BRIGALOW BELT (NORTH)

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

The Brigalow Belt (North) sits within two Natural Resource Management (NRM) group regions: Fitzroy Basin Association in the south and NQ Dry Tropics in the north. These peak environmental groups work with communities to achieve sustainable outcomes for resources and conservation. For more information visit fba.org.au or www.nqdrytropics.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 Brigalow Belt (North) 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 Brigalow Belt (North) region. Information about why and how to burn is presented for the 21 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.

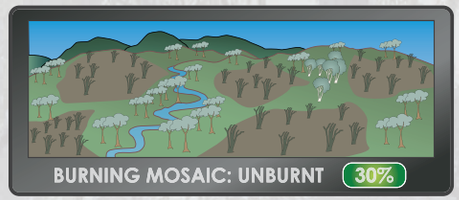
HIGH intensity fire has a flame height of typically > 3 m in height, with a fire front moving faster than walking speed.

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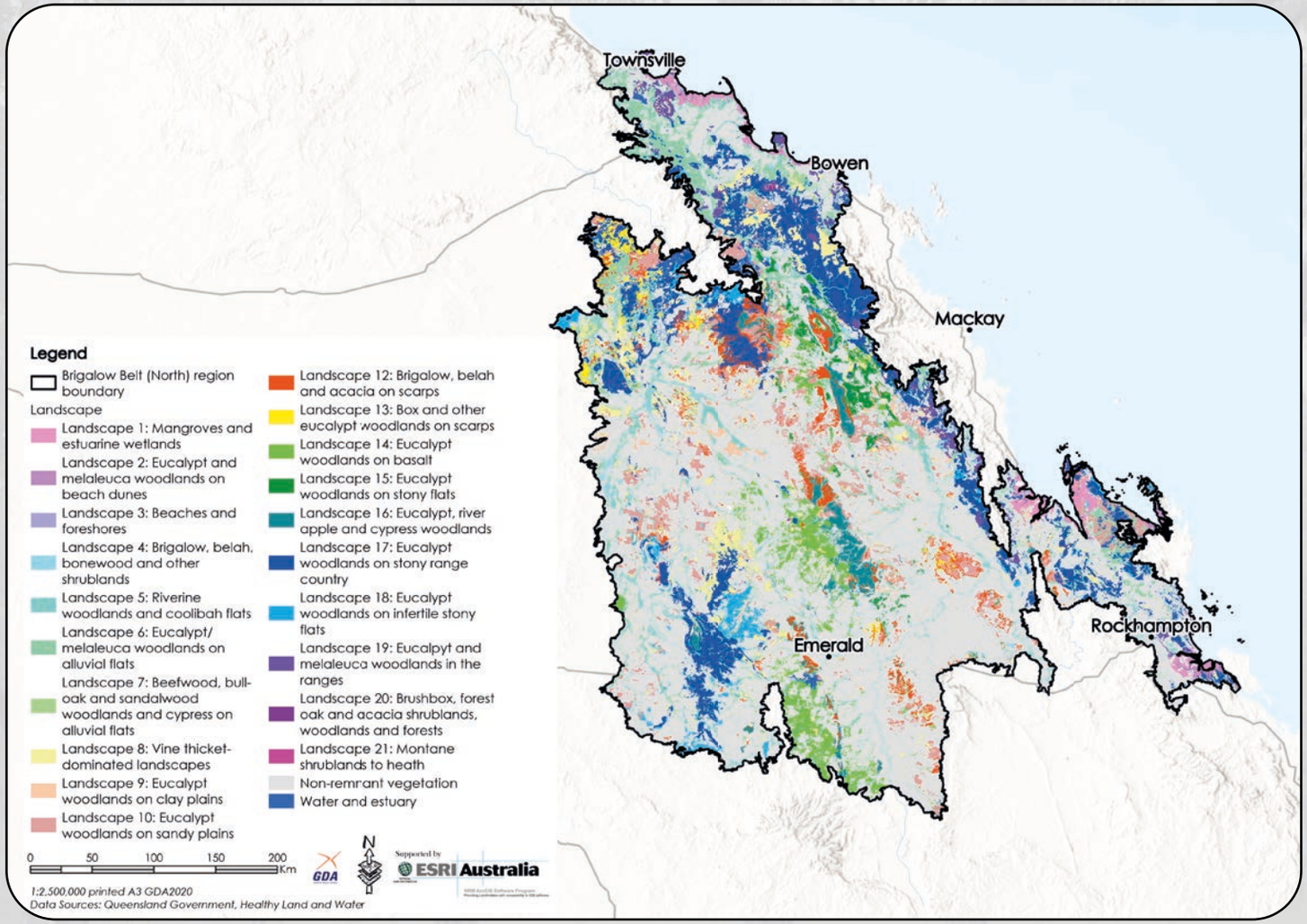
Thank you to the review team: Dr Paul Williams (Vegetation Management Science), Kira Andrews (Reef Catchments), Neil Kelso (QFES) and Dr Diana Virkki (Healthy Land & Water).

Vegetation groups of the Brigalow Belt (North)

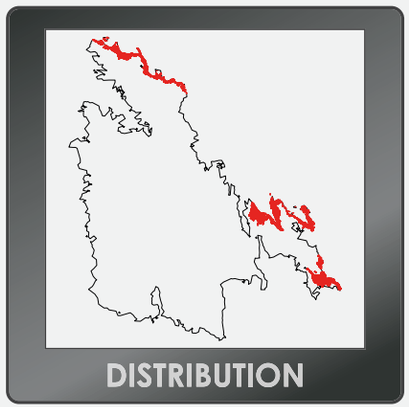


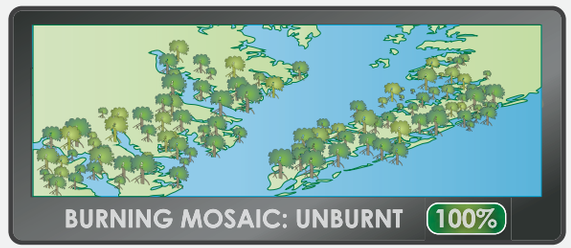
Mangroves and estuarine wetlands

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*).

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

Regional Ecosystems

11.1.1 11.1.2 11.1.3 11.1.4

Hazard reduction

Mangroves, adjacent saltwater grassland and saltmarsh are reguarly 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.

The fringes of these areas can become infested with exotic species (such as Guinea grass) that can develop high fuel loads between mangroves and other coastal vegetation.

There may be a need to reduce grassy fuels to prevent fire movement along these margins. However, this is best done by means other than fire (e.g. glyphosate herbicide) as some exotic grasses are promoted by fire and can build significant amounts of fuel in a single growing season.

In these cases, fuel reduction burning would likely need to be done every year to reduce risk, placing a significant burden on the land manager. Burning fire-adapted species (e.g. Guinea grass) can make the fire hazard worse and lead to severe damage to mangroves and adjacent coastal vegetation.

Production

Mangroves are well-known habitat and nurseries for fish and crustaceans. Saltwater grassland and saltmarsh are critical feeding areas for many of these species during high tide periods. A decrease in pasture biomass through fire or overgrazing will reduce the habitat value and fisheries production of these areas.

Saltwater couch is high in protein, digestible, and can be highly productive. If grazing, take care to manage stock during high tide periods, as the wet soil is easily rutted. This can result in higher salt retention and eventual scalding, leading to increased areas of bare soil and limiting the production value for both fisheries and stock.

Conservation

These wetlands are important for the conservation of many species, including migratory birds and the threatened water mouse (*Xeromys myoides*). Careful management of the land to maintain production values will also retain conservation values and benefit these species.

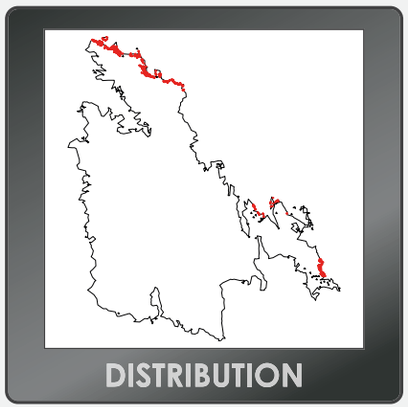
Maintaining the health of these wetlands by managing grazing and avoiding fire will also support their role in filtering excess nutrients and sediment from runoff. This helps to protect coastal fringing reefs, seagrass beds and the wildlife that depend upon them.

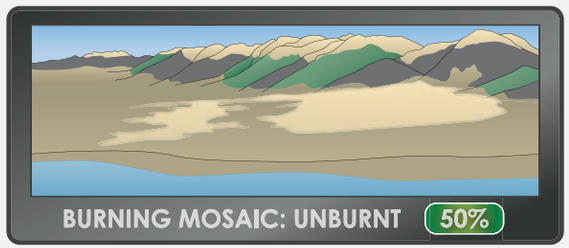
Eucalypt and melaleuca woodlands on beach dunes

Landscape 2

including associated wetlands in dune swales

Woodlands of Moreton Bay ash, poplar gum, paper bark and Queensland peppermint, with wattles, weeping tea tree and coastal banksias as a shrubby understorey and/or sedges and grasslands on coastal dunes.





Eucalypt and melaleuca woodlands on beach dunes

Landscape 2

including associated wetlands in dune swales

Hazard reduction

Vegetation on the back of beach dunes can pose a threat to people and adjacent infrastructure. Some fuel reduction will likely be required, especially where there is buildup of exotic grasses, such as Guinea grass.

A low intensity fire with good soil moisture (e.g. shortly after a storm) followed by patch herbicide spraying of the recovering exotic grass tussocks should provide good results. **Planned burning should not be any more frequent than every three years**.

Generally, native grasses do not accumulate large amounts of fuel compared to exotics, so control of weed grasses will reduce the need for hazard reduction burning and minimise long-term management costs.

Wetlands and swamps may be used as firebreaks while holding water, as they will retain green vegetation even when the surrounding areas become flammable.

Production

Clearing and introduction of exotic pasture species, combined with the impacts of stock, can severely damage fragile dune systems. Generally, these areas do not support productive pastures, and grazing pressure promote exotic weeds that spread into more valuable nearby grazing lands.

If weeds such as rubber vine are present in significant densities, fire can be used to gain initial control. Rubber vine seed, seedlings and young plants are fire sensitive, and larger plants are reduced in size by fire, allowing more efficient and cost-effective follow up chemical control.

The longer the stems are heated by fire, the better – use a moderate intensity backing fire and burn with good soil moisture for best results.

Conservation

In general, fire should only be applied for regeneration of native grasses, herbs and canopy trees, weed control, and fuel hazard management. Vegetation responses should be carefully monitored.

Some areas contain a native grass layer (typically kangaroo grass) and regular low intensity fires will benefit this species.

Coastal landscapes support a diverse range of plants and animals and some habitats are vulnerable to disturbance. Fires should be low intensity and create a good mosaic. **Fire should not be used more than once every five years**. Generally, native wetland vegetation will not promote a high intensity fire.

Fire can be used to gain initial control of weeds to prevent vegetation thickening and manage rainforest invasion into woodlands. Burn as soon as fire will carry after 30 – 50 mm of rainfall for effective control of most woody weeds.

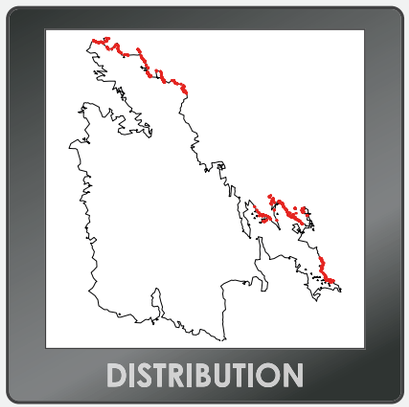
Disturbance of these habitats is caused by 4WD tracks, stock trampling and feral pigs. This activity allows exotic species to infiltrate the landscape, resulting in higher fuel loads and increased fire risk. Reducing disturbance is a cost-effective way to minimise fuel hazard.

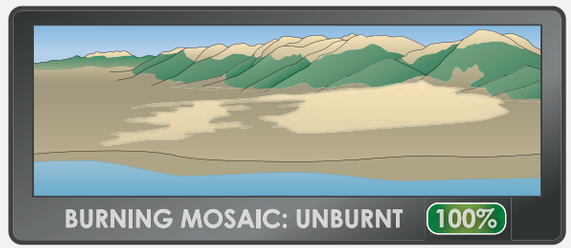
Regional Ecosystems

11.2.1 11.2.5 11.2.4

Beaches and foreshores

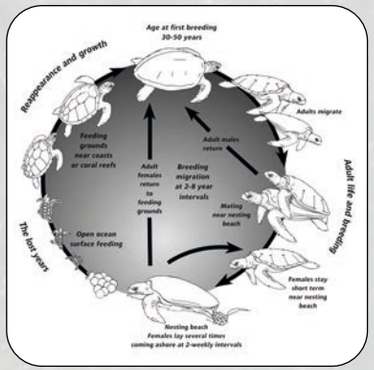
including ‘beach scrub’





Beaches and foreshores

including ‘beach scrub’



Turtle life cycle.

Rose-crowned fruit dove (*Ptilinopus regina*).

Regional Ecosystems

11.2.2 11.2.3

Hazard reduction

Coastal dunes are poor in nutrients, high in salt and exposed to other marine influences (such as tidal and wave pressures). They rarely accumulate sufficient fuel to support anything but a low intensity fire. Fuel reduction burns are better conducted within adjacent eucalypt and melaleuca woodlands.

In some cases, exotic grasses and weeds can significantly increase fuel loads. Control of these invasive species is best done by herbicide, as even very low intensity fire kills fire-sensitive canopy trees such as beach she-oaks.

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

Production

These areas have no production value and disturbance from grazing can lead to infestation of woody weeds, such as rubber vine.

Conservation

Beach scrub vegetation has high conservation value due to the diversity of species it supports. It provides habitat for a large number of iconic and threatened species such as northern quolls (*Dasyurus hallucatus*), rose-crowned fruit doves (*Ptilinopus regina*), and other fruit-eating pigeons.

If undisturbed, beach scrub is naturally resilient to weeds. However, this vegetation is fire-sensitive and even low intensity fire will damage its margins and result in weed invasion. **All practical efforts should be made to keep fire away from these areas**.

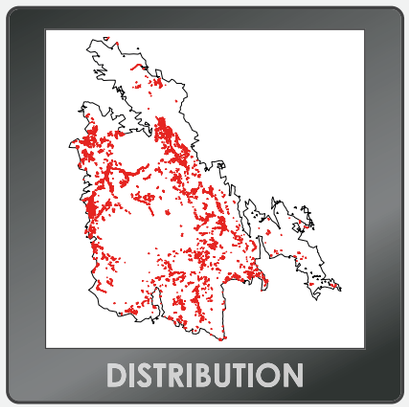
Open beach foreshore vegetation is particularly important because it helps stabilise beach fronts, which are critical nesting habitat for marine turtles. These areas should not be burnt.

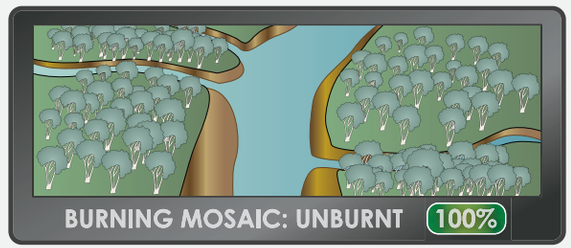
Northern quoll (*Dasyurus hallucatus*).

Brigalow, belah, bonewood and other shrublands

Landscape 4

including alluvial and stony flats and associated vine thickets





Brigalow, belah, bonewood and other shrublands

Landscape 4

including alluvial and stony flats and associated vine thickets

Hazard reduction

Brigalow, belah, bonewood and the associated vine thicket species in this landscape do not present a fire threat because they do not develop a significant fuel load.

Late dry season wildfires, especially in drier years, can damage this vegetation. Protection of these fire-sensitive communities requires fuel reduction burning in the adjacent eucalypt communities.

Burn only when soil moisture is high. Use natural features or wind direction to burn away from the edge of the brigalow, belah, bonewood and vine thickets to ensure minimal damage from planned fires. Create a mosaic fire pattern as the adjacent country dries out to improve protection from late season wildfires and retain patches of pasture for grazing.

Production

These vegetation communities offer little production value. They generally have a sparse ground cover and provide minimal pasture for grazing. In heavier black soils, this landscape can provide some native pasture growth and may be useful as shade areas.

Brigalow and belah return nitrogen to soil and some regrowth is often retained to help soils recover their nutrient status. Vine thickets offer no production value but have high conservation value.

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 and 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 intensity fires. High intensity fires will kill the entire plant.

Vine thickets within this landscape include areas of significant ecological value. These areas may contain trees such as the bottle tree and other scrub species that are susceptible to even low intensity fire. Fires impacting these areas open the canopy and allow grasses such as Guinea grass or buffel grass to invade, making them more susceptible to future fires. Protection burns should be undertaken in the adjacent fire-adapted vegetation.

The boundary between the fire-sensitive and fire-adapted community is transitional, so an occasional fire that burns the edge of this landscape is acceptable.

Where lantana occurs adjacent to vine thickets and is repeatedly impacted by high intensity fire, it can cause these communities to shrink to the point where they no longer exist. Take care when burning lantana adjacent to vine thickets and avoid if possible.

Regional Ecosystems

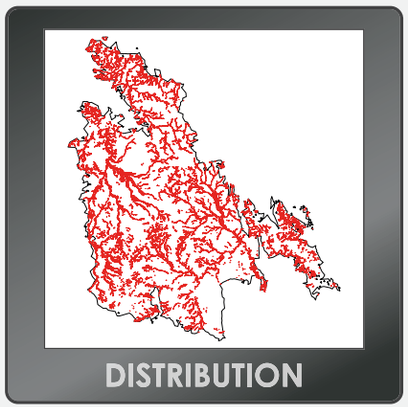
11.3.1	11.3.5	11.3.8
11.3.11	11.3.34	11.3.17
11.9.1	11.9.4	11.9.5
11.9.8	11.9.10	

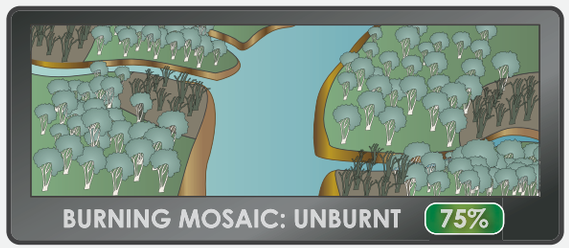
Riverine woodlands and coolibah flats

including freshwater wetlands

Landscape 5

Woodlands of coolibah, blue gum and river red gum with a shrubby understorey to grasslands.





Riverine woodlands and coolibah flats

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

11.3.3 11.3.25 11.3.37
11.3.27

Hazard reduction

This is an important landscape for using planned burns to broaden the firebreak potential of watercourses. However, the vegetation within and immediately adjacent to a watercourse (e.g. river red gum) must be protected from intense fires.

Hazard reduction burning should begin as soon as the country will carry a fire after the wet season or the first storm. These alluvial flats can be one of the first landscapes to ignite at the start of each fire season.

Progressive burning as the grasses cure creates 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 because it will form a 'green break' that 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 breaks that can be used later. Storm burning along access tracks will help pastures compete with invasive species, 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. The fire frequency should usually be within 3 – 5 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 avoid late dry season burning**.

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

Planned burning should focus on the vegetation away from watercourses. Burn the adjacent alluvial eucalypt woodlands from riparian edges, so that only small fires of low intensity enter the riparian zone. Aim to promote patchy fires to ensure a broad range of understorey species and habitat conditions (i.e. post-fire ages) in the landscape. Ideally, vegetation within and directly adjacent to riverine channels should not be burnt. Burning with good soil moisture will protect large trees from damage.

Avoid burning the balance of this landscape for about three years after a major flood. Flooding produces a similar disturbance to burning by providing a seed bed and reducing fuel loads. Excluding fire after flooding enables recruitment and allows the smaller flood debris to mulch down, which reduces overall fuel loads.

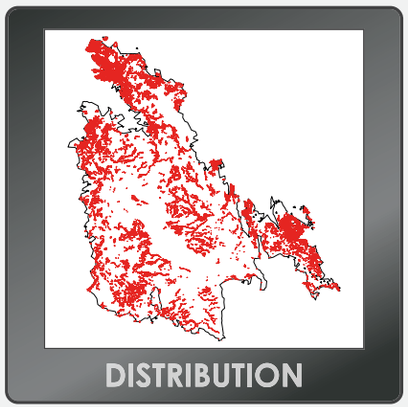
A good indicator of fire frequency is when the saplings recruited from the previous fire or flood are large enough to regrow from their tops after a fire of low to moderate intensity. This landscape should always be burnt with good soil moisture to minimise the loss of habitats such as tree hollows and fallen logs. Remove any accumulated flood debris from around old trees to reduce fuel load and protect these habitats.

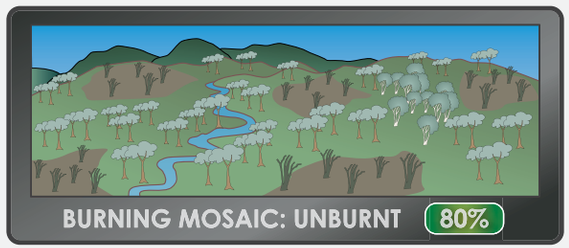
Eucalypt/melaleuca woodlands on alluvial flats

including grassy flats

Landscape 6

Variable woodlands to grassy woodlands with poplar box, bloodwood, blue gum, or broad-leaved tea tree. Native grasses are predominately blue grass or Mitchell grass.

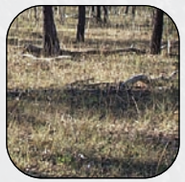




Eucalypt/melaleuca woodlands on alluvial flats

Landscape 6

including grassy flats



1 t/ha

2 t/ha

3 t/ha

4 t/ha

Regional Ecosystems

11.3.2	11.3.4	11.3.7
11.3.9	11.3.10	11.3.12
11.3.26	11.3.29	11.3.30
11.3.35	11.3.36	11.3.6
11.3.19	11.3.38	11.3.39
11.3.21	11.3.31	

Hazard reduction

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

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

Topography and prevailing winds can be used for smaller burns over several months within the secured boundaries. Aim to burn no more than 20% 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 fire frequency is directly related to grazing pressure. A moderate intensity fire every 3 – 5 years will promote a good balance of trees and grass in more heavily grazed areas. Destocking for a period before planned burning will help to increase fuel loads to achieve the intensity needed to kill tree suckers.

Lighter grazed areas benefit from a low to moderate intensity fire every 2 – 4 years to remove old grass. Restrict post-fire grazing when grasses are in the early stage of growth to achieve pasture vigour.

In this landscape, soil moisture is a critical factor for planned burning. Early dry or storm season burns will give the best results. Burning during the dry season will harm the soil by removing the mulch layer and grass seed store.

Vegetation can thicken or lantana can increase in heavily grazed areas that are not burned periodically. Fuel loads of 2 t/ha or greater may be needed to achieve a hotter fire for control of woody regrowth and dense weed infestations. It is difficult to control tree thickening by fire once regrowth is above flame height.

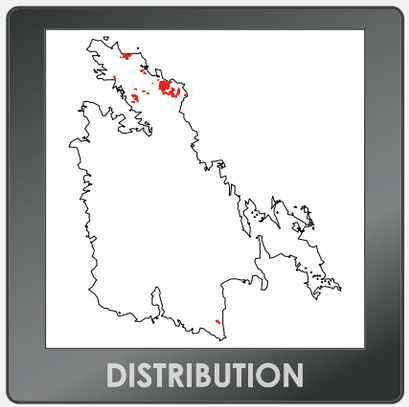
Conservation

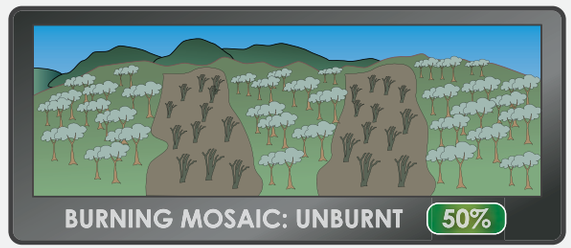
Controlling weeds and woody regrowth is important to maintain natural grasslands and a major focus of planned burning in this landscape. Small-scale patchy burns as the country dries out give a good variation in fire intensity and time since last burn. Identifying and retaining habitat trees, such as mature blue gums, will help conserve significant species (e.g. gliders) and provide seed trees for future regeneration.

Burn only when there is good soil moisture and aim to vary the time of burning from the early dry season 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.

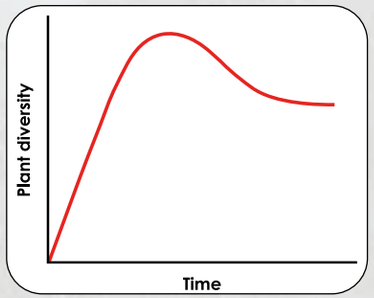
Beefwood, bull-oak and sandalwood woodlands and cypress on alluvial flats

Beefwood, bull-oak, sandalwood woodlands and cypress on alluvial flats.





Beefwood, bull-oak and sandalwood woodlands and cypress on alluvial flats



Plant diversity over time.

Glossy black-cockatoo (*Calyptorhynchus lathami*).

Regional Ecosystems

11.3.13 11.3.32 11.3.33
11.3.18

Hazard reduction

This vegetation type generally has a very sparse ground layer – except where exotic grasses have established. The canopy trees do not shed much leaf litter, so there is little buildup of fuel.

In this landscape, established exotic grass increases the fuel load exponentially and creates a fire intensity that can damage mature trees. Areas of exotic grasses should be burnt as soon after the wet season as a fire will carry.

The aim of hazard reduction in this landscape is to vary the time since last fire to protect vegetation and adjacent fire-sensitive communities from wildfire. **However, fire should not be used more than twice in a ten year period**. Fire-adapted eucalypt communities adjacent to this landscape should be included in broadscale protection burns.

Production

This landscape has been extensively cleared for agriculture and grazing. Fire is generally used for removing old grass, and is therefore best applied when soil moisture is high so that grasses can recover quickly. Burn after spring storms (when follow up rain is expected) or in the early dry season.

As this landscape has significant areas of introduced grasses (particularly buffel grass), the burn season should reflect the pasture characteristics. A low to moderate intensity fire with good soil moisture should provide a rapid response from pasture grasses and reduce woody weed invasion.

Conservation

Where practical, remove established exotic grasses before burning, as these fuels can generate enough heat to kill mature trees. Patchy, low intensity mosaic burns early in the dry season can provide protection from later wildfires. High intensity fire will kill parent trees in bull-oak stands. A low intensity fire several years later may be needed to reduce stem density.

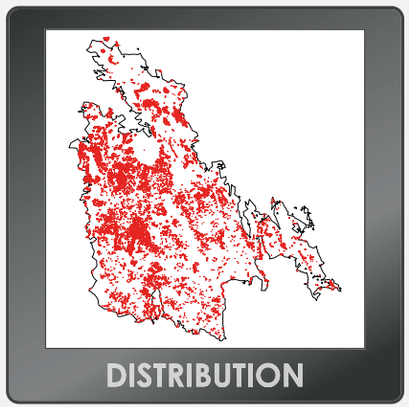
Bull-oak is an important food source for glossy black-cockatoos (*Calyptorhynchus lathami*), who tend to return to certain trees and stands rather than feeding across all available resources. It is important to burn with good soil moisture to retain these large trees.

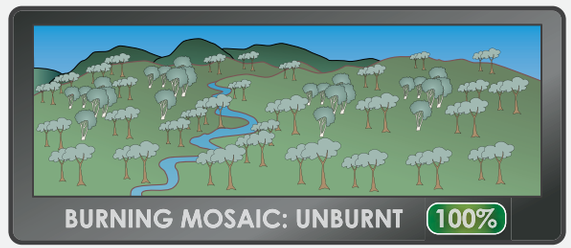
In areas bounded by Millmerran, Cecil Plains, Goondiwindi and Leyburn, a rare species of butterfly – the bull-oak jewel butterfly (*Hypochrysops piceatus*) – inhabits old-aged stands of bull-oak in association with the *Anonychomyrma inclinata* ant. The butterfly larvae shelter in the daytime in holes formed by the Xyloryctid moth larvae, and feed at night in the fresh upper branches of the bull-oak tree. The ant provides protection for the larvae from wasps and spiders in return for nutritious secretions produced by glands on the larvae's back. Low intensity fires remove the leaf litter crucial for these ants and can damage their nests. Moderate or high intensity fires will kill the adult trees and remove the butterfly altogether.

Road reserves and any common land with mature bull-oak stands should be checked for bull-oak jewel butterfly habitat before any planned burns.

Vine thicket-dominated landscapes

Vine thicket, blackwood, gidgee, brigalow and belah scrubby woodlands to open forest on clay plains. Vine thickets on basalt. Vine thickets, brigalow, belah, cyprus pine and bull-oak on sandy plains. Vine thickets, brigalow, acacia scrubs, and very shrubby eucalypt woodlands on stony soils, usually in range country and hills. Vine thicket, hoop pine and brigalow or other acacia.





Vine thicket-dominated landscapes

Bottle tree with recovering scrubs.

Edge of brigalow scrub showing dead trees from fire damage.

Regional Ecosystems

11.4.1	11.4.5	11.4.6
11.4.7	11.4.8	11.4.9
11.4.3	11.8.3	11.8.13
11.8.6	11.8.7	11.5.15
11.5.16	11.5.1	11.11.1
11.11.2	11.11.5	11.11.13
11.11.16	11.11.18	11.11.18
11.11.21	11.11.14	11.12.4
11.12.7	11.12.12	

Hazard reduction

Vine thickets in the southern Brigalow Belt rarely pose a wildfire threat and are often useful as 'green breaks' that disrupt the passage of fire. Many of the species are fire intolerant, and a naturally sparse ground layer results in little fuel development to support fire.

However, introduced species (such as grasses) can build up an unnaturally high fuel load, particularly on vine thicket boundaries. Lantana also tends to develop along boundary areas, where light levels are higher. The use of fire to reduce grass fuels and lantana will generally kill vine thicket species, resulting in a more open canopy and a subsequent expansion of these introduced species.

If vine thickets are going to be used as 'green breaks', protect them by lighting against the vine thicket rather than pushing a fire up into it.

Production

Generally, this landscape provides a very sparse pasture and is of little to no use in production.

Conservation

Vine thickets within this landscape type contain areas of significant ecological value. Vine thickets and many of the species associated with them are extremely fire sensitive. These areas may contain trees such as the bottle tree, ooline and other scrub species that are susceptible to even low intensity fire.

Vine thickets and scrubs have good nutrient cycles with a well-established mulch layer and seed bed. The black-breasted button quail (*Turnix melanogaster*) rely on this leaf litter to forage for invertebrates for their food. Even a low intensity fire trickling into the scrub edge will cause loss of leaf litter and death to the edge trees. A reduction in the area of vine thickets and scrubs reduces the habitat of the black-breasted button quail.

Fires in these areas open the canopy and allow grasses (such as buffel grass) to invade, making them more susceptible to future fires. This damaging cycle of exotic grass invasion, followed by fire, followed by further grass invasion, requires intervention. Burn away from the edges of vine thickets into adjacent eucalypt woodlands while there is good soil moisture.

Grazing is an effective way to reduce exotic grass abundance. Graze along the edge of vine thickets and adjacent landscapes to control species such as buffel grass. After grazing, maintain the edges with herbicide and promote natural regeneration for vine thickets where desired. Use protection burns in the adjacent fire-adapted vegetation, taking care to direct fire away from the edges rather than letting it burn up into the scrub.

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

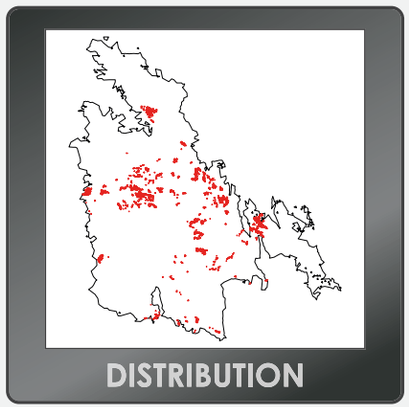
Black-breasted button quail chicks (© Luke Hogan, Queensland Herbarium).

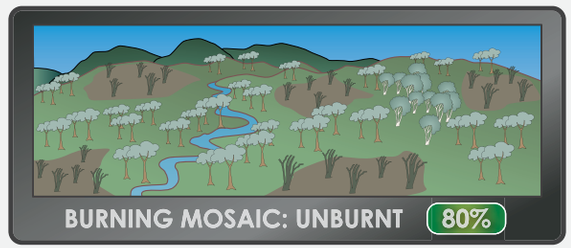
Eucalypt woodlands on clay plains

including grassland on clay plains

Landscape 9

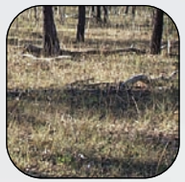
Grassy woodlands of coolibah or blue gum, with isolated clumps of brigalow. Native grasses are mainly blue grass or Mitchell grass.





Eucalypt woodlands on clay plains

including grassland on clay plains


1 t/ha


2 t/ha


3 t/ha


4 t/ha

Regional Ecosystems

11.4.2 11.4.13 11.4.4
11.4.11

Hazard reduction

The main aim for hazard reduction in this landscape is to provide a patchy mosaic of fuel loads that will offer some protection against spread of late season wildfire.

Eucalypt woodlands and grasslands on clay plains tend to retain soil moisture later into the dry season than the surrounding vegetation on sand or alluvium. This means that these areas can contain planned burns later into the dry season than adjacent landscapes. However, grasses can cure rapidly (particularly if they are frosted) and thus fire intensity and risk will develop quickly as the dry season progresses.

In this landscape, hazard reduction burns should begin as soon as fire will carry and with some soil moisture to allow native grasses and herbs to recolonise burnt areas quickly.

The organic layer is an important component of a soil profile. It is imperative to consider this 'earth' layer when planning burns. Burning with good soil moisture either after the wet season or spring storms will protect the soil and seed bank for grasses, forbs and shrubs.

Production

As heavy clay soils retain moisture longer than many other soil types, pastures on these soils offer good quality grazing later in the dry season.

The soils are often self-mulching – as the clay dries, it shrinks, forming cracks in the soil surface, allowing organic matter to fall in. On re-wetting, the clay expands and cracks close, and over time the trapped organic matter enriches the soil. Too frequent fires disrupt this process and can lower soil fertility.

In the woodlands, a fire every 4 – 5 years is suitable for production areas. Aim to burn no more than 30% of a given paddock each time. In the grasslands, a shorter fire frequency of 3 – 4 years is acceptable. **Fires should be planned for the earlier part of the dry season**. An occasional storm burn may be useful for controlling thickening by cypress and belah where it occurs. Fires should be started against fire-sensitive vegetation to reduce scorching.

Conservation

Burn when there is good soil moisture to promote rapid grass regrowth and help retain important habitat features, such as fallen logs and hollow-bearing trees. Fire is an important tool for preventing cypress, brigalow or belah communities from expanding into eucalypt woodlands and grasslands. Storm burns with a moderate intensity will help to remove this encroachment.

Aim to burn no more than 20% of the area in any one year, but retain some unburnt sections for up to around seven years. These long unburnt areas are important for a range of reptiles and mammals that also rely upon the late dry season capacity of the clay plains.

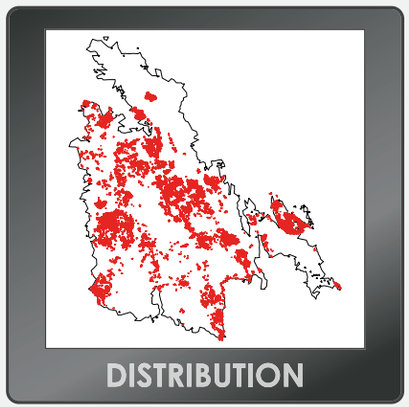
A hot fire may be required for canopy recruitment every third to fourth burn over a timeline of 20 – 25 years.

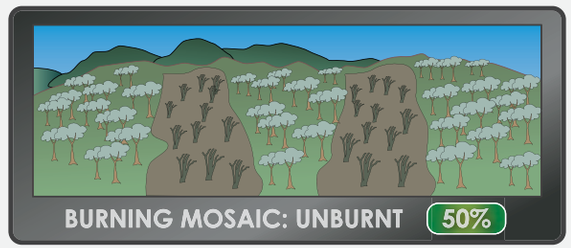
Eucalypt woodlands on sandy plains

Landscape 10

including woodlands on lower slopes and associated melaleuca woodlands

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

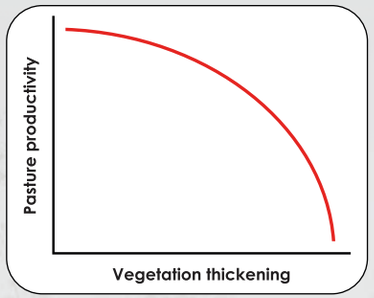




Eucalypt woodlands on sandy plains

Landscape 10

including woodlands on lower slopes and associated melaleuca woodlands



Vegetation thickening vs. pasture productivity.

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

Regional Ecosystems

11.5.3	11.5.9	11.5.10
11.5.12	11.5.17	11.5.2
11.5.5	11.5.8	11.5.20

Hazard reduction

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

Burn about 30 – 40% of the total area to break up continuous fuel levels and help 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 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, softwood scrub species may have encroached. In these instances, reduce grazing to build a suitable fuel load of around 2 t/ha that will 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 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

Management of these woodlands for conservation purposes may require establishing cover of both grassy and shrubby habitats. Areas with a shrubby understorey will need more unburnt patches than grassy areas to allow for the survival of some mature shrubs.

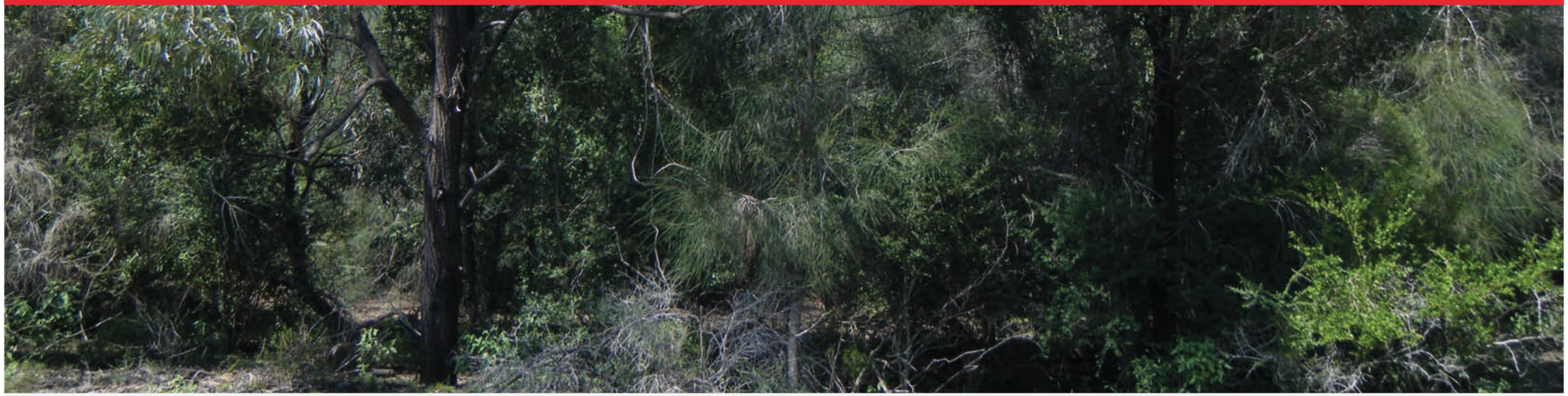
This landscape is important habitat for squatter pigeons (*Geophaps scripta*), which prefer a longer undisturbed ground layer for nesting. They feed on a range of grass seeds, legumes, herbs, insects and occasionally fallen acacia seeds.

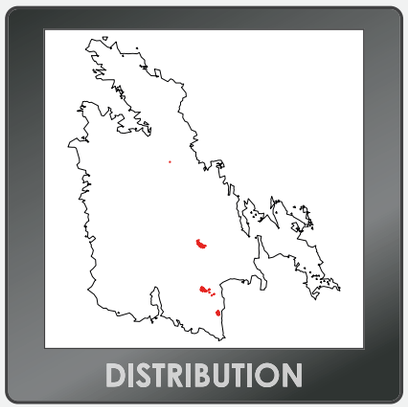
Within this landscape, a range of fires with varying intensity and size – resulting in a variety of vegetation ages or time since fire – will most benefit the squatter pigeon. This will help maintain a mix of areas that range from grassy to a dense shrub understorey. The presence of these pigeons in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

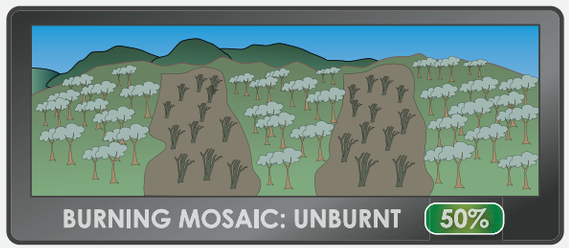
Some soil moisture is crucial for planned burning to allow quick recovery of grasses and avoid excessive loss of habitat features, such as hollow-bearing trees and fallen logs.

Heath on sandy plains

Landscape 11







Heath on sandy plains

Hazard reduction

This landscape occurs in relatively very small patches in the areas around Dysart, Middlemount, Mt Coolon and Comet. It is unlikely to be a fire hazard due to the slow accumulation of fuel. However, it may be burnt with neighbouring vegetation types if hazard reduction is required.

Production

This landscape has limited use for grazing or horticulture due to poor soil fertility and a high gravel content. In pastoral areas, slender wattle can sucker and thicken significantly after mechanical clearing or fire, reducing grasses to the point where stocking rates must be reduced.

Conservation

This landscape may occur as patches of sparse vegetation with a grassy understorey through to a dense thicket. While fire is required for regeneration, plants take at least 5 – 6 years to mature. Adult plants begin to wither at around 10 – 15 years.

As fuel buildup is generally low, a fire frequency less than the rate of tree maturity is rare. The plant diversity of heath decreases over time, and this can be used to indicate fire frequency.

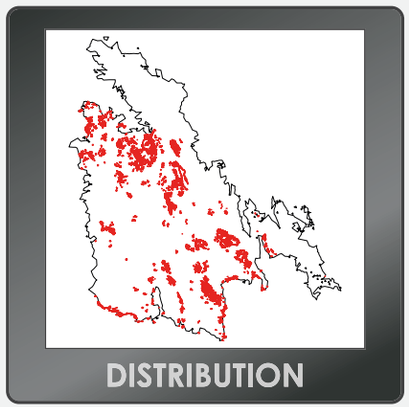
This landscape generally burns in association with surrounding vegetation types. Most occurrences of this vegetation are naturally small and thus difficult to break up into a mosaic. Aim for 50% unburnt to provide some variation in the age of the stand.

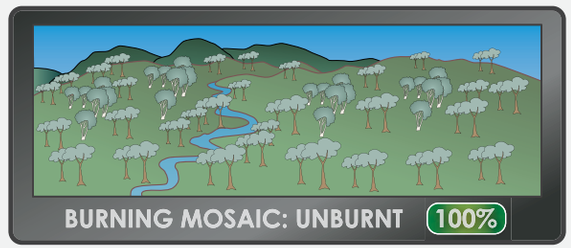
Regional Ecosystems

11.5.18

Brigalow, belah and acacia on scarps

Brigalow, belah and acacia on scarps. Lancewood, vine thickets and acacia scrubs on crests and scarps.





Brigalow, belah and acacia on scarps

Hazard reduction

This landscape generally does not accumulate significant fuel and will rarely support a fire. In many cases, this landscape can be used as a natural firebreak to restrict the spread of fire.

This landscape is fire sensitive and fuel reduction burning in adjacent areas should avoid scorching along margins.

Production

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

Conservation

This landscape is fire sensitive and should be excluded from planned burning. The margins must be protected from fire wherever practical. Where lancewood is present, ensure the landscape is protected from fire for at least 20 years. More frequent fire events will cause dieback of lancewood and contraction of this vegetation type.

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

Shrublands of acacias developing on natural scalds (that may also include hakea species) can tolerate fires every 6 – 10 years . However, there is no need for active burning as they will generally burn in association with surrounding landscapes.

Regional Ecosystems

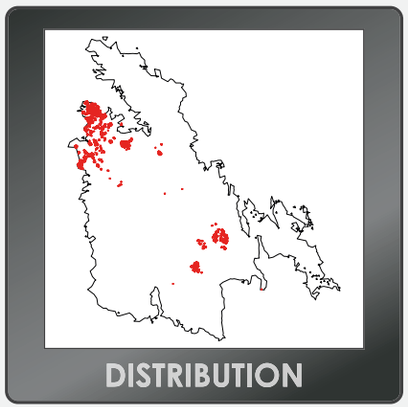
1.7.1	11.7.2	11.7.5
11.10.3	11.10.4	11.10.8

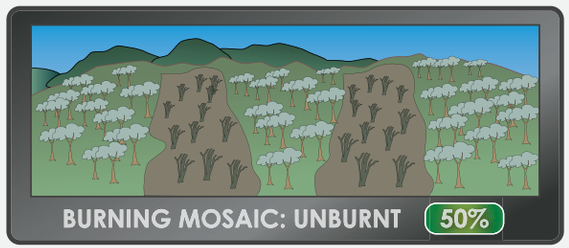
Box and other eucalypt woodlands on scarps

including grass and spinifex ground layers

Landscape 13

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





Box and other eucalypt woodlands on scarps

Landscape 13

including grass and spinifex ground layers

Hazard reduction

Hazard reduction needs to consider the steep topography of this landscape. Planned burning should focus on lighting in higher areas to allow fires to burn downhill.

Ideally, burn after the first rains or early in the dry season when the soil retains some moisture. A series of individual fires is preferred over a single fire event. However, the need to manage and protect production and conservation assets is paramount.

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 favour 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 must be considered in stocking rates and fire management.

In some areas, this landscape has been 'calendar' burnt with a high fire intensity every 2 – 3 years to suppress wattles and cypress. High intensity fires (and particularly uphill fires) 'cook' the organic layer in the topsoil, which kills beneficial soil microbes and the grass seed bank.

Because woody plants like wattles and cypress have a deeper root system, they recover more quickly in the damaged soil than grasses and forbs. This often results in them dominating the regrowth after fire.

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 – use a fire frequency of 3 – 5 years to freshen the pastures.

Conservation

This landscape faces an ongoing potential threat from wildfire due to its location on the scarps, where it is vulnerable to fires running up into it (usually during the driest times of the year). However, fire is needed to recruit future canopy species and can help to promote a variety of grasses.

Use a series of small fires at the end of the wet season to secure property and fire-sensitive vegetation boundaries. Later fires can be burnt back onto these earlier fires to create a mosaic of burnt and unburnt areas across the landscape. This protects against the spread of late season wildfires and creates good variation in grass seed availability and other habitat features. An occasional storm burn will help to promote other grasses and legumes.

In this landscape, the aim of conservation burning is to support diversity in the ground layer while retaining hollow-bearing trees in the canopy and a complete vegetation structure.

Regional Ecosystems

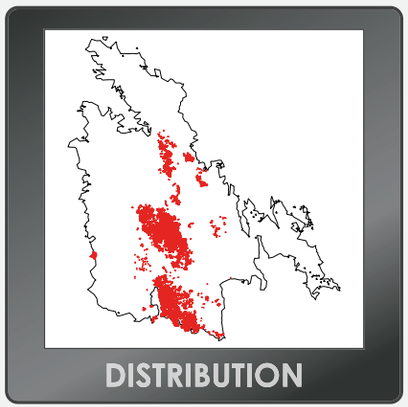
11.7.3 11.7.4

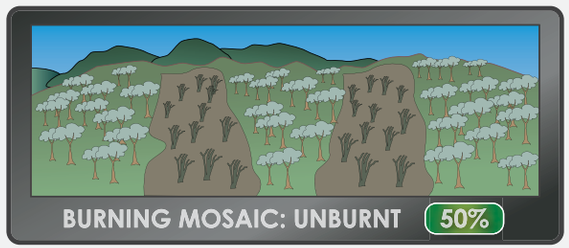
Eucalypt woodlands on basalt

including associated grasslands

Landscape 14

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





Eucalypt woodlands on basalt

including associated grasslands

1 t/ha

2 t/ha

3 t/ha

4 t/ha

Hazard reduction

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

An observation of grasses having set seed can indicate an appropriate time for fire in the early dry. In this landscape, hazard reduction should use as low a fire intensity as possible. Two options for reducing the fire intensity after rain are downhill burning and time of day of ignition. Frequent uphill hot fires will cause the woodland to thicken, shading out grasses.

Production

Basalt-based soils have moderate to high fertility but may be shallow on hilly country. Across the region, silver-leaved ironbark or mountain coolibah country produce some of the better native pastures for grazing. Queensland blue grass, forest blue grass and black speargrass are the primary native pastures. Good soil moisture is critical when burning to retain the organic mulch layer that helps break down leaf litter and old grass into the soil.

The timing of fire management and the level of grazing pressure after fire is crucial for retaining these native pastures. The grasses are most susceptible when sprouting from seed reserves 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. 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 which may be needed for 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, primarily 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. In addition, the spread of improved pasture grasses (such as buffel grass) into the heavy black clay soils has significantly reduced the extent and quality of Queensland blue grass grasslands. Mountain coolibah woodlands now provide refuge for many grassland species that previously preferred the open grasslands.

Wattles can thicken in these areas as a response to fire in drier periods. The woodlands need a low to moderate fire every 2 – 5 years to maintain an open structure and provide a variety of grasses and forbs.

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

Regional Ecosystems

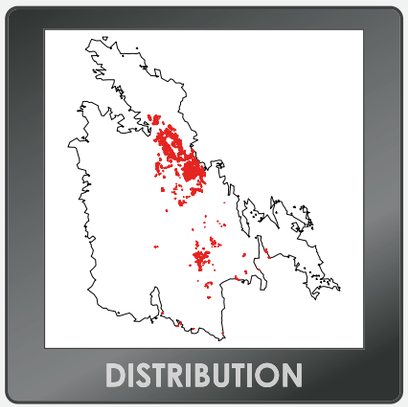
11.8.4	11.8.5	11.8.15
11.8.14	11.8.12	11.8.11

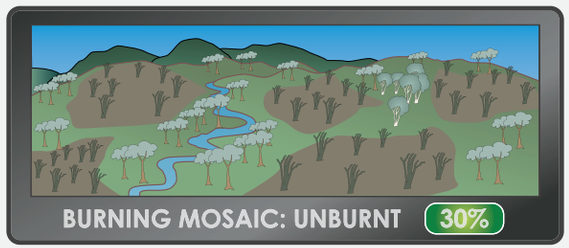
Eucalypt woodlands on stony flats

including shrubby areas and grassland

Landscape 15

Variable woodlands of ironbark, poplar box or gum-topped box, often with false sandalwood as a shrubby understorey. Main grass species in the woodlands and grasslands are blue grass and Mitchell grass.





Eucalypt woodlands on stony flats

including shrubby areas and grassland

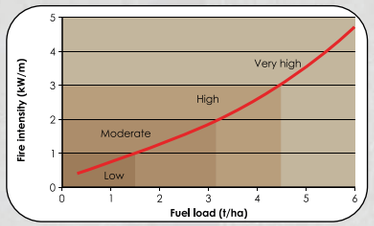
Landscape 15

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	11.9.3	11.9.12

Hazard reduction

This landscape is relatively flat and this allows for the construction of fire lines to create 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 30% remaining unburnt. A varied approach using mosaic burning is better than burning the same boundary lines repetitively.

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 decline in pasture quality.

Fire is important to remove rank grass and stimulate new growth. Spell the paddock after burning to allow grasses to shoot and regain vigour.

Fire is also effective for control of woody weeds and regrowth. Use fire when the crowns of the regrowth are still within reach of flame height, and thus likely to be killed. The paddock may need to be spelled to build up enough fuel to kill the regrowth.

In some cases, a high intensity fire may be required to reduce thickening. For this, a fuel load of 2 – 3 t/ha is needed. Good soil moisture will help pasture recover faster after burning. Fire frequency in grazed lands should be about 5 – 8 years.

Conservation

The spectacled hare-wallaby (*Lagorchestes conspicillatus*) is an important species that inhabits this landscape. This species uses old tussock grass and thick vegetation as nests, which can be removed by too frequent fire. The diet of this wallaby is mostly forbs, softwood scrub and broad-leaved vegetation. These foods are more common in recently burnt areas. The best habitat for this species is long unburnt areas with adjacent recently burnt country.

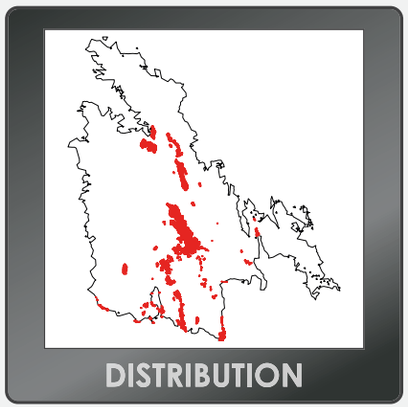
Grasslands benefit from a low to moderate fire every 3 – 5 years. For grassy woodlands, every 5 – 8 years is suitable. Both vegetation types need fire to prevent thickening. A high intensity fire after the first rains can be effective for this.

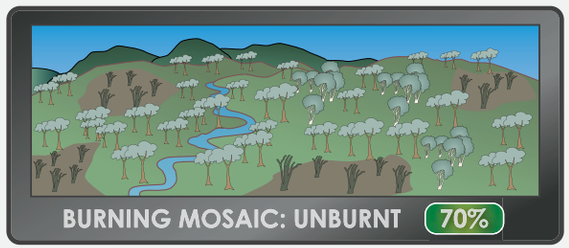
Spectacled hare-wallaby (*Lagorchestes conspicillatus*).

Eucalypt, river apple and cypress woodlands

Landscape 16

An open woodland that can have a shrubby or grassy understorey. Main species include lemon-scented gum, bloodwood, ironbark, poplar box and river apple. Grass trees, cypress or false sandalwood may be present.





Eucalypt, river apple and cypress woodlands

Hazard reduction

Topography, terrain and slow fuel buildup can naturally protect some of these areas from wildfires. Property planning should focus hazard reduction burning on less erodible soil types that are easier to access. A low intensity fire every 5 – 8 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 create a mosaic of 30% burnt.

Burn when there is good soil moisture during the wet season or at the end of summer. High moisture content will protect the soil mulch layer. Fire management in surrounding vegetation should provide long-term protection from late season wildfires burning uphill into this landscape.

Production

This landscape includes some of the less fertile scarps, plateaus and tablelands. The understorey can be shrubby or open and grassy. Traditionally, it is used as cattle breeding country. In a wetter year, it can produce a reasonable amount of grass, but it is not that 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 5 – 6 years is sufficient to maintain open woodlands with grass.

Use the topography and terrain to burn in patches to achieve 30% burnt. Burn with good soil moisture either at the end of the wet season or after the first storms (when follow up rain is expected). Reduce grazing pressure after burning to allow grasses to recover.

Conservation

This landscape is prime glider habitat. The key habitat features that help protect gliders are mature, hollow-bearing trees and open woodlands unaffected by thickening. It can take up to 60 years to produce a tree hollow that may form a suitable glider nest, so it is critical that these older trees are protected.

Fire management should occur late in the wet season or early in the dry season as soon as the country will carry a fire. Aim for a fine-scale patchy mosaic of burnt and unburnt areas, by lighting in the mid afternoon when there is a moderate fuel load. Retaining small unburnt patches is beneficial for obligate seeding plants in the shrub layer.

Regular low intensity fire maintains healthy mature cypress pine stands and reduces their expansion into adjacent woodlands. They are generally killed by high intensity fire.

Cypress thickening in the understorey will increase the fuel load and fire risk in dry years, which can result in canopy fires that kill mature eucalypts.

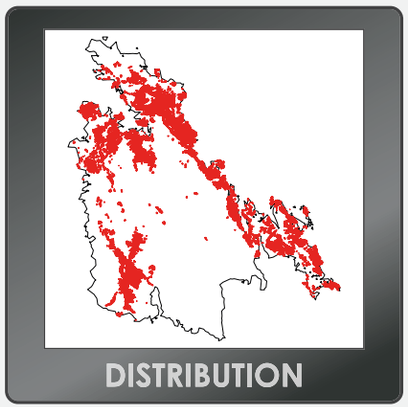
Regional Ecosystems

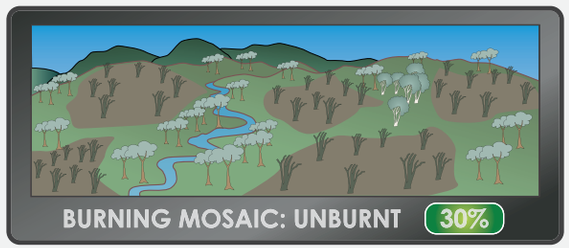
11.10.1	11.10.12	11.10.7
11.10.9	11.10.11	11.10.13

Eucalypt woodlands on stony range country

Landscape 17

Woodlands on shallow soils, often with a canopy dominanted by ironbark, lemon-scented gum, yellow stringybark or white mahogany. There may be grass trees and/or cycads in the understorey.





Eucalypt woodlands on stony range country

Landscape 17

Hazard reduction

As the dry season progresses and soil moisture decreases, fire intensity and the difficulty of wildfire control increases. This landscape generally occurs on slopes, hills and ranges, where it is at high risk from wildfires due to its elevated position. Fire running uphill is more intense and moves faster than fire burning downslope. Hazard reduction burning early in the dry season will help break 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 to manage vegetation thickening. A moderate intensity fire after the first storms is ideal.

Production

The stony range country has poor, shallow soils that are not very productive. Pasture quality is good, with common species including kangaroo grass, Mitchell grass, mountain oat grass and black speargrass. Cattle can use the range country as spelling during the wet season or late winter feed.

Cattle graze on preferred grasses, leaving less palatable grasses to seed. Over time, this changes the composition of grasses in the pasture. A controlled burn removes all the old grasses evenly.

Grazing pressures and seasonal variation will dictate the need for fire. However, a low to moderate intensity fire every 3 – 7 years is common. Burn with the feature from the top down, allowing the fire to creep or wander along the ridgelines following fuel loads.

Thickening (particularly of wattles) can be an issue after a wildfire. Reduce stocking to build a fuel load and storm burn before the wattles grow above flame height.

Conservation

In this landscape, planned burning should aim to promote patchy fires to ensure a mosaic of different vegetation types and ages. In the mid to late dry season, rangelands are prone to widespread intense wildfires – a key threat to biodiversity.

Too frequent intense fires lead to a loss of vegetation cover and directly threaten gliders, owls, and the mature hollow-bearing trees they depend on. A lack of fire can lead to thickening, shading and loss of tussock grasses and grass trees.

The gradient of some ridgelines can make it difficult to burn regularly if neighbours have improved pastures bordering the reserves. Aim to burn every 3 – 5 years, lighting 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.

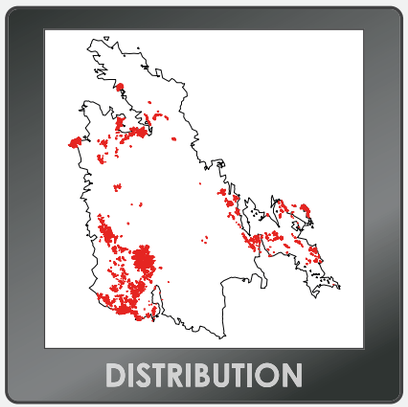
Regional Ecosystems

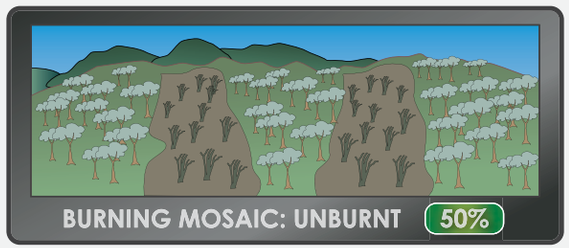
11.11.3	11.11.4	11.11.6
11.11.7	11.11.8	11.11.12
11.11.15	11.12.1	11.12.3

Eucalypt woodlands on infertile stony flats

Landscape 18

Woodlands on stony flats with poplar box, ironbark, bloodwood and mountain coolibah. The woodlands can have a grassy or shrubby layer of predominately wattle species.





Eucalypt woodlands on infertile stony flats

Hazard reduction

The undulating topography of this landscape assists in hazard reduction burning. While some volcanic intrusions are present, strategic fire breaks are usually easily constructed and maintained.

The soils are relatively infertile. However, in a good wet season, a reasonable fuel load can still accumulate. In drier years the fuel load will be sparse. Hazard reduction burning should reflect the growing seasons, with a fire frequency 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.

Production

For production areas, 3 – 5 years between burns is suitable, provided a mix of fire intensities are used. 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.

Too frequent fire (annual or every second year per patch) has negative impacts on soil health and long-term sustainability. Appropriate fire management will maintain a high diversity of grasses and herbs in this landscape.

Burn with good soil moisture and reduce grazing pressure post fire to allow grasses to recover. Heavy grazing or a lack of fire over time will change the composition of the pasture, with less palatable and 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 a diverse range of native grasses and herbs. A series of fires over several weeks, rather than a single fire, is the best way to maintain grass and herb 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 will produce more seed than unburnt grass. Burning different patches over several weeks produces a series of different aged 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.

Soil moisture is critical for good fire management outcomes. Early dry season or storm burning is ideal in this landscape. Fires should be low intensity and patchy, providing a good overall mosaic.

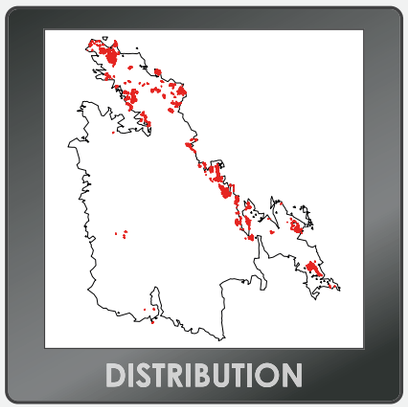
Regional Ecosystems

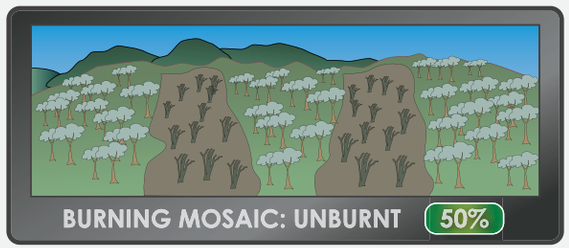
11.11.9	11.11.10	11.11.11
11.11.20	11.12.2	

Eucalypt and melaleuca woodlands in the ranges

Landscape 19

Grassy woodlands and open forests in the coastal ranges. Main species are ironbark, Moreton Bay ash, poplar gum, lemon-scented gum, bloodwood or broad-leaved tea tree, either as a single species canopy or with a mixture of canopy trees. There may be a shrubby understorey of acacia, tea tree and she-oaks.





Eucalypt and melaleuca woodlands in the ranges

Landscape 19

Hazard reduction

In this landscape, focus hazard reduction on burning early breaks to stop or reduce late season wildfires. Use a series of early dry season patch burns over several weeks. Due to the topography, most wildfires will burn uphill, which increases fire intensity. Strategic burning from ridgelines can help break up the fuel load at the landscape level to reduce wildfire spread later in the season.

Areas that have been affected by late season wildfires can have a mass seeding of wattle, creating an understorey shrub layer that can reach 3 – 5 metres within seven years. Under adverse wildfire conditions, this can promote a subcanopy fire of very high intensity, which in turn can lead to very dangerous crown fires. Vary fire regimes to leave some areas unburnt for seven years, while burning enough area to protect against late season wildfires.

Production

The grassy understorey of the woodlands and the grasslands associated with this landscape provide good native pasture grazing. A low to moderate intensity fire after the wet season or following spring storms can remove old grass and even out the pasture composition. A series of patchy fires is better than a single, large fire because it allows for a staggered recovery of grasses.

Fires should be lit from the tops of ridges and allowed to burn downhill to ensure a low intensity. Fires running uphill are more intense and increase grass recovery time and erosion risk.

Excluding fire or burning in the mid to late dry season will thicken vegetation, particularly wattle and lantana. A late summer burn of moderate to high intensity will be needed to control thickening and suppress lantana.

This landscape can also provide good pole and saw log timbers. Forest production areas are generally burnt before logging to create access and to allow top disposal fires of the tree heads to encourage regeneration. Post-logging, depending on the level of regeneration, fire may be used for thinning, or not used until regrowth is above flame height.

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

Conservation

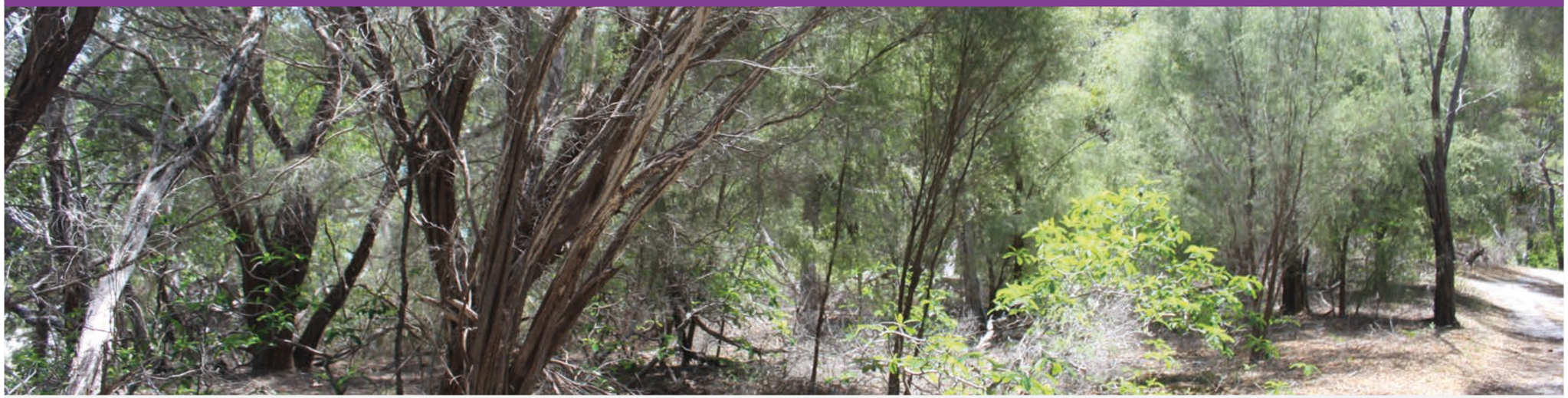
In this landscape type, the composition of trees, grasses and herbs is highly diverse. Use well-spaced spot ignitions when the soil is moist. The woodlands and forests of this landscape have either a grassy or shrubby understorey.

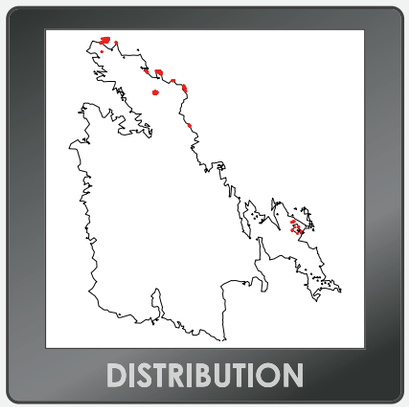
The grassy understorey needs fire every 4 – 5 years to keep it open. The shrubby understorey needs more unburnt patches, and fire intervals can extend to seven years for some areas. Be aware that the boundaries of shrublands and grasslands will naturally fluctuate to some degree. The important thing to remember is that they are both important for conservation and should be retained in the landscape.

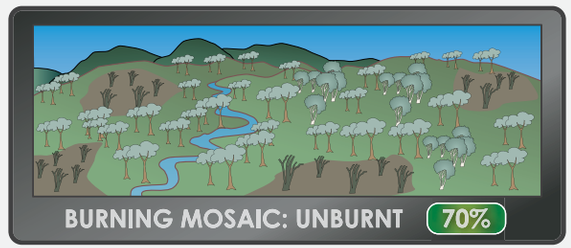
Regional Ecosystems

11.12.8	11.12.9	11.12.10
11.12.13	11.12.19	11.12.6
11.12.17		

Brushbox, forest oak and acacia shrublands, woodlands and forests







Brushbox, forest oak and acacia shrublands, woodlands and forests

Red-tailed black-cockatoo (*Calyptorhynchus banksii*).

Hazard reduction

Topography and seasonal variation will determine whether this vegetation burns in association with surrounding country or not. In wetter years, fuel loads can become high, and in dry years there is often a scarcity of fuel accumulation.

A few years after fire, this vegetation mix can carry a high intensity fire late in the dry season. The eucalypt, acacia, and forest oak litter fuels become a thick mat on the ground, and grass trees burn as a ladder fuel due to their hanging brown skirts. This landscape should be considered for hazard reduction burning in the wetter years on a 7 – 10 year rotation. The dominant canopy species will dictate fire intensity and season, with acacia species requiring high intensity fire.

Production

This landscape is a mix of low woodlands to shrublands that occurs on coastal ranges, headlands, islands and rocky outcrops. The low canopy can contain a mix of eucalypts, acacia and forest oak tree, with grass trees and a range of grasses in the understorey.

Grasses may include giant black spear, blady, scented top and cockatoo grass. While grazing does occur on this landscape, it is not widespread.

Conservation

These vegetation types require fire to survive, with the dominant species dictating the fire requirements. As acacias live for 10 – 15 years and the grasses start to disappear after five years, a fire frequency of 4 – 7 years is suitable.

Acacias are hard-seeded and require a moderate to high fire intensity for germination. Mature forest oak is killed by hot fire and will have to regenerate from seed. Seedlings will take at least seven years to mature and set seed, and should be allowed to do so at least twice before being burnt again. A low intensity fire within forest oak communities will promote a grassy ground layer. The eucalypt and brush box trees can tolerate a range of fire intensities and require fire to regenerate.

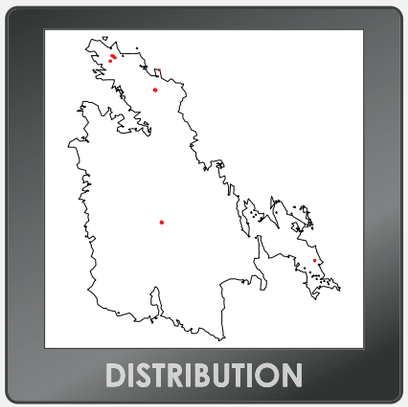
The allocasuarinas are an important source of food for the glossy (*Calyptorhynchus lathami*) and red-tailed black-cockatoos (*Calyptorhynchus banksii*). A mosaic burning pattern of no more than 30% burnt of this vegetation type at one time is important to ensure adequate food for these birds.

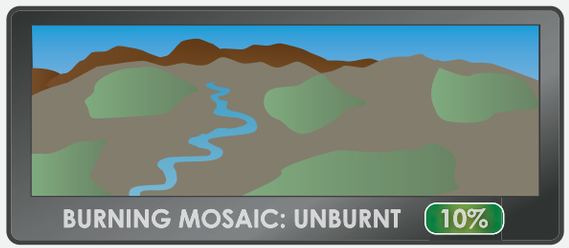
Regional Ecosystems

11.12.14 11.12.15 11.12.16

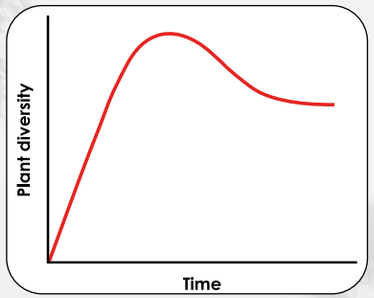
Montane shrublands to heath

Shrublands to heathland of mixed tea tree, acacia, Queensland peppermint and other shrubs on mountain tops.





Montane shrublands to heath



Plant diversity over time.

Hazard reduction

Heath is a diverse vegetation type that will usually either burn completely or not at all. Burning heath for hazard reduction should begin in the mid dry season because 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 up the country into small burnt areas.

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 limited.

Lantana can infest outcrops, and a slow-moving, moderate intensity fire will help to control this invasive species. Ensure there is soil moisture and a suitable fuel load (3 t/ha) and be prepared to do a second, follow up burn.

Low intensity fires do little to promote regeneration and generally don't work in heath because of its uniform fuel characteristics.

Conservation

A moderate to hot fire is required to release dormant seeds. Heath diversity reduces over time since the last 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 seeds from dormancy 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 – 14 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.

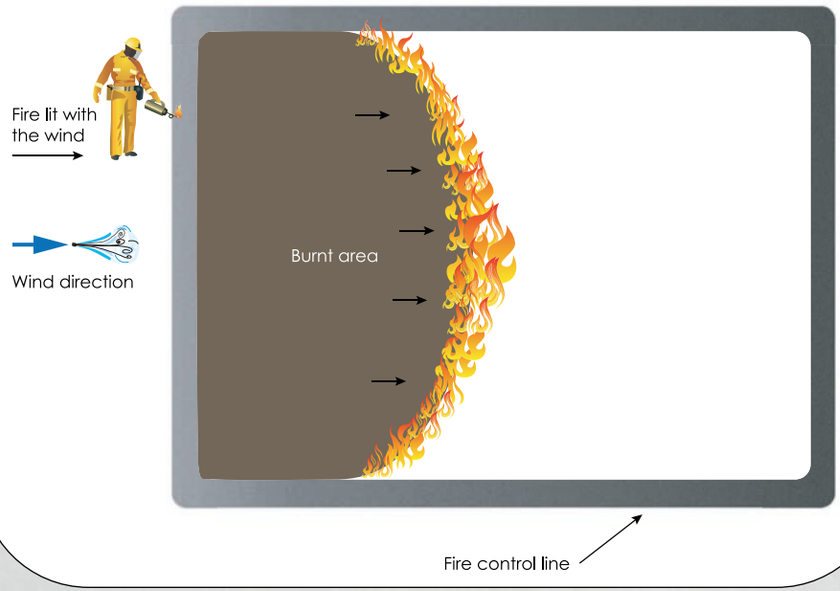
Regional Ecosystems

11.12.18

Fire diagrams

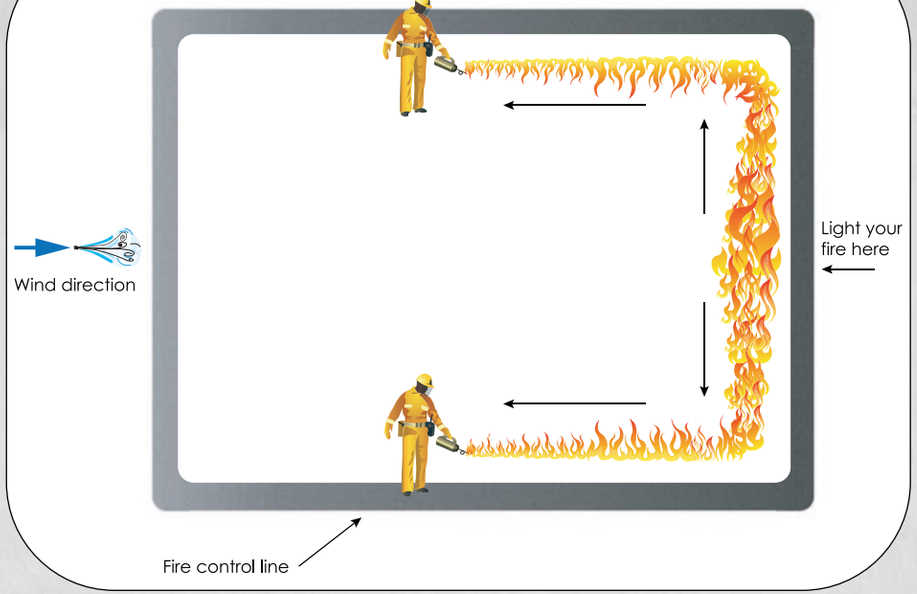
The following fire diagrams are provided to illustrate some ignition techniques for fire practitioners who are experienced in the lighting and use of fire. There are many variables that need to be considered prior to lighting a fire, including temperature, humidity, wind speed and direction, fuel type,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



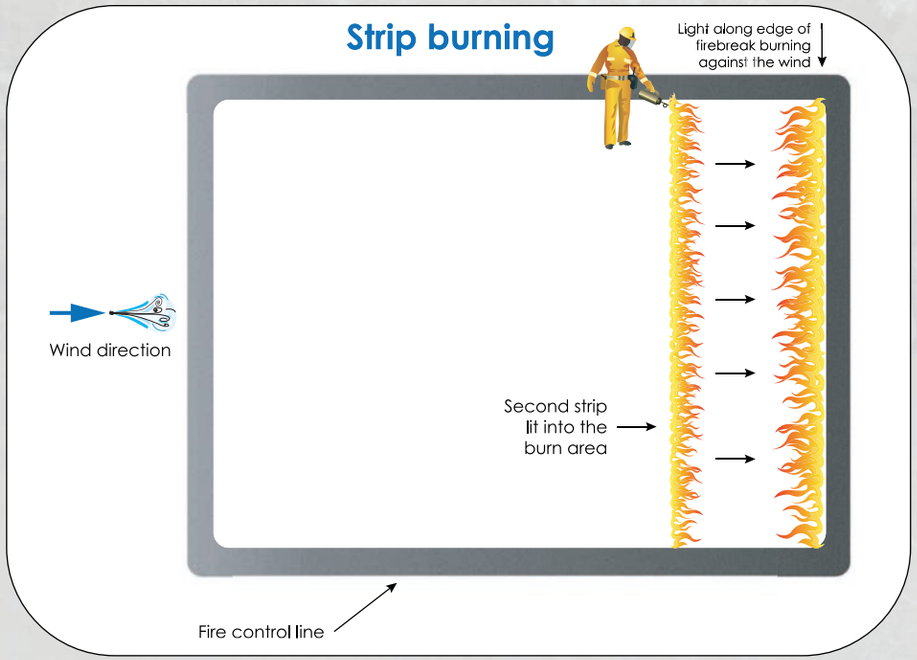
Forward burning can be used early in the season when conditions are still mild. A forward fire (lit with the wind) will move quickly over old grasses, removing only the dead material on the downwind side. A forward fire is also useful after storms to remove old dead material in damp conditions. The fire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



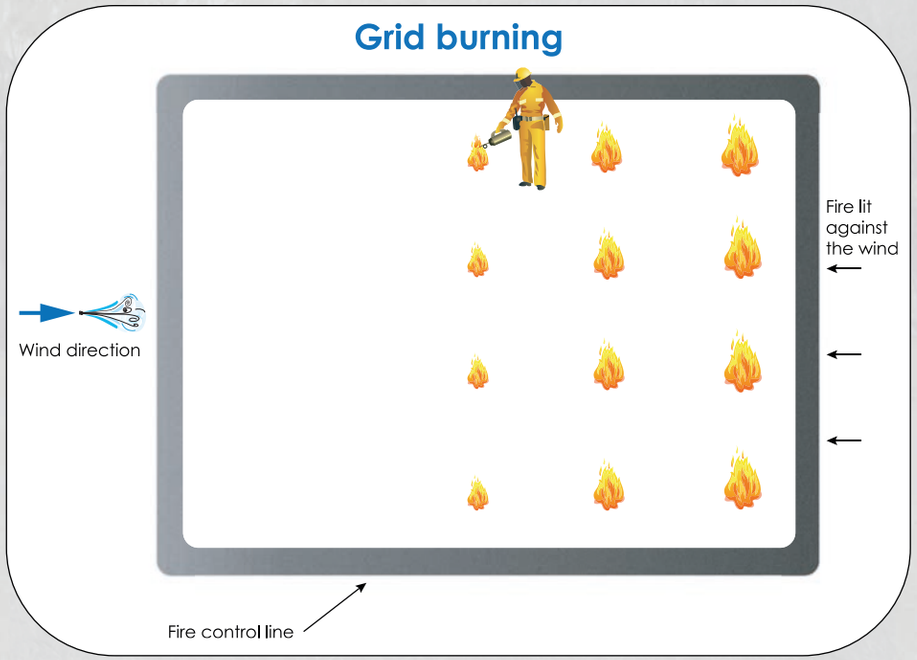
To secure a safe edge to a burn and/or to provide a slow-moving fire with maximum heat at the stem for killing woody weeds. The diagram shows the sides of the fire being brought down slowly to contain the fire.

Strip burning



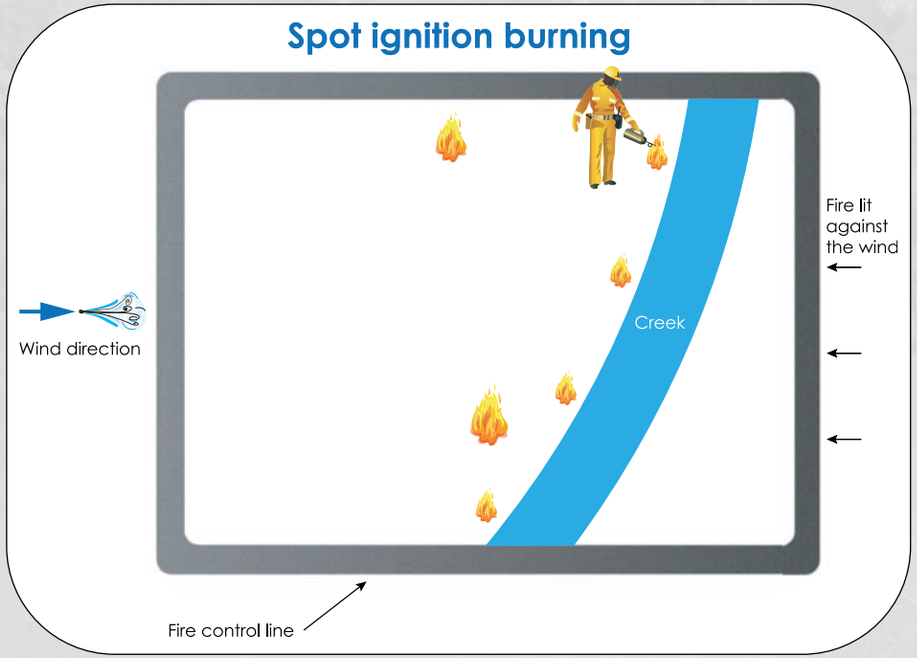
Strip burning is used to remove the fuel faster than a back burn would. It provides the advantage of the forward fire's heat and control by the backing fire being in front of the forward fire. This technique is useful in old slashed areas, cane trash, and areas with variable fuels where a backing fire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