



WARREN REGION REGIONAL FUEL MANAGEMENT PLAN



Department of **Biodiversity,
Conservation and Attractions**



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Custodian

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Table of contents

Document history	1
Custodian	1
Table of contents	2
1. Introduction	3
2. Bushfire risk criteria	4
2.1. Bushfire risk management zones	4
2.2. Fire management areas	4
2.3. Asset value	5
2.4. Asset resilience	7
2.5. Risk treatment strategies	9
2.6. Tolerable fuel age	9
2.7. Weather conditions	9
3. The Warren Region	10
3.1. Tenure and management arrangements	10
3.2. Climate and vegetation	10
3.3. Fire management considerations	10
3.4. Key fuel management strategies	12
4. Warren Region risk criteria	14
5. Asset categorisation and prioritisation	16
6. Indicators of acceptable bushfire risk	19
7. Spatial data	19
8. Monitoring and review	20
9. Knowledge gaps	20

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) Warren 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 Warren Region lies within the South West BRMZ.

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 its 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) and landscape risk reduction (LRR) categories are applied to the Warren Region.

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

Fire management area	Description
Settlement-hazard separation (SHS)	<ul style="list-style-type: none"> • 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.
Landscape risk reduction (LRR)	<ul style="list-style-type: none"> • 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 critical infrastructure buffer (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.

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 Warren Region requires complementary activities in the FMAs including SHS 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 community¹	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 APZs³ 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 conditions⁴ (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 Warren 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 Warren Region

DBCA's Warren Region is situated in the south-west of Western Australia between the South Coast, Wheatbelt and South West regions. It is delineated by the Hay River and Albany Highway in the east and the Vasse Highway and south to Black Point in the west. To the north, the regional boundary follows an irregular line between Mount Barker and Bridgetown.

3.1. Tenure and management arrangements

The Warren Region spans nine local government authorities, with 50 per cent of its area within the Shire of Manjimup, 15 per cent in the Shire of Plantagenet, and 14 per cent in the Shire of Denmark. The region has a population of approximately 16,000 people with the major towns being Manjimup, Pemberton, Walpole, Denmark, Northcliffe, Mt Barker, Rocky Gully, and Bridgetown.

The department manages 64 per cent (930,307 hectares) of the land in the region: 649,800 hectares of national parks and nature reserves; 270,857 hectares of State forest and timber reserves; 1446 hectares of marine park and 8164 hectares of other reserves. There is also approximately 30,000 hectares of unallocated Crown land and unmanaged reserves. Approximately 25 per cent of the region has been cleared of native vegetation and is utilised for agriculture—primarily raising cattle, sheep, and pigs; broadacre cropping; and fruit and vegetable farming.

3.2. Climate and vegetation

The region covers a major proportion of the Warren biogeographic region, the Southern Jarrah Forest biogeographic subregion (Jarrah Forest bioregion) and parts of the Leeuwin-Naturaliste and WA South Coast Integrated Marine and Coastal Regionalisation of Australia regions. The region contains a relatively intact, varied, and rich complex mosaic of natural landscapes and vegetation such as wetlands, heaths, woodlands, forests (including jarrah, karri, and tingle forests) riparian ecosystems, rivers, rock outcrops, inlets, estuaries, beaches, coastal plain and cliffs and islands.

Rainfall is highest in the south-west of the region (Pemberton ~1200mm of rain annually) and lowest in the north and east (Rocky Gully ~700mm). Most of the rainfall occurs between May and September.

Where water availability is lowest, jarrah-marri woodlands occur on lateritic soils and shrublands on sandy soils. The intermediate (900-1100mm) rainfall zone supports jarrah-marri forest. Areas of higher rainfall are dominated by karri forest. Poorly drained plains and depressions with leached sandy soils support a range of woodlands, heathland and sedge lands including low jarrah woodlands, paperbark and sedge swamps, and peppermint (*Agonis flexuosa*) and banksia woodlands and heaths. The eastern fringe of the region supports areas of wandoo and yate woodlands.

3.3. Fire management considerations

Across the Warren Region there are important natural, Aboriginal cultural, and built values that are at risk from bushfire or inappropriate fire management. When considering the application of prescribed fire and bushfire operations, it is necessary to identify these values and assets and plan to minimise the risk of adverse impacts. The Warren Region aims to achieve this by acknowledging that:

- Primary consideration is the protection of townsites, settlements and rural subdivisions that are situated in fire prone areas. The department will work with local government and the Department Fire and Emergency Services (DFES) to develop and implement appropriate fuel mitigation and bushfire response strategies.
- Iconic tourist destinations, nature-based, and wine and food tourism are important economically at local, regional and in some instances State level. Peak visitation to these sites coincides with the spring, summer and autumn prescribed burning period and the bushfire season.
- High value agriculture, horticulture, and viticulture enterprises with a strong 'clean green' marketing angle exist across the region. Prescribed burning and bushfire can have negative impacts on industry. Fire management planning needs to identify the potential for impact from fire and smoke, along with the required level of consultation to engage with individual growers and representative bodies.
- Economically important plantation resources that require a range of fire management treatments including exclusion of fire. Consultation with Forest Products Commission will be required to coordinate harvest and prescribed burn planning to protect plantation values.
- Forest enhancement areas that are planned to be, or have been, silviculturally treated by ecological thinning for forest health and resilience may require specific fire management applications. Consultation with DBCA's Forest Management Branch will be required to coordinate ecological thinning operations and prescribed burn planning to meet forest health objectives.
- Internationally significant biodiversity values and large areas of wilderness with diverse vegetation and complex structure that require varied and often competing fire management requirements. Ongoing engagement with DBCA's Biodiversity and Conservation Science and operational staff is important to ensure appropriate fire regimes are developed and implemented.
- Tingle forests are endemic to the region. The region also contains the majority of karri occurrence and a significant number of peat and organic wetlands that require specific fire management regimes which pose ongoing fire planning and operational challenges. Tingle and karri forests have a narrow window available for safely conducting prescribed burning and this window aligns with the summer tourism season and peak bushfire requirements in the south-west of the State. This can result in competition for resources, heightened political and community interest and high consequences for burn escapes. Wetlands, peat, and organic soils are drying out due to reduced rainfall and drying soil profiles which is altering the traditional burning opportunities and elevating fire intensity that potentially impacts on these systems.
- A variety of lodged, registered and unregistered 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.

- Neighbouring properties with a variety of land uses that have a range of fuel types, and high or unknown fuel ages, pose challenges to the planning and implementation of the prescribed burn program due to the potential for escape.
- To successfully undertake its fire management responsibilities, it is critical that the department builds and sustains a highly capable workforce. Developing and maintaining the Human Fire Capability Plan for the Warren Region is an important step in ensuring appropriately trained and experienced staff are engaged in fire management. Appropriate planning, operational tactics, and implementation to ensure the safety of departmental staff, volunteers, and the community is critical during prescribed burning and bushfire operations.

3.4. Key fuel management strategies

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

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

- protection of towns, settlements, subdivisions and other infrastructure of economic value where there is potential for impact from bushfires emanating from department managed lands
- limit on number of mixed fuel burns (5-7) that can be undertaken due to the risk of carrying these burns across summer (i.e. burn is active for more than four months), the resources required and the small window of suitable weather conditions providing an opportunity to safely conduct those burns
- application of fire to coastal landscape (approximately Black Point to William Bay), with the aim to reduce encroachment of woody shrub species and maintain the coastal ecosystem health
- protection of regenerating karri forests by initial period of fire exclusion, followed by the phasing in of silvicultural prescribed burning for the protection of forest health and resilience
- use of fire to protect, enhance and regenerate habitat for a range of threatened fauna species
- protection of visitors and associated visitor infrastructure.

Locations or areas where other forms of fuel management should be considered over prescribed burning:

- Elevated levels of fuel on DBCA managed estate and private property adjacent to settlements is potentially considered a higher risk to conduct prescribed burning in some areas. These include:
 - Nornalup
 - assorted smaller sub-divisions throughout the region.
- The Valley of the Giants (VOG) Tree Top Walk is challenging to protect using prescribed burning due to:
 - timing of burning conflicts with peak visitation periods
 - fuel type (i.e. tingle forest) is only available for prescribed burning for a short window each year
 - risk to the infrastructure and associated high value trees
 - lack of an appropriate network of new tracks and roads aligned to forest structure boundaries.

It is therefore highly unlikely prescribed burning will be used within the VOG precinct. However, it can be used in the surrounding areas to provide broader protection to prevent a large bushfire moving into the VOG area.

- Dependant of site quality, young karri regeneration forests should not be burnt until they reach between 15-25 years of age and may be excluded from prescribed burning for this period. However, between 0-7 years they can provide a moderate level of fire protection to surrounding areas due to lack of surface and trash fuels.
- Regenerating jarrah forests require a range of fire management actions, including exclusion from fire for up to 15 years.
- Softwood plantations within the region are excluded from fire management.
- Conditional burn areas (CBA) are areas that require specific fire regimes to support some management or research activity. Examples include:
 - fire exclusion reference areas
 - scientific study areas
 - no planned burn – management plan
 - fire exclusion – habitat
 - fire exclusion – cultural
 - specified management regimes.

4. Warren Region risk criteria

The Warren Region lies within the South West BRMZ. The indicators of acceptable bushfire risk are based upon the fuel and fire behaviour characteristics of dry eucalypt forest, wet eucalypt forest and sandplain shrubland fuels which have been broadly grouped across the region.

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

Fuel type	Dry eucalypt forest	Wet eucalypt forest	Sandplain shrubland
Fuel accumulation and fire behaviour models	Forest fire behaviour tables (Redbook) Dry eucalypt forest fire model (VESTA)	Forest fire behaviour tables (Redbook) Dry eucalypt forest fire model (VESTA)	Expert judgement Anderson Shrubland model
Weather parameters applied*	Location: Manjimup SMC: 5 FDI: 100 Location: Rocky Gully SMC: 6 FDI: 110	Location: Pemberton SMC: 6 FDI: 80 Location: Walpole SMC: 7 FDI: n/d	Location: Pemberton SMC: 6 FDI: 80 Location: Walpole SMC: 7 FDI: n/d
Tolerable fuel age	6	8	7
Settlement-hazard separation (SHS)	5km	5km	1km
Landscape risk reduction (LRR)	Remainder of South West BRMZ	Remainder of South West BRMZ	Remainder of South West BRMZ

*Weather parameters based on daily calculations of SMC and FDI collected from over 20 years of records at departmental work centres in the Warren Region.

NOTE: Other fuel types not addressed due to small amount of area they cover:

- *Banksia* woodland (included in dry eucalypt) – 478ha
- semi-arid woodland (included in dry eucalypt) – 58ha
- mallee heath (sandplain shrubland) – 43ha
- plantations – 1623ha
- thickets (included in dry eucalypt) – 1753ha
- non-fuel (lakes, rock outcrops, rivers, sand dunes) – 14,281ha

Map rulesets:

- *Banksia* woodlands, plantations, mallee heath and semi-arid woodland to map as dry eucalypt forest
- thickets to map as wet eucalypt forest.

5. Asset categorisation and prioritisation

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

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
Regional priority 1				
SHS	Settlements	Pemberton	Low	Surrounded by forest fuels and regrowth forests, contains many timber structures, high fuel loads and steep slopes.
		Northcliffe, Quinninup, Deanmill, Walpole	Low	Surrounded by forest fuels and regrowth forests, contains many timber structures.
		Windy Harbour	Low	Surrounded by continuous coastal shrubland fuels, one access route, high proportion of non-resident population, limited water available for firefighting and many older dwellings constructed of timber or fibro.
		Karri Valley	Low	Surrounded by continuous wet eucalypt forest fuels, one access route, high proportion of non-resident population, and many dwellings constructed of timber.
		Denmark	Low	Coastal town with significant resident population that has high visitation during the fire season, large pockets of very old fuels in dry and wet eucalypt forest contained within the town and on its outskirts.
		Peaceful Bay	Low	Small coastal town and shire lease area, large number of wooden homes/holiday houses, high fire season visitation, limited access and surrounded by sandplain shrubland and wet eucalypt forest.
		Nornalup, Kenton Estate	Low	Surrounded by continuous wet eucalypt forest fuels, one access route, proportion of non-resident population, and many dwellings constructed of timber.
	Nyamup	Low	Old mill town, wooden structures, limited access and surrounded by dry eucalypt forest fuels	
	Dispersed population	Valley of the Giants Tree Top Walk	Low	VOG is of state and regional importance for tourism, high fire season visitation and embedded within wet eucalypt forest.
		Parry's Beach, William Bay	Low	High fire season visitation, Parry's Beach embedded in coastal sandplain heath, access limited. William bay high summer visitation, single point of access, embedded in coastal sandplain heath.
Heart break trail / Warren River		Low	High summer visitation, steep terrain, and heavy fuel loads.	
Regional priority 2				
SHS	Settlements	Manjimup, Dingup, Balbarrup	Medium	Significant agricultural zone surrounding town, some timber structures and forested corridors leading into the townsite. Multiple highly trafficable access routes. Dingup and Balbarrup are subdivisions and less densely populated areas.
		Tone Bridge, Rocky Gully	Medium	Significant agricultural zone surrounding town, some timber structures and forested corridors leading into the townsite.
LRR	Dispersed population	Donnelly and Tone River settlements	Low	Old mill site used as a commercial tourism site, surrounded by wet eucalypt forest, old wooden buildings with limited access.
		Camfield (Broke Inlet)	Low	Shire recreation reserve with huts of timber construction, limited access, seasonal use.
		Donnelly River huts	Low	Timber huts near the mouth of the Donnelly River only accessible by river, surrounded by wet eucalypt forest or sandplain shrubland.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
		Gardner River huts	Low	Huts near mouth of Gardiner River to the east of Windy Harbour, 4wd access only, surrounded by wet eucalypt forest or sandplain shrubland.
		Bow Bridge	Medium	Small community on South Coast Highway
		D'Entrecasteaux National Park informal coastal camping	Low	Informal sites along the southern coast, popular fishing destination, particularly during late summer and autumn when Australian Salmon run is occurring.
		Black Point	Low	Newly developed camping and day use area. Popular fishing and surfing destination. Camping facilities/area in peppermint woodlands in dune swales.
		Yeagarup Lake	Low	Developed day use and camping area with a range of facilities, access point to Yeagarup beach. Wet eucalypt forest surrounds this camping area, limited access.
		Gloucester Tree & Bicentennial Tree	Low	Developed day use sites and climbing trees. Sites sit within wet eucalypt forest with med/high fire season visitation.
		One Tree Bridge precinct, Four Aces and Greens Island	Low	Developed day use sites and camping area with a range of facilities in the Donnelly River valley.
		Mt Chudalup	Low	Developed day use site
		Mount Frankland	Low	Newly developed day use site
		Fernhook Falls	Low	Camping and day use area on the Deep River with a range of facilities
		Bibbulmun Track and huts, Munda Bididi Trail, and huts	Low	Remote walking and mountain biking trails and facilities.
		Big Brook Dam and arboretum	Low	Very popular day use and camping site with a range of facilities, with swimming, trout fishing and marroning in summer.
		Oil Well track hut	Low	Camping area and facility managed by private enterprise on behalf of the department.
	Protected species and communities	Mt Lindesay	Low	Threatened ecological community, numerous declared rare flora, susceptible to phytophthora.
		Priority ecological communities	Low	Warren Regional NC Plan 2015-2019 identifies a number of communities that should be considered.
		Perup	Low	Area contains important populations of threatened fauna including the Perup enclosure and 3 fenced enclosures of critically endangered threatened flora.
		Muir – Byenaup Wetland System	Low	Peat based wetlands of international significance (RAMSAR) for waterbird breeding, small recreation facility associated with Lake Muir, low visitation during fire season.
		Meerup river system	Low	Translocation site for Western Swamp Tortoise
		Peat and organic based wetlands	Low	Peat based wetlands that are distinct to the SW of Western Australia and support a range of threatened species, low resilience to fire when peats/organic soils are dry.
		Lake Jasper Wetlands	Low	Freshwater wetlands along the coastal plain that support a range of threatened species.
Regional priority 3				
SHS	Settlements	Mt Barker, Frankland River, Palgarup, Yornup	High	Several access points, primarily surrounded by pasture and agricultural zone.
LRR	Dispersed population	Sandy Peak, Malimup, Quannup	Medium	Small privately owned enclaves within D'Entrecasteaux National Park, limited access, and development
		Warren River/Deep River/Donnelly River	Medium	Informal sites along these rivers utilised during marron season
		Boyup-Brook Cranbrook Rd	Medium	Alternate tourist and haul route between Albany and Bunbury, passes through areas of dry eucalypt forest and agricultural lands.

Fire management area	Asset class	Asset description and occurrences	Resilience	Rationale
		South West Highway, Muir Highway, Vasse Highway, South Coast Highway	Medium	Major highways that pass through significant areas of wet and dry eucalypt forest, high seasonal use in summer.
		Shannon Campsite	Medium	Newly developed campsite, open space with a range of facilities
	Protected species and communities	Quokka habitat, Tammar habitat	Medium	Both species highly mobile and widely dispersed.
	Economic assets	Timber plantations	Low	High value timber assets
		Horticultural, viticultural, apiarists	Low	Genuine Southern Forest, prime areas around Pemberton, Manjimup, Denmark, Frankland River, Mount Barker for a range of products produced with a low resilience to bushfire.
	Other assets	Forest enhancement areas	Medium	Ecological thinning areas identified on annual ecological thinning plans
		Historic/Old huts, Fish Creek, Broke Inlet, Bolghinup, Banksia Camp (Mossop)	Low	Locally historic huts, mostly of wooden construction, located on the coastal plain in sandplain shrubland.
		Communication towers	Low	Support radio and mobile phone. Important communication networks for emergency services.
Regional priority 4				
LRR	Dispersed population	Circular Pool, Mandalay Beach, Conspicuous Cliffs, Boat Harbour, Quarrum, Broke Inlet, Point D'Entrecasteaux, Donnelly boat landing, Lake Jasper	High	Range of day use recreational sites with a variety of facilities and access.
	Economic assets	Bunbury – Manjimup Railway line	Medium	Disused railway, still considered a state asset, wooden bridges across rivers.
	Other assets	Dingup, Unicup, Bokerup, Middlesex, Scotsdale, Tingledale	Medium	Historic settlements, now mostly uninhabited but containing dispersed populations but often containing buildings of local community value
		Perup Natures Guest House	Medium	Rammed earth visitor facilities, surrounded by dry eucalypt forest, limited access, low fire season visitation.

6. Indicators of acceptable bushfire risk

Bushfire risk is maintained at an acceptable level in the Warren 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 Warren Region.

Fire management area	Fuel type	Location	Target
Settlement-hazard separation (SHS)	Dry eucalypt forest Wet eucalypt forest	5km surrounding settlements	60% of fuel less than threshold intensity
	Sandplain shrubland	1km surrounding settlements	
Landscape risk reduction (LRR)	Dry eucalypt forest Wet eucalypt forest	Remainder of South West BRMZ	45% of fuel less than threshold intensity
	Sandplain shrubland	Remainder of South West BRMZ	30% of fuel less than threshold intensity

7. Spatial data

The descriptions of asset locations and FMA extents in Table 8 and Table 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 Warren 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,
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