MIDWEST REGION
REGIONAL FUEL MANAGEMENT PLAN

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Document history

Date of this version:	01/07/2025
Annual review due:	01/07/2026
Major review due	01/01/2031

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) Midwest 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 Midwest Region lies within the Midwest Coastal, Central Rangelands and Agricultural BRMZs.

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 Midwest Region.

Table 1: Fire management areas in the DBCA Midwest 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 BRMZs 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 Midwest 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 • 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 and Table 4

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 Midwest 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

[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.

represent extreme fire weather conditions have been contributed by experienced DBCA fire staff. This will be reviewed as more data becomes available.

3. The Midwest Region

The Midwest Region manages approximately 4.8 million hectares of CALM Act lands and waters between the Moore River (near Wanneroo) in the south, Carnarvon in the north and inland to Mount Magnet and Meekatharra.

The region manages land close to the coastal towns of Lancelin, Cervantes, Jurien Bay, Dongara, Geraldton, Kalbarri, Denham (Shark Bay) and Carnarvon, and inland settlements such as Cue, Mount Magnet, Payne's Find, Meekatharra and many smaller towns and settlements across the Murchison. There are 23 local government authorities in the region.

3.1. Tenure and management arrangements

The Midwest Region makes up 14.1 percent (37 million hectares) of Western Australia and is biogeographically diverse. The region includes 25 named national parks, 17 named conservation parks, three marine reserves (two marine parks and one marine nature reserve), 157 nature reserves (117 named and 40 unnamed) and various other non-CALM Act reserves and areas of unallocated Crown land.

Natural icons of the region include the Pinnacles at Nambung National Park; biodiversity hotspots of the Geraldton to Shark Bay sandplains including the Shark Bay World Heritage Area and Lesueur National Park; Monkey Mia dolphins; Kalbarri National Park geological features, Mount Augustus and Kennedy Range national parks; and the marine reserves of Shark Bay and Jurien Bay. Over the past decade more than four million hectares of former pastoral rangelands in the Gascoyne Murchison region have been purchased by the State Government for addition to the conservation estate, and will be jointly managed with Traditional Owner groups and the department once formal agreements are in place. The region also has responsibility for fire mitigation on 1.5 million hectares of unallocated Crown land and unmanaged reserves.

3.2. Climate and vegetation

A variety of climatic conditions exist across the region from a Mediterranean climate near the coast to semi-arid further inland. Episodic rainfall is typical in inland areas resulting from cyclones that cross the coast and decay into rain bearing depressions. Rainfall is low near the coast (200–650mm) and occurs primarily in the winter months.

The vegetation is characterised by a rich diversity that includes dense coastal heaths on sand plains, extensive areas of acacia shrubland and grasslands, and areas of low eucalypt woodland.

The region also contains many islands such as Bernier and Dorrie Islands, Dirk Hartog Island, the Houtman Abrolhos Islands and various smaller islands located along the Turquoise Coast that support unique biotic communities.

Department-managed land is typified by large coastal reserves adjacent to towns and major arterial roads, and inland reserves embedded in an agricultural or pastoral landscape. The northern and eastern parts of the region are generally utilised for pastoral enterprise and contain large areas of contiguous vegetation. Vegetation further to the south and nearer the coast consist of banksia

woodlands, heaths, and acacia shrublands, and there are often isolated remnants in an agricultural landscape.

Some of these areas, such as Lesueur and Kalbarri national parks, Peron Peninsula and several of the islands, contain biodiversity of international significance. Although mostly being covered with contiguous vegetation, the large areas of ex-pastoral land have been impacted by grazing. These areas are in recovery with an associated changing fire risk.

3.3. Fire management considerations

The Midwest Region has limited fire management capacity and shares significant lengths of boundary with private property and other landholders where bushfire risk is present. The department is committed to fire management partnerships with the Department of Fire and Emergency Services, local government authorities and volunteer bushfire brigades for mutual aid in fire suppression and bushfire risk reduction.

The region features major arterial roads, rail lines, and telecommunication infrastructure that connect the north of Western Australia to the south. Power, water, and gas pipeline infrastructure, that service large population areas to the south, are located on or near department-managed lands. These are important factors when considering the level of bushfire risk mitigation in this region.

The region also has several high visitation recreation and camping sites and trails in fire prone locations. Many of these locations are remote from fire suppression resources and response times are very prolonged. The sites in the north and east of the region experience significantly higher visitation during the winter months, outside the normal bushfire season.

Weather events resulting in lightning are the dominant cause of fires in the region. Multiple ignitions commonly occur with the passage of active troughs during the fire season. Response times and activities can be challenged where there are numerous ignitions, limited resources available, limited access, and large distances involved. Effective fire containment is heavily dependent on using existing low fuel areas in the landscape such as lake systems, fuel modified areas and fire scars to slow or stop fire runs.

Other important bushfire risk factors include the sporadic variability in flammability across the landscape. Vegetation growth is strongly influenced by previous rainfall patterns. Pulses of water associated with cyclones and rain bearing depressions trigger the germination and growth of forbs and grasses that fill the bare space between shrubs and provide a contiguous ground fuel layer until they wither and decay over a six to 12-month period. The presence of widespread, contiguous, near surface fuels significantly increases the bushfire risk.

Large areas of department-managed land consist of ex-pastoral leases. These areas have been degraded by pastoral practice and contain areas where vegetation is sparse and bushfire risk will remain very low for decades. Other areas are infested with flammable grassy weeds and bushfire risk can be heightened if the extent and flammability of these areas is not managed. Fire can both benefit and hinder the rehabilitation of these areas.

Active mining and extensive mineral exploration operations occur on and adjacent to department managed land. Some operations include residential villages and valuable infrastructure. Service and transport corridors for mine products are important to the State economy. Mineral exploration operations can involve temporary camps located in fire prone areas.

Large areas of department managed land are utilised by extractive industries such as beekeeping and cut flowers dependent on biological resources occurring. The potential impacts from fire on mature vegetation favoured by these industries may have an intermittent and variable effect on the fuel management undertaken across broad areas.

Traditional Owners have a significant interest in the management of land vested in or managed by the department. Fire management is of particular interest to Aboriginal people as they use fire as the main land management tool to manage and care for Country. A variety of lodged, registered and un-registered Aboriginal heritage sites and cultural landscapes exist in the region which can be adversely impacted by bushfire and prescribed burning activities. 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.

Santalum spicatum (sandalwood) is a fire vulnerable asset in the landscape which provides an opportunity for economic development for Traditional Owners in the region. Complexities relating to the protection of sandalwood communities may be addressed through prescribed fire plans.

There are also several large islands located off the Midwest coast. These include:

- Houtman Abrolhos island group vested as a national park. The islands are made up of three main groups, contain 210 islands and some are regularly used by professional fishers for accommodation in permanent basic accommodation. These areas are vested with the WA Minister for Fisheries. Heritage values are present on the islands. Due to the vegetation, climate and landforms, fire is unlikely to be a significant risk to life or property.
- Dirk Hartog Island is located to the north of the Shark Bay landform. The island is 62,000 hectares, predominantly native vegetation, and vested with the department as a national park. The island has undertaken significant work to remove and minimise the impact of introduced exotic species such as goats, sheep and cats, resulting in native fauna being successfully re-introduced to the island. Feral animal grazing impacts have reduced available fuel loads and the risk of fire impacts has been low. This may change as the island rehabilitates and tourism interest increases.
- Dorre and Bernier islands are located to the north of Dirk Hartog Island and off the coast of Carnarvon. The two islands are subjected to low levels of visitation. There is a low likelihood of fire, however, should it occur it is likely to have significant consequences for biodiversity values.
- Other smaller islands are not visited regularly and do not carry a significant fire risk.

3.4. Key fuel management strategies

The primary objective of the department's fire management in the Midwest 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.

Fuel management strategies applied across the Midwest Region focus on the application of prescribed burning at a landscape scale as well as within medium sized (100 to 1000 hectare) reserves to reduce bushfire risk to life and property, while promoting positive ecological outcomes.

District fire management areas within the region include:

- Turquoise Coast: the boundary between LRR and RAM is defined by the Midlands Road, with the area west of Midlands Road being LRR and the remainder of the district being RAM.
- Murchison District: LRR and RAM is based on bushfire risk management zone, land tenure and size. Areas of conservation estate within the Midwest coastal and agricultural zones greater than 1000 hectares will be treated as LRR, with the remainder as RAM.
- Gascoyne District: predominantly RAM with defined areas with specific management outcomes identified as LRR.

Site-based treatment tactics include:

- a combination of physical fuel treatment along boundaries, strategic prescribed burning and strategic fire access (Kalbarri National Park and Turquoise Coast coastal reserves)
- opportunistic fire management operations as and when appropriate and feasible (remote areas of the region)
- the creation of east-west and north-south fuel managed buffers to enhance the probability of controlling large intense fires with the resources available under the predominate prevailing weather conditions (Turquoise Coast District coastal reserves).

The application of prescribed burning is not appropriate or practical in some reserves within the region and other forms of physical fuel management, or no treatment at all, may be more appropriate. Examples of these locations are reserves with high conservation value and low resilience to fire, vegetation types that may not burn under prescribed burning conditions, and small or linear reserves. The maintenance of appropriate landscape-scale fuel mosaics is important to address fuel age distribution across the landscape and reduce risk to these important reserves and surrounding assets.

Some existing national park management plans note a ‘no planned burn’ (NPB) strategy. These plans were developed in the mid to late 1990s and reflect the precautionary approach that was being taken at that time. Although now expired, they have not been replaced and the general management regime applies. For fuel management in these areas, the general principle will be that burns in the adjacent ‘open edge burn zone’ will be lit under prescribed conditions where fire travel is unlikely to enter the NPB areas. Where fire does enter these areas, they will be allowed to burn with no direct attack applied.

4. Midwest Region risk criteria

The Midwest Region lies within the Midwest Coastal, Southern Rangelands, and Desert BRMZs. The indicators of acceptable bushfire risk are based upon the fuel and fire behaviour characteristics of acacia woodland, sandplain shrublands, thicket, semi-arid woodland, and chenopod shrubland fuel types which have been broadly grouped across the region.

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

Fuel type	**Acacia woodland**	**Banksia woodland**	**Dry eucalypt forest**	**Hummock grassland**	**Sandplain shrublands (northwest coastal)/mallee heath**
Fuel accumulation and fire behaviour models	Not applicable	Dry eucalypt forest fire model (VESTA)	Dry eucalypt forest fire model (VESTA)	WA spinifex model	Expert judgement Anderson shrubland model, Cruz mallee-heath model
Weather parameters applied	Location: Gascoyne inland Temperature: 35°C Relative humidity: 10% Wind speed: 35 km/h	Location: Inland central west - south Temperature: 35°C Relative humidity: 10% Wind speed: 35 km/h	Location: Coastal central west - south Temperature: 35°C Relative humidity: 10% Wind speed: 35 km/h	Location: Gascoyne inland Temperature: 35°C Relative humidity: 10% Wind speed: 35 km/h	Location: Coastal central west - north Temperature: 35°C Relative humidity: 10% Wind speed: 35 km/h
Tolerable fuel age	20 years	10 years	8 years	10 years	10 years
Settlement-hazard separation (SHS)	N/A – not applicable to fuel type	1km surrounding settlements	5km surrounding settlements	500m surrounding settlements	1km surrounding settlements
Critical infrastructure buffer (CIB)	N/A – not applicable to fuel type	100m surrounding fire vulnerable critical infrastructure	N/A – not applicable to fuel type	50m surrounding fire vulnerable critical infrastructure	100m surrounding fire vulnerable critical infrastructure
Landscape risk reduction (LRR)	N/A – not applicable to fuel type	As defined in Table 8	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 – not applicable to fuel type	N/A	N/A
Comment	Eastern parts of the Murchison and Gascoyne districts mainly associated with former pastoral lands including Peron and Kennedy Range national parks.	Parts of Turquoise Coast District near to Dandaragan, Badgingarra, and Watheroo national parks. Adjacent to the Boothendarra Plantation which is managed as part of this fire regime.	Parts of Lesueur and Coomalloo national parks.	Kennedy Range National Park and Doolgunna (former pastoral lease), Collier Range. Parts of Peron Peninsula. Dirk Hartog Island. Associated with acacia woodland fuel type.	Kalbarri National Park and Zuytdorp Nature Reserve and surrounding former pastoral lease.

Fuel type	Sandplain shrublands (south-west coastal)	Sandplain shrublands (Inland)/ mallee heath	Thicket	Semi-arid woodlands	Chenopod shrublands
Fuel accumulation and fire behaviour models	Expert judgement Anderson shrubland model	Expert judgement Anderson shrubland model, Cruz mallee-heath model)	Expert judgement Anderson shrubland model	Forest fire behaviour tables; Dry eucalypt Forest fire model; McArthur Mk5 forest fire behaviour meter	None
Weather parameters applied	Location: Coastal central west - south Temperature: 35ºC Relative humidity: 30% Wind speed: 35 km/h	Location: Inland central west - south Temperature: 35ºC Relative humidity: 10% Wind speed: 35 km/h	Location: Gascoyne Inland Temperature: 35ºC Relative humidity: 10% Wind speed: 35 km/h	Location: Inland central west - south Temperature: 35ºC Relative humidity: 10% Wind speed: 35 km/h	N/A
Tolerable fuel age	8 years	10 years	15 years	N/A	N/A
Settlement-hazard separation (SHS)	1km surrounding settlements	1km surrounding settlements	1km surrounding settlements	N/A – not applicable to fuel type	N/A – not applicable to fuel type
Critical infrastructure buffer (CIB)	100m surrounding fire vulnerable critical infrastructure	100m surrounding fire vulnerable critical infrastructure	100m surrounding fire vulnerable critical infrastructure	N/A – not applicable to fuel type	N/A – not applicable to fuel type
Landscape risk reduction (LRR)	As defined in Table 8	As defined in Table 8	As defined in Table 8	N/A – not applicable to fuel type	N/A – not applicable to fuel type
Remote area management (RAM)	N/A	N/A	N/A	N/A	N/A
Comment	West of Brand Highway (south) and North West Coastal Highway (northern extent to Kalbarri National Park).	Areas bounded by Brand Highway and Midlands Road including Watheroo National Park and Big Soak Plains UCL.	Within and adjacent to Kalbarri National Park and the UCL and former pastoral leases to the east of Kalbarri National Park.	Watheroo National Park and eastern areas of Turquoise Coast District	Variety of locations primarily in the eastern portion of the region

5. Asset categorisation and prioritisation

The following table applies the department's bushfire risk criteria to identify and prioritise assets in the Midwest 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 Midwest Region.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
Regional priority 1				
SHS	Settlements	Lancelin, Cervantes, Jurien Bay, Greenhead, Leeman, Kalbarri	Low	Regionally significant towns. Refuge available on the beach. Flammable fuels within 100m of dwellings. Restricted access/egress.
	Settlements	Ocean Farms and Seaview Estate (Lancelin), Hill River (Cervantes), Jurien Bay Heights, Alta Mare (Jurien Bay)	Low	Semi-rural subdivisions. Flammable fuels within 100m of dwellings. Restricted access/egress.
	Settlements	Wedge and Grey	Low	High fire season visitation. Site is located within areas of natural vegetation. Limited (single) access egress (one way loop) within limited turn around opportunities. Transient holiday and tourist population.
	Settlements	Pinnacles Discovery Centre (Nambung National Park), Lesueur National Park loop, Z-Bend, Skywalk, Natures Window (Kalbarri National Park)	Low	High fire season visitation. Site is located within areas of natural vegetation.
Regional priority 2				
SHS	Settlements	Badgingarra, Eneabba, Cataby, Regans Ford, Moora, Coorow, Carnamah, Three Springs, Watheroo, Dandaragan, Dongara and Port Denison, Port Gregory	Medium	Townsites located within natural vegetation areas. Reduced fuel in the immediate vicinity of the townsites. Multiple egress or refuge areas available.
	Settlements	North Head and Sandy Cape	Medium	High fire season visitation. Remote camping site with limited access/egress. Low fuels in the vicinity
	Settlements	Lancelin Defence Training Area base	Medium	High fire season visitation. Onsite accommodation for Department of Defence personnel. Moderate clearing in the vicinity. Management plan and caretaker in place.
CIB	Critical infrastructure	Indian Ocean Drive, Brand Highway	Medium	Major road networks with mixed tourist, trucks (heavy and light) and public motorists. Limited support/traffic management resources in place. Flammable fuel within proximity to the road edge. High volume of heavy and tourist traffic.
LRR	Dispersed population Protected species and communities Economic assets Other assets	In the Turquoise Coast District: Department-managed land west of the Midlands Road. In the Murchison District: Department-managed land within the Midwest Coastal and Agricultural zones, which is greater than 1000Ha in size	Low-Med	This area contains a concentration of assets including individual dwellings, travelling public, recreation infrastructure, biodiversity values and economic assets. Formal and informal camping activities are popular, especially near the coast.
	Dispersed population	Fishing shacks/settlements: Cliff Head, North Head, Coolimba, Illawong, Nobby Head Informal camping: North Head, Sandy Cape, Karda campground (Lesueur) and Banovich Rd, Wanagarren (Wedge), Yued Ponar & Yonga Overnight Walk Trail (Lesueur NP)	Low	Small settlements with non-permanent populations. Population is a mix of transient professional fishers and tourists, including families. Shacks are generally of poor design and construction. Natural vegetation within 50m of buildings. Limited access/egress.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
		Indian Ocean Drive lookouts (Wanagarren Nature Reserve) National park access and lookouts: Grigson's Lookout (Beekeepers Nature Reserve) Stockyard Gully recreation site (Beekeepers Nature Reserve)	Low	Moderate fire season visitation. Isolated recreation sites. Tourist population with very limited fire awareness. Limited access/egress. Limited internal refuge areas. Flammable fuel within proximity to road.
Regional priority 3				
SHS	Settlements	Greenough, Northampton, Carnamah, Coorow, Hill River, Shark Bay, Denham, Useless Loop	High	These towns have some separation from natural, intact native vegetation with resulting lower fuel loads.
		Mining camps: Iluka (Cataby and Eneabba), Behara Springs Gas office and camp (Mount Adams)	High	Cleared areas around camps.
		Pinnacles (Nambung NP)	Medium	Part of structured accommodation with integrated response plan.
LRR	Dispersed population	Hangover Bay and Kangaroo Point	Medium	High fire season visitation. Cleared areas available for refuge.
	Economic assets	Apiary sites	Medium	Single access/egress road. High numbers of international tourists.
	Other assets	Orchid species	High	Infrequent visitation during high fire danger periods. Refuge available on beach. Single or limited access/egress tracks.
Regional priority 4				
LRR	Dispersed population	Blowholes	High	Infrequent visitation during high fire danger periods. Fuel is generally low. Very limited access/egress in the event of an incident.
	Protected species and communities	Banksia woodland TEC	Moderate	Requires appropriate fire and land management regimes. Return cycle is likely to be 16 years. Proposal is that 30% of area is >16-year-old, with 30% maintained <10-year-old for fuel management.

6. Indicators of acceptable bushfire risk

Bushfire risk is maintained at an acceptable level in the Midwest Region if fuels are managed to the condition described in the below table (Table 9). 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 Midwest Region.

Fire management area	Fuel type	Location	Target
Settlement hazard separation (SHS)	Dry eucalypt forest	5km surrounding settlements	60% of fuel less than threshold intensity
	Sandplain shrubland, thicket, *Banksia* woodland	1km surrounding settlements	
	Mallee-heath	500m surrounding settlements	
	Acacia woodland, Semi-arid woodland, chenopod shrubland	N/A	No targets apply
Critical infrastructure buffer (CIB)	Sandplain shrubland, thicket, mallee-heath, *Banksia* woodland, dry eucalypt forest	100m surrounding critical infrastructure	50% of fuel less than threshold intensity
	Acacia woodland, semi-arid woodland, chenopod shrubland	N/A	No targets apply
	Dry eucalypt forest, wet eucalypt forest, *Banksia* woodland, *Acacia* woodland, semi-arid woodland, chenopod shrubland	N/A	No targets apply
Landscape risk reduction (LRR)	Dry eucalypt forest	As defined in Table 8	45% of fuel less than threshold intensity
	Banksia woodland, sandplain shrubland, mallee-heath, thicket	As defined in Table 8	30% of fuel less than threshold intensity
	Acacia woodland, Semi-arid woodland, chenopod shrubland	N/A	No targets apply. Managed as required to meet land management objectives

Fire management area	Fuel type	Location	Target
Remote area management (RAM)	Dry eucalypt forest, *Acacia* woodland, sandplain shrubland, thicket, mallee-heath, semi-arid woodland, chenopod shrubland, *Banksia* woodland	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 Midwest 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**

2025_547_1025