as possible to reduce the fuel.

Downhill burning and lighting in the mid afternoon are two tactics to consider for reducing the fire intensity after rain. Frequent uphill hot fires will cause the woodland to thicken, shading out the grass.

Production

Basalt-based soils have moderate to high fertility although the soils may be shallow on hilly country. Queensland blue grass, forest blue grass and black speargrass are the primary native pastures. Good soil moisture is a critical component for burning.

The timing of fire management with late autumn/spring rains and the limiting the level of grazing pressure placed on this landscape after fire is crucial for retaining these native pastures. The grasses are most susceptible when sprouting after a fire, drought or winter dormancy. As such, they should not be grazed until they have re-established vigorous growth.

A low to moderate fire every 2 – 5 years will keep the country open from regrowth and remove older rank grasses.

Coastal areas should aim for 30% unburnt, whilst inland areas should aim to burn about one third of the area at a time.

Wetter years provide an opportunity to develop a fuel load of 2 – 3 t/ha required for burning to achieve weed control of curry bush and other shrubs.

Conservation

The main conservation objective in this landscape is to maintain the presence of grasslands on basalt, especially Queensland blue grass communities, which have become rare. Grazing pressure (particularly in the drier years) and inappropriate fire regimes that favour less desirable grasses like Indian couch threaten these areas.

The spread of improved pasture grasses (e.g. buffel grass) into the heavy black soils has significantly reduced the extent and integrity of Queensland blue grass. Mountain coolibah and silver leaf ironbark woodlands now provide refuge for many of the grassland species that previously would have preferred the open grasslands.

Wattle thickening can occur in these areas as a response to fire in drier periods. The woodlands require a low to moderate fire every 2 – 5 years to maintain the open structure and provide a variety of grasses and forbs.

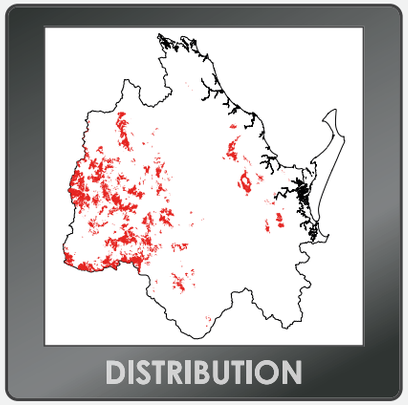
Grasslands benefit from a low to moderate fire event every 3 – 5 years. Queensland blue grass seed will persist in the soil for at least five years. Burn around 30% of the area to maintain mature grasses as native animal habitat.

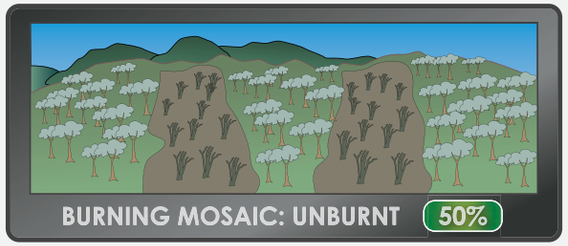
Box and other eucalypt woodlands on scarps

including grass and spinifex ground layers

Landscape 11

Open woodlands with a mix of box, ironbark, bloodwood and spotted gum. Spinifex replaces grasses in the more arid areas.





Box and other eucalypt woodlands on scarps

Landscape 11

including grass and spinifex ground layers

Hazard reduction

Hazard reduction in this landscape can help provide a break in fuel loads across the broader landscape. It will need to take into account steep slopes and planned burning should focus on lighting from more elevated areas, allowing fire to burn downhill.

Burning is ideally conducted after the first rains with good soil moisture or early in the dry season when the soil still retains some moisture. A series of individual fires is preferred over a single prescription. However, the imperative is to manage and protect production and conservation assets.

A low intensity downhill fire will reduce the fuel load without damaging the mulch layer. Aim to secure burnt breaks into geographical features such as cliffs and stone screes.

Production

The shallow, poorer soils of this landscape do not provide an opportunity for significant pasture improvement. Thus, grazing is based on native grasses that offer bulk but are not high in nutrition.

In the more arid areas spinifex is a good soil stabiliser and soil stability must be considered in both stocking rates and fire management.

This landscape in some areas has traditionally been 'calendar' burnt with high fire intensity every 2 – 3 years to keep cypress and wattles suppressed. The higher intensity fires (particularly uphill rather than downhill) 'cook' the organic layer in the topsoil, killing the helpful soil microbes and grass seedbank.

The woody plants have a deeper root system and can recover in the damaged soil quicker than grasses and forbs, resulting in another crop of wattles or cypress.

Aim to secure control lines by burning boundaries early after the wet season. After good spring rains or storms (greater than 50 mm) burn downhill with a slow backing fire of low intensity.

Plan to burn about 50% of the area in an average season. Fire should be part of grazing management with a fire frequency of 5 – 7 years to freshen the pastures. In the more coastal areas, several wet years in a row may create a need to burn every 4 – 7 years.

Conservation

Aim to secure control lines by burning boundaries early after the wet season. After good spring rains or storms (greater than 50 mm) burn downhill with a slow backing fire of low intensity.

Plan to burn about 50% of the area in an average season. Fire should be part of grazing management with a fire frequency of 5 – 7 years to freshen the pastures. In the more coastal areas several wet years may create a need to burn every 4 – 7 years.

Regional Ecosystems

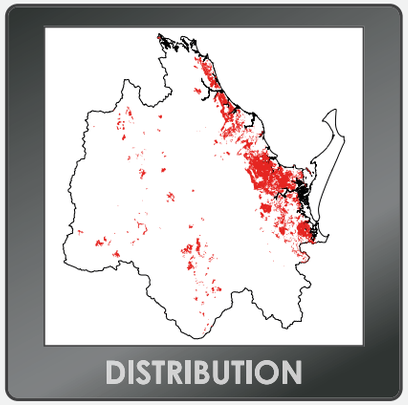
11.7.4	11.7.4c	11.7.6
11.7.7	12.7.1	12.7.2
12.9-10.5	12.9-10.5b	12.9-10.19

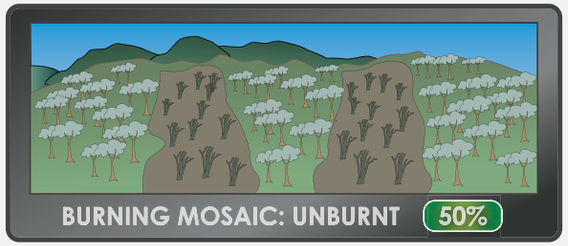
Eucalypt woodlands on plateaus, lower slopes and plains

Landscape 12

including woodlands on lower slopes and associated grasslands

Open woodlands with a shrubby or grassy understorey with a mix of ironbark, bloodwood, spotted gum, blue gum and poplar box. Generally weathered red soils.

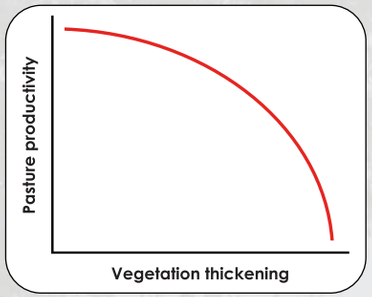




Eucalypt woodlands on plateaus, lower slopes and plains

Landscape 12

including woodlands on lower slopes and associated grasslands



Vegetation thickening vs. pasture productivity.

Squatter pigeon (*Geophaps scripta*) (© Rosanne Houley, Fire & Landscape Strategies).

Regional Ecosystems

12.5.1	12.5.1a	12.5.1b
12.5.1e	12.5.2	12.5.2a
12.5.2b	12.5.4	12.5.4a
12.5.5	12.5.7	12.5.7a
12.5.8	12.5.12-12.9-10.4	

Hazard reduction

This landscape is common across the coastal parts of the Burnett Mary with the Childers area a good example of landscape type. The soils can range from moderate to poor fertility, with the better soils generally cleared for agriculture.

Burns that result in about 40 – 50% of the total area burnt will provide a breakup of continuous fuel levels which will reduce the spread of late season wildfire. Avoid burning too frequently or in the same place (such as along a track or road edge), as this can favour weeds.

Production

These woodlands usually have a grassy understorey but may develop a shrub layer. The landscape is used extensively for grazing and pasture vigour, and therefore productivity is closely linked to periodic fire management. In more lightly grazed areas, fire can be used to remove old grass and freshen the pasture every 4 – 6 years.

In heavily grazed areas or where fire has not been used for extended periods, softwood scrub species may have encroached. In these instances, a reduction in grazing to build a suitable fuel load (about 2 t/ha) will be needed to carry a fire of sufficient intensity to remove the trees and shrubs causing thickening. Fire should be used when soil moisture levels are relatively high, such as early in the wet season or straight

after the first rains of the storm season when follow up rain is imminent, to ensure pasture grasses recover quickly.

Burning in a dry year will not give a return in grazing value – instead, thickening or woody weed invasion is probable.

Conservation

Burning only when the soil is moist is crucial to enable quick recovery of grasses and to avoid excessive loss of habitat features, such as hollow trees and fallen timber.

To manage these woodlands for conservation purposes, consider the needs of each habitat type. For example, areas with a shrubby understorey will need a greater proportion of unburnt patches to ensure some unburnt mature shrubs survive.

This landscape is important habitat for squatter pigeons (*Geophaps scripta*), which prefer a longer undisturbed ground layer for nesting. They feed on a range of grass seeds, legumes, herbs, insects, and occasionally fallen acacia seeds.

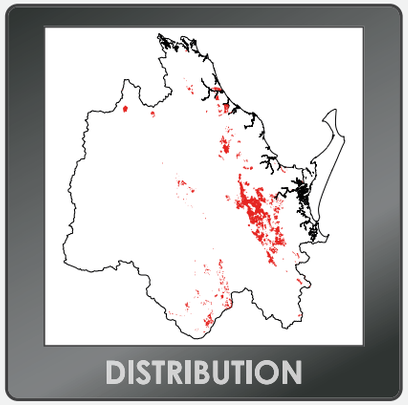
A range of fires with varying intensity and size – resulting in a variety of vegetation ages or time since fire – will most benefit the squatter pigeon. This will help maintain a mix of areas that range from open and grassy to a dense shrub understorey. The presence of these pigeons in the landscape can be an indicator of good long-term pasture and fire management.

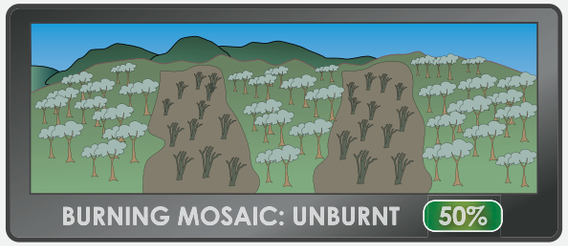
Eucalypt woodlands on undulating stony hills and flats

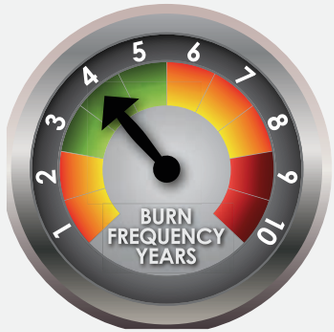
including shrubby areas and grassland

Landscape 13

Variable woodlands of ironbark, poplar box, spotted gum or gum-topped box. May have a shrubby understorey including false sandalwood and wattles. Main grass species iinclude blue grass and mitchell grass.







Eucalypt woodlands on undulating stony hills and flats

Landscape 13

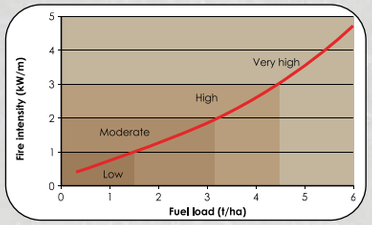
including shrubby areas and grassland

1 t/ha

2 t/ha

3 t/ha

4 t/ha



Regional Ecosystems

11.9.2	11.9.7	11.9.9
11.9.13	12.9-10.2	12.9-10.3
12.9-10.7	12.9-10.7a	12.9-10.8
12.9-10.17	12.9-10.17a	12.9-10.17b
12.9-10.18	12.9-10.18a	12.9-10.18b
12.9-10.21		

Hazard reduction

This landscape has an undulating topography often with flats and rolling hills. This allows for the construction of fire lines and a separation from other vegetation types on steeper slopes or more erodible soil types. Hazard reduction burning should begin as soon as the landscape will carry a fire.

Aim for a low to moderate fire intensity with approximately 50% remaining unburnt. A varied approach to hazard reduction burns is better than burning the same boundary lines repeatedly.

Production

The woodlands can have a grassy or shrubby layer with the former having better native grass grazing value. Stocking rates and longer term grazing pressures are important in this landscape as there is a risk of overgrazing the palatable grasses, leading to an overall degradation of the pasture.

Always burn with good soil moisture using spring rains, storms or during the wet season so that the grasses can respond before the woody regrowth.

Fire is also an important tool in the control of woody weeds and regrowth. In a paddock with severe regrowth and suckers the paddock may need to be spelled to build up enough fuel to kill the regrowth. In some cases a high fire intensity may be required to reduce thickening. To achieve a high intensity fire a fuel load of 2 – 3 t /ha is required.

Conservation

Grasslands and grassy woodlands benefit from a low to moderate fire every 3 – 5 average seasons. The grassy woodlands and grasslands need regular fire with good soil moisture to prevent woody thickening with the aim of a moderate fire after spring rains or storms keeping the country open. The boundary between shrubby and grassy understorey in parts of this landscape will often reflect the seasons.

In wetter years the grasslands will accumulate a lot of fuel, recruiting shrubs and tree saplings that require fire to thin. Fire regimes rather than a single fire event will ensure management of mid strata woody plant density.

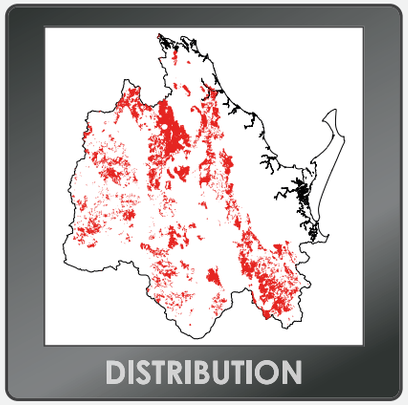
The shrubby understorey and associated leaf litter, fallen limbs and hollow logs are important habitat for reptiles like the brigalow scaly-foot (*Paradelma orientalis*). The brigalow scaly foot is a legless lizard – not a snake. It feeds on the sap of the Hickory wattle as a juvenile. As an adult it eats a variety of insects, including spiders and crickets. The bark litter, fallen branches and trees are particularly important habitat for lizards and skinks. Use a series of fires to create a fine-scale mosaic to retain the litter layer as habitat for reptiles.

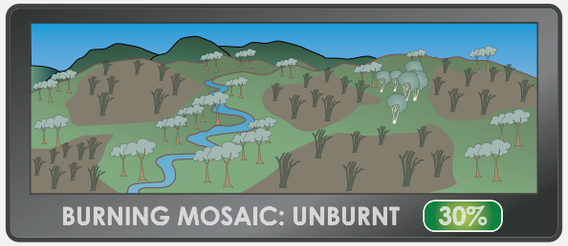
Brigalow scaly-foot *(Paradelma orientalis)* (© Alexander Dudley).

Eucalypt woodlands on stony range country

Landscape 14

Grassy woodlands and open forests of ironbark, bloodwoods, Moreton Bay ash, spotted gum, yellow stringybark or white mahogany. There may be grass trees, cycads, wattles or hibiscus in the understorey.





Eucalypt woodlands on stony range country

Landscape 14

Areas long unburnt will lose key species. This grass tree area is being overcome by vines and shrubs.

Hazard reduction

This vegetation type generally occurs on slopes, hills, and ranges, and is common across the Burnett Mary catchment. This landscape can be at high risk from wildfires due to its elevated position. Fire running uphill will be of a higher intensity and move faster than fire burning downslope. Hazard reduction burning conducted during autumn to early spring will assist in breaking up the country and provide a buffer from wildfires.

Landscape scale hazard reduction planning is the best approach to managing fire in this landscape. Fire control lines to target specific areas with a history of wildfire may need to extend across several boundaries. If bordering improved pastures, this landscape should be burnt first for pasture protection. Aim to burn 70% of a property or patch per year when soil moisture is good. Storm burning is also useful in this landscape type to manage vegetation thickening. A moderate intensity fire after the first storms is ideal.

Production

Graziers utilise the range country, spelling the lower pastures during the wet season as well as late winter pick after frosts. The season of grazing will dictate the burning season. Cattle graze preferred grasses, leaving less palatable grasses to seed. Over time this will change the composition of grasses in the pasture.

A controlled burn removes all the old grasses evenly making the less palatable grasses attractive as fresh shoots called 'green pick'. Grazing pressures and seasonal variation will dictate the requirement for fire, however a low to moderate intensity fire when there is good soil moisture every 3 – 7 years is common.

Burn with the feature from the top down, allowing the fire to creep or wander around the ridge system following fuel loads. Thickening can be an issue (particularly of wattles) after a wildfire event. Reduce stocking to build a fuel load and storm burn before the wattle grow above flame height.

Conservation

Planned burning in this landscape should aim to promote patchy fires to ensure a mosaic of different vegetation types and time since fire across the landscape. Rangelands are prone to widespread intense wildfires in a dry spring and summer creating a key threat to biodiversity, including thickening by wattles.

A lack of fire in this landscape can also lead to thickening, shading, loss of tussock grasses and grass trees. Aim to burn every 3 – 5 years, using spot ignitions from ridges downhill with good soil moisture to maintain this type. In areas with a wildfire history burn as soon after the wet season as a fire will carry. In areas where it is difficult to introduce fire, aim to burn during the storm season.

Healthy grass tree ridge with good grass cover.

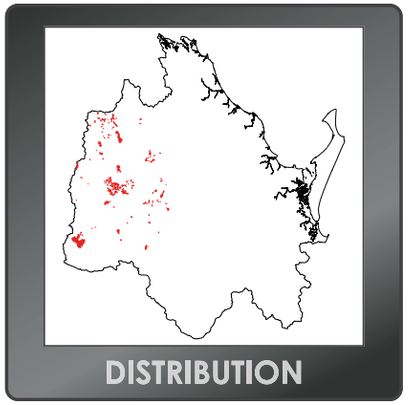
Regional Ecosystems

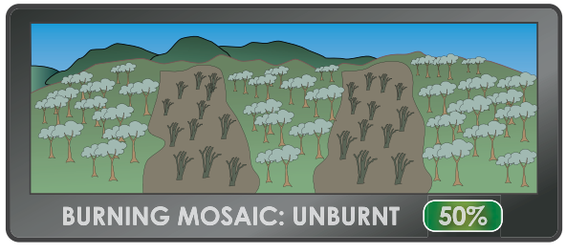
11.11.3	11.11.4	11.11.4a
11.11.15	11.11.15a	12.11.1
12.11.1a	12.11.3	12.11.5e
12.11.5j	12.11.6	12.11.7
12.11.8	12.11.14	12.11.15
12.11.17	12.11.18	12.11.19
12.11.22		

Eucalypt woodlands on infertile stony hills and flats

Landscape 15

Woodlands on infertile stony undulating hills and flats. Main tree species are poplar box, ironbark, bloodwood and mountain coolibah. The woodlands can have a grassy or shrub layer.





Eucalypt woodlands on infertile stony hills and flats

Landscape 15

Hazard reduction

The undulating topography of this landscape assists in hazard reduction planning. There are some volcanic intrusions but generally strategic firebreaks can be constructed and maintained easily.

While the soils are relatively infertile, in a good wet season a reasonable fuel load can still accumulate. This landscape occurs in the west of the Burnett Mary catchments in the Brigalow Belt South areas. Hazard reduction burning should reflect the growing seasons, with a fire frequency range of 3 – 5 years.

Use early burns as soon as possible after the wet season to provide a break to protect fire-sensitive vegetation such as softwood scrubs or fringing forests along drainage lines.

Later, moderate intensity fires can then be lit from the edges of earlier burnt country to achieve a broader fuel reduced area. Areas requiring regular hazard reduction burning will benefit from fires that vary in the time of year, direction of lighting, and intensity used.

Production

For production areas, 3 – 5 years between burns is suitable providing a mix of fire intensities are applied. Avoid 'calendar' burning where fire is used at the same time every year. Varying the season, intensity and area burnt will create a mosaic of habitats, whereas too frequent fire (annual or every second year) has serious impacts on soil health and long-term sustainability.

Burning with soil moisture will protect the important mulch layer of the soil, which allows for quicker recovery of grasses and forbs. Heavy grazing or a lack of fire over time will change the composition of the pasture grasses, with the less palatable and less productive grasses becoming dominant because they are able to seed.

Vary burning times from the early dry season to storm burning to maintain grass composition.

Conservation

This landscape requires fire to maintain and promote the diverse range of native grasses and herbs it contains. A series of fires over a period of weeks (rather than a single fire event) is the best way to maintain this diversity. Burning should start using spots of ignition as soon as the country will carry a fire at the end of the wet season and continue as the country dries out.

Recently burnt grass clumps will produce more seed than unburnt grass. Burning different patches over several weeks produces a series of different age regrowth, extending the grass seed supply, which is important for small mammals and seed eating birds.

A range of fires over the early dry will also provide a greater range of seed, as the early burnt grass will mature and seed earlier than grass burnt later on. Fires should be low intensity, providing patchiness with a good overall mosaic.

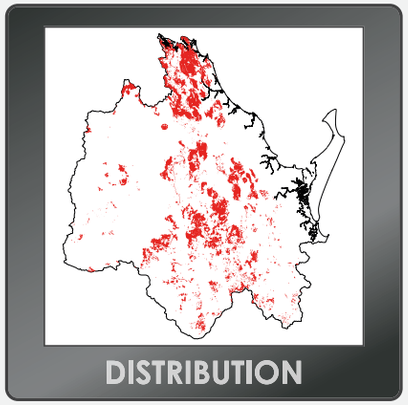
Regional Ecosystems

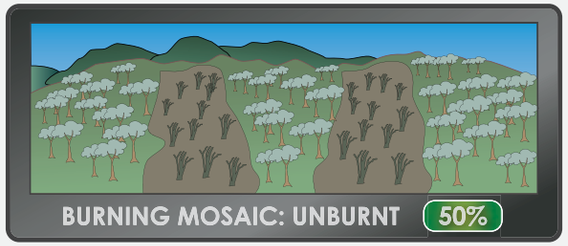
11.11.9	11.11.10	11.11.10a
11.12.2	11.12.2b	

Eucalypt and melaleuca woodlands in the ranges

Landscape 16

Grassy woodlands to open forests of the coastal ranges of ironbark, Moreton Bay ash, spotted gum, bloodwood and tea tree generally in a mixed canopy. There may be a shrubby understorey of acacia, tea tree or she-oaks.





Eucalypt and melaleuca woodlands in the ranges

Landscape 16

Hazard reduction

Hazard reduction in this landscape should focus on burning early breaks to stop or reduce wildfires late in the dry season. This can be achieved through a series of mid winter to early spring patchy burns over a number of weeks. The topography dictates that most wildfires will travel uphill causing an increase in fire intensity. Strategic burning from ridgelines can provide a good breakup of the fuel load at the landscape level to reduce wildfire spread later in the season.

Areas that have been affected by late dry season wildfires can have a mass seeding of wattle. This understorey shrub layer can reach 3 – 5 meters in a seven year period. Under adverse wildfire conditions it can create a subcanopy fire with very high intensity. This in turn can lead to very dangerous crown fire conditions. Vary fire regimes to leave some areas unburnt for seven years, whilst burning enough area to give protection from late spring or summer wildfires.

Production

The grassy understorey of the woodlands and the grass lands associated with this landscape provide good native pasture grazing.

A low to moderate intensity fire after the wet season or following storms can remove old grass and even out the pasture composition. A series of patchy fires is better than a single, large fire event as it provides for a staggered recovery of grasses. Fires should be lit from the tops of ridges and allowed to burn downhill to achieve a low fire intensity.

Fires lit uphill will be of high intensity, causing grasses to take longer to recover and increasing the risk of erosion.

This landscape can also provide good pole and saw log timbers. Forest production areas are generally burnt prior to logging for access and after logging by conducting top disposal burns of the tree heads to encourage regeneration.

Post logging, depending on the regeneration levels, fire may be used for thinning or not used until regeneration is above flame height.

A backing or downhill fire will kill the regrowth more effectively than an uphill fire.

Conservation

There is high diversity in the composition of the trees, grasses and herbs in this landscape type. A number of these ecosystems are endangered and require fire management to provide protection from late season wildfires. Use well-spaced spot ignitions when the soil is moist.

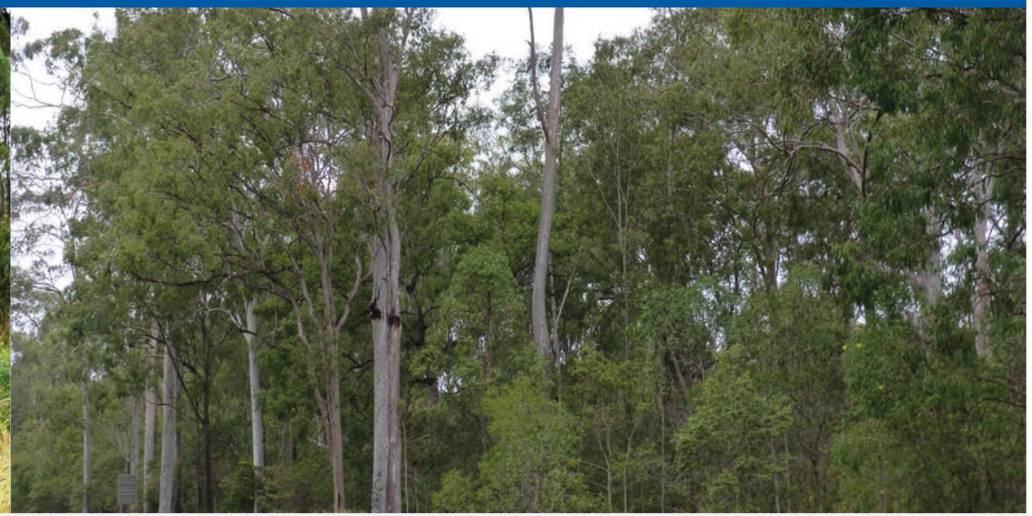
The woodlands and forests of this landscape have either a grassy or shrubby understorey. The grassy understorey requires fire to keep it open with fire intervals of 4 – 6 years. The shrubby understorey requires more patchy fires and potentially slightly longer fire intervals to allow the understorey species to mature and seed.

Be aware that the boundaries of shrublands and grasslands will naturally fluctuate to some degree.

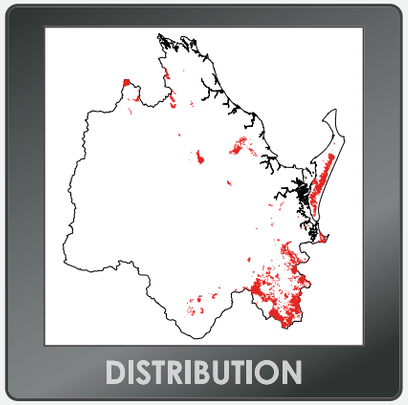
Regional Ecosystems

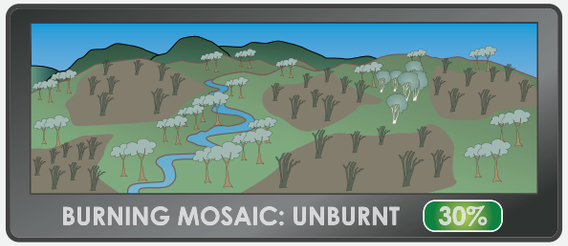
11.12.5	11.12.6	11.12.6b
11.12.17	11.12.20	12.12.3
12.12.5	12.12.7	12.12.8
12.12.9	12.12.11	12.12.12
12.12.14	12.12.21	12.12.22
12.12.23	12.12.24	12.12.25
12.12.27	12.12.28	12.12.28x1

Tall open forests

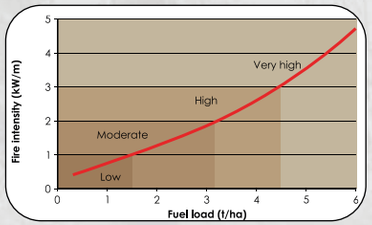


Tall open forests with a variety of main species including rose gum, blue gum/forest red gum, spotted gum, blackbutt, white mahogany, grey gum, red stringybark, brush box, turpentine and bloodwood with a grassy to dense shrub layer.





Tall open forests



Koala (*Phascolarctos cinereus*).

Regional Ecosystems

11.10.2	12.2.4	12.2.8
12.3.2	12.5.6a	12.5.6b
12.5.6c	12.5.11	12.8.1a
12.8.8	12.8.8a	12.8.9
12.9-10.1	12.9-10.1x1	12.9-10.14
12.9-10.14a	12.9-10.20	12.11.2
12.11.3a	12.11.3b	12.11.9
12.11.9x1	12.11.16	12.11.16x1
12.12.2	12.12.4	12.12.6
12.12.15	12.12.15a	12.12.15b
12.12.20		

Hazard reduction

These forests may have a sparse or dense shrub layer which will influence fuel accumulation and arrangement. Tall open eucalypt forests can naturally accumulate very large fuel loads and support widespread high intensity fires. Protection areas are best managed by regularly burning small areas with good soil moisture and managing weed impacts post fire. Aim to burn a patch every 3 – 5 years (using fuel loads as an indicator of frequency) or the repeated disturbance will promote weed invasions.

Burning should only be undertaken when conditions are suitable. Vary the season of burning to account for fuel and soil moisture levels and avoid burning when conditions are very dry, as the fire risk is extreme. Later season fires are acceptable in this landscape as vegetation can take longer to dry out than surrounding woodlands. Plan to burn in late winter or at the first storms when follow up rain is imminent, allowing groundcover to quickly recover.

Areas long unburnt with dense lantana and rank grasses can carry intense fires due to the heavy fuel load. Burning lantana with good soil moisture or after frost has defoliated plants can result in a better kill rate. Reducing weedy fuel hazards on the edges with approved herbicide is often a good option either before or after fire.

Production

The tall open forests on fertile soils are productive timber forests. Fire management should include a fuel reduction burn prior to logging across the intended logging area. The logging debris is burnt post harvest when the canopy trees are carrying mature seed. The timing of these fires is planned to follow rainfall events with a focus on ensuring good regeneration of the logged area.

The fire can be intense in patches and is designed to stimulate seed fall into the prepared ash bed. Fire should then generally be excluded until the regeneration is above flame height.

Conservation

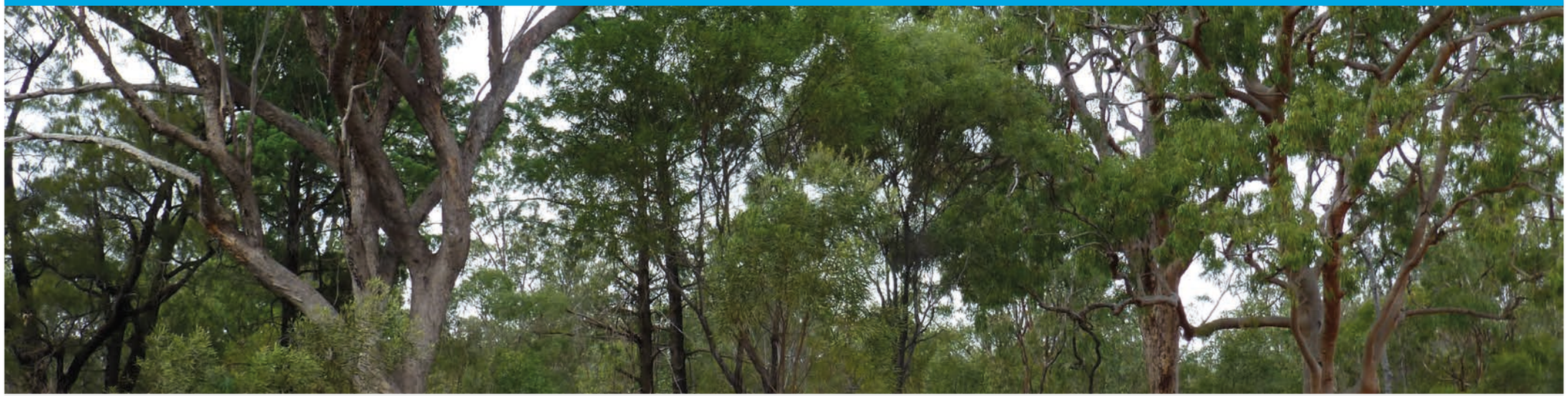
It is essential to prioritise fire management in tall forests retaining a grassy understorey. A moderate intensity, patchy burn every 3 – 5 years is recommended to keep the grasses in good condition. Implement fires with soil moisture because dry fires promote thickening by wattles and some rainforest trees. Vary fire regimes to maintain a mosaic of understorey types to mimic natural conditions. Where practical, plan for an occasional hot fire – storm burning is recommended to reduce the risk of fire escaping into the surrounding landscape.

Grasses will begin thinning out in the absence of fire for five years and a dense scrubby understorey may develop over a ten year period, to the point that the forest will not burn unless in extreme conditions. Intense dry season fires are the key threats to these habitats and the species that depend on them, such as the koala (*Phascolarctos cinereus*). As koalas cannot escape a crown fire, they have no protection from these fire events. The reduction of fuel loads on a regular basis ensures crown fires are avoided.

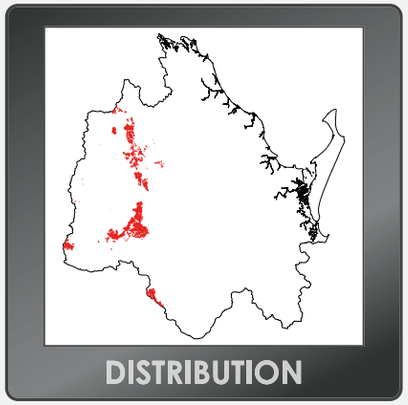
Protect adjacent rainforest or semi-evergreen vine thicket edges from the impacts of hot fire. Carefully planned mosaic patch burning in adjacent woodlands may reduce severity and extent of wildfire by breaking up the fuel load, reducing the potential fire front.

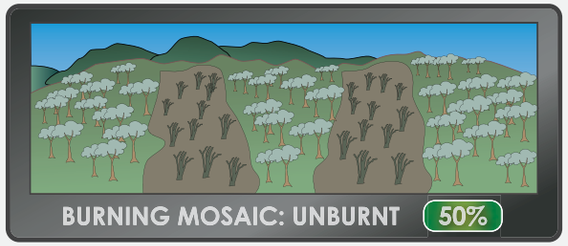
Eucalypt, river apple, bull-oak and cypress woodlands

Landscape 18



An open woodland that can have a grassy or shrubby understorey. Main species include spotted gum, river apple, ironbark, bull-oak and/or cypress. Grass trees, false sandalwood and wattles may be present.





Eucalypt, river apple, bull-oak and cypress woodlands

Landscape 18

Canopy fire damage to eucalypts.

Golden-tailed gecko (*Strophurus taenicauda*) (© Mark Sanders, EcoSmart Ecology).

Regional Ecosystems

11.10.1	11.10.1a	11.10.7
11.10.9	11.10.13a	

Hazard reduction

Topography, terrain and slow fuel build up can naturally protect some of these areas from most wildfires. Property planning should focus hazard reduction burning on less erodible soil types that are easier to access. A low intensity fire every 3 – 6 years will reduce fuel loads to a manageable level for wildfire control.

Plan burns when fuel loads are moderate (less than 2 t/ha) to achieve a mosaic of 30 – 50% burnt. Plan burns to occur with good soil moisture such as during the wet season or at the end of summer. High moisture content will protect the soil mulch layer. Fire management in adjacent landscapes in the intervening years should provide long-term protection from late season wildfires burning uphill into this vegetation type.

Production

This landscape includes some of the less fertile scarps, plateaus, and tablelands. The understorey can be shrubby or open and grassy. It is traditionally used as cattle breeding country.

In a wetter year it can produce a reasonable amount of grass, but these are not very productive or palatable. The soils tend to be phosphorous-deficient and prone to erosion. Fire is primarily used to control thickening of the understorey. A low to moderate fire every 3 – 6 years is sufficient to maintain open woodland with grass. The topography and terrain should be used to burn in patches to achieve 30 – 50% burnt. Burn with good soil moisture either at the end of the wet season or after the first storm. Grazing pressure should be reduced after burning to allow for grass recovery.

Conservation

This landscape is important habitat for a range of reptiles such as the golden-tailed gecko (*Strophurus taenicauda*). The golden-tailed gecko lives above the ground in hollow limbs and behind dead or loose bark, mainly in ironbark, cypress and brigalow woodlands, coming out at night to feed on insects. Avoid burning in dry conditions that could cause a high intensity fire. A high intensity fire will damage the habitat of this gecko by removing or reducing hollows and dead bark.

Fire management should occur late in the wet season to early in the dry season or as soon as the country will carry a fire. Aim for a fine scale mosaic of patchy burns by burning in conditions that will provide a low to moderate intensity fire. The key factor in achieving a low to moderate intensity fire is the presence of a moderate fuel load that is only sufficiently cured to carry a patchy fire lit in the mid afternoon.

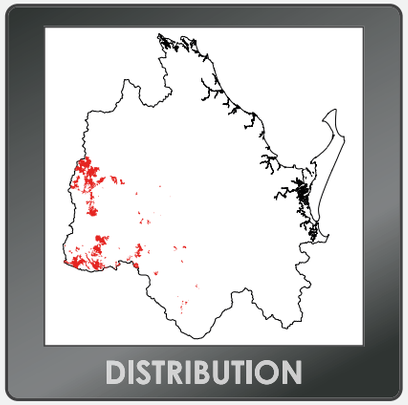
Some plants in the shrub layer will be obligate seeders and benefit from the retention of small unburnt patches. Regular low intensity fires maintain healthy mature cypress pine stands but high intensity fire kills cypress pines. Conversely, regular fire will reduce the expansion of young cypress plants invading eucalypt areas. Cypress thickening in the understorey will increase the fuel load and subsequent fire behaviour in dry years, resulting in canopy fires with heat that can kill mature eucalypts.

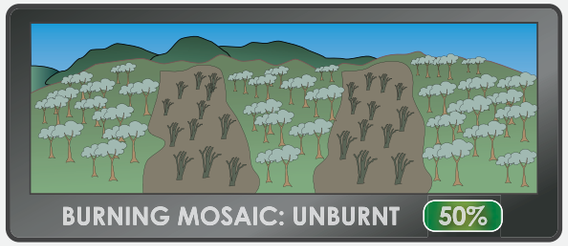
Eucalypt woodlands on sandy plains

including woodlands on lower slopes and associated grasslands

Landscape 19

Open woodlands with a shrubby or grassy understorey containing ironbark, bloodwood, smooth barked apple, black tea tree, poplar box. Often has bull-oak and/or cypress in the understorey.

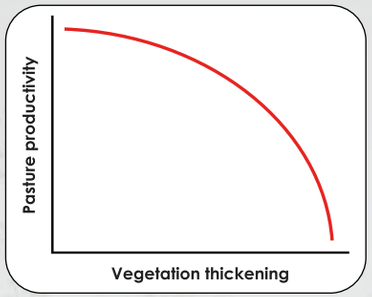




Eucalypt woodlands on sandy plains

Landscape 19

including woodlands on lower slopes and associated grasslands



Vegetation thickening vs. pasture productivity.

Hazard reduction

This landscape is often braided by numerous creeklines and gullies that often retain some standing water or at least high soil moisture during the early part of the dry season. These can be helpful in implementing early dry season burns that produce a patchy mosaic of burnt and unburnt fuels.

Burns that result in about 30 – 50% of the total area burnt will provide a breakup of continuous fuel levels which will reduce the spread of late season wildfire. Avoid burning too frequently or in the same place (such as along a track or road edge), as this can favour weeds.

Production

These woodlands usually have a grassy understorey but may develop a shrub layer. The landscape is used extensively for grazing and therefore productivity is closely linked to periodic fire management. In more lightly grazed areas, fire can be used to remove old grass and freshen the pasture every 3 – 5 years.

In heavily grazed areas or where fire has not been used for extended periods, there may be encroachment of softwood scrub species. In these instances a reduction in grazing to build a suitable fuel load of around 2 t/ha will be required to carry a fire of sufficient intensity to remove the trees and shrubs causing thickening.

Fire should be used when soil moisture levels are relatively high, such as during the wet season or directly after the first rains of the storm season (when follow up rain is expected) to ensure pasture grasses recover quickly.

Burning in a dry year will not give a return in grazing value and will likely result in thickening or woody weed invasion.

Conservation

Burning only when the soil is moist is crucial for allowing quick recovery of grasses and to avoid excessive loss of habitat features such as hollow trees and fallen timber.

Management of these woodlands for conservation purposes may require catering for both grassy and shrubby habitats. Areas containing a shrubby understorey will require a greater proportion of unburnt patches to allow for the survival of some unburnt mature shrubs.

This landscape is important habitat for squatter pigeons (*Geophaps scipta scipta*), which prefer a longer undisturbed ground layer for nesting.

A range of fires with varying intensity and size – resulting in a variety of vegetation ages or time since fire – will most benefit the squatter pigeon. This will help maintain a mix of areas that range from open and grassy to a dense shrub understorey. The presence of these pigeons in the landscape can be an indicator of good long-term pasture and fire management.

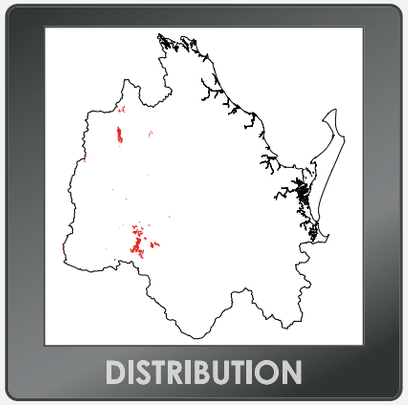
Regional Ecosystems

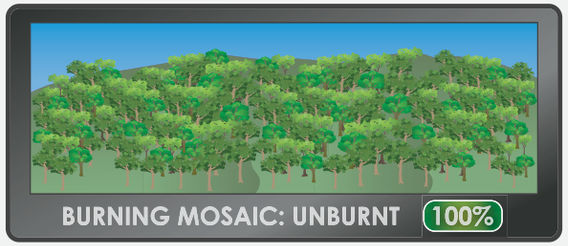
11.5.1	11.5.1a	11.5.2
11.5.13	11.5.17	11.5.20
11.5.21		

Brigalow, belah, lancewood or rosewood with acacia scrubs on crests and scarps

Landscape 20

Brigalow, belah, lancewood, rosewood with acacia scrubs on crests and scarps.





Brigalow, belah, lancewood or rosewood with acacia scrubs on crests and scarps

These vegetation types normally occur on the edge of geological change and are often self protecting from fire. This picture shows the natural separation.

Hazard reduction

The position of this vegetation type in the landscape puts it at risk of late dry season wildfires racing uphill and scorching the fire-sensitive vegetation.

This landscape generally fails to accumulate any significant amount of fuel and thus will rarely support a fire. In many cases this landscape can be useful as a naturally fuel reduced area that will restrict the spread of fire.

This landscape is fire sensitive and fuel reduction burning in adjacent areas should avoid scorching along margins as this weakens the stand and allows invasive exotic grasses such as buffel grass to enter. Exotic grasses invading this landscape will increase the fuel load.

Production

This landscape generally has shallow soils which do not develop a grassy understorey. As with other brigalow-dominated ecosystems, this landscape is of limited production value and there is no need to manage it with fire.

Conservation

This landscape is fire sensitive and should be excluded from planned burning. Its margins should be protected from fire wherever practical by burning away from edges into adjacent eucalypt woodlands. Moderate and even low intensity fires can kill adult brigalow and belah trees. However, they are generally self-protecting within this landscape.

Fire management in adjacent areas should be conducted as early in the dry season as possible and lit from the edge of this land type rather than letting fire run up into the edge.

When lancewood is present, ensure the landscape is protected from fire for at least 20 year intervals. More frequent fire events will cause dieback of lancewood and subsequent contraction of this vegetation type.

Glossy black-cockatoos (*Calyptorhynchus lathami*) feed almost exclusively on belah seed. Belah does not regenerate after fire and will typically be killed by even very low fire intensity events.

Shrublands of acacias developing on natural scalds (that may also include hakea species) can tolerate fires with a 6 – 10 year interval. However, it is not necessary to actively burn as they will generally burn in association with the surrounding landscapes.

Exotic grasses (particularly buffel grass) can invade this vegetation type, increasing the fuel load and ignition potential. Treat invasive grasses with herbicide before they enter the vegetation.

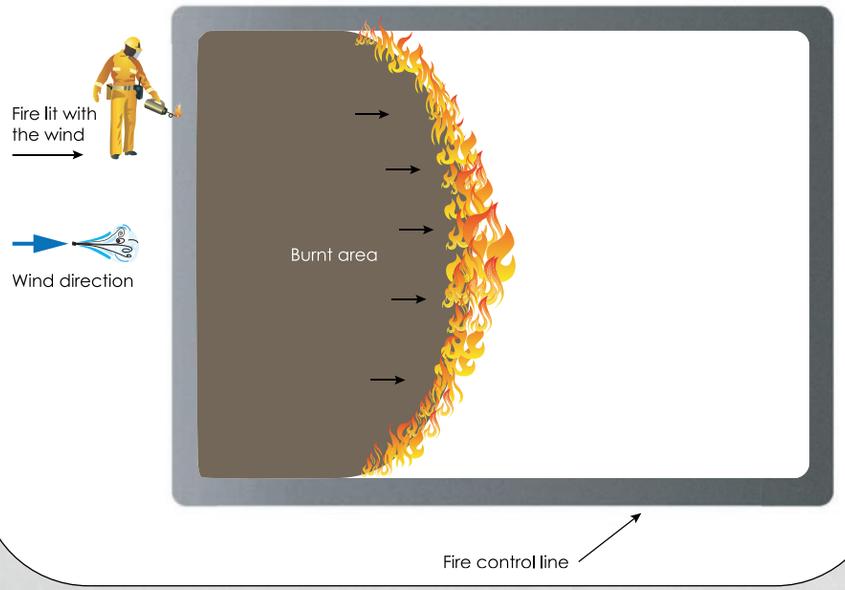
Regional Ecosystems

11.7.2 11.10.3 11.10.4
11.10.8

Fire diagrams

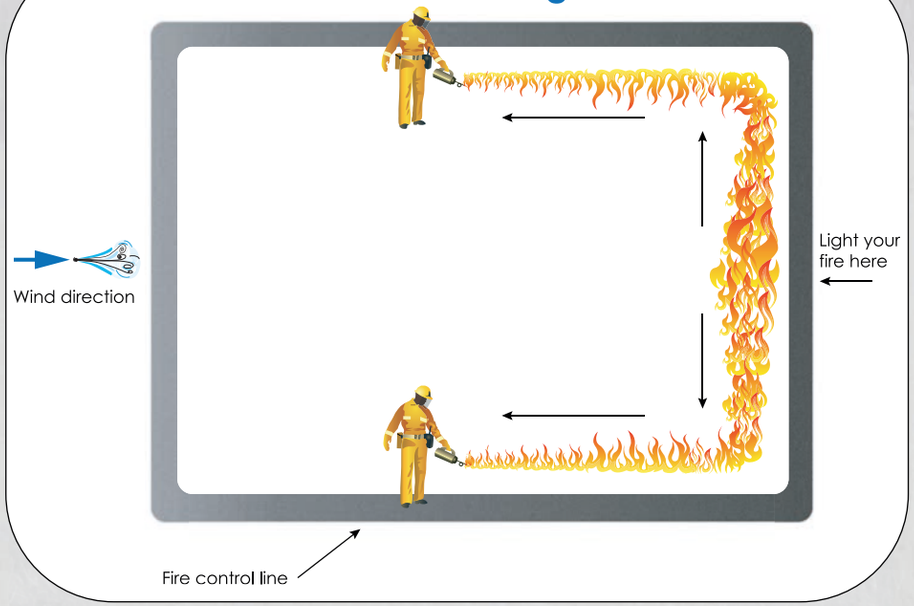
The following fire diagrams are provided to illustrate some ignition techniques for fire practitioners who are experienced in the lighting and use of fire. There are many variables that need to be considered prior to lighting a fire, including temperature, humidity, wind speed and direction, fuel type, amount of fuel and how cured or available to burn the fuel is, time of day and season, and the degree of difficulty to control the fire, which relates to number of people, water capacity and firebreaks required. All fires in Queensland greater than two metres in diameter require a *Permit to Light Fire* from a local Fire Warden appointed under the *Fire and Emergency Service Act 1990*.

Forward burning



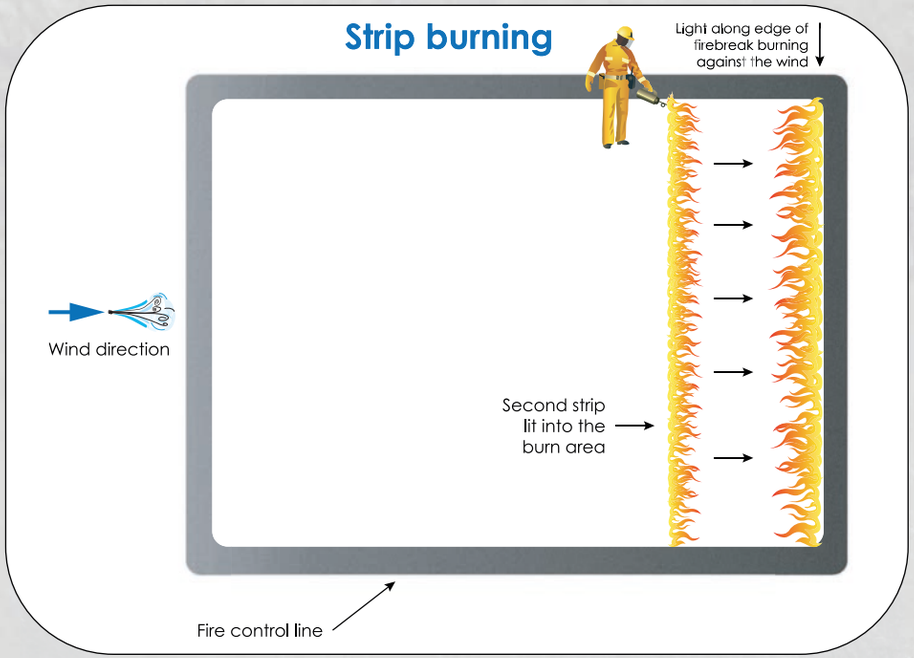
Forward burning can be used early in the season when conditions are still mild. A forward fire (lit with the wind) will move quickly over old grasses, removing only the dead material on the downwind side. A forward fire is also useful after storms to remove old dead material in damp conditions. The fire moves quickly across the fuel without too much heat applied to the grass crown, allowing the grasses to recover quickly. There will need to be a natural break such as a waterway or scrub edge or a constructed fire line, road or earlier burn to contain the fire.

Back burning



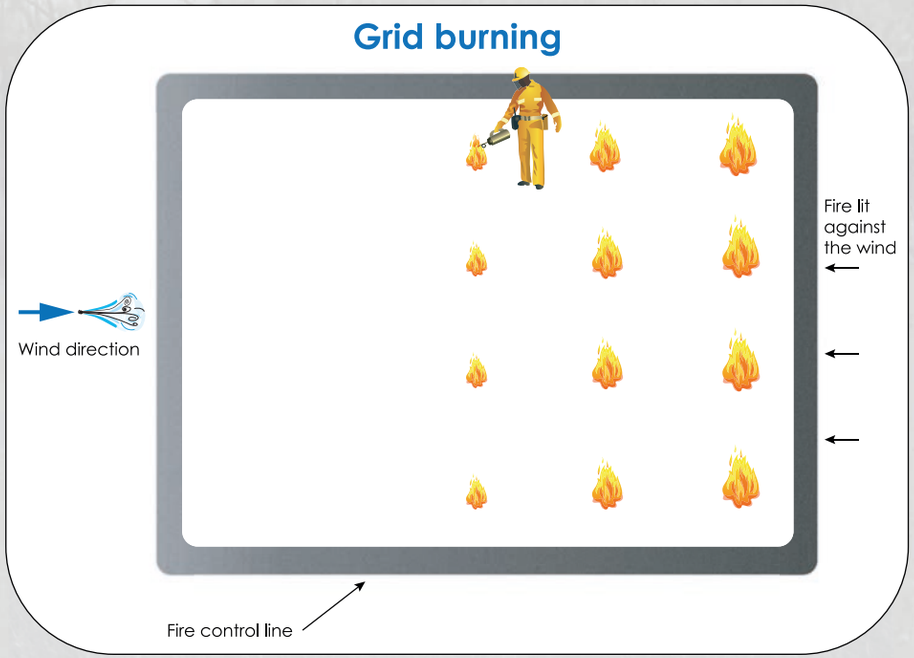
To secure a safe edge to a burn and/or to provide a slow-moving fire with maximum heat at the stem for killing woody weeds. The diagram shows the sides of the fire being brought down slowly to contain the fire.

Strip burning



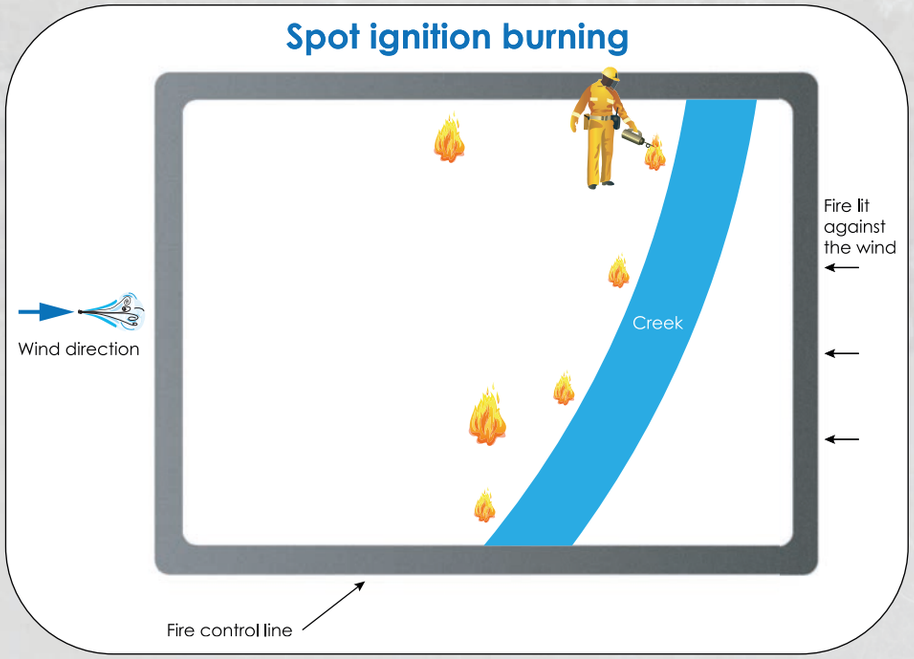
Strip burning is used to remove the fuel faster than a back burn would. It provides the advantage of the forward fire's heat and control by the backing fire being in front of the forward fire. This technique is useful in old slashed areas, cane trash, and areas with variable fuels where a backing fire may not carry through the variation in fuel loads.

Grid burning



A technique that uses a series of smaller fires to reduce scorch under the canopy or where a moderate fire is required in drier conditions. Each of the fires are impacted by the surrounding fires. A fire front will not develop because as each fire burns out, it reaches another fire's edge. Spacing of the fires is important, so start on the downwind edge and test the spacing to achieve the fire intensity required by observing the time and heat generated before the fires join up. Keep checking the spacing as the burn progresses.

Spot ignition burning



Spot ignition is lit while fuel and soil are sufficiently moist to ensure a patchy, low intensity fire. Spots of ignition can be positioned to burn away from the edges of sensitive vegetation (such as riparian forests and vine thickets) and to burn downslope from the tops of ridges.

Notes and sketches


QUEENSLAND FIRE & BIODIVERSITY CONSORTIUM
a program of
Healthy land & water
Australian Government
National Landcare Programme
QUEENSLAND FIRE AND EMERGENCY SERVICES
Queensland Government
Burnett Mary REGIONAL GROUP
Practical Solutions for Natural Resource Management
FLS
Fire & Landscape Strategies