CLARKE CONNORS RANGE

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

Reef Catchments

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Introduction

In the Clarke Connors Range, satellite imaging shows that many large and intense dry season wildfires have occurred over the last ten years. There is concern that a drier and hotter climate may further increase the incidence of these fires and associated economic and environmental impacts. Rural communities recognise the threat of these fires, and their effects on life, property, productivity, and the environment.

Reef Catchments is a community based, not-for-profit organisation with a proven track record in advancing natural resource management in the Mackay Whitsunday Isaac region. The Clarke Connors Range also extends to the east into the Fitzroy Basin Association and North Queensland Dry Tropics Natural Resource Management (NRM) group regions. Reef Catchments works across private and all levels of the public sectors to deliver results where they matter. For more information visit reefcatchments.com.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 Clarke Connors Range were developed by Reef Catchments. They have been updated by the QFBC, in partnership with Queensland Fire and Emergency Services (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 Clarke Connors Range region. Information about why and how to burn is presented for the 10 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 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. 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.

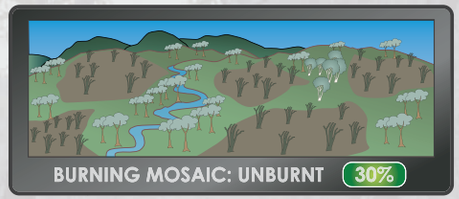
HIGH intensity fire has a flame height of typically > 3 m in height, with a fire front moving faster than walking speed.

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 fires can be ignited in the same area on different days through a season to manage fuel consumption (ignite the drier fuels first), spread the duration of green pick (fresh grass regrowth) and extend the production of grass seeding.

Diagrams of the various ignition techniques are provided at the end of these guidelines.

Australian Government

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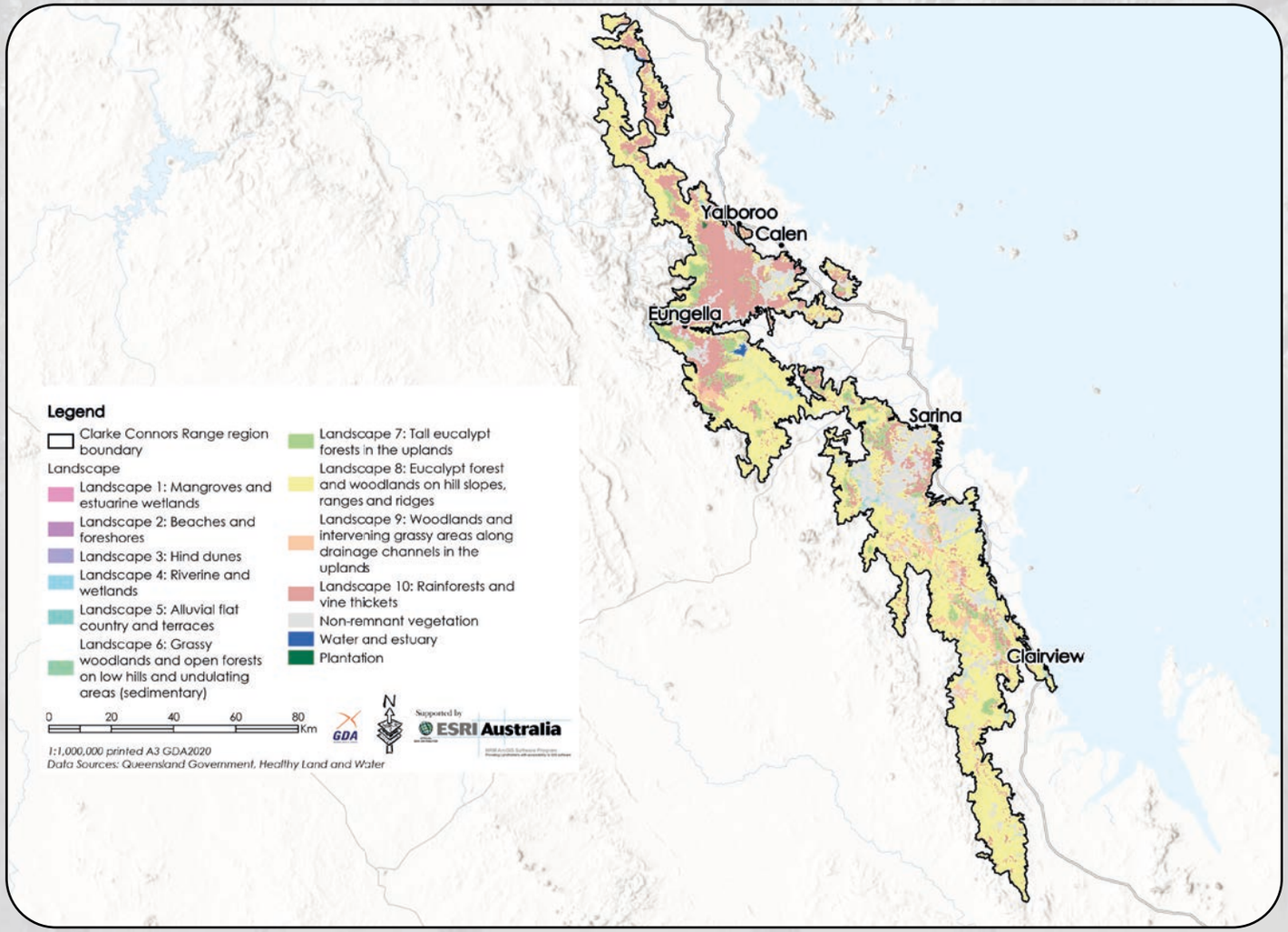
Thank you to the review team: Dr Paul Williams (Vegetation Management Science), Kira Andrews (Reef Catchments), Neil Kelso (QFES) and Dr Diana Virkki (Healthy Land & Water).

The Clarke Connors Range region



The Clarke Connors Range region covers approximately 940,000 ha in a narrow coastal strip extending from just south of Bowen to Flaggy Rock Creek, south of Carmila

The area includes the majority of the Central Queensland Coast bioregion.

The region's climate is humid and tropical, with hot wet summers and cooler dry winters.

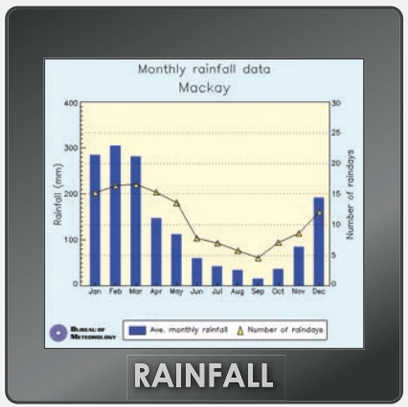
Rainfall varies significantly across the region, ranging from an average of 1600 mm/year on the coast of Mackay to 3 mm/year in the elevated sections of the Clarke Connors Range.

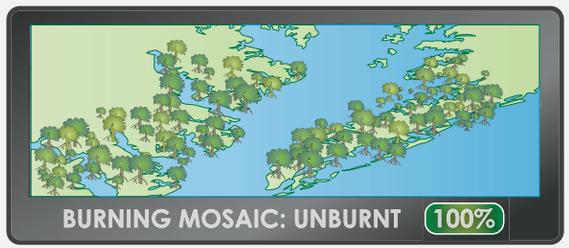
The average temperature range is 23° C to 31° C in summer to 11° C to 22° C in winter.

Mangroves and estuarine wetlands

Landscape 1

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





Mangroves and estuarine wetlands

Barramundi (*Lates calcarifer*).

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

Regional Ecosystems

8.1.1	8.1.2	8.1.3
8.1.4	8.1.5	

Hazard reduction

Saltmarsh and saltwater couch grasslands are regularly flooded by high tides throughout the year. Because of this, they maintain high soil moisture and green growth throughout the year. Wildfire is rarely a risk. These grasslands do not tend to accumulate large amounts of fuel and are often broken up by patches of saline clay and sparse saltmarsh.

The native groundcover within fringing melaleuca woodlands and forests is saltwater couch, which does not carry a high fire hazard. However, many areas have been invaded by Guinea grass and other exotic grasses which can accumulate high fuel loads that pose a fire risk in the dry season. These introduced grasses quickly increase in biomass after fire and can build up 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 an approved herbicide such as glyphosate.

Production

Due to high salt levels in the soil, weed infestations are rarely a problem in saltwater couch grasslands and burning for weed control is not necessary.

Saltwater couch is a perennial grass and pasture condition is strongly dependent on tidal cycles. Fire does not improve productivity and can lead to loss of important nutrients.

Saltmarsh and saltwater couch grasslands are an important food source and refuge for juvenile fish. There is strong evidence that juvenile fish feed heavily in these areas during high tides. A decrease in biomass through removal by fire or overgrazing may have a significant impact on coastal fisheries production.

Conservation

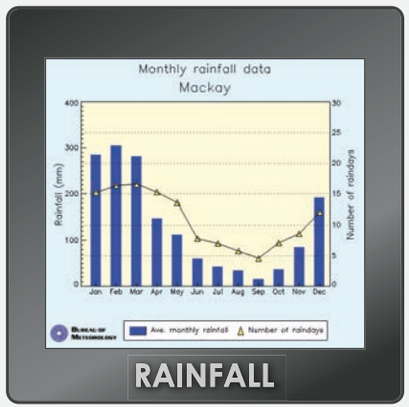
Apart from their value to coastal fisheries, mangroves, saltmarsh and saltwater couch grasslands provide essential habitat for a range of conservation-dependent species.

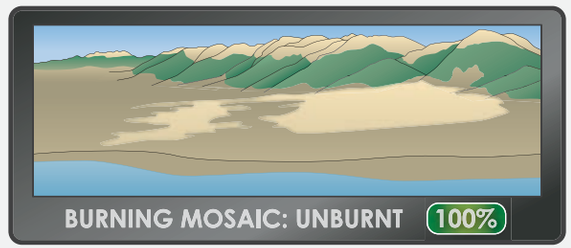
Minimising fire and other disturbance within these areas helps protect migratory and resident shorebirds, seabirds and the threatened water mouse (*Xeromys myoides*).

Beaches and foreshores

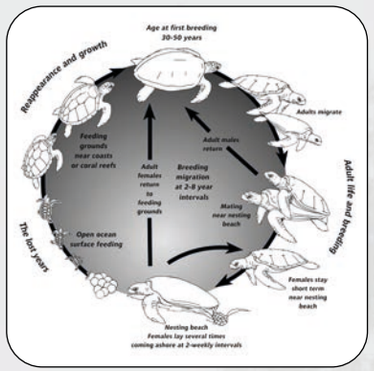
Landscape 2

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





Beaches and foreshores



Turtle life cycle.

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

Regional Ecosystems

8.2.1 8.2.2 8.2.10

Hazard reduction

Coastal she-oak and beach scrub (rainforest on sand dunes) habitats are fire sensitive and will be killed or severely degraded by even low intensity fire.

The native groundcover within beach scrubs and coastal foreshores does not accumulate large amounts of fuel and therefore does not represent a high fire hazard. However, infestations of exotic grasses and weeds can significantly increase hazardous fuels, especially along disturbed edges of this landscape.

Hazard reduction burning is generally not suitable in coastal areas, as Guinea grass and other fire-adapted grasses often build up similar fuel loads soon after fire.

An effective long-term strategy is the use of herbicide to reduce fuel hazards where required. Apply when grasses are actively growing, preferably prior to the dry season.

Production

Many remaining areas of beach scrub are islands in a sea of cleared land. The remaining foreshore vegetation is often the only buffer between the land and the ocean.

While undisturbed foreshores and beach scrubs are generally resistant to weed invasion, smaller patches and disturbed areas are more vulnerable.

Disturbance caused by stock trampling and feral pigs can encourage the spread of lantana and other weeds into otherwise intact areas. Manage stock access and provide shade and watering points away from beach scrub and foreshores to 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

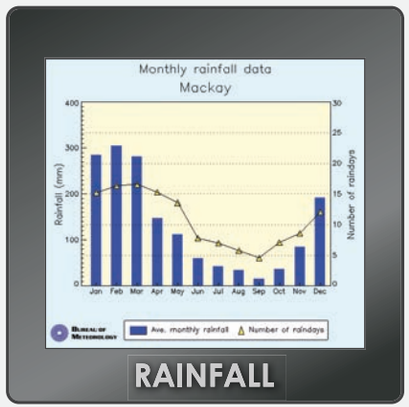
Fire is a key threat to remaining areas of beach scrub – a critically endangered ecological community under the *National Environment Protection and Biodiversity Conservation Act (1999)*. Beach scrubs and foreshores are key habitats for many rare and threatened plants and animals. Foreshores are breeding sites for marine turtles and shorebirds, such as the bush stone-curlew (*Burhinus grallarius*).

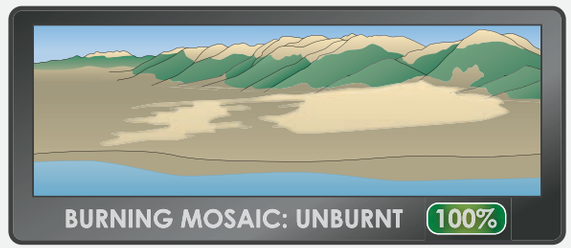
Disturbance of these habitats by arson, clearing or mowing of undergrowth, dumping of garden waste, trampling, and 4WD and pedestrian tracks, leads to weed invasion and increased fire risk. **Weed management, rather than fire management, should be used to protect and rehabilitate remaining areas**.

Very careful use of fire in adjacent fire-prone landscapes is needed. However, it is important to ensure that there is little to no scorch into beach scrubs and foreshores.

Hind dunes

Mixed vegetation on hind dunes (behind main beach and foreshore areas) including Moreton Bay ash, acacia, coastal banksia, paperbarks, bloodwoods, black she-oak, peppermint and stringybarks, and grasslands on sand dunes.





Hind dunes

Orange-footed scrubfowl (*Megapodius reinwardt*) (© Rosanne Houley, Fire & Landscape Strategies).

Hazard reduction

Burning is generally not recommended in coastal dune systems and adjacent buffer zones, unless for rehabilitation or protection in special circumstances.

Exotic grass infestations (such as Guinea grass) are common along the edges of coastal dune vegetation. Disturbance often favours these introduced grasses, which rapidly regrow after fire and can accumulate similar fuel loads within a single season.

Landowners in built up areas may desire protection burning to reduce hazard. Fire should only be used to gain initial control of weedy areas as part of a long-term weed management strategy. Burn with low intensity fire no more than once every 3 – 5 years, ensuring good soil moisture is present (e.g. after 50 mm of rain). Avoid regular or repeated burning and do not burn in dry conditions.

Manage exotic grasses and other weeds by using an approved herbicide when the plant is actively growing. Guinea grass is easily killed after fire with minimal herbicide use.

Production

Clearing and the introduction of exotic pasture species (combined with the impacts of stock) can severely affect fragile dune systems. Exotic species can outcompete natives in disturbed areas and alter natural fire regimes.

Open dune grasslands supporting native grasses (such as black speargrass) tolerate a low intensity fire every 3 – 7 years. Burn only when rapid regeneration of the grassy layer is expected.

Burn with good soil moisture and when follow up rain is expected. Avoid regular or repeated burning, as loss of groundcover and soil nutrients will encourage weeds and less desirable grasses.

Disturbance of the ground layer leads to weed invasion and loss of native grasses. **Minimise disturbance from stock trampling and manage weeds using methods other than fire**.

Conservation

Lack of knowledge about this ecosystem and its need for fire is a major barrier to effective fire management. In general, fire should only be applied for regeneration of native grasses and canopy trees. Responses should be carefully monitored.

Fire management could be trialled in areas supporting a native grass ground layer. A low intensity fire no more than once every 3 – 7 years with good soil moisture is advised. Indicators of successful fire management include germination of canopy tree species, stable native grass density, abundant fauna, and reduced exotic grasses.

Many areas supporting beach scrub pioneer species in the understorey will naturally revert to beach scrub – actively exclude fire from these areas.

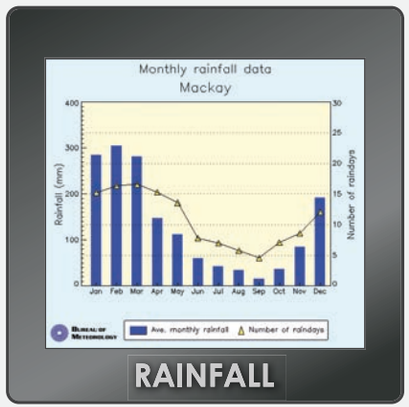
Coastal landscapes support a diverse range of plants and animals, and their habitats are vulnerable to disturbance. Reducing disturbance and managing weeds without the use of fire will protect coastal habitats and wildlife, such as the orange-footed scrubfowl (*Megapodius reinwardt*).

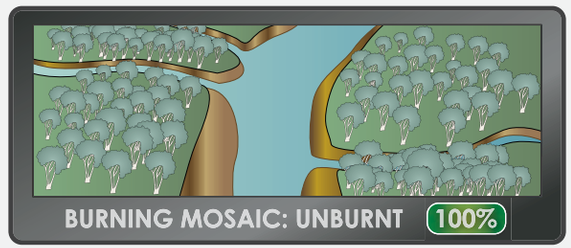
Regional Ecosystems

8.2.3	8.2.8	8.2.6
8.2.9	8.2.13	

Riverine and wetlands

Melaleuca (paperbark), river oak and lowland rainforest along creeklines. Freshwater wetlands and sedgelands.





Riverine and wetlands

Rufous owl (*Ninox rufa*).

Regional Ecosystems

8.3.1 8.3.3 8.3.4
8.3.15

Hazard reduction

Burning is not generally recommended in vegetation fringing watercourses.

Riparian vegetation can act as a firebreak during a wildfire, but is less effective when dominated by weeds and grasses. Disturbance by fire and other means (e.g. machinery or stock trampling) encourages weed infestations and increases risk of fire. Common exotic grasses (including Guinea grass and elephant grass) rapidly regrow after disturbance and can accumulate very hazardous fuel loads.

Riparian and wetland vegetation is fire sensitive, and even low intensity fire can damage these communities. Burning is sometimes used to gain initial control over weed infestations. Do not allow fire to burn into the vegetation – ignite along the edges as a backing fire to reduce the risk of scorching. Burn with good soil moisture to retain groundcover and do not burn more than once every 3 – 5 years.

Riparian and wetland vegetation may require active protection from wildfire in the dry season. This could include slashing or grazing along edges. Herbicide can be effective to reduce grassy fuels when applied soon after the wet season or post fire.

Production

Fencing off creeklines and wetlands and providing offstream watering points protects creek banks and reduces erosion. However, seasonal pulse grazing can be useful to reduce grassy fuel hazards and gain access for weed control.

Ponded pasture grasses are the greatest threat to freshwater habitats, as they can completely choke out waterways, even when grazed. Olive hymenachne and para grass can build up very large fuel loads and severely damage riparian vegetation if burnt in the dry season.

Heavy late dry season grazing of ponded pastures reduces the risk of intense fire and is useful prior to wet season flooding, when grazed patches can drown. Fire can be used to help control these grasses, but take care to reduce fire intensity to protect fringing vegetation. Burn only when fuels are moist and ensure fringing canopy trees remain unscorched.

Herbicide approved for use in and around waterways (such as glyphosate) is effective at killing weeds, including ponded pasture grasses, Guinea grass, and lantana.

As with all weed control programs, follow up is essential. Ongoing monitoring is needed to ensure infestations remain under control.

Conservation

Clearing of vegetation fringing wetlands and water courses has been extensive, and most remaining areas are heavily impacted by weeds. **Weed management is preferable to fire management to maintain or rehabilitate these areas**.

Riparian and wetland vegetation provide many services, including reducing soil erosion and supporting aquatic habitats and fishery stocks. They are also vital habitat for many migratory birds and conservation-dependent species, such as the rufous owl (*Ninox rufa*).

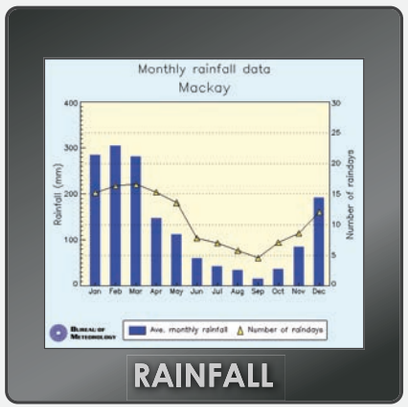
Reducing disturbance to creek and wetland edges and adjacent buffers is important to prevent the spread of weeds. Common disturbances include feral pigs, uncontrolled or heavy grazing pressure, regular or intense fire, and damage by machinery.

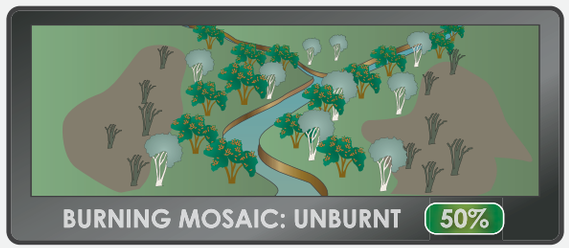
Well-planned burns in surrounding fire-prone vegetation can help protect riparian species from hot, damaging fires. Indicators of successful fire management include weed-free buffers and creek edges, and riparian trees that are unscorched by surrounding fires.

Alluvial flat country and creek terraces

Landscape 5

Grassy woodlands and open forests of broad-leaved melaleuca, weeping tea tree or mixed eucalypts (blue gum, Moreton Bay ash, bloodwoods, poplar gum) +/- swamp mahogany, acacia, cocky apple and cabbage palms, with areas of grasslands.





Alluvial flat country and creek terraces

Regional Ecosystems

8.3.2	8.3.5	8.3.6
8.5.1	8.3.11	8.3.12
8.5.2	8.5.3	8.5.5
8.5.6		

Hazard reduction

This landscape has been widely cleared for agriculture. Remaining patches may be heavily infested with weeds, especially in disturbed areas with high soil fertility (such as creek terraces). In these instances, planned burning is important to protect mangrove and riparian vegetation and reduce the risk of widespread wildfires.

Use smaller-scale, patchy fires every two years, beginning soon after the wet season (generally late March – April onwards). Burn with good soil moisture to ensure rapid recovery of groundcover. Aim to burn no more than 20 – 50% of a patch or property in one year and coordinate with neighbours where required for protection burning.

Guinea grass and other introduced grasses rapidly colonise burnt or otherwise disturbed areas, often reaching very high fuel loads in as little as one season. Regular or intense dry season fires will promote weeds and invasive grasses. This can cause a decline in native grasses and other desirable species and increase the fire hazard over time. Dense infestations of flammable grasses and weeds should not be burnt too often (allow at least 2 – 3 years between burns) and may be best controlled by chemical or manual methods.

Production

Avoid regular or calendar burning in this landscape. Vary fire regimes by burning when conditions are suitable for management needs. Include storm burning where possible, and avoid dry season burning unless hotter fires are required and there is a good chance of follow up rain. Vegetation thickening and loss of grassy groundcover can occur in heavily grazed areas or if fire is too infrequent or low intensity.

To maintain a good balance of trees and grass, use a moderate intensity fire every 5 – 7 years. Good pasture composition may be maintained with lower intensity fires every 2 – 4 years, but allow for some recruitment of canopy trees. Burn with good soil moisture (ideally after 50 mm of rain) to retain some litter cover. Restrict grazing post fire when pastures are in early growth.

Hotter fires may be needed to control woody regrowth and dense lantana infestations. Aim for fuel loads of 1.5 – 2 t/ha to achieve this. Spelling stock to increase fuel loads may be required in heavily grazed areas. Control of dense trees and shrubs over two metres may be difficult once established.

Indicators of successful fire management include a diverse ground layer of grasses and herbs (especially in the first year after fire), reduced lantana and weeds, and a retained open canopy structure.

Conservation

Controlling weeds, woody regrowth and rainforest invasion is a major focus of planned burning in this landscape. Vary the extent, season, and time between burns to promote a diversity of habitat types, leaving some areas unburnt for seven years or longer.

Identifying and retaining habitat trees (such as mature, hollow-bearing blue gums) will help conserve significant species including gliders and rufous owls (*Ninox rufa*). Fire management should aim to promote recruitment of blue gums into the canopy by minimising grazing, fire and weed pressures for the first 3 – 5 years.

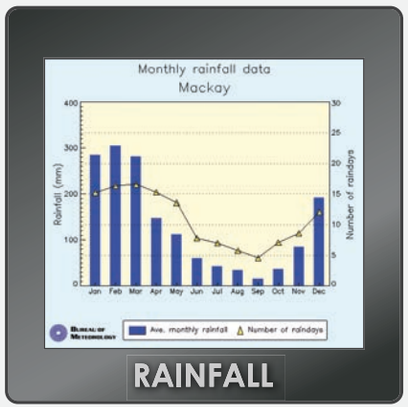
Control of denser, woody areas (including lantana infestations and rainforest regrowth) may initially require hotter fires. Take care when burning for weed control, as wildfire risk is high. Burn with good soil moisture or after early storms when follow up rain is expected. Burning lantana after defoliation from frost or herbicide is effective, as this increases available fuels and allows access for ongoing management.

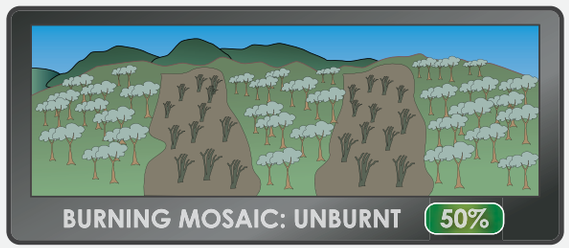
Low-lying, wetter areas may not burn often (between 5 – 10+ years when conditions are suitable), but require fire for canopy tree recruitment and maintaining ground layer diversity.

Grassy woodlands and open forests on low hills and undulating areas (sedimentary)

Landscape 6

Grassy woodlands and open forests of ironbark, bloodwoods, Moreton Bay ash, poplar gum, blue gum and stringybark, often with grasstrees and/or cycad. May have a dense understorey layer of broad-leaved paperbark, brushbox and/or acacia and hibiscus.





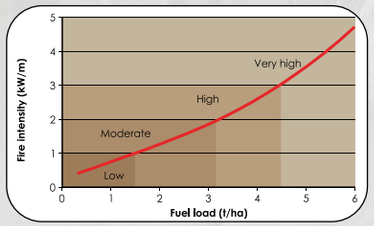
Grassy woodlands and open forests on low hills and undulating areas (sedimentary)

1 t/ha

2 t/ha

3 t/ha

4 t/ha



Regional Ecosystems

8.11.1 8.11.3 8.11.4
8.11.5 8.11.8

Hazard reduction

This landscape is most common on the lower foothills on the eastern edge of the Clarke Connors Range near Homebush, Walkerston, and Mia Mia in the south, through to Kuttabul, Mt Ossa, and Calen area in the north.

The vegetation communities benefit from a mix of fire regimes, including occasional higher intensity fires in spring. Moderate intensity and occasional hot fires promote grass and groundcover density and help control lantana and woody regrowth. For hotter fires, burn after the first storms when follow up rain is expected.

Aim to burn an area every 3 – 5 years with varying fire regimes. When planning for hotter fires late in the season, implement early patchy burns as soon as possible after the wet season. These early burns will provide a break to contain the later, hotter fires.

Guinea grass and other exotic grasses rapidly colonise burnt or otherwise disturbed areas, often reaching very high fuel loads in as little as one season. Where hazards exist, herbicide can be used as an alternative to fire. Herbicide applied after fire is also effective for controlling invasive grasses.

Production

For production areas, burn every 3 – 6 years using a mix of fire intensities. Include some winter and storm burning, or burn as soon as possible after the wet season.

Successful fire management will maintain a high diversity of grasses and herbs in this landscape. However, with heavy grazing or lack of fire over time, dense lantana infestations can remove productive grasses from the ground layer.

Conservative grazing on steeper slopes and wet season spelling after fire will help reduce soil erosion and weed pressures.

Hotter fires can be used to control lantana and woody regrowth if sufficient fuel loads are available. Early patchy burns in surrounding areas will help reduce the risk of hot fires. Fire can be ignited on ridge tops and allowed to burn downhill or along rainforest edges to protect these areas.

Conservation

Exposed, rocky outcrops in these eucalypt woodlands are core habitat for the endangered northern quoll (*Dasyurus hallucatus*). Do not burn between mid September and mid December when juvenile quolls are most vulnerable to fire.

Small-scale patchy burns are recommended around rocky outcrops to reduce threats to quolls from late dry season fires. Burn early after the wet season when the ground, leaf litter and vegetation are moist, or during winter after rain.

Vary fire regimes in this landscape and leave some areas unburnt for seven years or longer, especially after a hot fire has occurred.

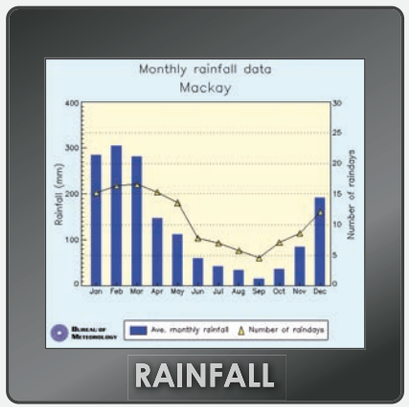
Indicators of successful fire management in this landscape include a dense native ground layer, reduced weeds (especially lantana), and stable quoll populations.

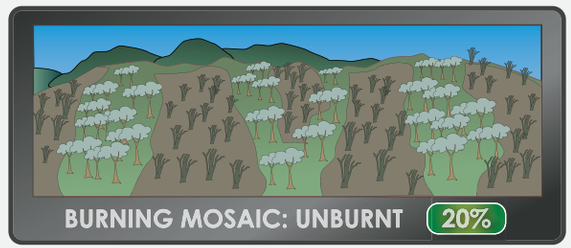
Northern quoll (*Dasyurus hallucatus*).

Tall wet eucalypt forests in the uplands

Landscape 7

Tall grassy forest of flooded (rose) gum, pink bloodwood, red mahogany and New England blackbutt, sometimes with yellow stringybark, blue gum and brown bloodwood. A sub layer of black oak, banksia or rainforest species may be present. Bracken and grasses as ground layer.





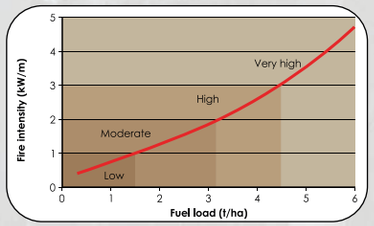
Tall wet eucalypt forests in the uplands

1 t/ha

2 t/ha

3 t/ha

4 t/ha



Regional Ecosystems

8.12.4 8.12.8 8.12.31

Hazard reduction

Tall wet eucalypt forests can naturally accumulate very large fuel loads and support widespread, high intensity fires.

Protection efforts should focus on burning small areas with good soil moisture and managing weed impacts after fire. Aim to burn a patch no more than once every three years using fuel loads as an indicator of frequency. Repeated disturbance will promote weed invasion.

Only burn when conditions are suitable and vary the season to account for fuel and soil moisture levels. Avoid burning when conditions are very dry, as the fire risk is extreme. Later season fires are acceptable in this landscape, as the vegetation can take longer to dry out than the surrounding woodlands. Traditional burning coincides with the first storms (when follow up rain is expected), as this allows groundcover to recover quickly.

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

Production

For grazing areas, burn every 3 – 5 years when conditions are suitable to maintain pasture condition. The country responds rapidly when there is sufficient soil moisture. Burning a few days after rain, towards the onset of the wet season is recommended. Avoid mid – late dry season burning to maintain productive groundcover.

Fire exclusion, overgrazing, or regular low intensity burning can result in a loss of grassy ground layer. A fuel load of 2 t/ha or more is recommended for promoting green pick in native pastures.

Spelling and increasing time between fires will allow sufficient fuel loads to accumulate to carry a moderate intensity fire.

Burning to maintain a woody vegetation structure generally requires fuel loads of 2 – 3 t/ha. Reducing dense woody regrowth may require between 2.5 – 4 t/ha.

Vary fire regimes to prevent a simplified forest structure. In areas more frequently burnt, ensure there is ongoing recruitment of canopy trees. Rainforest regrowth can be controlled by fire, but this may be difficult once trees are over two metres. Fire can still be used in these areas for maintaining a grassy layer.

Conservation

Less frequent burning of these forests over the past 100 years has resulted in dense thickening of trees and shrubs in many areas. A dense rainforest understorey may develop over 15 – 17 years, to the point where the forest will not burn unless in extreme conditions.

Where areas of grassy understorey remain, a moderate intensity patchy burn every 3 – 5 years is recommended.

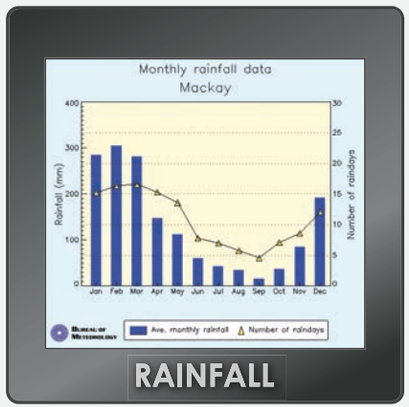
Vary fire regimes to maintain a mosaic of understorey types to mimic natural conditions. Where practical, plan for an occasional hot fire – storm burning is recommended to reduce the risk of escape into the surrounding landscape.

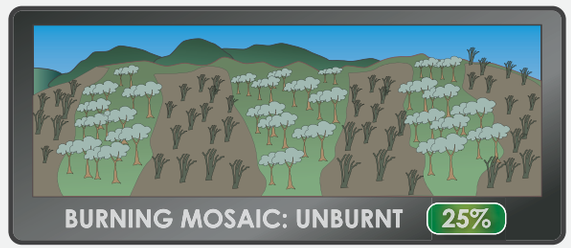
Aim to protect mature hollow-bearing trees as yellow-bellied gliders (*Petaurus australis*), powerful owls (*Ninox strenua*), and glossy black-cockatoos (*Calyptorhynchus lathami*) are largely dependent on these habitats. Intense dry season fires are the key threats to these habitats.

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

Eucalypt forest and woodlands on hillslopes, ranges and ridges

Variable woodlands to open forests of ironbark, Moreton Bay ash, bloodwoods, poplar gum, blue gum, yellow stringybark, brushbox, white mahogany and lemon scented gum (depending on altitude and exposure).





Eucalypt forest and woodlands on hillslopes, ranges and ridges

Glossy black-cockatoo (*Calyptorhynchus lathami*).

Regional Ecosystems

8.12.5	8.12.6	8.12.7
8.12.12	8.12.20	8.12.22
8.12.23	8.12.27	8.12.32
8.12.26		

Hazard reduction

Fire intensity and risk increases as the dry season progresses. Fires in the early dry and wet seasons are usually lower intensity and more patchy.

Guinea grass and other introduced grasses rapidly colonise burnt or otherwise disturbed areas, often reaching very high fuel loads in as little as one season. Guinea grass will outcompete native and desirable species and spread to new areas if burnt too regularly or in dry conditions.

To reduce the severity of wildfires and the threat they pose to life and property:

- Coordinate controlled burns with neighbours to manage fuel hazard and maintain a mosaic of different ages of vegetation in the landscape.
- Aim to burn 60 – 70% of a patch or property in a year. Remaining grassy patches can be reburnt or sprayed in protection zones post fire.
- Vary the timing and frequency of burning and burn with good soil moisture. Burning is generally not advised between August and October, unless after 50 mm or more rain with a high chance of follow up rain.
- Observe vegetation responses and fuel load accumulation and adapt management if needed.
- Construct and maintain strategic firebreaks in populated areas or 'hot spots', potentially across several properties.

Production

Burn season and frequency will vary depending on climatic conditions, grazing pressure, type of eucalypt community, and whether there is a grassy or dense shrub understorey. Varying the season, intensity and area burnt will create a mosaic of habitats, whereas too frequent fire (annual or every second year per patch) reduces understorey diversity and has serious impacts on soil health and long term sustainability.

A fire after 50mm or more of rain (or the first storms) every 3 – 5 years will maintain a good balance of trees and grass. This period should be longer in dryer, steeper, or heavily grazed country. A dense shrub layer or thicker regrowth may develop with longer intervals.

For effective control of woody regrowth and dense shrub undergrowth, fuel loads of at least 2.5 t/ha are required. Trees and shrubs below around two metres high will be suppressed with a moderate intensity fire. Control of regrowth greater than two metres will be difficult, as greater fuel loads are required and most eucalypts will resprout after fire.

Take care to protect adjacent rainforest and creek edges from hot fires. Igniting along rainforest edges and burning downhill will reduce fire intensity and protect fire-sensitive vegetation.

Country may need to be destocked prior to burning to allow fuels to accumulate. Wet season spelling after fire will promote native grasses and diversity in ground cover.

Conservation

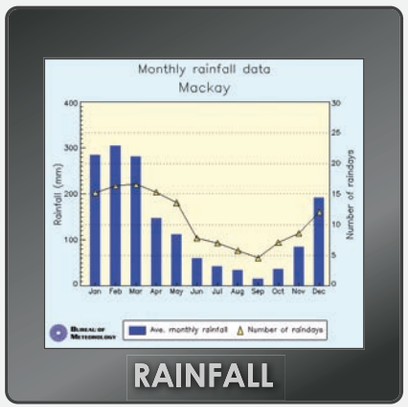
Planned burning in this landscape should aim to promote patchy fires to ensure a mosaic of different vegetation types and ages across the landscape. Woodlands are prone to widespread intense fires in the dry season – a key threat to biodiversity. Too regular fire leads to a loss of vegetation cover and directly threatens yellow-bellied glider (*Petaurus australis*), rufous owl (*Ninox rufa*) and glossy black-cockatoo (*Calyptorhynchus lathami*) habitat.

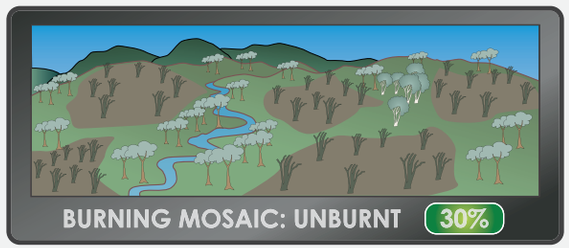
Rocky outcrops in the forest are essential habitat for the endangered northern quoll (*Dasyurus hallucatus*). Do not burn between mid September and mid December when juvenile quolls are most vulnerable to fire. In potential or known quoll habitat, small-scale patch burns of 17 ha or less are best. Burn with good soil moisture or just after the wet season when the ground, leaf litter, and vegetation are still very wet. Burn around every 3 – 5 years and leave some areas unburnt for seven years or longer, especially after a hot fire has occurred.

Controlling weeds (especially lantana), woody regrowth, and rainforest invasion is a major focus of planned burning in this landscape. Dense areas of lantana may require hotter fires to reduce infestations. Frost or herbicide before a burn can cure fuels and give better control.

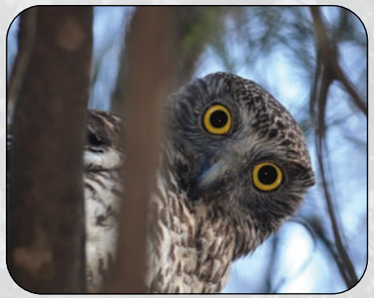
Woodlands and intervening grassy areas along drainage channels in the uplands

Blue gum and swamp mahogany grassy open woodlands on alluvial flats and associated grasslands in drainage lines on gently undulating upland areas.





Woodlands and intervening grassy areas along drainage channels in the uplands



Powerful owl (*Ninox strenua*).

Hazard reduction

Large areas of blue gum have been cleared, and many of the remaining areas are heavily grazed or logged and infested with weeds, including dense lantana.

These areas can be difficult to burn if sufficient ground layer fuels are not available due to grazing pressure or woody thickening.

Lantana infestations and areas dominated by invasive grasses can support very intense fires in dry years.

Surrounding fire-prone habitats should be managed to break up the country into a mosaic of vegetation ages to reduce widespread fires.

Grassy areas along drainage channels do not generally require fire. However, disturbance from feral pigs leading to greater weed pressures can alter fire regimes.

Production

A moderate intensity fire every 3 – 5 years will reduce woody regrowth and maintain open woodland canopy with a grassy understorey. Burn after rain or with good soil moisture to encourage rapid recovery of the ground layer.

Spelling country after fire or over the wet season will promote native grasses and canopy tree recruitment. Where possible, protect blue gum saplings from fire and stock until they are at least two metres high.

A moderate intensity, downhill fire in autumn may be effective for managing lantana. For dense areas, burn after frost when fuels are cured, or selectively spray prior to burning to increase the fuel load and ignition potential.

For control of woody regrowth, fuel loads of at least 1.5 – 2 t/ha are required. However, very dense tree and shrub growth can be difficult to burn if ground layer fuels have been shaded out.

Conservation

Very few intact stands of these grassy woodlands remain. The aim of good fire and grazing management is to maintain an open woodland structure, with some recruitment of blue gums into the canopy.

Blue gums grow into very large hollow-bearing trees that are vital habitat for species such as squirrel gliders (*Petaurus norfolcensis*), yellow-bellied gliders (*Petaurus australis*), powerful owls (*Ninox strenua*) and rufous owls (*Ninox rufa*). Burning practices should ensure the long-term protection and persistence of these larger trees in the landscape.

Take care when burning thin woody regrowth, as this can create hot fires and damage adjacent fire-sensitive areas.

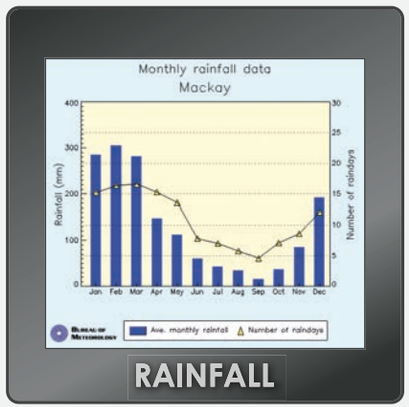
An indication of good fire management in this landscape is the presence of blue gum seedlings being recruited into the canopy. Seedlings are much smaller than coppice shoots of saplings, which are often multi-stemmed.

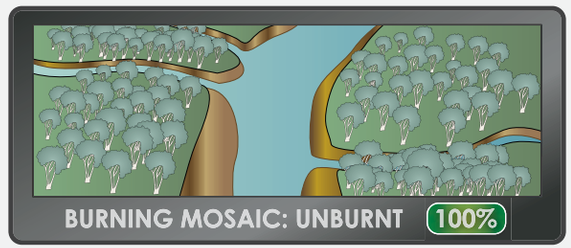
Regional Ecosystems

8.12.9 8.3.14

Rainforests and vine thickets

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





Rainforests and vine thickets

Hazard reduction

Rainforests generally will not burn. However, fire scorch of rainforest edges can encourage grassy fuels and lantana to build up.

Some lantana and grass burning may be needed along margins to gain initial control of weeds, but follow up control is essential to reduce fuel loads over time. Take care to ensure burning does not intrude into the rainforest and check that there is no scorching. Burn with no or very low wind in areas of high fuel load. Burning small patches is less hazardous than burning in a continuous line.

Use patchy, protective burns in the areas adjacent to rainforests to create a mosaic of burnt and unburnt areas. This will break up the fire front in a wildfire and reduce rainforest loss. Ignite from rainforest edges at the top of ridges and allow fire to burn downhill to reduce fire intensity.

Production

As rainforest supports little to no grassy understorey, there is no viable grazing production. Disturbance facilitates weed invasion, so it is preferable to restrict stock access.

Lack of fire allows rainforest species to spread out into adjacent areas of open forest and woodland. Burn surrounding fire-prone communities to maintain species and canopy composition and an open understorey to reduce rainforest invasion.

Where possible, keep the forest edge weed and grass free with herbicide, and facilitate natural regeneration to increase rainforest edge where desired.

Conservation

Rainforest edges provide persistent, effective firebreaks, and are highly valued in wildfire situations. It is important to burn surrounding fire-prone landscapes in a patchy mosaic to break up fuels and the wildfire front to protect rainforest.

When burning edges for weed control, ensure sufficient soil moisture is present and allow for follow up control. Avoid exposing rainforests to fire when conditions are hot and dry, as this can cause further weed infestations, increasing fire risk and reducing the integrity of rainforest edges.

Many rare and threatened plant species exist on rainforest edges, and many are susceptible to repeated fires.

Feral pigs cause damage to the soil surface and encourage the spread of weeds, including invasive grasses and lantana.

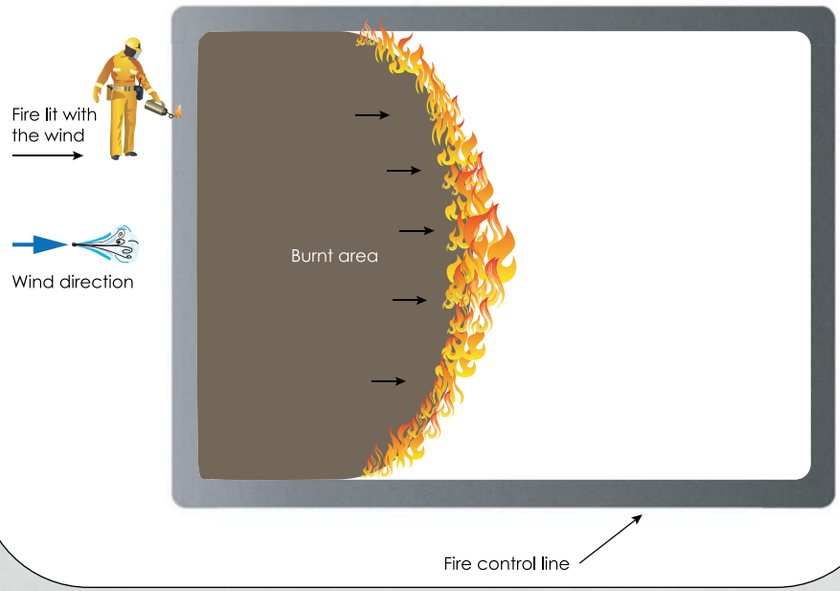
Regional Ecosystems

8.12.1	8.12.2	8.12.3
8.11.2	8.12.11	8.12.16
8.12.17	8.12.18	8.12.19
8.12.28	8.12.30	8.3.9
8.3.10	8.2.5	8.8.1

Fire diagrams

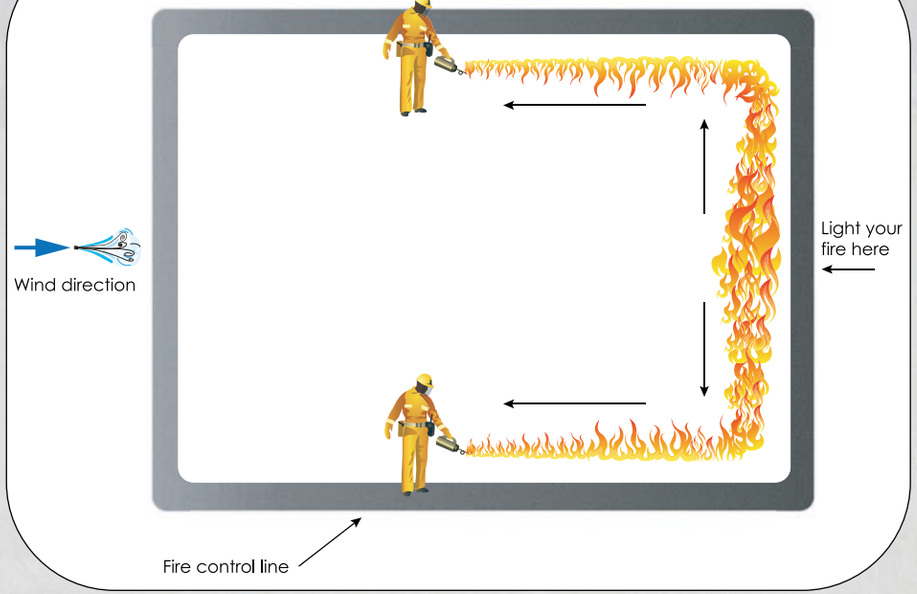
The following fire diagrams are provided to illustrate some ignition techniques for fire practitioners who are experienced in the lighting and use of fire. There are many variables that need to be considered prior to lighting a fire, including temperature, humidity, wind speed and direction, fuel type, 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



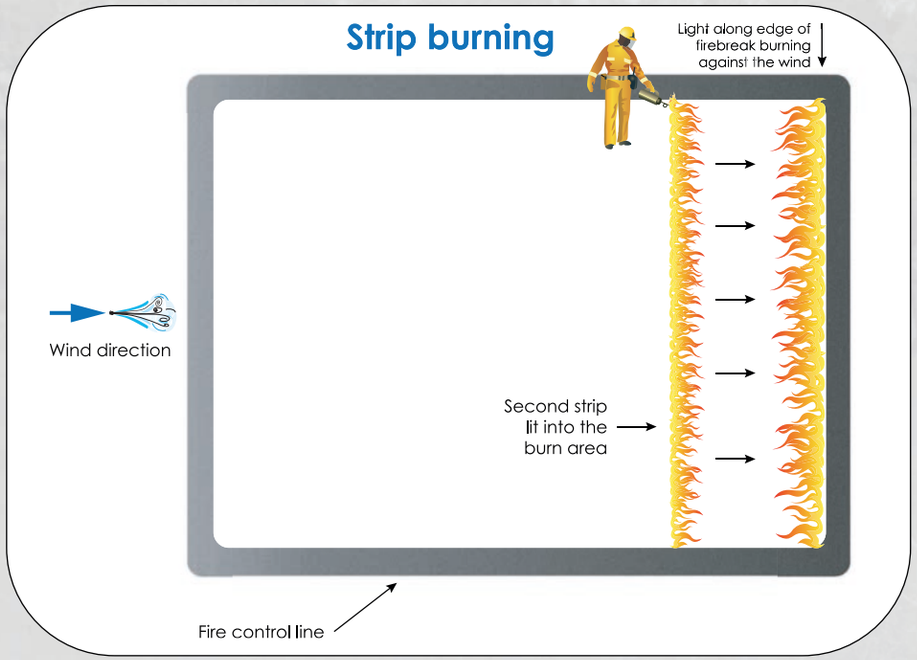
Forward burning can be used early in the season when conditions are still mild. A forward fire (lit with the wind) will move quickly over old grasses, removing only the dead material on the downwind side. A forward fire is also useful after storms to remove old dead material in damp conditions. The fire 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



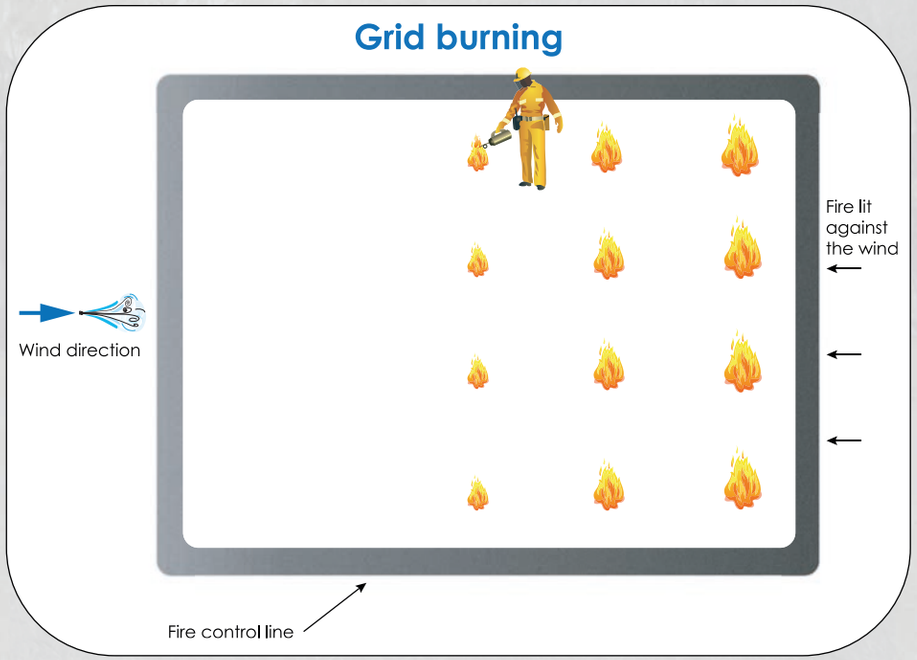
To secure a safe edge to a burn and/or to provide a slow-moving fire with maximum heat at the stem for killing woody weeds. The diagram shows the sides of the fire being brought down slowly to contain the fire.

Strip burning



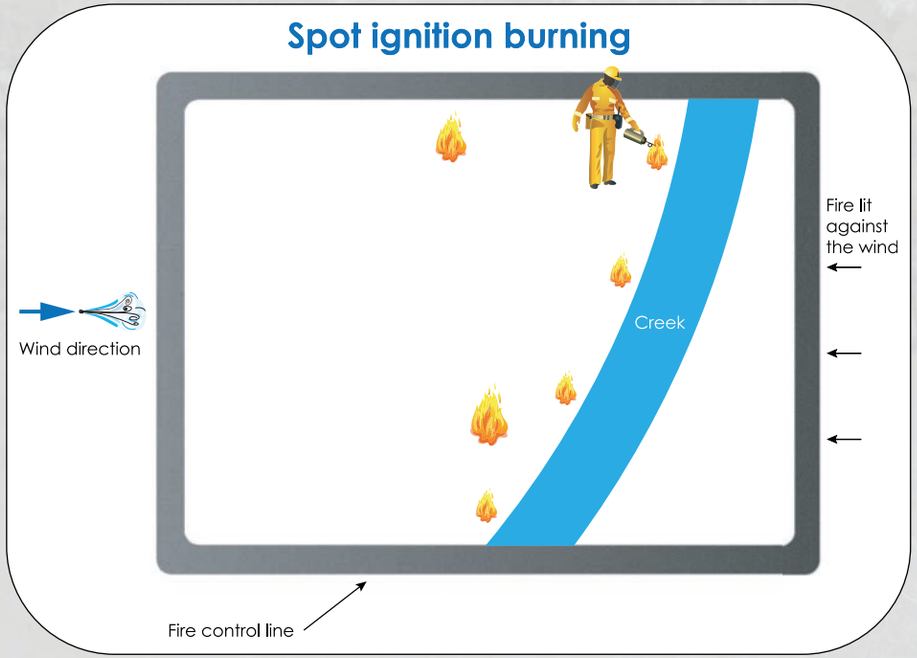
Strip burning is used to remove the fuel faster than a back burn would. It provides the advantage of the forward fire's heat and control by the backing fire being in front of the forward fire. This technique is useful in old slashed areas, cane trash, and areas with variable fuels where a backing fire 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
REEF CATCHMENTS