PILBARA REGION
REGIONAL FUEL MANAGEMENT PLAN

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Document history

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Custodian

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1. Introduction

This regional fuel management plan (RFMP) assesses risks associated with bushfire in the Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions' (the department) Pilbara Region to assist planning the department's fuel management program. It interprets the department's Bushfire Risk Management Framework into regional indicators of acceptable bushfire risk and recommends tactics by which these may be achieved. The annual comparison of the current landscape condition to the indicators will inform planning for fuel management in the region.

The RFMP addresses bushfire risk at a regional scale. Fire management requirements relating to Aboriginal sites, places and values, species, or populations of species are addressed separately in documents such as nature conservation strategies, local area management plans, species recovery plans, and individual burn prescriptions.

The RFMP considers the hazard posed by bushfire to people, communities, infrastructure, and the natural environment. It is underpinned by the principle that managing the fuel available to bushfire is the most efficient and effective way to reduce the impacts of unplanned bushfire. This plan should be read in conjunction with the department's Bushfire Risk Management Framework which further describes this principle and bushfire risk management criteria.

Targets in the RFMP apply to land managed by the department and the tactics proposed are restricted to prescribed burning and physical fuel management such as scrub rolling. Other key aspects of managing bushfire-related risk (including preparation for, response to and recovery from bushfire) are not within the RFMP scope.

The RFMP will be reviewed annually, and a comprehensive review undertaken at the end of its five-year life at the beginning of 2031. Any important new information that emerges between reviews will be incorporated immediately and the plan re-endorsed if those changes are significant.

2. Bushfire risk criteria

2.1. Bushfire risk management zones

A bushfire risk management zone (BRMZ) is an area with similar environmental variables, land use and cultural conditions and therefore a similar characteristic risk profile. It is an area within which fuel management activities are guided by a single set of bushfire risk indicators. Western Australia's BRMZs are defined and described in the department's Bushfire Risk Management Framework.

The department's Pilbara Region lies within the Northern Rangelands BRMZ to the west and Desert BRMZ to the east. There is also a belt of Central Rangelands BRMZ along the southern boundary and a very small section of Tropical BRMZ to the north along the coast.

2.2. Fire management areas

The department divides the land it manages into six fire management areas (FMAs) to guide bushfire risk assessment and fuel management planning. These areas are defined according to the primary purpose of fuel management in the area and described relative to their proximity to assets.

The department's indicators of acceptable bushfire risk (defined in the department's Bushfire Risk Management Framework) allow fuel management activities to be tailored according to the risk profile and the management purpose of the land, including designating areas where there are no targets due to the limited capacity or requirement to manage fuels. The settlement-hazard separation (SHS), critical infrastructure buffer (CIB), landscape risk reduction (LRR) and remote area management (RAM) categories are applied to the Pilbara Region.

Table 1: Fire management areas in the DBCA Pilbara Region. (Refer to the department's Bushfire Risk Management Framework for more information.)

Fire management area	Description
Settlement-hazard separation (SHS)	• An area of managed fuel adjacent to towns, subdivisions, and other areas of human settlement. • Management objective is to reduce the likelihood of direct flame contact, damaging intensities of radiant heat and ember attack from posing a threat to people. • Breadth of area considers the fuels, climate and topography of the area and the nature of the appropriate fuel management strategies. • Fuels are managed relatively intensively to minimise the likelihood of a bushfire being sustained and to facilitate fire suppression. • The use of fuel management to achieve other land management objectives is supported where it is complementary to the primary management intent.
Critical infrastructure buffer (CIB)	• An area of low fuel around items of critical infrastructure. • Management intent and intensity of fuel management is similar to SHS, however the CIB will generally be applied to a less extensive area than the SHS due to these assets having a higher level of resilience to ember attack. • Only applies in BRMZ where the most appropriate strategy to protect critical infrastructure from bushfire is localised, rather than landscape scale fuel management.
Landscape risk reduction (LRR)	• Encompasses areas where the density or significance of infrastructure, economic activity or environmental assets necessitates fuel management at a landscape scale. • Fuel management will achieve a range of outcomes, including preventing the occurrence of large bushfires that may threaten life, damage infrastructure, cause financial or social impacts, degrade the natural environment, or threaten SHS or CIB fire management areas. • This is usually achieved by creating a mosaic of fuel ages to reduce the likelihood of fires igniting and spreading and provides greater opportunity for suppression.
Remote area management (RAM)	• Areas where remoteness, inaccessibility, resource constraints and a lack of consequential assets make it impractical or unnecessary to intervene in the prevailing fire regimes. • Fuel management activities are a lower priority but may still occur where required to achieve land management outcomes.

The RFMP identifies where each FMA occurs in the region and details bushfire risk indicators for each fuel type within them. The effective management of bushfire risk in the Pilbara Region requires complementary activities in the FMAs including SHS, CIB, and LRR. These areas have differing management intents, but do not represent a hierarchy of priorities for fuel management.

2.3. Asset value

The department's Bushfire Risk Management Framework applies the National Emergency Risk Analysis Guidelines (NERAG) and the State Emergency Management Prevention and Mitigation Procedure (SEMPMP) to group and prioritise assets at risk from bushfire. These priorities are used to define FMAs and guide the planning of mitigation activities.

Table 2: Asset class categorisation and prioritisation used when assessing bushfire risk.

Asset class	Priority	Description
Settlements	1	Areas of higher population density and low resilience to bushfire: • settlements, towns, and subdivisions • recreation and camping sites with high fire-season visitation.
Dispersed population	2	Areas of low or transient population density and low resilience to bushfire: • individual dwellings • roads with high usage in fire-vulnerable areas • recreation and camping sites with moderate fire-season visitation.
Critical infrastructure	2	Locations where there is a considerable threat to critical infrastructure with State-level significance and no redundancy: • major highways and other primary distributors • major rail routes • major infrastructure associated with electricity generation • gas transmission pipelines • water supply and pipelines and associated pumps and pumping stations • major optical TELCO cables • major wastewater treatment sites.
Protected species and communities	2	Areas that are critical to the survival of a legislatively protected species or threatened ecological communities (TEC) with low resilience to fire.
Economic assets	3	Locations where bushfires may have a significant effect on the livelihood of individuals or community financial sustainability, such as: • farmland • infrastructure of local and/or regional significance • major industry e.g. mine sites, refineries, manufacturing plants • native and plantation timber resources • water supply catchments.
Other assets	3	Other significant built, natural, or cultural assets, such as: • infrastructure of local significance • significant ecological communities or species habitat • areas with specific fire regime requirements • fire vulnerable Aboriginal or European heritage sites.

2.4. Asset resilience

The likelihood that the potential consequences of a bushfire will be realised depends partly on the resilience of the asset to fire. It is difficult to model resilience given there are many variables that affect the outcome of a fire, however some considerations for determining the resilience of an asset are shown in Table 3 (settlements) and Table 4 (biodiversity assets).

Table 3: Factors affecting the resilience of settlements to bushfire. Some of these factors are also applicable to other built assets and recreation sites.

More resilient to fire →	Less resilient to fire
Interface community[1]	Intermix community[2]
Hardened urban area without vegetation	Vegetation exists within developed area
Multiple access routes	One access route
Access routes highly trafficable	Access routes have limited trafficability
Access routes protected by low fuel buffers	Access routes have adjacent vegetation
Surrounding vegetation is fragmented	Surrounding vegetation is continuous
Adequate refuge available (oval, beach etc.)	Little refuge available
Most residents are capable of self-evacuation	Large population of elderly, infirm or children
Local population well prepared for fire	Population has low level of preparedness
Adequate water supply	Limited water available for fire fighting
Most dwellings constructed of brick	Dwellings constructed of timber or fibro
Building APZs[3] well maintained	Building APZs poorly maintained
Permanent resident population	Campsite or tourist/transient population

[1] An interface community is where a clear demarcation exists between urban areas and native vegetation and bushland does not continue into the developed area.
[2] An intermix community is where structures occur throughout a bushland area without a clear demarcation between urban and bushland areas.
[3] Asset protection zone: a low-fuel area maintained around a building to increase the likelihood that it will survive a bushfire.

Table 4: Factors affecting the resilience of species, communities, and ecosystems to bushfire.

More resilient to fire →	Less resilient to fire
Key plant species are resprouters	Key plant species are obligate seeders
No other threatening processes occurring	Fire may exacerbate other threatening process
Species have short juvenile periods	Species have long juvenile periods
Species have wide distributions	Species have restricted distributions
Species have multiple populations	Species have few populations
Connections exist between populations	Populations are isolated
Fauna is more mobile	Fauna is less mobile
Fauna is adapted to persistence in refugia	Fauna has limited ability to persist in refugia
Fauna can utilise a variety of habitats	Fauna has specialised habitat requirements
Habitat re-establishes rapidly post-fire	Habitat slow to re-establish post-fire
Fauna has a broad diet or can vary diet post-fire	Fauna has specific dietary requirements
Fire has little effect on predation rate	Fauna vulnerable to post-fire predation
Fauna has high rate of population increase	Fauna has low rate of population increase

Asset resilience is combined with the asset class priority rating (Table 2) to provide a regional priority for each asset. This is done using the matrix in Table 5. The regional priority is recorded in Table 8 of the RFMP and will guide the programming of works to mitigate bushfire risk.

Table 5: Matrix for determining the regional priority of assets in each class. The asset class priority is shown in Table 2, and the asset resilience is set with guidance from the criteria in Table 3.

Asset class priority	Resilience		
	High	**Medium**	**Low**
1	3	2	1
2	4	3	2
3	5	4	3

2.5. Risk treatment strategies

The department applies two broad strategies for managing fuels to reduce bushfire risk:

1. Establishment and maintenance of low fuel areas close to assets or in strategic locations in order to interrupt a fire run. Low fuel areas may be established by prescribed burning or physical fuel modification.

2. Landscape-scale fuel management using prescribed burning to create a mosaic of fuel availability within which there is reduced potential for the development of large bushfires and increased opportunities for successful fire suppression.

These strategies are applied individually or in combination to achieve the fuel conditions required by the indicators of acceptable bushfire risk.

2.6. Tolerable fuel age

The tolerable fuel age is the maximum age at which fuel in an FMA is deemed to be in a managed state. It is defined as the age at which the fuel will burn with an intensity that is double the upper limit at which machine and tanker attack on the head fire is possible under 95th percentile fire danger index (FDI) weather conditions[4] (see Section 2.7). This is determined by using fuel accumulation and fire behaviour models for the appropriate fuel type. Where this period is unknown, an alternative figure of 1.5 times the minimum period required post-fire before the vegetation will again sustain a bushfire is used.

Table 6: Maximum intensity and rate of spread thresholds for head fire attack on a bushfire.

Machine and tanker attack possible	Intensity < 2000kW/m and/or ROS < 400m/hr in forest
	Intensity < 2000kW/m and/or ROS < 1000m/hr in shrubland
	Intensity < 5000kW/m and/or ROS < 6500m/hr in grassland

2.7. Weather conditions

When defining the range of each FMA and the tolerable age of fuels within it, the department's bushfire risk management criteria require the application of the conditions that produce the 95th percentile FDI in the area. Worse fire conditions than this would only be expected to occur approximately seven times per year.

The 95th percentile weather conditions have not been applied to the Pilbara Region RFMP. Weather conditions derived from the Bureau of Meteorology weather reanalysis project were not considered to accurately reflect extreme fire conditions in the region. This is likely due to there being only five years' data currently available from the weather reanalysis project. Weather variables considered to represent extreme fire weather conditions have been contributed by experienced DBCA fire staff. This will be reviewed as more data becomes available.

[4] The intensity values for machine and tanker attack are doubled because the thresholds in Table 6 relate to head fire intensity, while the department's usual approach to a direct attack on a bushfire is to begin from the tail fire and work along the flank to the head. This means that most of the suppression effort is undertaken on parts of the fire exhibiting much lower fire intensity than the head fire. Flank fire intensity may be up to four times lower than head fire intensity, but a more conservative two-fold factor is used to set the risk indicators.

3. The Pilbara Region

The department's Pilbara Region is situated in northern Western Australia between the Kimberley, Midwest and Goldfields regions and is one of the largest regions in the State covering an area of 59 million hectares.

3.1. Tenure and management arrangements

The Pilbara Region includes seven local government authorities, with 63 per cent of its area within the Shire of East Pilbara, 18 per cent in the Shire of Ashburton and eight per cent in the Shire of Meekatharra. The region has a population of approximately 20,000 people with the major towns being Exmouth, Onslow, Karratha, Port Hedland, Newman, Paraburdoo, Pannawonica, and Tom Price.

The department manages six per cent (3,470,792 hectares) of the land in the region: 2,436,824 hectares of national parks; 281,778 hectares of conservation park; 259,635 hectares of nature reserves; and 482,290 hectares of marine parks and marine management areas. Unallocated crown land represents 49 per cent (28,186,424 hectares) including 785,208 hectares of recently purchased pastoral leases and 395,976 hectares of ex 2015 pastoral exclusions.

The region has rich Aboriginal culture and heritage values along with state and nationally significant biodiversity, tourism, pastoralism, mineral and energy resource industries.

3.2. Climate and vegetation

Climate

Most rainfall occurs in summer, along with thunderstorms and occasional cyclonic activity. Average annual rainfall is 290mm. January, February and March are the wettest months while September and October are the driest. There is substantial year-to-year variation in rainfall, both locally and regionally. At least one cyclone traverses the region in a normal summer and others pass close by along the coast. They supply half of the annual rainfall.

Monthly maximum temperatures range from an average of 25°C in July to 37°C in January, and minimum temperatures from an average of 12°C in July to 25°C in January. The Pilbara straddles two bioclimatic regions. The higher rainfall areas inland (Hamersley Plateau) and the cooler areas near the coast have a semi-desert tropical climate with nine to eleven months of dry weather. The rest has a desert climate characterised by up to 12 months of dry weather and generally higher temperatures. The region's broad near-coastal band has a hot, humid summer with a warm winter, while inland areas experience a hot dry summer and a mild winter.

Vegetation

The Pilbara landscape is classified into seven large geographically distinct bioregions based on common climate, geology, landform, native vegetation, and species information. A summary of the most significant vegetation types is included for each biogeographic region.

Carnarvon biogeographic region

The Cape Range National Park, unallocated Crown land (UCL) Ningaloo Coastal Area, UCL Giralia and UCL Mount Minnie form part of this biogeographic region. Barrow Island shares elements of the Carnarvon and Pilbara biogeographic regions. The Cape Range itself is vegetated with *Eucalyptus* over *Triodia*, with *Acacia-Cassia* shrubs as understory or locally dominant. The lower ranges are

vegetated with *Acacia* shrublands over *Triodia*. The coastal plain is vegetated with grasslands, coastal strand vegetation, low shrublands (including samphires and saltbush) and mangrove low forest and the sandplain by heath over *Triodia*. In the south-west around Onslow is predominantly tidal mud flats and unwooded succulent steppe.

Pilbara biogeographic region

The Cane River Conservation Park, UCL Nanutarra, Millstream Chichester National Park, UCL ex Karratha station, Murujuga National Park, Mungaroona Range Nature Reserve, Karijini National Park, UCL Fortescue Marsh and UCL Meentheena form part of this biogeographic region. In the main central area of the Pilbara biogeographic region (Chichester subregion) the predominant vegetation formations are tree and shrub steppe (hummock grassland) communities with *Eucalyptus* trees, *Acacia* shrubs and *Triodia* hummock grasses. Mulga (*Acacia aneura*) communities occur in valleys and short bunch grasslands occur on alluvial plains.

In the Roebourne subregion along the coast the river deltas support a mosaic unit of bunch grasslands mixed with spinifex. Along much of the coastline there are bare tidal mud flats and areas of mangrove. Along the major rivers there are sclerophyll woodlands, mostly with coolabah (*Eucalyptus victrix*) and river red gum (*Eucalyptus camaldulensis*). Between the Fortescue and Robe rivers on the coast there is a mosaic of shrub savanna (with snakewood – *Acacia xiphophylla*) and shrub steppe (with kanji bush).

The Fortescue subregion is characterised by patches of short bunch grassland along the north side of the Fortescue river, mulga in groves and patches in the main valley and a large salt marsh (Fortescue Marsh) which supports unwooded succulent steppe (halophytic low shrublands) with saltbush, bluebush, and samphire. In the rugged Hamersley subregion on the south side of the Fortescue valley, tree steppe with snappy gum is predominant. Mulga low woodland occurs in valleys. In the south-west corner, around Cane River homestead, there is sparse shrub steppe with snakewood on drainage lines.

Gascoyne biogeographic region

The Barlee Range Nature Reserve and Collier Range National Park form part of this biogeographic region. The river floodplains carry dense marginal vegetation with *Eucalyptus camaldulensis*. Mulga and other acacias occur as subordinate trees, with a shrub layer below. Snakewood (*A.siphophylla*) occurs associated with an understorey of *Ptilotus* and saltbush, or in some situations with little associated vegetation. The vegetation in Collier Range National Park is dominated by mulga low woodland or mulga in groves and tree and shrub steppe communities with hummock grasses.

Little Sandy biogeographic region

The Karlamilyi National Park west of Lake Dora and vast areas of UCL form part of this biogeographic region. The vegetation is dominated by shrub steppe with scattered shrubs and buck spinifex. To the east of Robertson Range there are areas of mulga low woodland and patches of tree steppe with desert oak (*Allocasuarina decaisneana*).

Great Sandy biogeographic region

The Karlamilyi National Park east of Lake Dora and vast areas of UCL form part of this biogeographic region. The vegetation is dominated by shrub steppe on sandplain and between sand dunes in the

south and tree steppe with desert walnut (*Owenia reticulata*) on sandplain to the north. Sandstone mesas have grass steppe (with no trees or shrubs) between scattered shrub steppe with acacia.

Dampier land biogeographic region

The Eighty Mile Beach Marine Park forms part of this biogeographic region. The vegetation is dominated by pindan; a three-tiered community with trees, shrubs, and spinifex. Short bunch grassland occurs along the coast.

3.3. Fire management considerations

Across the Pilbara Region there are important natural, Aboriginal, and built values that are at risk from bushfire or inappropriate application of fire. When considering the application of prescribed fire and bushfire response operations, it is necessary to identify these values and assets and plan to minimise the risk of adverse impacts. This is achieved by acknowledging that:

- The primary consideration is the protection of townsites, settlements and rural subdivisions that are situated in fire-prone areas. The department will need to work with local government (LGA) and Department of Fire and Emergency Services (DFES) to develop and implement appropriate fuel mitigation and bushfire response strategies.
- Major transport corridors traverse the region. The Great Northern Highway and North West Coastal Highway are critical transport corridors to northern Western Australia. Significant economic impacts to the community and industry will occur if these transport corridors are closed due to bushfire. Strategic fuel reduction treatments should be implemented to protect road users.
- Iconic tourist destinations are important economically at a local, regional and in some instances State level. Peak visitation is higher from April to August when prescribed burning is being undertaken. If possible, burning is implemented outside the school holiday period.
- Pastoral stations and mining activity surround the majority of department-managed lands. Prescribed burning and bushfire can have negative impacts on these activities. Fire management planning needs to identify the potential for impact from fire, along with the required level of consultation to engage with relevant stakeholders. The department will consult with the mining industry to identify settlements and significant infrastructure that require additional bushfire risk mitigation treatments to ensure minimal disruption to business and protection of infrastructure.
- Barrow Island is a Class A nature reserve containing several endemic and threatened species. Various mining leases overlay the conservation tenure. The mining leases and associated infrastructure make the manipulation of fuel age very complex to manage. Risks include the Gorgon Gas Plant, an active oil field, exposed electrical transmission and oil delivery lines. Due to the uniqueness of Barrow Island, a tenure/island specific fire management plan is being developed in collaboration with Chevron.
- Internationally significant biodiversity values and large areas of wilderness result in challenges for fire management. Ongoing engagement with the department's Biodiversity and Conservation Science and operational staff is important to ensure appropriate fire regimes are developed and implemented.
- A variety of intact registered and unregistered Aboriginal heritage sites and cultural landscapes exist in the region which must be identified and protected from potential burn impacts. To achieve appropriate fire management planning and operational outcomes the

department will undertake thorough assessment of Aboriginal culture as part of its burn planning process and where possible develop and implement strategies to protect cultural values. The department will increasingly encourage Aboriginal rangers from various language groups to attend the basic firefighter crew member training and participate in prescribed burns to develop their knowledge and enhance their skills. To achieve appropriate fire management planning, operational outcomes, and the preservation of cultural values, burns will be planned and implemented in consultation and collaboration with Traditional Owners.

- The Pilbara is a fire-prone region, with vegetation largely comprised of highly flammable spinifex hummock grasslands. Large-scale bushfires in these semi-arid and arid environments result from a combination of vegetation accumulated after seasonal rainfall usually associated with cyclone activity, and the prolonged absence of fire across the landscape. Lightning season occurs from September through to March, resulting in multiple bushfires that can spread over vast distances and burn over long periods of time.
- Spinifex grasslands have the potential to re-burn every five to seven years after fire, depending on rainfall, but can take 18 to 20 years to reach full maturity as a fuel.
- Fire-sensitive plant communities exist within spinifex-dominated hummock grasslands, such as woodlands of mulga, snakewood, callitris, gorge communities, Burrup rock pile communities, and fig trees amongst many others. Most of these communities are self-protected from fire, but in situations where horizontal continuity of fuels exist that might damage these fire-sensitive communities, a focus on protecting these locations should be applied.
- To successfully undertake its fire management responsibilities, it is critical that the department builds and sustain a highly capable workforce. Developing the skills and knowledge of staff in fire management in semi-arid environments is an important step in ensuring the continuation of an effective fire program that protects the region from the impacts of large-scale bushfires.

3.4. Key fuel management strategies

The primary objective of the department's fire management in the Pilbara Region is to protect human life (people and communities) and important community infrastructure. The department also aims to manage fire in a way that promotes ecosystem health and avoids compounding the effects of other threatening processes.

To achieve these objectives, the department:

- uses prescribed burning to maintain a landscape-scale mosaic of fuel age and structure to inhibit the spread of bushfires, create opportunities for successful fire suppression, and maintain adequate habitat linkages to support biota
- uses prescribed burning to maintain a mosaic of fuel age and structure within reserves to reduce bushfire risk to and from surrounding lands and to support ecosystem resilience
- uses prescribed burning or other forms of fuel management to maintain areas of low-fuel adjacent to private property and important infrastructure
- applies prescribed fire to the landscape with consideration of ecosystems and the requirements of important species and ecological communities.

Landscape risk reduction

- Since the 1970s, the pre-existing fine-scale mosaic containing a diverse range of fuel ages in the Pilbara Region has progressively broken down. The landscape is now dominated by large, homogenised areas with high fuel load. This fuel regime has resulted in large, landscape-scale bushfires that burn with high rates of spread and intensity. A reactive approach to fire suppression under this fuel structure and associated bushfire regime is not feasible due to the large size, high intensity and rate of spread of the fire, ruggedness of the country and limited staff and other suppression resources.
- Experience has shown that fuel treatment regimes immediately adjacent to assets like those prescribed by the BRMF (60 per cent < threshold intensity for 500m surrounding settlements and 50 per cent < threshold intensity for 50m surrounding critical infrastructure) are not consistently capable of stopping a fast-moving bushfire where there is no landscape-scale fuel treatment in hummock grassland. However, a 'buffer' approach combined with landscape-scale treatment has been demonstrated to be highly effective. The two approaches should be applied in conjunction with one another to maximise bushfire risk reduction effort and outcomes through the sustained combined use of strategic small-scale ground burns linked to assets, complemented with broad-scale aerial burns in the landscape.
- Recent prescribed burning results in hummock grassland have shown that the need for bushfire suppression intervention becomes limited where the landscape is in a treated condition comprising a relatively fine-scale mosaic (target 45 per cent of fuels < six year threshold age for targeted fuel types).
- Parts of department managed land within the hummock grassland fuel type contain settlements, critical infrastructure, economic assets and a significantly increasing dispersed population (campers, tourists, mining tenement activities, professional and casual prospecting). A selected portion of the Pilbara Region has been identified through this RFMP where landscape scale treatment is considered necessary to adequately protect these values and classified as LRR.

Key principles used during planning for fuel management in Pilbara Region are:

- Protection of towns, settlements, subdivisions, and other infrastructure of economic value where there is potential for impact from bushfires emanating from the lands we manage.
- Use of time since last fire (fuel age) to guide prioritisation of burns. Spinifex hummock grasslands less than six years old are effective anchor points for future burns.
- Use of fire to protect, enhance and regenerate habitat for a range of threatened fauna species.
- Protection of visitors and associated visitor infrastructure.

Key principles for the application of prescribed burning in the Pilbara Region:

- Prescribed burning is the key fuel management tool used by the department to manage the bushfire risk to social, economic and conservation values. Due to the size and remoteness of the region, prescribed burning is only applied to targeted areas where there is a concentration of State priority assets comprising approximately 11 per cent of land managed by the department in the region.
- The department aims at maintaining 45 per cent of the spinifex and acacia shrubland vegetation type on its tenure at an age less than six years old (average eight per cent of actual burnt per annum). This intensity of treatment ensures the protection of life and community assets through strategic implementation of burns but also promotes conservation values by maintaining older seral vegetation stages, providing diverse habitats across the landscape.

- The timing for burning will depend heavily on weather conditions including accumulated rainfall. Opportunistic small-scale burns can occur at any time of the year dependent on rainfall and meeting prescription parameters. Due to the large scale and extent of the management tenure, the Pilbara Region aims to implement the core prescribed burning program in the cooler months of the year (May–August) to minimise the risk of the burn not self-extinguishing, potentially resulting in actual burnt areas per annum exceeding the threshold limits.
- The effectiveness and success of this fuel management plan relies heavily on the sustained combined use of strategic small-scale ground burns linked to assets, complemented with broad-scale aerial burns in the landscape. Ground burns in isolation will not achieve the required landscape-scale outcomes required to limit the size of bushfires. Without ground burns, the aerial burn program will not have natural anchor areas in place and bushfires are more likely to escape the planned boundaries. The broad-scale aerial burn program contributes towards the reduction of the likelihood of large bushfires and its potential impacts on people and infrastructure. In the event where smaller bushfires occur, suppression personnel can then focus on specific areas of the bushfire.
- Ground burns are targeted to protect townsites, settlements, relevant infrastructure and to create low fuel buffers along transport corridors (classified in this plan as SHS and CIB). These treatments are implemented using ground personnel in collaboration with Traditional Owners. Other relevant stakeholders (e.g. Department of Fire and Emergency Services, local government authorities, volunteer bush fire brigades) are involved in the implementation of the burns as required. Operationally, ground burns are based on open edge burning with the wind. Burn anchor points generally rely on fire scars less than four years old, areas of sparse vegetation or self-extinguishment overnight.
- Aerial burns are targeted to create a patch mosaic of burnt and unburnt areas that act as natural barriers to the spread of a bushfire at landscape scale. To be effective, this vegetation age mosaic should preferably be uniformly distributed across the management tenure, providing that ecologically appropriate burning patterns are factored into implementation. In the plan, these areas are classified as LRR.

4. Pilbara Region risk criteria

The Pilbara Region lies within the Northern Rangelands BRMZ to the west and Desert BRMZ to the east. There is also a belt of Central Rangelands BRMZ along the southern boundary and a very small section of Tropical BRMZ to the north along the coast. The indicators of acceptable bushfire risk are based upon the fuel and fire behaviour characteristics of hummock grassland, *Acacia* woodland and sandplain shrubland which have been broadly grouped across the region.

Table 7: Summary of bushfire risk criteria for the Pilbara Region.

Fuel type	**Hummock grassland**	**Acacia woodland**	**Sandplain shrubland**
Fuel accumulation and fire behaviour models	Fuel accumulation – WA Spinifex model Fire behaviour model - WA Spinifex model	Fuel Accumulation – None Fire behaviour model - None	Fuel Accumulation - Expert judgement Fire behaviour model - Anderson shrubland model
Weather parameters applied	Location: Karijini Temperature: 40 °C Relative humidity: 6% Wind speed: 40km/h	Location: Karijini Temperature: 40 °C Relative humidity: 6% Wind speed: 40km/h	Location: Karijini Temperature: 40 °C Relative humidity: 6% Wind speed: 40km/h
Tolerable fuel age	6	8	8
Settlement-hazard separation (SHS)	500m surrounding settlements	500m surrounding settlements	1000m surrounding settlements
Critical infrastructure buffer (CIB)	50m surrounding critical infrastructure	50m surrounding critical infrastructure	50m surrounding critical infrastructure
Landscape risk reduction (LRR)	As defined in Table 8	As defined in Table 8	As defined in Table 8
Remote area management (RAM)	N/A	N/A	N/A

Note: The fuel type layer the department uses to support the Bushfire Risk Management Framework shows *Acacia* woodland based on the overstorey stratum. However, it is recognised that much of this mapped layer in the Pilbara Region contains a high content of hummock grassland which determines the fire behaviour. In the initial years of implementing this RFMP, consideration will be given to treating these areas as hummock grassland as work is progressed to improve the supporting fuel type layer.

Other fuel types under the framework within the Pilbara Region include chenopod shrubland, pindan (e.g. Goldsworthy), semi-arid woodland (e.g. small areas in Karlamilyi NP), thicket (e.g. Cundam native well, Mujingerra, Karlamilyi NP and Isabella Range). The area occupied by these fuel types is very small in the regional context. For the current plan, chenopod shrubland and thicket will be allocated to the sandplain shrubland fuel type. Pindan and semi-arid woodland will be allocated to the hummock grassland fuel type.

5. Asset categorisation and prioritisation

The following table applies the department's bushfire risk criteria to identify and prioritise assets in the Pilbara Region, establishing where each FMA applies. Table 9 then provides the indicators of acceptable bushfire risk for these areas.

Table 8: Asset categorisation and prioritisation for the Pilbara Region.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
Regional priority 1				
SHS	Settlements	Karijini Eco Retreat	Low	Surrounded by old spinifex in the vicinity of the tents. Contains highly flammable canvas tents.
		Dales	Low	High visitation camping area in Karijini National Park.
		Osprey Bay, Kurrajong	Low	High visitation camping area in Cape Range National Park.
Regional priority 2				
SHS	Settlements	Exmouth	Medium	Surrounded by very old spinifex grasslands in the Cape Range and coastal plains, high proportion of non-resident population.
		Coral Bay	Medium	High visitation, single point of access, embedded in coastal sandplain dominated by buffel grass.
		Tom Price	Medium	Mining town with significant fuel reduction areas surrounding town. Multiple trafficable access routes.
		Parnngurr, Punmu, Kunawarritji	Medium	Surrounded by spinifex grasslands with limited access related to the time required to travel to the community. Generally, well protected from fire due to mosaic of burns around the houses.
		Innawonga	Medium	Good access surrounded by a mosaic of different ages of spinifex and extensive areas of buffel grass.
		Butler Park and Production camp accommodation	Medium	Surrounded by high fuel loads of spinifex grasslands, good access around the facilities, mining lease managed by Chevron, limited fire suppression capability on the island.
CIB	Critical infrastructure	Great Northern Highway, North West Coastal Highway	Medium	Major transport corridor into the northwest. Road closures as a result from a bushfire will have significant State-level and regional impacts. Continuation of fuel reduction burns will minimize risk to people travelling along these roads and reduce both social and economic impacts.
LRR	Dispersed population	Miniplay-Exmouth Road, Burkett Road, Onslow Road, Warlu Road, Roebourne Wittenoom Road, Karijini Drive, Nanutarra Wittenoom Road, Munjina Wittenoom Road, Tom Price Paraburdoo Road, Nameless Valley Road, Bingaro Road, Marble Bar Road, Rippon Hills Road, Pannawonica Road, Samson Roebourne Road, Burrup Road	Medium	Road closures due to bushfire will result in significant regional and local impacts.
		Neds, Mesa, Tulki, North Mandu, Bungarra, Yardie Creek, One K, Boat harbour, Milyering Visitor Centre	Low	Moderate visitation sites in Cape Range National Park. Surrounded by old spinifex hummock grasslands.
		Ranger housing Cape Range HQ	Low	Departmental infrastructure in Cape Range National Park.
		Milyanha, Stargazers	Low	Moderate visitation sites in Millstream Chichester National Park.
		Karijini Visitor Centre, Staff residences	Low	DBCA infrastructure in Karijini National Park.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
		Deep Reach Pool, Cliff Lookout, Python Pool	Low	Range of day use recreational sites with a variety of facilities and access at Millstream Chichester National Park.
		Giralia Homestead, Giralia Camping sites	Low	Proposed national park as part of Plan for Our Parks. Low visitation. One-way access from Burkett Road to homestead and Giralia Bay.
		Cape Range National Park, Karijini National Park, Millstream Chichester National Park, Ningaloo Coast, Cane River Conservation Park	Low	Formal remote camping sites along the Ningaloo coast, other formal sites not frequently monitored by NP Rangers in Millstream Chichester (George River) and Karijini national parks (Milli Milli springs, Bobs Swim, Turee Creek). Informal campsite at the Cane River old homestead.
	Protected species and communities	Cape Range National Park, Karijini National Park, Millstream Chichester National Park, Cane River Conservation Park, Karlamilyi National Park, Collier Range National Park, Mungaroona Nature Reserve, Barlee Range Nature Reserve, UCL Ningaloo Coast, UCL Giralia, UCL Mount Minnie, UCL Nanutarra, UCL Mentheenna, UCL Fortescue Marsh, UCL ex Karratha Station	Low	Critically endangered and endangered fauna (night parrot, great desert skink, bilby, back-flanked rock wallaby, Pilbara olive python). Large-scale bushfires reduce the size of suitable habitat and negatively impact on the number and distribution of these species. See DBCA corporate dataset – Threatened and Priority Fauna (GDB).
Regional priority 3				
SHS	Settlements	Onslow, Dampier, Karratha, Roebourne, Wickham, Cossack, Point Samson, Port Hedland, Marble Bar, Nullagine, Newman	Medium	Several access points, primarily surrounded by low fuel areas, extensive areas of buffel grass.
LRR	Other assets	Mythological; ceremonial (without other associated sites types); historical use sites; artefacts	High	These sites generally have a higher resilience to bush fire as they do not hold physical materials that may be damaged or destroyed by fire. These sites are likely to have other asset types within proximity.
		Traditional camps	High	Traditional camps require ongoing traditional burning to maintain a mosaic of different vegetation ages and protect the site from bushfires.
Regional priority 4				
CIB	Critical infrastructure	Water Corporation pipeline and bore field infrastructure, Dampier Bunbury Gas pipeline	High	Infrastructure with high resilience to fire. Damage unlikely.
		Rail lines	High	High volume of traffic on all mining company rail lines in the Pilbara Region.
		Mount Wongama communications tower	High	Woodside operations rely on communications tower on Mount Wongama (Murujuga National Park).
		Cape Range, Millstream and Karijini DBCA communications towers	High	DBCA communications towers exist on Cape Range, Millstream and Karijini. Minimal risk of damage from bushfire.
Regional priority 5				
		Nil identified		

6. Indicators of acceptable bushfire risk

Bushfire risk is maintained at an acceptable level in the Pilbara Region if fuels are managed to the condition described in the below table. The current landscape condition will be compared to these indicators at least annually and the outcomes of that comparison used to inform the development of the annual fuel management program.

Table 9: Summary of indicators of acceptable bushfire risk in the Pilbara Region. Fire management area

Fire management area	Fuel type	Location	Target
Settlement-hazard separation (SHS)	Sandplain shrubland	1km surrounding settlements	60% of fuel less than threshold intensity
	Hummock grassland	500m surrounding settlements	
	Acacia woodland	N/A	No targets apply
Critical infrastructure buffer (CIB)	Sandplain shrubland	100m surrounding critical infrastructure	50% of fuel less than threshold intensity
	Hummock grassland	50m surrounding critical infrastructure	
	Acacia woodland	N/A	No targets apply
Landscape risk reduction (LRR)	Sandplain shrubland Hummock grassland	As defined in Table 8	45% of fuel less than threshold intensity
	Acacia woodland	N/A	No targets apply. Managed as required to meet land management objectives
Remote area management (RAM)	*Acacia* woodland Sandplain shrubland Hummock grassland	All other Parks and Wildlife Service managed lands	No targets apply. Managed as required to meet land management objectives

7. Spatial data

The descriptions of asset locations and FMA extents in Tables 8 and 9 are depicted spatially in a geodatabase that supports this RFMP. These data form the basis for comparison of the current landscape condition against the department's indicators of acceptable bushfire risk. This comparison will be conducted annually, at a minimum, and used to inform the fuel management program planning process. The master copy of the geodatabase is maintained in-house by the department's Regional Leader Fire Management with a copy provided to Fire Management Services Branch (FMSB) information officers to facilitate corporate reporting.

8. Monitoring and review

This plan will be regularly monitored and reviewed to ensure content remains accurate and up to date. The plan will be endorsed annually by the content custodian prior to being used in the burn program planning process.

FMSB will advise the Pilbara Regional Manager of any changes to the department's Bushfire Risk Management Framework that will need to be reflected in the RFMP.

The Regional Manager, or their delegate, will review the regional context statement, regional risk criteria and asset categorisation and prioritisation annually (at a minimum). The most important aspect of this review is confirmation that Table 8 continues to represent a comprehensive and accurate catalogue of the assets in the region requiring protection from bushfire. Any changes to Table 8 will also be reflected in the accompanying spatial data, including the mapping of FMA extents.

The spatial data that supports the RFMP will be reviewed at least annually to capture any changes in the distribution of assets, fuel, or department-managed tenure. Updated datasets will be provided to FMSB whenever any changes are made.

9. Knowledge gaps

The department's risk criteria and indicators of acceptable risk were developed using the best available science, practitioner judgement and supporting data. These inputs will be monitored by the department to ensure that the RFMP continues to reflect industry best-practice. It is expected that ongoing adjustment to the settings will be required as the State's social, political and natural environments change; better data become available, or knowledge of bushfire risk management is refined or improved. The framework will also be updated to incorporate the findings of any relevant research or adaptive management, and as new models are developed and refined.

Department of **Biodiversity, Conservation and Attractions**

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