Bushfire Risk Management Plan

2021 - 2026

Shire of Murray

Adopted 25 November 2021

Office of Bushfire Risk Management endorsed 29 October 2021
Shire of Murray endorsed 25 November 2021 (OCM21/188)

Shire of Murray

Contents

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Document Control

Document Name	Bushfire Risk Management Plan	Current Version	1.2
Document Owner	Shire of Murray Chief Executive Officer	Issue Date	25 October 2021
Document Location	Shire of Murray Administration Centre	Next Review Date	25 October 2026

Document Endorsements

The Shire of Murray Council endorses that the Bushfire Risk Management Plan (BRM Plan) has been reviewed and assessed by the Office of Bushfire Risk Management as consistent with the standard for bushfire risk management planning in Western Australia, the *'Guidelines for Preparing a Bushfire Risk Management Plan'*.

The Shire of Murray is the owner of this document and has responsibility, as far as is reasonable, to manage the implementation of the BRM Plan and facilitate the implementation of bushfire risk management treatments by risk owners. The approval of the BRM Plan by the Shire of Murray Council satisfies their endorsement obligations under State Hazard Plan – Fire.

Local Government	Representative	Signature	Date
Shire of Murray	Dean Unsworth		29/11/2021

Disclaimer

In approving this BRM Plan, the Shire of Murray Council is acknowledging the assets that have been identified within their local community and the risk ratings and treatment priorities assigned. Approval of the plan is a commitment by the Shire of Murray to work with land owners and managers to address unacceptable risk within the community. Endorsement of this plan is not an acceptance of responsibility or commitment by the Shire of Murray to treat risks occurring on land that is not owned or managed by the Shire.[1]

[1] Guidelines for Preparing a Bushfire Risk Management Plan. November 2020. Page 44

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Amendment List

Version	Date	Author	Section
Draft v1	August 2019	RP	All – Initial Draft
Draft V1.1	October 2020	DW	All – Apply style guide changes
Draft v.1.2	April 2021	DW	All – Align to new OBRM template

Publication Information

1. Introduction

1.1. Background

Under the *State Hazard Plan - Fire* an integrated Bushfire Risk Management (BRM) Plan is to be developed for local government areas with significant bushfire risk. This BRM Plan has been prepared for the Shire of Murray in accordance with the requirements of the '*Guidelines for Preparing a Bushfire Risk Management Plan'* (the Guidelines) from the Office of Bushfire Risk Management (OBRM) within the Department of Fire and Emergency Services (DFES). The risk management processes used to develop this BRM Plan are aligned to the key principles of *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines* and those described in the National Emergency Risk Assessment Guidelines. This approach is consistent with State Emergency Management (SEM) Policy and SEM Prevention Mitigation Procedure 1.

This BRM Plan is a strategic document that facilitates a coordinated approach towards the identification, assessment and treatment of assets exposed to bushfire risk. The Treatment Schedule sets out a broad program of coordinated multi-agency treatments to address risks identified in the BRM Plan. Government agencies and other land managers responsible for implementing treatments participate in developing the BRM Plan and Treatment Schedule to ensure treatment strategies are collaborative and efficient, regardless of land tenure.

1.2. Aim and Objectives

The aim of the BRM Plan is to effectively manage bushfire risk in order to protect people, assets and other things of local value in the Shire of Murray. The objectives of this BRM Plan are to:

- Guide and coordinate a tenure blind, multi-agency BRM program over a five year period;
- Document the process used to identify, analyse and evaluate risk, determine priorities and develop a plan to systematically treat risk;
- Facilitate the effective use of the financial and physical resources available for BRM activities;
- Integrate BRM into the business processes of local government, land owners and other agencies;
- Ensure there is integration between land owners, BRM programs and activities; and
- Document processes used to monitor and review the implementation of treatment plans to ensure they are adaptable and that risk is managed at an acceptable level.

1.3. Legislation, Policy and Standards

The following legislation, policy and standards were considered to be applicable in the development and implementation of the BRM Plan.

1.3.1. Legislation and Policy

- *Aboriginal Heritage Act 1972*
- *Biodiversity Conservation Act 2016*
- *Building Act 2011*
- *Bush Fires Act 1954*
- *Conservation and Land Management Act 1984*
- *Country Areas Water Supply Act 1947*
- *Emergency Management Act 2005*
- *Environmental Protection Act 1986*
- *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)*
- *Fire Brigades Act 1942*
- *Fire and Emergency Service Act 1998*
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909*
- *National Trust of Australia (WA) Act 1964*
- *Bush Fires Regulations 1954*
- *Emergency Management Regulations 2006*
- *Planning and Development (Local Planning Scheme) Regulations 2015*
- *SEM Plan (State Emergency Management Committee (SEMC) 2019)*
- *SEM Policy (SEMC 2019)*
- *SEM Prevention and Mitigation Procedure 1 (SEMC 2019)*
- *State Hazard Plan Fire (SEMC 2019)*
- *State Planning Policy 3.4: Natural Hazards and Disasters Western Australian Planning Commission (WAPC 2016)*
- *State Planning Policy 3.7: Planning in Bushfire Prone Areas (WAPC 2015, as amended)*

1.3.2. Other Related Documents

- A Capability Roadmap: Enhancing Emergency Management in Australia 2016 (Australasian Fire and Emergency Services Authorities Council 2016)
- A Guide to Constructing and Maintaining Fire Breaks (DFES 2018)
- AS 3959-2009 Construction of Buildings in Bushfire-Prone Areas (Standards Australia 2009)
- AS/NZS ISO 31000:2009 - Risk Management – Principles and Guidelines (Standards Australia 2009)
- Australian Disaster Resilience Handbook 10: National Emergency Risk Assessment Guidelines (Australian Institute for Disaster Resilience 2015)

- Bushfire Risk Management Planning Handbook (DFES 2018)
- Code of Practice for Timber Plantations in Western Australia (Forest Products Commission (FPC) 2006)
- Guidelines for Preparing a Bushfire Risk Management Plan 2020 (DFES 2020)
- Guidelines for Planning in Bushfire Prone Areas (WAPC 2017)
- Guidelines for Plantation Fire Protection (DFES 2011)
- National Disaster Risk Reduction Framework (Department of Home Affairs 2018)
- National Strategy for Disaster Resilience (Attorney-General's Department 2011)
- Public Service Circular No. 88 use of Herbicides in Water Catchment Areas (Department of Health 2007)
- Western Australian Emergency Risk Management Guide (SEMC 2015)

1.3.3. Shire of Murray Related Documents

- Peel Region Local Emergency Welfare Plan 2021
- SoM Asset Management Improvement Strategy 2017 – 2020
- SoM Bushfire Management Arrangements 2019
- SoM Coastal Hazard Risk Management and Adaptation Plan *(under development)*
- SoM Community Safety and Crime Prevention Strategy 2016 – 2021
- SoM Community Strategic Plan 2021-2031
- SoM Corporate Business Plan 2021-2025
- SoM Corporate Risk Register
- SoM Firebreak Notice and Bushfire Information Booklet (annual notice)
- SoM Infrastructure Asset Management Plan
- SoM Local Biodiversity Strategy 2013
- SoM Local Emergency Management Arrangements 2018
- SoM Local Recovery Plan 2018
- SoM Local Recovery Resource Manual 2018
- SoM Peel Business Park – Agri-innovation Precinct Asset Management Plan
- SoM Policy A15 – Asset Management
- SoM Policy ES1 – Bushfire Preparedness, Prevention, Planning and Enforcement
- SoM Policy ES2 – Emergency Management
- SoM Policy G7 – Risk Management
- SoM Policy W17 – Weed Control Works within Road Reserves
- SoM Risk Management Strategy 2019
- SoM Volunteer Bush Fire Brigade Support Documentation 2013
- SoM Workforce and Diversity Plan 2021 – 2025

2. The Risk Management Process

The risk management processes used to identify and address risk in this BRM Plan are aligned with the international standard for risk management, *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines.* This process is outlined in Figure 1.

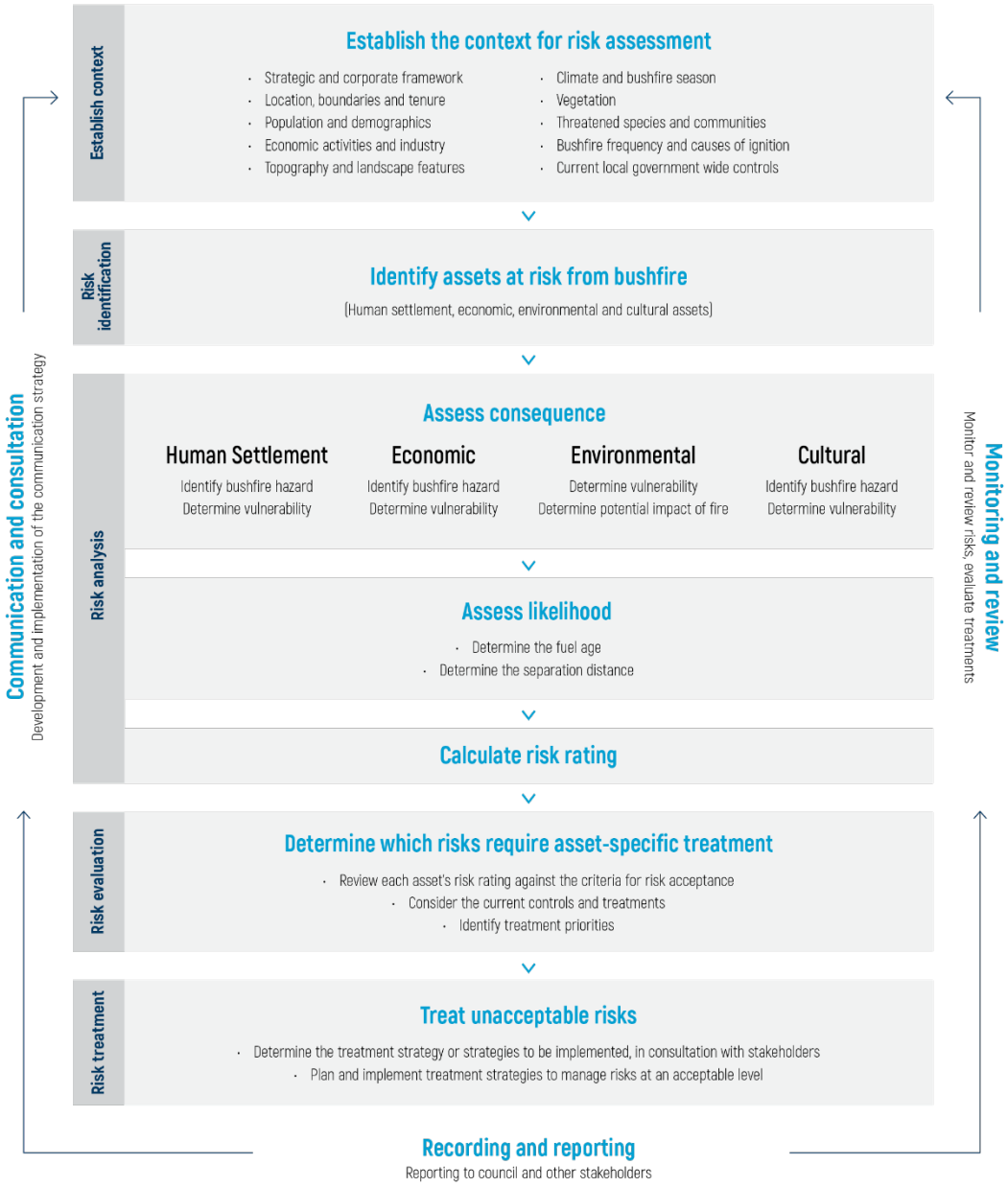


Figure 1 - An overview of the risk management process[2]

[2] Adapted from: AS/NZS ISO 31000:2009, with permission from SAI Global under Licence 1210-c081.

2.1. Roles and Responsibilities

The roles and responsibilities of the key stakeholders involved in the development of the BRM Plan are outlined in Table 1.

Table 1 – Roles and Responsibilities

Stakeholder Name	Roles and Responsibilities
Local Government	• Custodian of the Bushfire Risk Management Plan (BRM Plan) • Coordinate the development and ongoing review of the integrated BRM Plan • Negotiate a commitment from landowners to treat risks identified in the BRM Plan • Undertake treatments on lands owned or managed by them • Submit the draft BRM Plan to DFES's Office of Bushfire Risk Management (OBRM) for review and endorsement • Submission of the OBRM endorsed BRM Plan to council for their approval and adoption.
Department of Fire and Emergency Services	• Participate in and contribute to the development and implementation of BRM Plans • Support to local government through expert knowledge and advice in relation to the identification, prevention and treatment of bushfire risk • Facilitate local government engagement with state and federal government agencies in the local planning process • Undertake treatments on Unmanaged Reserves and Unallocated Crown Land within gazetted town site boundaries • In accordance with Memorandums of Understanding and other agreements, implement treatment strategies for other land owners • Review BRM Plans for consistency with the Guidelines prior to final approval by council • Administer and coordinate the Mitigation Activity Fund Grants Program.
Department of Biodiversity, Conservation and Attractions	• Participate in and contribute to the development and implementation of BRM Plans • Provide advice for the identification of environmental assets that are vulnerable to fire and planning appropriate treatment strategies for their protection • Undertake treatments on department managed land, and Unmanaged Reserves and Unallocated Crown Land outside gazetted town site boundaries and land in which they have an agreement for.

Stakeholder Name	Roles and Responsibilities
Forest Products Commission	• Participate in and contribute to the development and implementation of BRM Plans • Provide information about their assets and current risk treatment programs • Undertake treatments on lands owned or managed by them.
Department of Planning, Lands and Heritage	• Provide advice for the identification of their assets and infrastructure, specifically Aboriginal and European heritage.
Other State and Federal Government Agencies and Public Utilities	• Provide information about their assets and current risk treatment programs • Participate in and contribute to the development and implementation of BRM Plans • Undertake treatments on lands they manage.
Corporations and Private Land Owners	• Provide information about their assets and current risk treatment programs.

2.2. Communication and Consultation

Communication and consultation throughout the risk management process is fundamental to the development, implementation and review of the BRM Plan. To ensure appropriate and effective communication occurred with relevant stakeholders at each stage of the BRM planning process, a Communication Strategy was prepared **(Appendix 1)**.

3. Establishing the Context

3.1. Description of the Local Government and Community Context

3.1.1. Strategic and Corporate Framework

Vision

By 2031, the Shire of Murray will be a place where business thrives, we protect our environment, and all people enjoy an outstanding quality of life.

Mission

We will be an organisation with a can-do attitude that strives for service excellence, continued improvement and a commitment to outcomes.

Focus Areas and Aspirations to 2031

The *Strategic Community Plan 2021-2031* is the blueprint that will guide the Shire of Murray over the next ten years. The Plan sets the strategic direction to 2031 and beyond by specifying the Vision, Aspirations and Focus Areas. The five focus areas are identified in Figure 2.

Figure 2 – Shire of Murray Focus Areas and Aspirations[3]

This BRM Plan aims to strengthen the Shire's capacity to achieve its overall corporate vision and goals as detailed in the Strategic Community Plan 2031 and Corporate Business Plan 2021–2025. The key objectives and strategies elements that link with bushfire risk planning are outlined in Table 2.

[3] Shire of Murray Strategic Community Plan 2021-2031

Table 2 – Linkages of the Strategic and Corporate Framework to Bushfire Risk Planning

Strategic Plan Element	Link to BRM Planning
Objective 1.1 – Socially connected, safe and cohesive community Strategy 1.1.6 – Facilitate safe neighbourhoods and communities • 1.1.6.1 – Develop, implement and maintain bushfire risk management planning • 1.1.6.5 – Facilitate, implement and maintain effective emergency management	• BRM Planning and implementation is integral to the management of bushfire risk. The BRM Plan will be linked with existing structures such as the LEMC and BFAC • The BRM Plan will assist the LEMC by identifying high bushfire risk and the appropriate treatments to reduce risk
Objective 1.2 – Maximise and connect the natural assets to the community Strategy 1.2.1 – Connect the natural assets and waterways, parks and reserves to the community • 1.2.1.1 - Implement a Public Open Space Strategy that links recreation areas to people	• Safe visitation, managing ignitions, communication education around high risk periods and uses • The BRM Plan will assist with identifying areas of high risk to the community • Mitigation works are undertaken to reduce fuel loads in natural areas, parks and reserves to ensure community safety
Objective 1.4 – Encourage an active and healthy community Strategy 1.4.4 – Support volunteer opportunities and organisations • 1.4.4.2 - Oversee emergency services volunteers	• Implementation of the plan will provide opportunities for brigades and volunteers to develop and extend skills in fire management and mitigation activities • Volunteers brigades are engaged and valued in the planning and undertaking of mitigation works in their brigade areas using local knowledge and experience
Objective 3.1 – Protect and enhance our existing natural assets – waterways, bushland and biodiversity Strategy 3.1.1 – Protect and enhance natural areas and biodiversity on public and private land • 3.1.1.2 – Prepare and implement Shire of Murray Reserve Management Plans	• Weed management supports fire objectives through removal of fine fuels • Mitigation works undertaken reduce likelihood of increased weed species • Reduce fuel loads on reserves using a variety of hazard reduction activities

Strategic Plan Element	Link to BRM Planning
Objective 5.3 – Actively increase the level of engagement with the community Strategy 5.3.1 – A participatory community to engage with the Shire to build better places • 5.3.1.2 - Implement the Communications and Engagement Strategy	• Engaging the community in a wide range of ways is critical to ensuring the success of BRM Planning. The communication of bushfire risk, property preparation and other elements of emergency management will be a feature of the Shire's community engagement activities

The Shire recognises the importance of leadership and coordination in emergency management and has an active Local Emergency Management Committee (LEMC) with a multi-agency membership. This committee provides an important multi-agency forum to enable consultation around the BRM Plan.

An extensive Emergency Risk Management project was previously conducted to identify and focus on risks most likely to threaten the safety and well-being of the communities and environments within the Shire of Murray. Bushfire has continually been identified as the highest risk to our community. A Risk Register and Treatment Schedule was developed and is monitored through the LEMC.[4]

The Shire's organisational structure, Figure 3, identifies that the Office of the Chief Executive Officer is responsible for the BRM Planning process, sustainability and continuity. Accepting that there are multiple stakeholders involved in the implementation of the BRM Plan, it is important to note that the Shire's responsibility is to facilitate the management of community bushfire risk, as identified in the BRM Plan.

When the current arrangements supporting the role of the Bushfire Risk Planning Coordinator concludes, the Shire of Murray's CEO shall delegate responsibility for the implementation of this plan to the appropriate Shire officer.

[4] Shire of Murray Emergency Risk Management Project

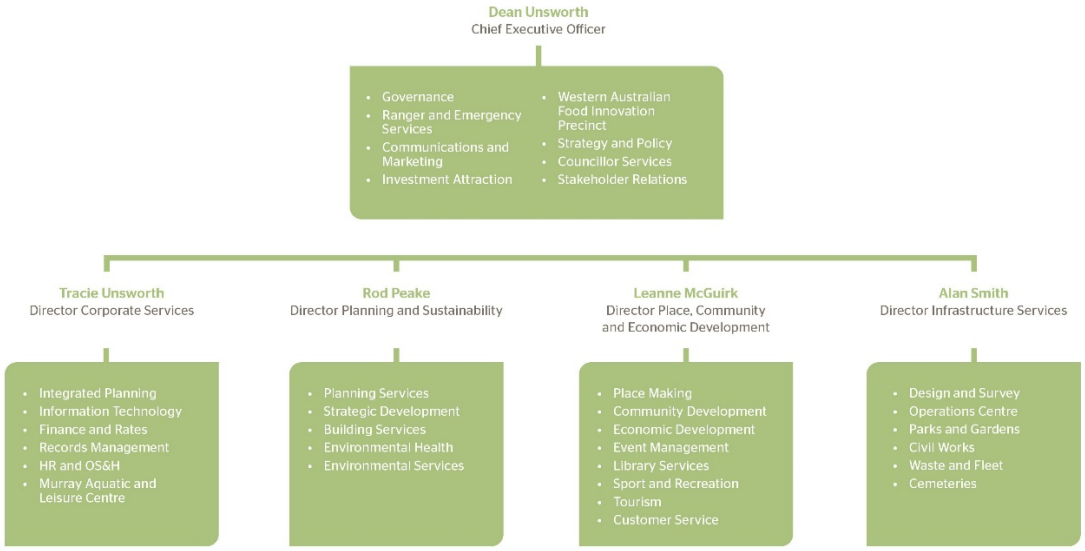


Figure 3 – Shire of Murray organisational structure[5]

3.1.1.1. Resource Sharing Agreement

Resource sharing arrangements between the Shires of Murray and Waroona has been successful for many years. In January 2020, the resource sharing agreement included access to the services of a Community Emergency Services Manager (CESM). This position is supported by the Department of Fire and Emergency Services (DFES), managed by a Memorandum of Understanding (MOU), with the terms of the arrangement subject to review at regular intervals.

The CESM position will have a key role throughout the implementation, monitoring and review phases of this BRM Plan, particularly in relation to the Shire's mitigation program.

The position has strong support from the emergency services volunteers, including advice from the Chief Bushfire Control Officers, Bushfire Advisory and Local Emergency Management Committee when determining bushfire risk, treatment strategies and priorities.

However, given the changing priorities, funding limitations and political landscape, the current arrangements supporting the CESM position may be subject to change in the future. Should this position not continue, the CESM responsibilities will be allocated to another officer within the Shire that is tasked with responsibilities for emergency management, noting however, that the capability of the Shire will be reduced overall, as there would no longer be a dedicated resourced available to support these functions.

[5] Shire of Murray Corporate Business Plan 2021-2025

3.1.2. Location, Boundaries and Tenure

Murray is the ancestral home of the Bindjareb people, an Aboriginal Australian group of Noongar speakers, their name taken from the word “pinjar” or “benjas” meaning “wetlands” or “swamps”. The Bindjareb Noongar people were accommodated by Murray’s abundant waterways and diverse natural bushland.

The Shire of Murray is named after the Murray River. It is approximately 86 kilometres south, south east of the Perth CBD and comprises an area of 1,821 square kilometres. The municipal boundary is bordered by the City of Rockingham and the Shire of Serpentine/Jarrahdale in the north, the Shires of Wandering and Boddington to the east, the Shire of Waroona to the south and the City of Mandurah to the west.

Bounded by the idyllic shores of Herron Point in the west, the adventure town of Dwellingup in the east and the equestrian playgrounds of North Dandalup and Coolup to the north and south respectively, the district offers an abundance of leisure opportunities as well as a diverse range of land use options.

The Shire is roughly divided by the South West Highway with the Darling Escarpment and Plateau to the east and the Swan Coastal Plain located on the west of the highway.

There are 29 localities within the Shire of Murray with Pinjarra townsite as the centre point of the district.

Pinjarra

Established in 1834 as one of the first colonial settlements in Western Australia, it is however, Binjareb Nyungar country.

The historic town of Pinjarra is located centrally in the Shire and is the hub of the district with the Murray River flowing through the townsite. A population boost was a result of Alumina mining established in North Pinjarra in 1974. The town has significant heritage sites such as Edenvale, the home of former WA Premier Sir Ross McLarty.

A variety of community services, primary and secondary schools, Shire’s administration centre, police station, hospital, aquatic and recreational centre, sporting facilities, public golf course, local businesses and a shopping centre precinct make this town a thriving community with a rural feel.

The landscape is generally flat with the exception of the banks along the Murray River that vary from 5-10^{o} slopes and tends to flatten out as the river moves further west.

North Dandalup

Originally a stopping place on the South Western Railway in 1894, North Dandalup was not declared a township until 1972. Today, a primary school, community hall, fire brigade and fuel station exist. It also serves as a stop on the Australind passenger train from Perth to Bunbury. The majority of private properties are made up of rural farming, semi-rural living and equestrian pursuits. Smaller residential lots are generally located in the middle of the township. The population of North Dandalup is approximately 800 people.

Two major water catchment areas being the North and South Dandalup Dams are located at the top of the Scarp which forms the western border of the Darling Ranges. The two dams situated within State Forest are popular visitor destinations throughout the year.

The landscape is generally flat to the west of the South West Highway and becomes steeper further east from inclined slopes at the foot of the Scarp, to moderately inclined to steep high slopes forming the western edge of the Darling Plateau.

Dwellingup

Situated 263 metres above sea level in an area known as the Northern jarrah forest, the historic town of Dwellingup is set amongst pristine Jarrah and Marri forests of the Darling Escarpment and Plateau. In the early part of the century, the developing, largely international timber industry centralised in Dwellingup when the rail from Perth was pushed through Pinjarra. The town has an approximate residential population of 720 people.

Once a small timber logging town, and almost obliterated by the 1961 bushfires, this award winning town has now become a year round destination and major tourism attraction within the Murray district with many outdoor activities and events which draw large visitor numbers to the town. Lane Pool Reserve, a 55,000ha conservation park in the jarrah forest, popular for recreational activities is located south east of the townsite and along the banks of the Murray River. The Munda Biddi cycling track, the Bibbulmun Track and the Captain Fawcett 4WD Trail intersect and pass through the reserve.

Within the townsite there is a supermarket, hotel, post office, police station and several cafes and craft shops. The Dwellingup Trails and Visitor Centre draws over 50,000 visitors a year looking for a variety of adventures in and around the townsite. The Hotham Valley Tourist Railway travels through forest and farmlands to Pinjarra and operates from November to April.

Coolup

Coolup is located approximately 12km south of Pinjarra and stretches across the South West Highway from the east to the Forrest Highway in the west. Once a thriving dairy industry, it has now given way to cattle farming, rural and semi-rural living and equestrian pursuits. The population was recorded at 386 persons at the 2016 Census.

The town settlement on the western side of South West Highway has a general store, post office, two community halls and a volunteer bush fire brigade.

The Perth to Bunbury railway line runs through the township. Coolup is also home to the Murray Regional Equestrian Centre.

The landscape is generally flat to the west of the South West Highway with some slightly inclined slopes parallel to the Peel Harvey Estuary and becomes steeper further east of the highway from inclined slopes at the foot of the Scarp, to moderately inclined to high slopes east of Burnside Road.

Barragup / Furnissdale / Stake Hill

The communities of Barragup and Furnissdale are located on either side of Pinjarra Road at the western end of the Shire with a combined population of approximately 1960 people.

South of Pinjarra Road is the settlement of Furnissdale which is made up of a combination of rural, residential, five acre lifestyle properties and extensive foreshore reserves. A caravan park and a mixture of light commercial premises are located in and around Pinjarra Road. The Serpentine River serves as the border from the City of Mandurah.

To the north, Barragup lies between the Forrest Highway and the Serpentine River. A predominately semi-rural lifestyle community comprising of five acre properties nestled around Goegrup Lake Nature Reserve, the Serpentine River and Black Lake – a 136ha protected wetland.

Stake Hill is situated immediately east of the Forrest Highway and is located towards the Shire's north western boundary. There are no public or commercial facilities in this suburb and entry is via Lymon Road only. This semi-rural community made up of five acre lifestyle properties has an approximate population 490 people.

The landscape in these communities is generally flat with sandy soils and vegetation is made up of low to medium woodlands of tea tree and banksia.

North Yunderup / South Yunderup / Ravenswood

Much of the population and forecasted growth is in the western suburbs of the Shire where the localities of North Yunderup, South Yunderup and Ravenswood are situated. The 2016 Census recorded a combined population of 6,139 however, the forecasted population is expected to increase considerably over the next 10 years. The Murray River flows through these suburbs offering both river and canal living.

Ravenswood lies to the east of the Forrest Highway with a mixture of new subdivisions and older residential blocks giving the community a range of varying groups from young families to retired couples. A caravan park and the historic Ravenswood Hotel lies on the banks of the Murray River and is a popular stop for boaties and visitors particularly during the summer months. Minimal services are available in this suburb however future expansion and development has indicated that a school and a shopping precinct is forecasted to service the growing community.

Yunderup is divided by the Murray River and has two distinct communities – North Yunderup and South Yunderup. Additionally, at the mouth of the river is the Delta Island Group where several of the islands are habitable by predominately absentee landowners who utilise the properties during the summer months and peak holiday periods. These islands can only be accessed by boat.

North Yunderup is accessible via Pinjarra Road and is a one way in, one way out community. With an approximate population of 860 this small community has a community hall, boat ramp and general store. Properties are a mixture of semi-rural lifestyle properties, residential lots and river frontage properties.

South Yunderup is one of the fastest growing communities within the Shire of Murray. With new subdivisions and a private school catering from Kindergarten to Year 12, young families have boosted the population of this riverside hamlet. South Yunderup is the only community in the district that has a canal system and offers both river and canal living.

South Yunderup has a tavern, bowling club and sports oval, shopping precinct, volunteer fire brigade, shops, cafes and three boat ramps for easy access to the river and the Peel Harvey Estuary.

The landscape is flat with vegetation consisting of low woodlands of tea tree and banksia with riparian vegetation dominant around waterways.

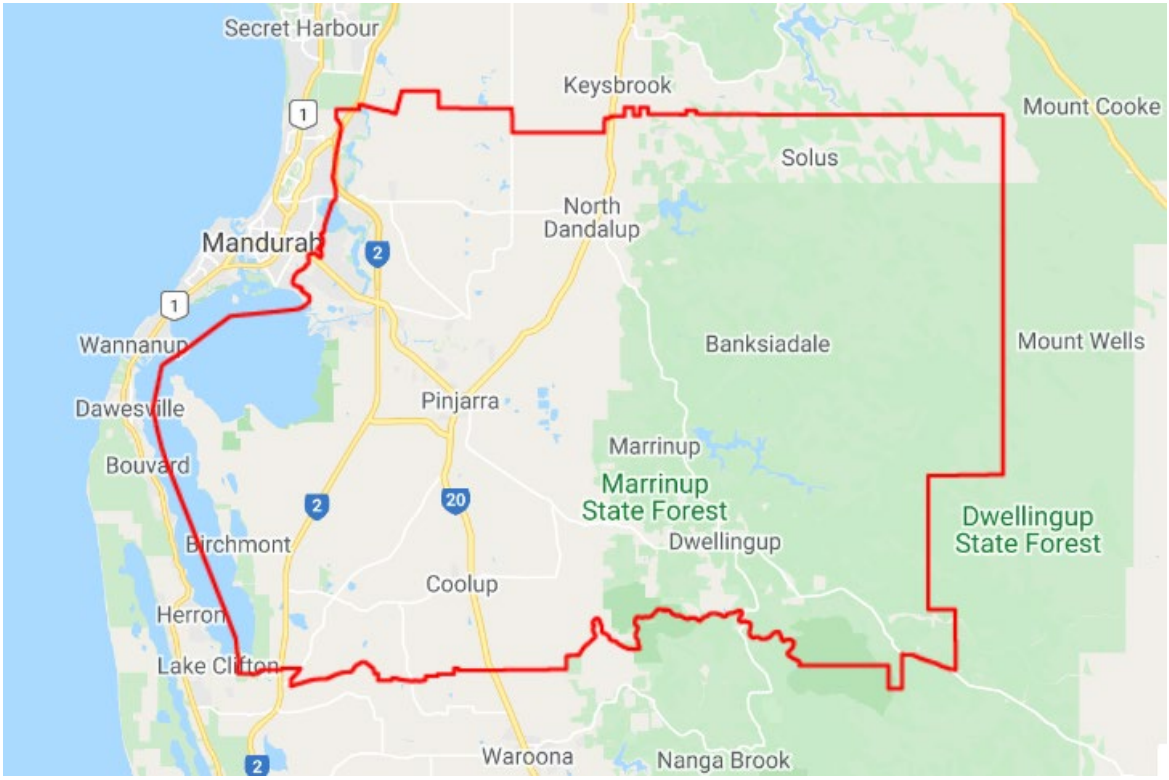


Figure 4 – Shire of Murray boundary map

The Shire is made up of a complex mosaic of land tenures with Crown, State and private land occurring closely, meaning that fires often impact on multiple tenures and move through various land uses.

Land tenure within the Shire of Murray is shown in Table 3. With 47% of the Shire being managed by Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Services, it is the largest proportion of the Shire made up of State Forest, National Parks or Reserves, predominately on the Darling Scarp and within Bushfire Prone Areas. Representatives from Parks and Wildlife Services provide advice on their seasonal mitigation programs and fire response activities at the Shire's Bush Fire Advisory Committee (BFAC) and Local Emergency Management Committee (LEMC).

Privately owned property makes up 45% of land tenure with a variety of land uses such as residential, farming, commercial zoned, rural and semi-rural living. Having a large portion of private land can pose challenges such as having a large number of stakeholders to engage with, who have varying interest, understanding and ability regarding property mitigation and preparation. This creates a high workload for the Shire to undertake engagement activities and compliance to ensure properties are well prepared. Fire impacting significantly on one property can have substantial economic and social implications for the community and the Shire. Consideration is to be given to balancing the impacts of mitigation and risk reduction in the context of productivity and associated costs.

The Shire will use the BRM Plan to highlight risks to both private and public land owners and managers and support them to undertake appropriate mitigation works where possible.

Table 3 – Overview of Land Tenure and Management within the BRM Plan Area[6]

Land Manager/Agency*	Percentage of Local Government Area
Local Government	2.25%
Private	45.25%
Department of Biodiversity, Conservation and Attractions - Parks and Wildlife Service	47.75%
Department of Planning, Lands and Heritage	1.25%
Other	3.50%
Total	100%

[6] Source Shire of Murray – Intramaps Online Mapping

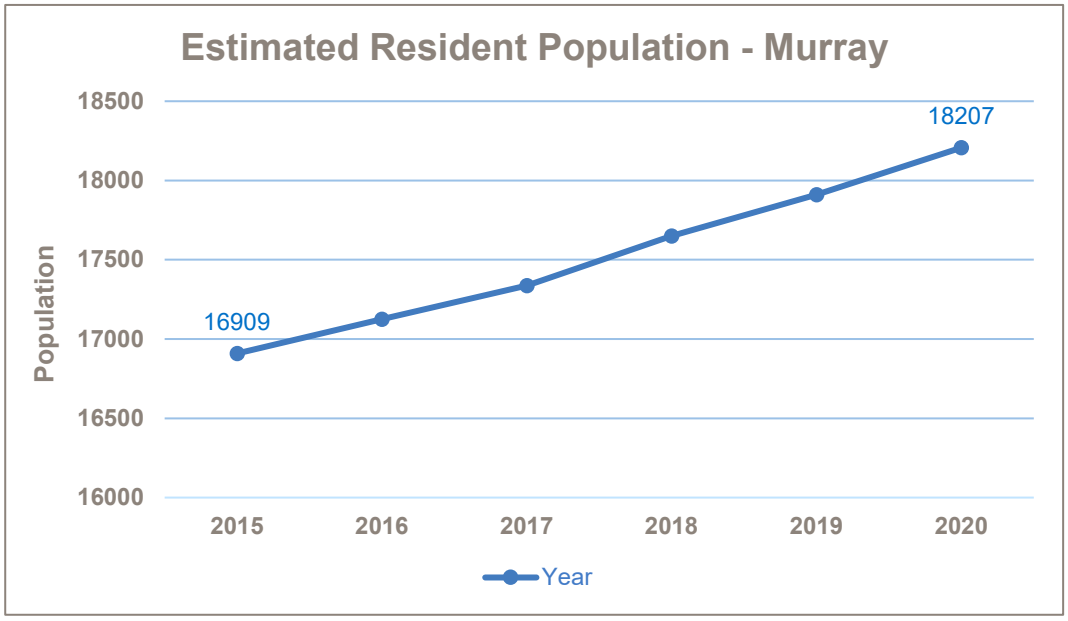
The management of fuel loads on State Land, Unallocated Crown Land and Unmanaged Reserves outside the metropolitan area, regional centres and town sites are carried out by the Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service.

Fuel load management of Unallocated Crown land and Unmanaged Reserves inside the metropolitan area, regional centres and town sites is arranged by the Department of Fire and Emergency Services.

3.1.3. Population and Demographics

The most comprehensive population count available in Australia is derived from the Population and Household Census conducted every 5 years by the ABS. This population figure includes overseas visitors but excludes Australians overseas. However, the Census count is not the official population of an area. To provide a more accurate population figure the ABS also produces "Estimated Resident Population" (ERP) numbers.

The Estimated Resident Population as of June 2021 is 18,336 persons. Since the previous year, the population has grown by 1.64% with a predicted forecasting growth rate of 3.44% by 2051.



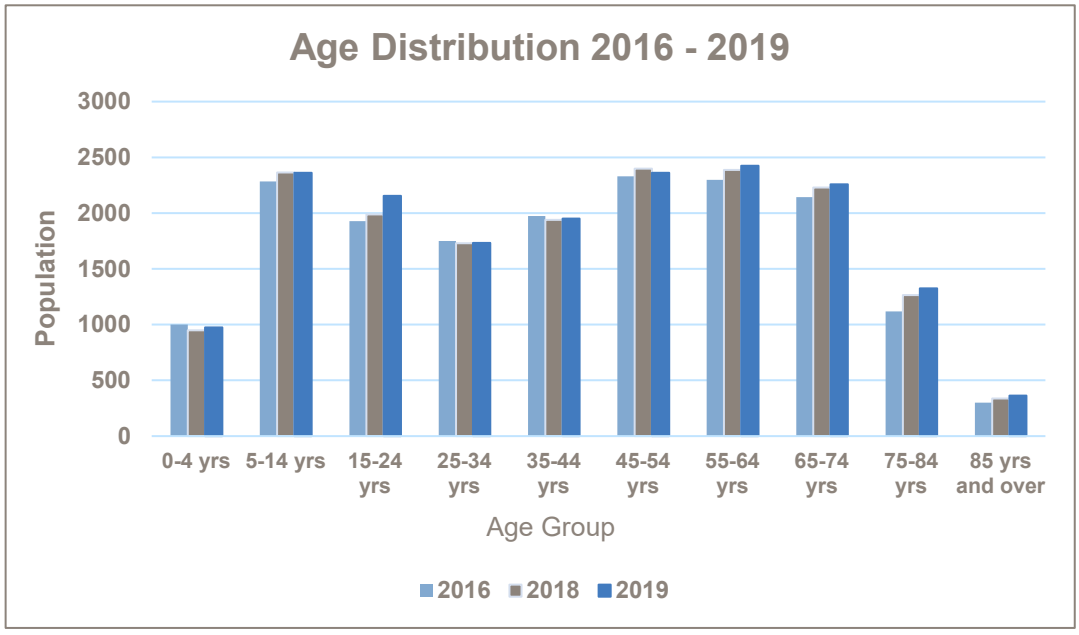
Graph 1 – Shire of Murray Population Growth 2015-2020[7]

The data from the 2016 Census showed that the gender distribution between males and females in the Shire is a near even split of population. The data also showed that the Aboriginal and Torres Strait Islander population within the Shire was 2.4%.

[7] Australian Bureau of Statistics – Regional Summary

In 2019, the working age population (15 to 64 years) was 59.3% and there has been a slight decrease of working age people each year from 2015 to 2019.

With a median age of 44, this number has increased over the same period, showing a pattern of an ageing population. In 2019 the largest age cohort in Murray was 55-64 years, closely followed by the 45-54 years age of age group indicating an increase in older/retired residents within the community.



Graph 2 – Shire of Murray Age Distribution

With an increase in older/retired residents within the community it is acknowledged that these older members are more likely to have limited mobility, suffer from health conditions and/or require the care of others. Elderly residents living independently may over estimate their abilities and/or have limited scope to undertake property preparedness and respond to bushfires appropriately.

In addition, the elderly population often have specific needs or requirements during evacuation to address these limitations. Understanding the distribution of elderly population will be critical in helping the Shire to plan for and work with this group.

Over the coming years, the Shire will look at how many of these residents are living in higher risk areas and what planning can be undertaken to better support positive outcomes in emergency events. This will help to improve community resilience.

Absentee landowners and seasonal tourists are also considered as vulnerable groups who are likely to have less appreciation of the hazard of bushfire due to their lack of knowledge of the local areas, understanding of local conditions and/or limited experience with bushfires. These groups pose a challenge for the Shire in how to address community

education on all bushfire related matters due to the transient nature of their occupancy within the region.

Bushfire Ready Groups with assistance from local brigades and the DFES Community Preparedness Directorate promote bushfire preparedness programs and strategies that can be targeted at specific times of the year to capture the audience of these vulnerable groups.

3.1.4. Economic Activities and Industry

The Shire of Murray forms part of the Peel Region, one of nine regions within Western Australia. It consists of the City of Mandurah, and the Shires of Serpentine/Jarrahdale, Boddington and Waroona.

Murray is a rapidly evolving district that services the diverse social and economic needs of a growing community. The strong natural asset base is a feature unique to the Shire of Murray, providing potential to develop across a wide range of sectors and to play a substantial role in the provision of sustainable development.

The principal industrial and commercial activities in the district are construction, mining, tourism and other services such as retail trade, education and health.

The economic base of the Shire is strongly influenced by Alumina refining, with more than a third of all jobs carried out in the Shire of Murray associated with this industry. An alumina refinery is located at the bottom of the Scarp just north of Pinjarra townsite and a bauxite mine is situated further east at the top of the Scarp. The risk of bushfire to mining operations varies dependent on the location of the infrastructure, fuel age and vegetation type and the mining landscape. Production loss or significant reduction of productivity to the mining operations could potentially have an economic impact at a local, regional and state level.

Agriculture and forestry are the dominant land uses but employ less than ten per cent of the population. Vegetation types and fuel loads in these landscapes also vary from grasslands, pasture and crops to forestry vegetation of jarrah, karri and wandoo used for timber logging.

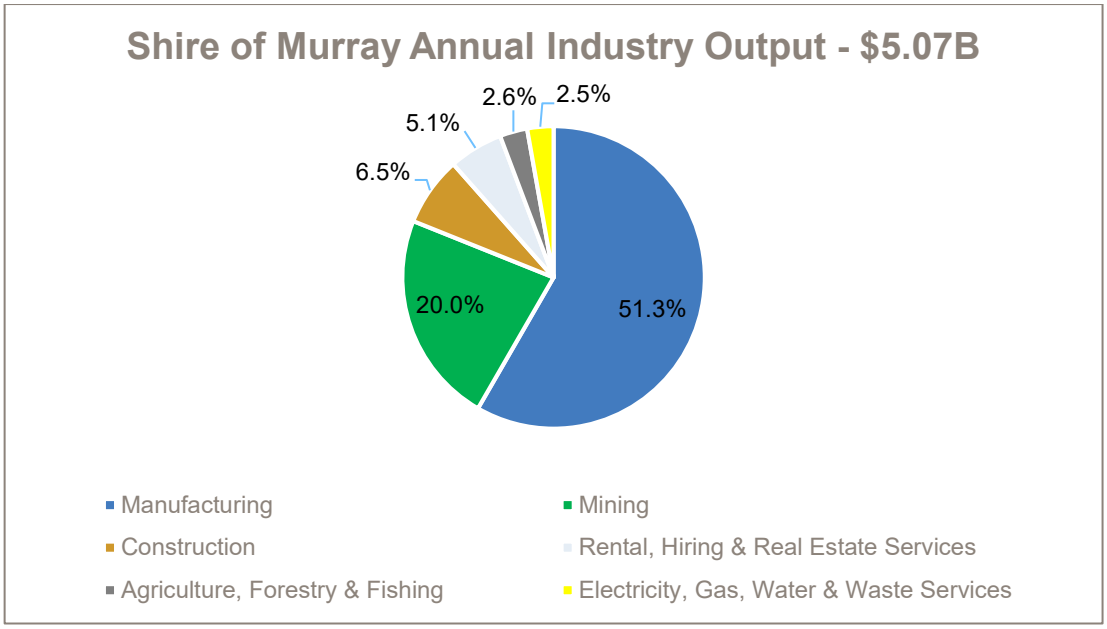
Strategically located between Perth and the South West, the Peel Business Park in Nambeelup is a 120ha development and is the centrepiece of the 35 year visionary Transform Peel project that will create new industries, more jobs and better food security. It is focused on powering the transformation of the Peel region through job creation by delivering industry development opportunities. The Transform Peel program is projected to generate 33,000 regional jobs by 2050.

The Western Australian Food Innovation precinct, developed by the Shire of Murray is set to broaden Peel's economic base by enabling Australian and global entrepreneurs, food companies and agri-enterprises to cost-effectively network, research, develop, prototype and market-test new value-added food products derived from WA primary produce.

The Peel Business Park is also home to the DFES Bushfire Centre of Excellence which will be a leading facility nationally in bushfire learning and skills development for career officers, emergency service volunteers, researchers and scientists.

The Shire of Murray generates an estimated $5.07 billion in output which accounts for 24.4% of the total economic output in the Peel Region. Output data represents the gross revenue generated by businesses/organisations in each of the industry sectors.

Manufacturing is the largest output generating sector with an estimated $2.6 billion and Pinjarra generates the most economic output in the Peel Region in this industry. Mining is the second largest industry contributor within Murray with an estimated $1 billion.[8]



Graph 3 – Total Gross Revenue by Industry

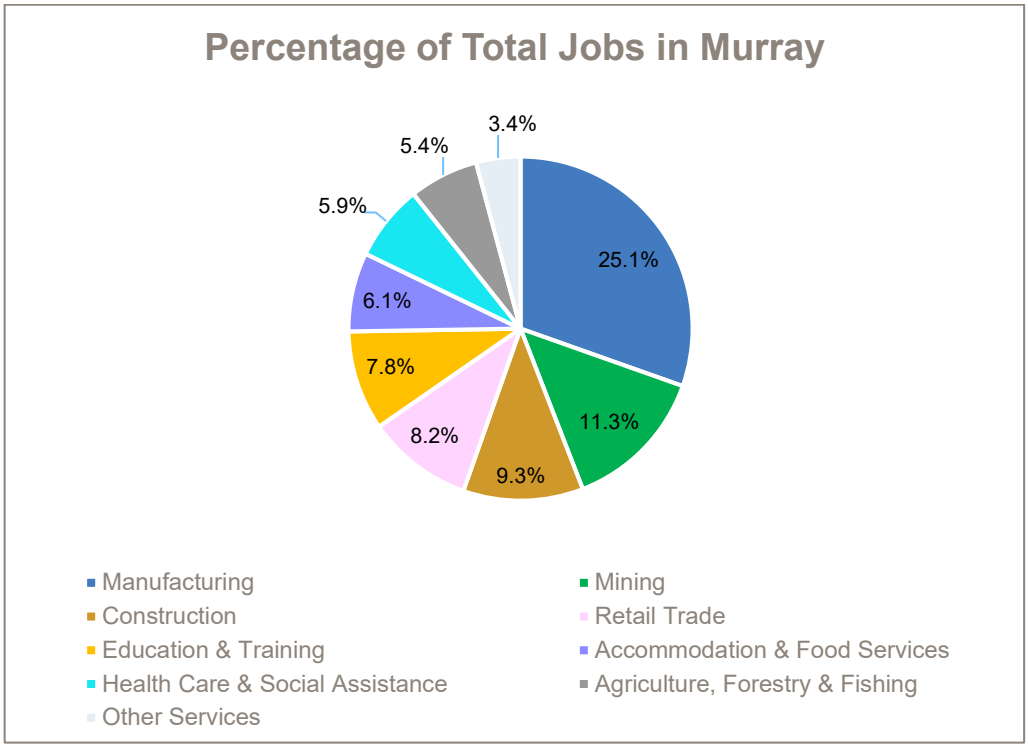
The ABS census showed that the Shire of Murray's total labour force was 7,103 persons, of which 51.9% were employed full time and 36.7% part-time. A further 1.7% did not state their current employment status and 9.7% were unemployed.

The total number of jobs in Murray in 2016 was 5,641 which equates to 15% of the total number of jobs in the Peel Region.

Manufacturing was the largest employment sector within Murray with 25% of the total jobs employed in this industry. The second largest industry is mining with 11% followed by construction with 9%.

8 Remplan - Peel Region – Economic Output - Murray

The remaining industries are made up of health care & social assistance, accommodation & food, education and training, agriculture, forestry & fishing and retail trade.



Graph 4 – Total Jobs in Murray by Industry

The 2016 Census data showed that 36.9% of employed residents work within the Shire. 55% of residents travelled outside to work with a large proportion working in neighbouring local government areas such as Rockingham, Mandurah and Waroona. The remaining were made up of residents who worked within the Perth metropolitan area. Approximately 7% of residents had no fixed place of work.

3.1.4.1. Major Transport Routes

Two major highways being the South Western Highway and Forrest Highway run north to south through the Shire and links the south-west region to the Perth metropolitan area.

Greenlands Road connects the two highways and is also used as an alternate route for heavy vehicles. Construction of the Pinjarra Heavy Haulage Deviation to divert traffic around the Pinjarra town centre is due to commence in 2023 and will provide another major arterial route through the Shire.

South West Highway is the preferred route by many residents travelling to the Alumina refineries located in Pinjarra and further south at Wagerup (Shire of Waroona) for work.

The potential impact on these major road networks in the event of a large scale bushfire could have a significant effect on the economy on a local, regional and/or state level as was identified during the Waroona/Yarloop Bushfire in 2016. Various industries could be impacted if the main arterial roads running through the Shire were temporarily closed or affected by bushfire if goods could not be transported to support these industries.

Running east to west is Pinjarra Road connecting to Mandurah whilst Pinjarra-Williams Road runs east to west from Pinjarra townsite through the township of Dwellingup to Boddington and the Albany Highway.

Rail services also run through the Shire adjacent to the South West Highway for freight and recreational purposes. The Perth to Bunbury railway line services "The Australind", a daily passenger service with stops at North Dandalup and Pinjarra.

Main Roads and ARC Infrastructure manage major road and railroad networks within the Shire of Murray. The Shire works collaboratively with these stakeholders to reduce the fuel loadings and maintain firebreaks and service tracks to an acceptable level. By reducing the risk of bushfire arising from dense vegetated road and rail corridors, consideration to protecting and minimising environmental impacts is also included in all mitigation work assigned.

3.1.4.2. Tourism

Tourism generates approximately $54.8 million in the Murray district which is the second largest contributor within the Peel Region. Located in the Murray River region of Western Australia, the natural and built environment in the Shire attracts many people to the area to enjoy a variety of recreational pursuits all year round.

Many events occur annually within the Shire with the largest being the Pinjarra Festival held on the long weekend in June drawing approximately 20,000 people. A range of other notable events held are listed in Table 4.

Table 4 – Annual events held within the Shire of Murray

Event	Month	Visitor Numbers (approx.)
Australia Day	January	250
ANZAC Day Remembrance Day & Breakfast	April	2000
Fairbridge Festival	April	6,000
MAX Auto Pinjarra	April	6,000
Dwellingup Pumpkin Festival	April	10,000
Rotary Art Show	June	1,000
Pinjarra Festival	June	20,000
Hotham Valley Railway Festival	September	1,000
Murray / Mandurah Motorcycle Charity Ride	December	700

Along the Scarp, the town of Dwellingup and surrounding sites such as Marrinup attract many visitors to the area. Lane Poole Reserve offers a variety of outdoor activities such as camping, bushwalking, mountain biking, canoeing, fishing and horse riding. The Hotham Valley Steam Train and the new Murray Valley Mountain Bike Trails are major attractions to the area.

Many of these activities are in bushfire prone areas and within National Parks and recreational areas managed by the Department of Biodiversity, Conservation & Attractions – Parks & Wildlife. High fire danger ratings and severe weather forecasts may cause for Total Fire Bans to be imposed in high bushfire risk areas and parks may be closed. These closures are communicated by Parks and Wildlife to the general public and external stakeholders including local governments who replicate this information to their community through a range of media platforms.

Smoke alerts are also issued when smoke from prescribed burning or bushfires on lands managed by the department may affect people in towns and communities or restrict visibility for motorists.

On the Swan Coastal Plain, the suburbs of Yunderup and Ravenswood attract many people to the area because of its direct access to the Murray River and the Peel Harvey Estuary. Yunderup also has a number of absentee landowners who occupy their properties during peak holiday periods and includes the nearby Delta Island Group at the mouth of the estuary.

These islands are only accessible by boat and three of the habitable islands are predominately holiday homes. The risk of fire to the Delta Islands is in the event of an escaped campfire or a structure fire on the islands.

Absentee landowners may not have high levels of engagement with the local community or may not have the time to attend meetings or undertaken full fire preparations on their properties.

3.2. Description of the Environment and Bushfire Context

3.2.1. Topography and Landscape Features

Topography has a significant effect on bushfire behaviour and its management. Steep valleys can create localised wind patterns which make predicting fire behaviour more challenging while also limiting access to the landscape which can reduce suppression efforts. Topography also affects bushfire behaviour with increased rates of spread, large flame length and increased radiant heat when travelling upslope. With these factors affecting bushfire behaviour and management, exposed assets in these areas are at an increased likelihood of damage or loss.

Geographically, the Shire is roughly divided into two equal sections: The Darling Range consisting of an escarpment and plateau in the east and the Swan Coastal Plain to the west.

The landscape of the area is basically comprised of two primary physiographic areas:

- The Darling Plateau, an undulating area of lateritic surface overlying Archean and Proterozoic granites and gneisses and bordered on the west by the Darling Scarp. The scarp, which runs from north to south through the region, effectively dominates the landscape and defines distinctive changes in landform and vegetation.
- The Swan Coastal Plain to the west of the Scarp is low lying and gently undulating to a flat surface.

The steep rise in topography from the eastern edge of the coastal plain up to the hills is known as the Darling Scarp. It is the surface expression of the Darling Fault, a major and ancient geological fracture in the Earth's crust separating the Archaean Yilgarn Craton in the east from the young Pinjarra Orogen and overlying Phanerozoic Perth Basin in the west.

Darling Scarp

The escarpment rises about 300m above the Plain and has localised areas of steep and rugged terrain running east to west. It is deeply dissected by water systems and tributaries with the main tributary being the Murray River. With its origin in the hills of the Darling Scarp beyond the town of Dwellingup, the river features still pools and flowing rapids edged by forest.

The steepness of topography, especially around river valley and drainage lines are a challenge for fire management.

Limitations arising from access and egress for fire fighters as well as localised weather patterns and wind effects can make fires hard to predict and control. Additionally, fuel reduction and mitigation strategies may be limited due to inaccessibility and/or environmental consideration around waterways and catchment areas.

Vegetation in the Scarp can generally be described as open Jarrah/Marri woodland with associated heathland on the slopes, and forest areas of Jarrah/Marri within the valleys. There are also some areas of dense dryandra thickets.

A variety of land uses exist within the scarp with bauxite mining, extractive industries and forestry being the main use along with farming. The towns and communities within this landscape are Dwellingup, Holyoake, Whittaker, North Dandalup, Teesdale and Yamba.

Darling Plateau

The Darling Plateau is an undulating lateric upland with an average elevation of 300-340m Australian Height Datum (AHD) with occasional higher points exceeding 450m elevation. Mount Solus located on the north eastern boundary of the Shire has an altitude of about 572m AHD. The plateau is dissected by the Murray River which trends roughly north-south and has localised slopes up to 20^{o} and outcropping of the basement igneous rock.

The eastern part of the plateau is characterised by flat-topped hills bound by small erosional scarps called breakaways. The valleys of the plateau show a distinct trend from west to east. They can be divided along their river courses into three valley forms based on the nature of their slopes, floors, and the erosional modifications to the weathered material.

The Darling escarpment and plateau from the foothills to the eastern boundary of the Shire is typical of this type of topographical feature. Generally, the soils are of the Yarrigal and Dwellingup formations, depending on the location.

The natural vegetation ranges from scrub species to tall, open forest dominated by Jarrah and Marri in the area known as the Northern Jarrah Forest and includes important populations of fringing vegetation bordering the banks of rivers.

Swan Coastal Plain

The Swan Coastal Plain consists of a series of distinct landforms, roughly parallel to the coast. The most eastern landform comprises the colluvial slopes which form the foothills of the Darling Plateau and which represent dissected remnants of a sand-covered, wave-cut platform known as the Ridge Hill Shelf. To the west of the colluvial slopes lies the Pinjarra Plain, a piedmont and valley flat alluvial plain consisting predominately of clayey alluvial that has been transported by rivers and streams from the Darling Plateau.

The terrain is generally flat with deep sandy type soil being common to most areas west of Pinjarra.

Clearing has occurred on the coastal plain and large areas are now utilised for agricultural pursuits. Areas of remanent vegetation that do remain are made up of various scrub species to compact stands of Jarrah and Marri.

There is an abundance of permanent natural swamps and water bodies located in the western section of the coastal plain. These areas generally have heavy stands of dense scrub species of Tee Tree and Paperbark within close proximity to the water bodies.

The Murray River flows through the Plain where its meets up with the Dandalup River downstream from Pinjarra and is known as the lower Murray which then empties into the Peel Estuary.

3.2.2. Climate and Bushfire Season

The Shire is located in the temperate zone and enjoys a Mediterranean type climate. The prevailing winds are the rain bearing South Westerly's to North Westerly's, which occur during the months of April to September, and dry Easterly's during the remaining months.

The township of Pinjarra on the Swan Coastal Plain enjoys a mean annual maximum temperature of 23.9ºC and mean annual minimum temperature of 12.7ºC with the annual average rainfall being 805.7mm.

However, the township of Dwellingup to the east on the Darling Plateau enjoys a lower mean annual maximum temperature of 21.8ºC and mean annual minimum temperature of 9.5ºC with the annual average rainfall being a higher 1118.5mm.

The Bureau of Meteorology's Automatic Weather Station (AWS) is located at Dwellingup along the Darling Scarp at an elevation of 267m ASL. The following graphs and data are representative of climatic conditions on the Darling Plateau. The following graphs reflect the mean rainfall and wind speeds from the Dwellingup weather station.

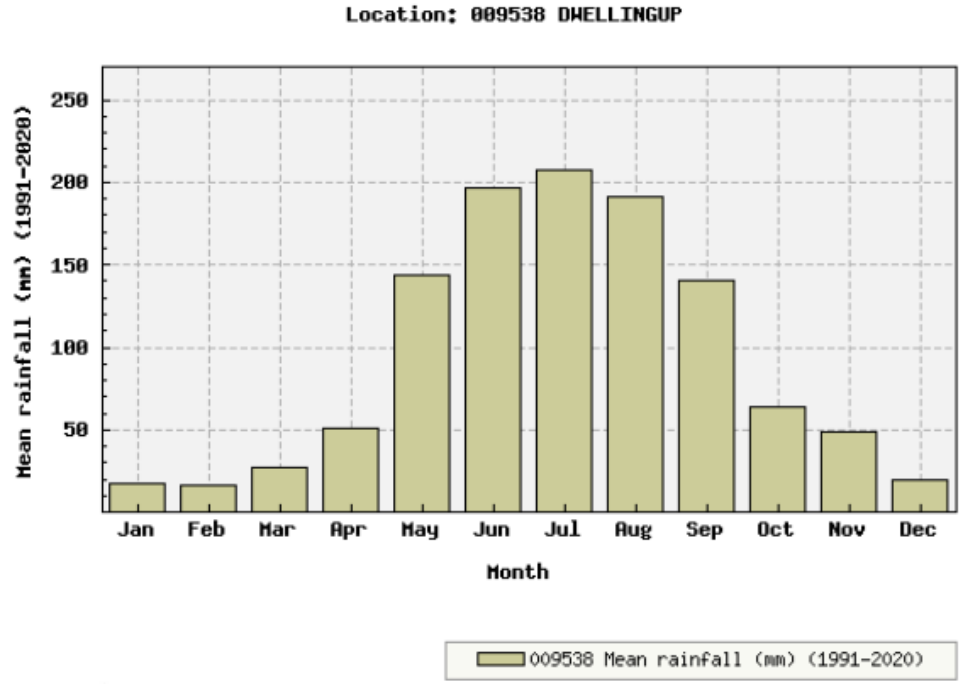


Figure 5 – Monthly mean rainfall – Dwellingup (BOM)

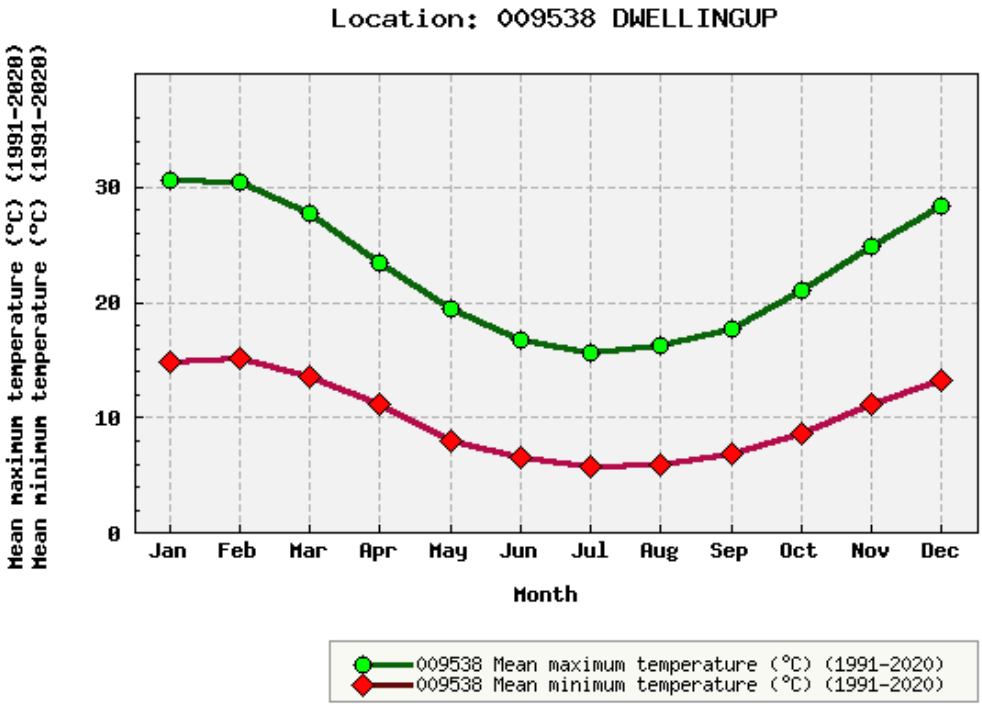


Figure 6 – Monthly mean temperatures – Dwellingup (BOM)[9]

[9] Bureau of Meteorology (site Number 009538) www.bom.wa.gov.au

A weather station monitored by Department of Primary Industries and Regional Development (DPIRD) is located approximately 8.3km south east of Pinjarra townsite. The statistics below were taken from the DPIRD weather station, Pinjarra (P1001). The climatic statistics below is considered representative of local weather conditions on the coastal plain.

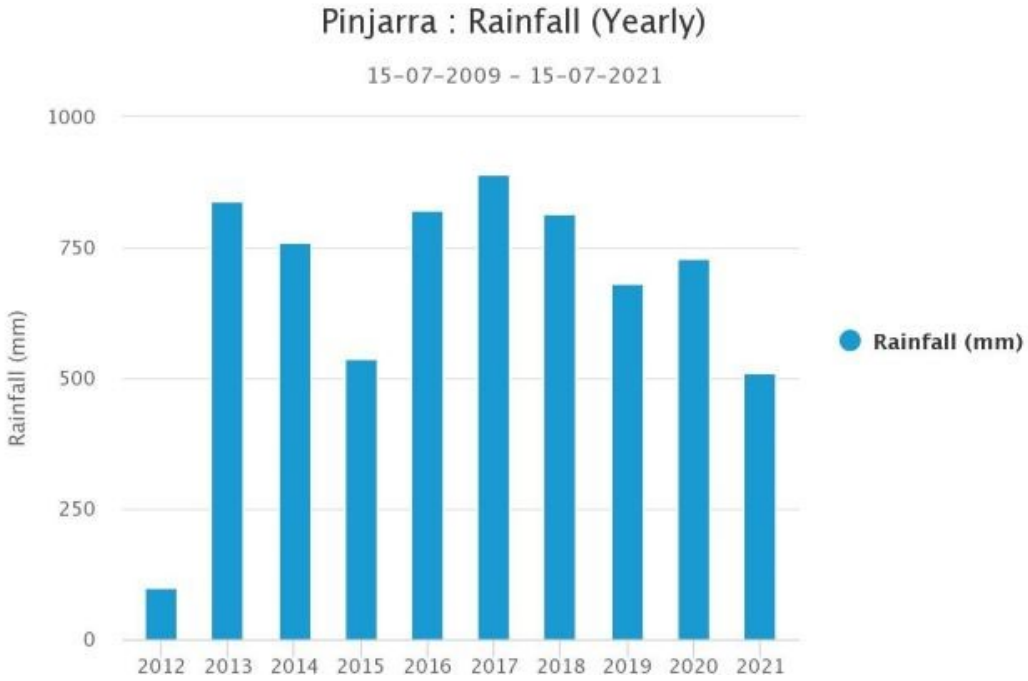


Figure 7 – Annual Rainfall (mm) 2012 - 2021 – Pinjarra (DPIRD)

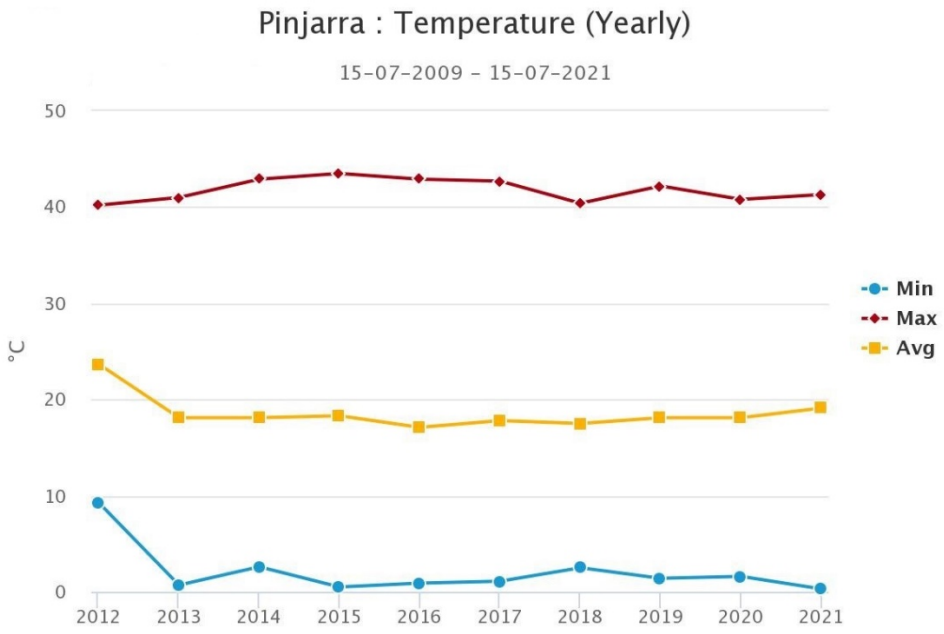


Figure 8 – Annual Temperatures – Pinjarra (DPIRD)

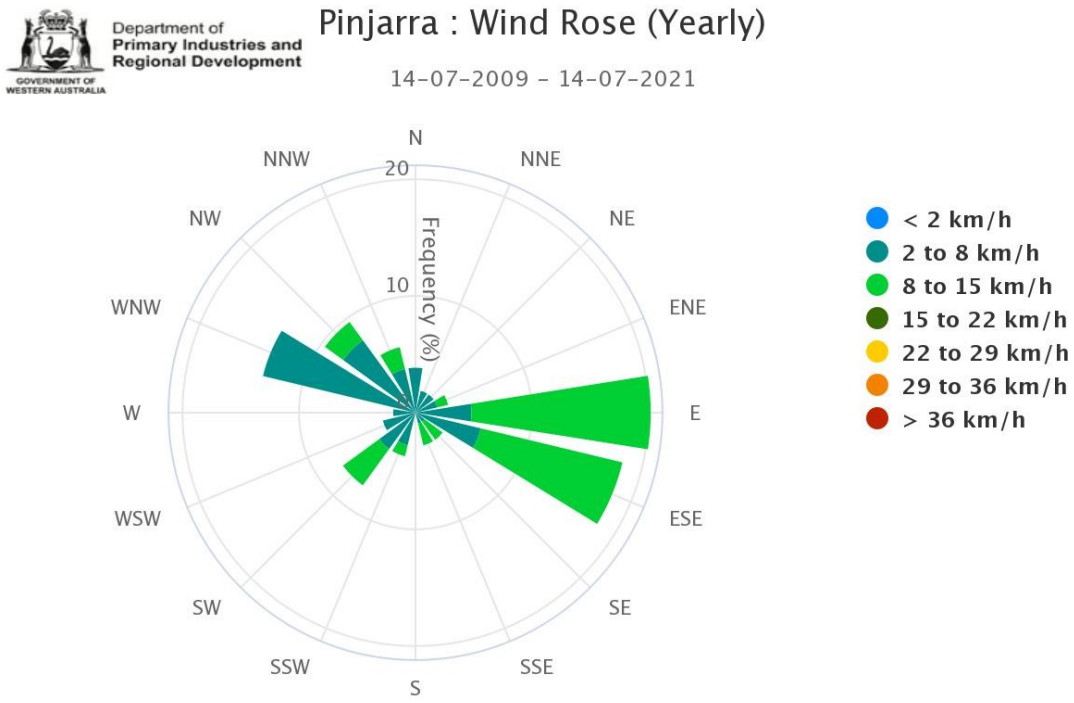


Figure 9 – Pinjarra Wind Rose[10]

Bushfire Season

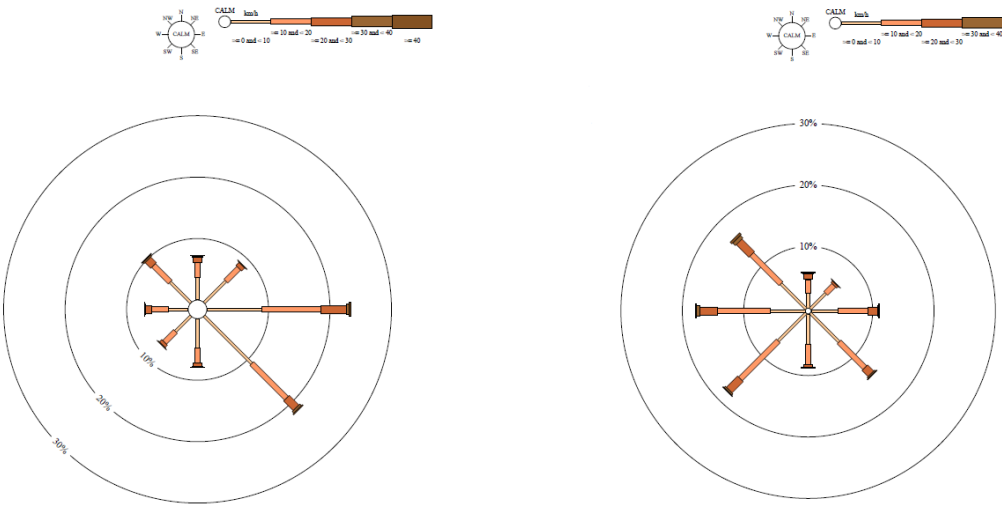
Bushfires can happen all year round but the risk is much higher during the hotter and drier times of the year. Generally, the bushfire season for Southern WA is from October through to April, however seasonal factors may influence and vary these times.

During the summer months anti-cyclones move along the southern edge of the continent directing easterly winds across the south-west, accompanied by the development of a west coast trough. Winds associated with this synoptic pattern are predominately easterly overnight and during the morning and may be strong and gusty close to the escarpment and on adjacent parts of the coastal plain.

A sea breeze from the south to south west is common during the afternoon, with the influence zone dependent on the temperature gradient and strength of the easterly gradient. Summer seas breezes commonly reach the escarpment and may influence Dwellingup and the Murray Valley under favourable circumstances. Winds typically return to the east and increase in strength after sundown.

Observations at Dwellingup (Site 009538) from the period January 1957 to August 2020 indicate the wind rose direction versus wind speed in km/h at 9am and at 3pm, showing typical wind patterns along the Darling Plateau.

[10] Source: https://weather.agric.wa.gov.au/station/PI001



9am conditions

3pm conditions

Figure 10 – Wind speed vs direction plot, Dwellingup

The Darling Scarp running north to south, falls sharply at the western portion of the area, and features steep gullies and valleys running east to west. The area experiences an average six month summer fire season annually, with regular strong overnight and morning easterly winds. The southwest afternoon sea breeze also influences fire behaviour. Winds are influenced strongly by "gully-effect" with resultant erratic fire behaviour.

Weather conditions influence the size, intensity, speed and predictability of bushfires and how dangerous they can be to the community. Vegetation growth can be encouraged by periods of wet weather, increasing the amount of fuel available (grass, leaf litter, twigs, bark). When the weather is hot, the humidity is low and there has been little recent rain, this vegetation dries out and becomes more flammable. A fire is more likely to start, and continue to burn in hot, dry and windy conditions.

Strong gusty winds help fan the flames and cause a fire to spread faster across the landscape. Strong winds can carry hot embers long distances, these can start spot fires many kilometres ahead of the main fire front. Changes in wind directions can bring periods of dangerous bushfire activity.

Fire Danger Ratings

In Australia there is a system of assessing these in conjunction with the state of the available fuels to determine a measure of 'fire danger', or the difficulty of putting out any fire which may occur. The Bureau of Meteorology alerts the public when conditions are likely to be dangerous.

Fire Danger Ratings are based on the forecast weather conditions and offers advice about the level of bushfire threat on a particular day.

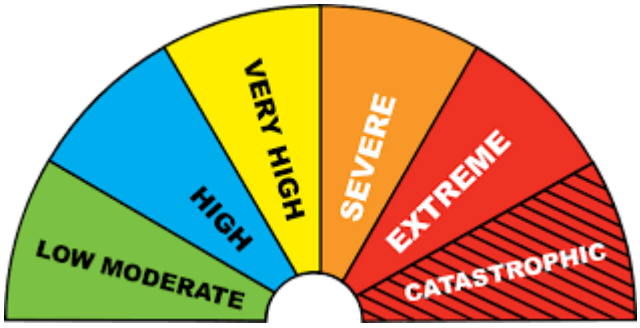


Figure 11 – Fire Danger Rating

In Australia, the McArthur Forest Fire Danger Index (FFDI) is widely used to forecast the influence of weather on fire behaviour, and the Australian Bureau of Meteorology routinely issues forecasts of Grassland and Forest Fire Danger Index (GFDI and FFDI) for use by fire authorities. The FFDI is based on a combination of different weather conditions known to influence the risk of dangerous bushfire conditions including temperature, rainfall, humidity and wind speed. In addition to the weather, bushfire events are also influenced by factors such as vegetation conditions, terrain and ignition sources.

Unlike the Fire Danger Rating which has six levels ranging from 'Low to Moderate' to Catastrophic, both the Grass Fire Danger Index (GFDI) and the Forest Fire Danger Index (FFDI) are expressed as a number ranging from 0 to 200. When a Fire Danger Index reaches 50, the conditions are considered as Severe; when conditions reach 75, the conditions are considered as Extreme.

The Bureau of Meteorology issue fire weather warnings when forecast weather conditions are likely to be dangerous. Warnings are issued for the following day via radio news broadcasts and other media platforms. These warnings are issued for the areas delineated by fire weather districts and knowledge of these districts is beneficial for local bushfire brigades, the community and in particular, the rural farming communities.

The Shire of Murray is within two fire weather districts of the Southwest Land Division, with the South Western highway, roughly separating the two. These districts are:

- Lower West Coast
- Lower West Inland

Over the past five years, the Shire has experienced an average of 53 days per year above 'Very High' Fire Danger Rating over the two weather districts, however fires can still occur at the lower fire danger ratings. During this period there were no 'Catastrophic' days recorded.

Table 5 shows the Fire Danger Rating for the Lower West fire weather districts from 2015 to 2020.

The data is taken from the 4pm forecast only, not including any updates or revision that occur in the evening or early morning. The data is per calendar year and is not intended as a direct indicator of future conditions.

Table 5 – Number of FDR Ratings above Very High for the Lower West Fire Districts from 2015 - 2020

		2015	2016	2017	2018	2019	2020
District	**FDR**						
Lower West Coast	Very High	16	16	6	15	30	24
	Severe	1	1	0	0	9	3
	Extreme	0	0	0	0	0	0
District	**FDR**						
Lower West Inland	Very High	21	36	23	18	42	28
	Severe	4	6	3	0	7	8
	Extreme	0	1	0	0	2	0

Total Fire Bans

Total Fire Bans (TFB) are declared because of predicted extreme weather conditions or when widespread fires are seriously stretching firefighting resources. A TFB is declared by the Department of Fire and Emergency Services following consultation with Local Governments. TFB's apply to the whole local government boundary and often apply to more than one local government area.

A total of 54 Total Fire Bans affecting the Shire of Murray were declared over the period 2015 to 2021 as seen in Table 6.

Table 6 – Total Fire Bans declared in the Shire of Murray between 2015 and 2021

Shire	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
Murray	11	3	0	5	17	18

The statistics in Tables 5 and 6 show that the 2019-20 and 2020-21 fire seasons recorded the highest number of TFB's declared which aligns with the extreme climatic conditions for those years. Climate data for Western Australia recorded 2019 as the warmest and driest year on record followed by 2020 as the second warmest year on record.[11]

[11] Bureau of Meteorology/Annual Climate Summary for Western Australia

The hot conditions combined with the dry landscape and strong winds produced dangerous fire weather during December 2019 into early January 2020 continuing a run of three consecutive months of highest accumulated FFDI on record.

Harvest and Vehicle Movement Bans

Harvest and Vehicle Movement Bans (HVMB) are imposed by local governments under the *Bush Fires Regulations 1954* Section 38A, and/or Section 24C, when prevailing and/or anticipated weather conditions and/or availability and/or response capacity of the local firefighting resources are reduced. The local government can issue HVMB's to restrict the use of vehicles and machinery that have an increased risk of igniting a fire.

Harvest and Vehicle Movement Bans are issued from the advice of the Shire's Chief Bush Fire Control Officer (CBFCO) when the use of engines, vehicles, plant or machinery during the Limited Burning times is likely to cause a fire or contribute to the spread of a bushfire. A HVMB may be imposed for any length of time but is generally imposed for the 'heat of the day' periods and may be extended or revoked by the local government, should weather conditions change.

Between 2015 and 2021, a total of 13 Harvest and Movement Bans were issued over the past seven years with an average of one to two per year. The exception being in 2019 where five HVMB's were issued. This statistic is comparative to the FDR Ratings above Very High for 2019, the number of Total Fire Bans issued and the climate data reflecting the warmest year on record.

The Shire of Murray utilises the Telstra Integrated Messaging System (TIMS) to notify residents and/or landowners, emergency services and Shire staff of important timely bushfire related messages via SMS alerts. The SMS alerts are an opt-in service for members of the community who wish to receive these notifications. These include:

- Restricted Burning Times
- Prohibited Burning Times
- Total Fire Bans; and
- Harvest & Vehicle Movement Bans

The TIMS messaging is also used to activate if required, the Shire's Local Recovery Coordination Group in the event of a major bushfire or emergency event occurring in the Shire.

3.2.3. Vegetation

Bushland, wetlands, rivers and other natural areas are key assets of environmental, social and economic value to the Shire of Murray.

The protection of remnant vegetation and the retention of biodiversity is a high priority. The Shire has a Local Biodiversity Strategy[12] in place, which establishes goals for biodiversity and native vegetation retention.

The Shire has diverse geographic areas given the wide range of landform and vegetation types: forests, rock outcrops and creeks of the Darling Plateau, escarpments of the Ridge Hill Shelf and bushland, forests and wetlands of the Swan Coastal Plan.

Characteristic native plant species in the Shire include trees such as the Marri, Tuart, Jarrah and Freshwater Paperbark. Smaller trees and shrubs include various species of Banksia, Hakea, and Acacia.

While much of the Scarp has been cleared for pasture, there are more stands of remnant forest than in the foothills – probably because of the more difficult terrain. Marri forest is most common along with Jarrah, Wandoo and Ghost Gum. Vegetation varies in response to annual rainfall and soil depth. On the deeper soils in areas receiving more than 1100mm of annual rainfall, an open forest of Jarrah-Marri exists, with intrusions of Wandoo on the slopes and valley floors. Yarri occurs on the lower slopes. In areas receiving 650-1100mm of annual rainfall, a mixture of open Jarrah-Marri-Yarri forest occurs on the deeper soils, while the shallower soils support an open Wandoo woodland.

These forests have a leaf litter bed typically ranging from 2cm to 6cm across the forest. The fuel loads in these areas is often high, with a large proportion being dead dry fine fuels which mean that fire will easily start and spread quickly in this vegetation. Fires in this vegetation will often quickly reach the canopy due to the horizontal distribution of fuels. The trees in these forests have fine fibrous loose bark which easily ignites and can be blown by the winds to carry the fires forward. Ember brands can travel long distances and start new fires ahead of the main fire front. Combined with the topography on which it occurs, these forest vegetation types create very intense and fast moving fires. Once established, fires in this vegetation type can be difficult to access and suppress and may continue to burn until there is a significant change in conditions.

Too frequent and intense fires can impact negatively on plants that have long juvenile phases or are slow to set seed. Cooler mosaic burning with follow up monitoring for weeds will provide diversity and reduce fuel loading within litter beds and near surface fuels.

On the Darling Plateau vegetation pattern ranges from tall open forests of Jarrah (Eucalyptus marginata) and Marri on the upper slopes, to Marri dominance within the gullies.

[12] Shire of Murray Biodiversity Strategy 2013

The valley floors contain mixtures of Yarri (E. patens), Wandoo (E wandoo) and Bullich (E. megacarpa). Bullich, Yarri scattered Marri and Flooded Gum occur along drainage channels and swamp margins, with a mixed understorey.

As the annual rainfall decreases, the vegetation becomes a low open woodland of Wandoo-Marri with open forests of Jarrah-Marri on the deeper soils.

In the lower rainfall areas is a low open woodland of Wandoo-Marri with admixtures of Jarrah. Associated with granite rocks in this area are Sheoak, Heath and Herblands.

Fire management within these vegetation types such as mosaic burning to maintain a diversity of vegetation age classes in unburnt patches can reduce the incidence and extent of wildfire.

Figure 12 – Tall open forest of Jarrah and Marri at Lane Poole Reserve[13]

The Swan Coastal Plain is a low lying coastal plain, mainly covered with woodlands. The inland regions of the Swan Coastal Plain have had substantial clearing, and the remaining areas of native vegetation are generally small and dispersed.

The vegetation of the Spearwood Dunes relates to the depth of soil and is dominated by an open forest of Jarrah, Marri and Tuart (Eucalyptus gomphocephala).

[13] Photo credit: Josh Cowling Photography

Tuart is important as it is the only Eucalypt endemic to the Coastal Plain and found nowhere else in the world.

The understorey consists of Banksia species, Peppermint (Agonis flexuosa), and Sheoak. The lower storey is dense and contains perennials such as Hakea and Acacia. Near water bodies, Paperbark, Saltwater Sheoak and rushes are common.

Figure 13 - Jarrah, Marri and Banksia within the soils of the Spearwood Dune system.

Figure 14 – Paperbarks at Lake Mealup on the Swan Coastal Plain.

The well-drained sands of the Bassendean system support areas of Jarrah-Marri woodland, giving way to Jarrah-Banksia to the east. Swamps and low-lying areas contain Paperbarks, swamp Banksia, Flooded Gum (Eucalyptus rudis), bulrushes and sedges. There has been extensive clearing of native vegetation for agriculture.

The western regions of the Swan Coastal Plain include several wetlands that support riparian vegetation. Swamp Sheoak and Saltwater paperbark are common along the Peel-Harvey Estuary shoreline. Samphire marshes occur on low-lying, flood prone land where they are periodically inundated. The most extensive marshes are along the eastern shore of Peel Inlet, around Creery Island and at the southern end of the Harvey Estuary. Riparian vegetation is important for preventing erosion and maintaining the watercourse channel structure and provides habitat for local fauna.

Acid sulphate soils and peat soils are common in the Swan Coastal Plain. Fires in peat soils are extremely difficult to extinguish and burn for long periods of time. Increasing aridity from climate change may make peat soils more prone to fire.

Acid sulphate soils contain iron sulphides that have not been exposed to air. These soils react when exposed to air from sulphuric acid. When burnt, this acidity releases elements such as metals and nutrients from the soil profile that can be transported to waterways, wetlands and groundwater systems, often with harmful environmental impacts.

Much of the remaining vegetation on the Swan Coastal Plain (Figure 15), of which less than 20% is remaining from pre-European times, is home to various Threatened Ecological Communities and Species listed under the Federal *Environment Protection and Biodiversity Conservation Act 1999* and the Western Australian *Biodiversity Protection Act 2017*. These include Banksia Woodlands, Tuart Forest, Clay Pans as well as key habitats for a variety of species. Bushfire risk planning has to include the management requirements of these systems and measures to protect critical ecological assets.

Vegetation Complexes

The Shire's vegetated natural areas can be categorised into very broad scale ecological groups referred to as vegetation complexes. Vegetation complexes are groups of vegetation that occur on similar underlying landforms and soils and are influenced by similar climatic influences (eg. rainfall).

There are 21 vegetation complexes that occur in the Shire (Figures 15, 16 and Table 7). Vegetation within each of the complexes is not a uniform mix of species over the extent of the complex, but rather a collection of different plant and animal species that change with variations in soils, slope, rainfall and vegetation condition.

Table 7 shows the amount of each of these vegetation complexes remaining and protected within the Swan Coastal Plain/Jarrah Forest and the Shire (local extent). The local extent of each vegetation complex is shown in Columns 1 and 2 of Table 7.

These statistics are part of the 2013 native vegetation dataset released by the WA Local Government Association's Local Biodiversity Program (Local Biodiversity Program, 2013a & b). The statistics enable State and local governments to determine whether sufficient areas of each vegetation complex are protected and retained across their regional natural range to conserve biodiversity.

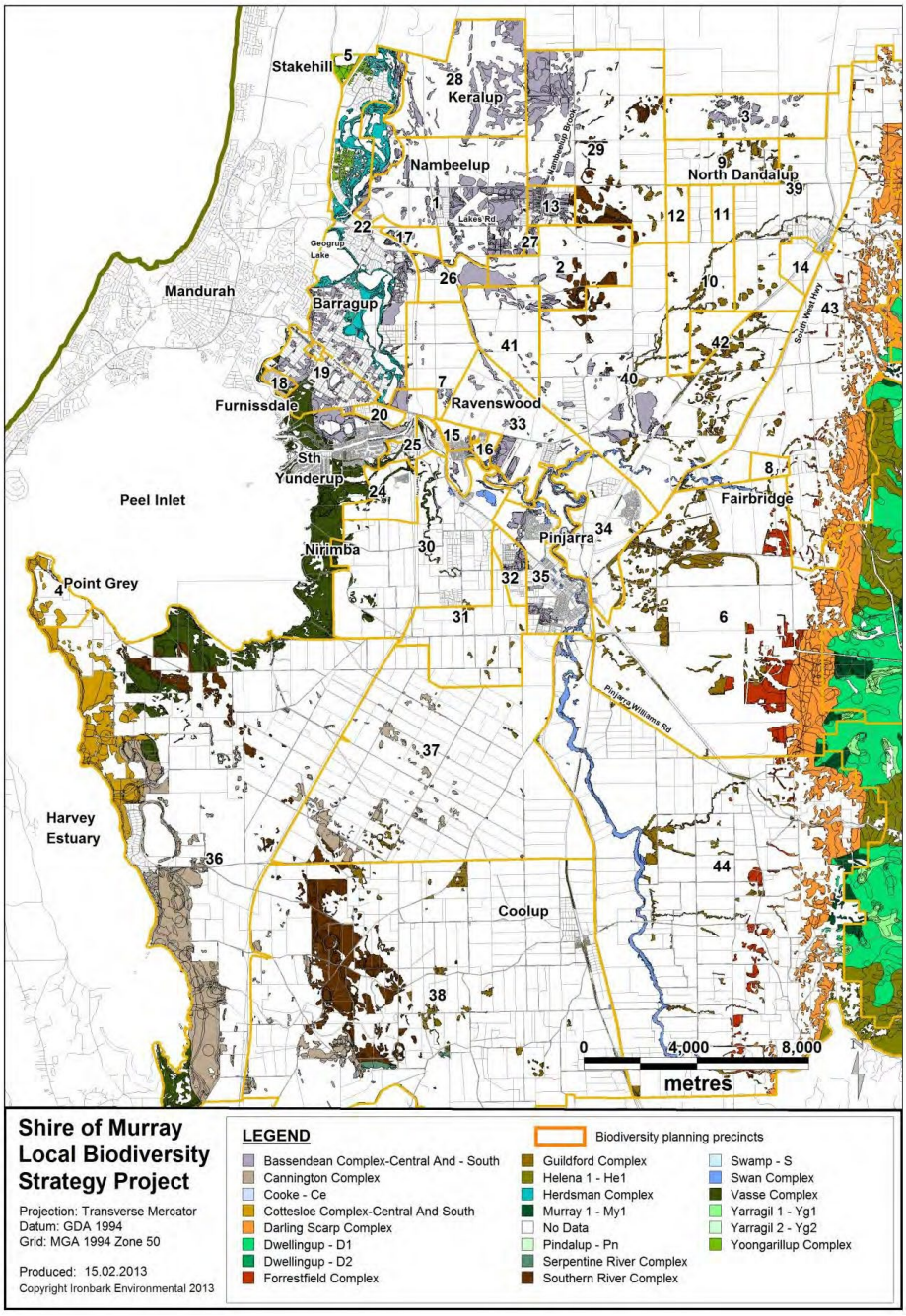


Figure 15 – Vegetation complexes (Swan Coastal Plain)[14]

[14] Source: Shire of Murray Local Biodiversity Strategy 2013

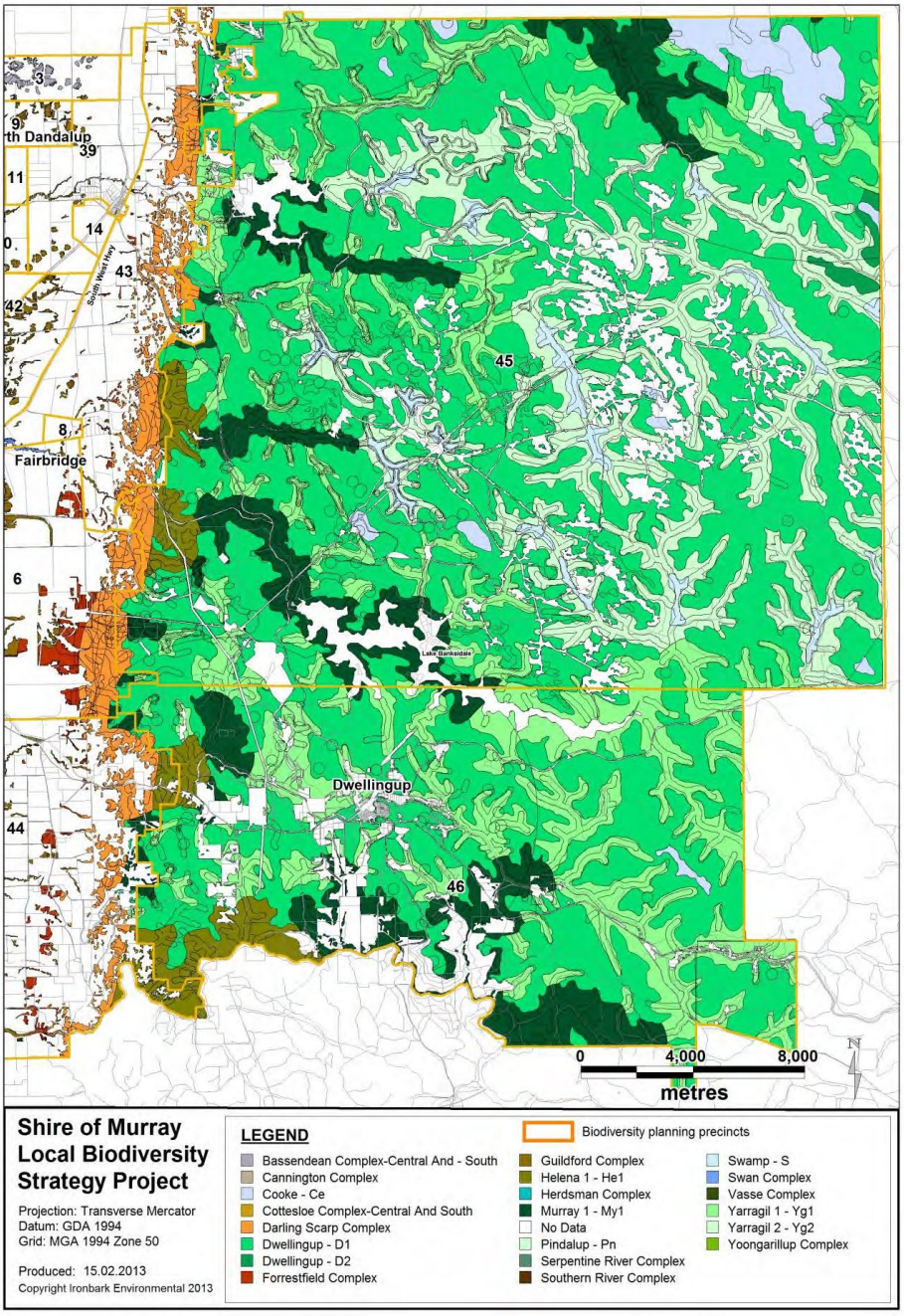


Figure 16 – Vegetation complexes (Darling Scarp)[15]

[15] Source: Shire of Murray Local Biodiversity Strategy 2013

Table 7 – Extent of Vegetation Complexes in the Shire of Murray[16]

Vegetation Complex	Remaining extent 2010 (ha)	Remaining extent 2010 (%)	DPAW Conservation lands (ha)	% pre-European in DPAW Conservation lands	Local Natural Areas remaining (ha)
Cannington	1701.33	16	886.97	8.4	814.36
Forrestfield	557.58	11	7.90	0.1	549.69
Guildford	1681.56	6	5.82	0.0	1675.41
Serpentine River	41.97	9	0.00	0.0	41.97
Swan	566.42	14	0.00	0.0	566.42
Bassendean Central & South	3057.42	22	66.86	0.4	2990.56
Cottesloe Central & South	770.00	43	81.64	4.5	688.36
Darling Scarp	2996.60	45	61.27	0.9	2670.41
Herdsman	595.05	38	253.78	16.3	341.27
Southern River	1525.75	23	158.82	2.4	1366.93
Vasse	1823.26	36	896.75	17	926.51
Cooke	1634.80	95	0.00	0.0	0.00
Dwellingup 1	40281.43	91	905.59	2.0	577.90
Dwellingup 2	235.66	100	0.00	0.0	0.00
Helena 1	2099.97	88	548.96	22.9	739.43
Murray 1	6768.32	73	869.65	9.3	669.19
Pindalup	89.27	100	0.00	0.0	0.00
Swamp	1231.8	98	0.00	0.0	0.00
Yarragil 1	13424.1	89	193.62	1.2	745.37
Yarragil 2	10776.1	96	0.00	0.0	0.00
Yoongarillup	106.5	39	0.00	0.0	106.57
No Data	121.66		20.96		98.14
TOTAL (ha)	92086.70	54	4958.60		15568.46

[16] Source: Shire of Murray Local Biodiversity Strategy 2013

3.2.4. Threatened Species and Communities

An ecological community is a collection of species that have a strong common association. Some ecological communities found in the Shire are rare and threatened and classified as Threatened Ecological Communities (TEC's).

A TEC is a community presumed to be totally destroyed or at risk of becoming totally destroyed. Being listed as a TEC offers the vegetation protections under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Shire of Murray is within the catchment of the nationally registered TEC – *Banksia Woodlands of the Swan Coastal Plain* and the nationally significant TEC – *Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain.*

Banksia Woodlands is typically a prominent tree layer of Banksia sometimes with scattered eucalypts and other tree species present within or emerging above the Banksia canopy. The understorey is species rich and has many wildflowers, including scherophyllous shrubs, sedges and forbs. Banksia Woodlands vary in their structure (height, cover, density) and species composition across the area in which they occur.

The ecological community provides habitat for many native plants and animals that rely on Banksia Woodlands for their homes and food. Remaining patches of the ecological community provide important wildlife corridors and refuges in a mostly fragmented landscape.

The Tuart Woodlands and Forests can most commonly be found on the calcareous soils of the Spearwood dune systems, the Quindalup dune systems and in some places, also found on the Bassendean dune systems. The ecological community is comprised of woodlands or forests within which the presence of tuart trees in the uppermost canopy are the primary defining feature. The community often contains other native trees such as Peppermint, Banksia or Jarrah, with a substantial diversity of understorey plants. The Tuart is the largest tree species found on the Swan Coastal Plain with tree growth being dependent on conditions such as shelter, soil depth and water supply.

The Tuart Woodlands and Forests are an important part of providing vital habitat, shelter and critical ecosystem services for a range of species, including some that are nationally threatened, such as Black Cockatoos and the Western Ringtail Possum.

Fire management regimes in these TEC's should ensure that life cycles of the component species of the ecological community are not disrupted such as using mosaic burning techniques, applied in a variety of seasons and intensities. Retaining a range of vegetation age classes throughout the mosaic ensures diversity and reduces the likelihood of a whole reserve or patch being lost in a single fire event.

Figure 17 – An example of a Tuart with grassy understorey within the Tuart Woodlands and Forests of the Swan Coastal Plain (left). Jarrah & Marri within the Banksia Woodlands of the Swan Coastal Plain

Due to the sensitive nature of information around protected flora and fauna, some discretion has been applied to the amount of information recorded so further advice will need to be sought from subject matter experts to confirm the location of environmental assets with the shire and the potential impact of both mitigation and response strategies.

The Biodiversity Conservation Act 2016 provides for native fauna and flora to be protected where they are under an identifiable threat of extinction and, as such, are considered to be "threatened".

The Department of Biodiversity, Conservation and Attractions, 'Nature Map' database has recorded over 2800 conservation status species (as shown in Table 8) and currently lists 12 species of Declared Rare Flora (DRF) and 21 species of threatened fauna within the Shire of Murray.

Table 8 – Conservation status species within the Shire of Murray[17]

Conservation Status	Species	Records
Rare or likely to become extinct	33	1227
Protected under international agreement	33	1313
Other specially protected fauna	3	16
Priority 1	4	18
Priority 2	11	49
Priority 3	39	156
Priority 4	30	602
Non-conservation taxon	2673	39755
TOTAL	**2826**	**43136**

Among the many species of native flora in the Shire are species or rare and threatened flora such as the Grand Spider Orchard *(Caladenia huegelii)*, and critically endangered species *Synaphea sp. Fairbridge Farm* and *Synaphea sp. Pinjarra*.

Threatened species of fauna, with known or potential habitat in the Shire are the Southern Brown Bandicoot *(Isoodon obesulus fusciventer)*, Western Grey kangaroo *(Macropus fuliginosus)* and Bungarra (Goulds's sand monitor).

Other species found which are already at critically low numbers across their natural range are the Carnaby's Black Cockatoo *(Calyptorhynchus latirostris)*, Baudin's Black Cockatoo *(Calyptorhynchus baudinii)* and Forest Red-tailed Black Cockatoo *(Calyptorhynchus banksia naso)*. These species are protected under the *EPBC Act 1999* and the *Biodiversity Conservation Act 2016*.

Figure 18 – Bungarra (Left), Grand Spider Orchard (Centre) and the Forest Red-tailed Black Cockatoo (right)

[17] Source – https://naturemap.dbca.wa.gov.au

Flora and Fauna represent particular significance for the Shire as they are not only recognised environmental assets in their own right, but also impact the treatment options available for identified risks in relation to other assets.

All treatments need to be assessed in line with the requirements of the identified flora and/or fauna detailed below with care given to ensure appropriate authorities are consulted prior to any mitigation work commencing. The Shire will, where possible, remind landowners/managers of their obligation to obtain appropriate clearances and approvals prior to commencing vegetation based treatments. This includes:

- Environmentally Sensitive areas (ESA's)
- Declared Rare Flora and Fauna (DRF's)
- Threatened Ecological Communities (TEC's)

A further consideration in relation to both bushfire protection and response strategies is the potential spread of weeds or diseases such as *Phytopthora Cinnamomi* (Dieback). Dieback has infected large areas of jarrah forest. It is easily spread through soil movement from vehicles, animals, water and feet. Other fungal-borne diseases can also be spread through these pathways. This risk must be considered in the context of planned prevention and response strategies and the risk minimised wherever possible.

Wetlands and Waterways

At the ecosystem and landscape scale, the Shire supports numerous important natural assets, including the Peel-Harvey Estuary, Murray River and the Serpentine Lakes System.

The Murray River is the only continuously flowing river in the northern Jarrah forests of Western Australia. With its origin in the hills of the Darling Scarp beyond Dwellingup, the river drops 200 metres to the sandy plateau west of Pinjarra and out to the Peel Inlet and Harvey Estuary.

Wetlands include the broad, seasonally waterlogged damplands and palusplains distinctive of Nambeelup and Coolup, the estuarine wetlands of Austin Cove, and lakes such as Barragup Swamp. Lake McLarty Nature Reserve - an internationally renowned wetland and part of the Peel-Yalgorup System, was designated to the List of Wetlands of International Importance under the Convention of Wetlands in 1990.

Fire sensitive species and ecosystems are most typically associated with the less flammable parts of the landscape that are not regularly exposed to fire (eg. wetlands and riparian vegetation). Inappropriate fire regimes are particularly damaging to threatened species and ecological communities that have specific fire regime requirements or are found in geographically or temporary restricted habitats (eg. riparian vegetation often needs near total exclusion of fire to persist).

Catchment Areas

The South Dandalup Dam and Pipehead Dam were built in 1971 in response to rapid population growth in Perth and is a strategic source of public drinking water. The dam is located on the Darling Plateau where the South Dandalup River flows out of Lake Banksiadale. The reservoir has a capacity of 208.2GL and is the largest dam supplying water to the Integrated Water Supply System. The Pipehead Dam is approximately 7km downstream from the dam on the South Dandalup River and has a capacity of 76ML.

The North Dandalup Dam is the newest dam serving Perth's public water source. It is located at the top of the Scarp and has a capacity of 75 billion litres with a catchment area of 153km2.

Both dams have public recreational facilities such as picnic areas with barbecues for use all year round. Land uses within and around the catchments are recreation, mining, gravel extraction and forestry and plantation management.

Fire can be used to manage catchment vegetation to ensure there is enough cover to maintain water quality for environmental reasons while optimising the amount of potable water. Low intensity prescribed burns reduce the amount of vegetation and ground cover to increase runoff without affecting water quality. Intense bushfires expose the soil surface and lead to erosion. This can impact catchments by depositing silt and ash that block drainage channels. Bushfires also impact water storages, by causing turbidity, dissolving of nutrients, algal blooms, fish kills and increased water treatment costs.

3.2.5. Bushfire Frequency and Causes of Ignition

The Shire of Murray has experienced several significant wildfires in its history with the most notable being the devastating Dwellingup Fire in 1961. Caused by multiple lightning strikes on 19 January, the fire burnt through a total area of 150,000ha with catastrophic damage to properties at Dwellingup, Holyoake and Nanga Brook. Fortunately no lives were lost however, the townships mentioned were destroyed along with large scale damage to the forestry and wildlife.

History has shown that lightning and suspicious/deliberate have been the two main causes of the major fires that have occurred in this Shire. Targeted education and prevention programs are just one example of allocating resources effectively to implement strategies in the BRM Plan areas where suspicious/deliberate, burn off fires and re-ignition of previous fires are occurring most.

Below is a brief description of two notable fires that have occurred in the district.

Dwellingup Fires 2007

Beginning on Australia Day, a series of fires known as the 'Dwellingup Fires' burnt through an estimated 14,000ha of forest and private property between Dwellingup and Coolup. The first fire was deliberately lit and started three kilometres north of the Dwellingup townsite. Lightning strikes and re-ignition of previous fires ignited the main fire under strong winds in hot, dry conditions pushing the fire towards the Murray Hills estate. The steep and rugged terrain in some sectors made suppression and mop up slow and difficult therefore drawing heavily on firefighting crews and management efforts. With a boundary of a 100km perimeter, the fire was not contained and under control until 8 February and recovery efforts continued for 12 months after the fire.

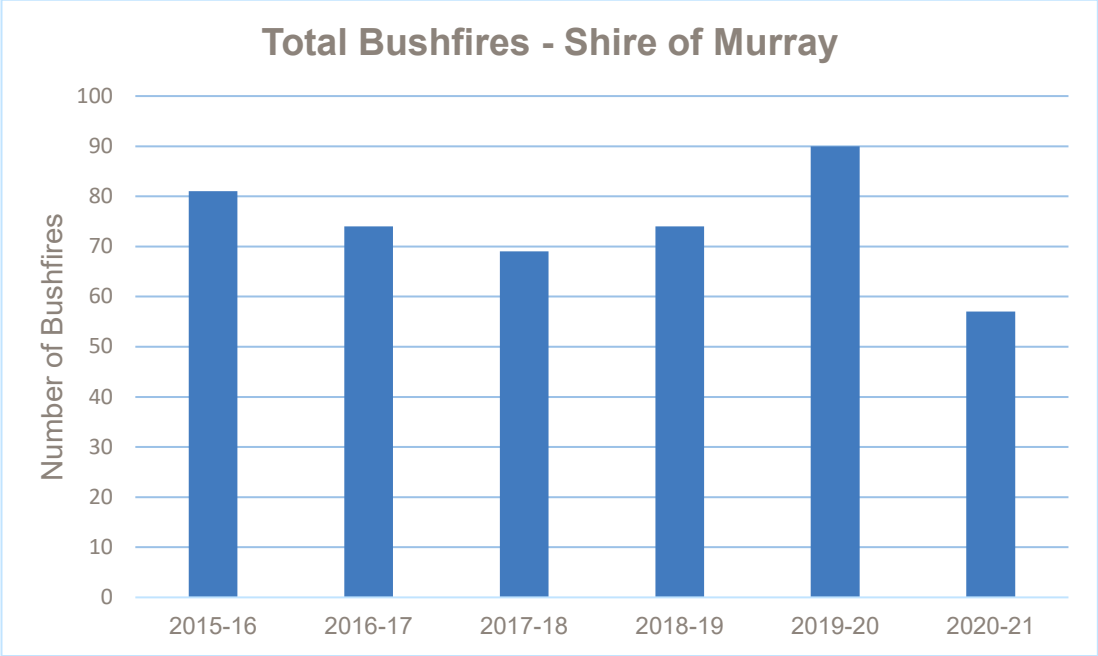
A total of 14 houses were destroyed and damage to sheds, fences, vehicles and livestock and the Hotham Valley railway was recorded.

Teesdale Fire 2016

Occurring in the early hours of the 14th March, the fire was started by a stolen vehicle on Scarp Road. Under the influence of a strong north easterly wind, the fire travelled rapidly towards Meelon, Teesdale and Murray Hills estate. The fire continued for several days burning through approximately 1250 hectares of mixed tenure. There were 12 people registered at the evacuation centre located in Pinjarra. Approximately 100 properties were affected and damage was sustained to one shed, 22 power poles and the Hotham Valley rail line.

Reporting

Fires are recorded using the DFES Incident Reporting System (IRS). A bushfire is considered to be any vegetation fire (bush, grass, scrub, forest) of any size. Fire (large) is a bushfire more than one hectare in size. Graph 5 shows that from the period starting 1 July 2015 to 30 June 2021, there were a total of 445 bushfire ignitions within the Shire of Murray, at an average of 74 per year.

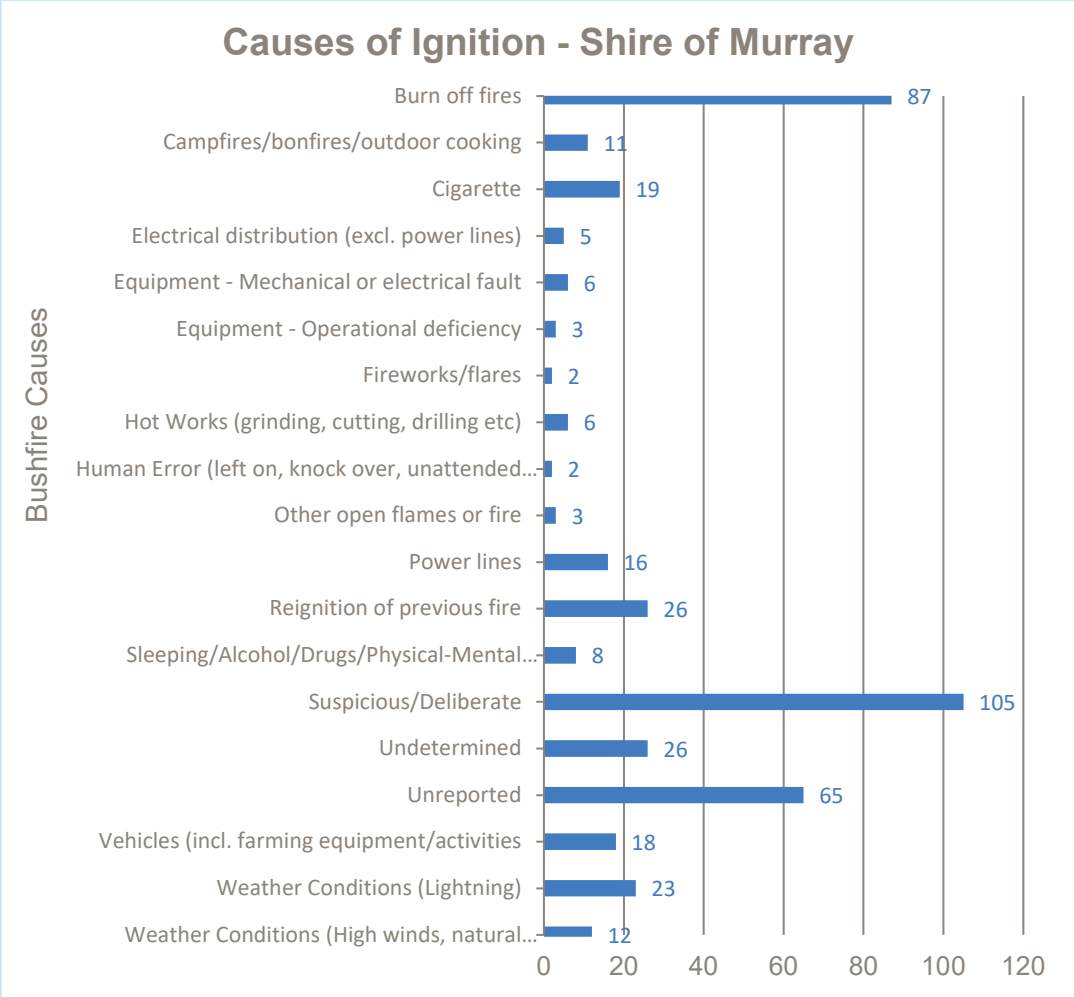


Graph 5 – Total Number of Bushfires within the Shire of Murray[18]

The data retrieved however, has its limitations and not all ignitions are reported and recorded within the Incident Reporting System. These figures may not reflect all incidents attended only by the DBCA – Parks and Wildlife Service for which they manage 47% of the land within the Shire of Murray.

There are a number of reasons why bushfires occur. Graph 6 shows that 23% of all ignitions across the Shire are suspicious/deliberate behaviour as the most common cause. Burn off fires account for 19% followed by unreported fires with 15%. Undetermined causes and re-ignition of previous fires combined accounted for 11%. Weather conditions, cigarettes, vehicles, power lines and campfires accounted for another 30% of all ignitions.

[18] DFES Operational Information Systems Branch



Graph 6 – Summary of Bushfire Causes of Ignition[19] (2015/16 to 2020/21)

This fire history data may serve to influence the decision making process by identifying potential areas where fires are more likely to start and why, contributing to the implementation of appropriate treatment strategies.

Targeted education and prevention programs are just one example of allocating resources effectively to implement strategies in the BRM Plan where, for example, suspicious/deliberate fires, burn off fires and re-ignition of previous fires are occurring most.

Figure 19 shows the ignition causes by map location for the period 1 July 2015 to 30 June 2021.

[19] Source: DFES Operational Information Systems Branch

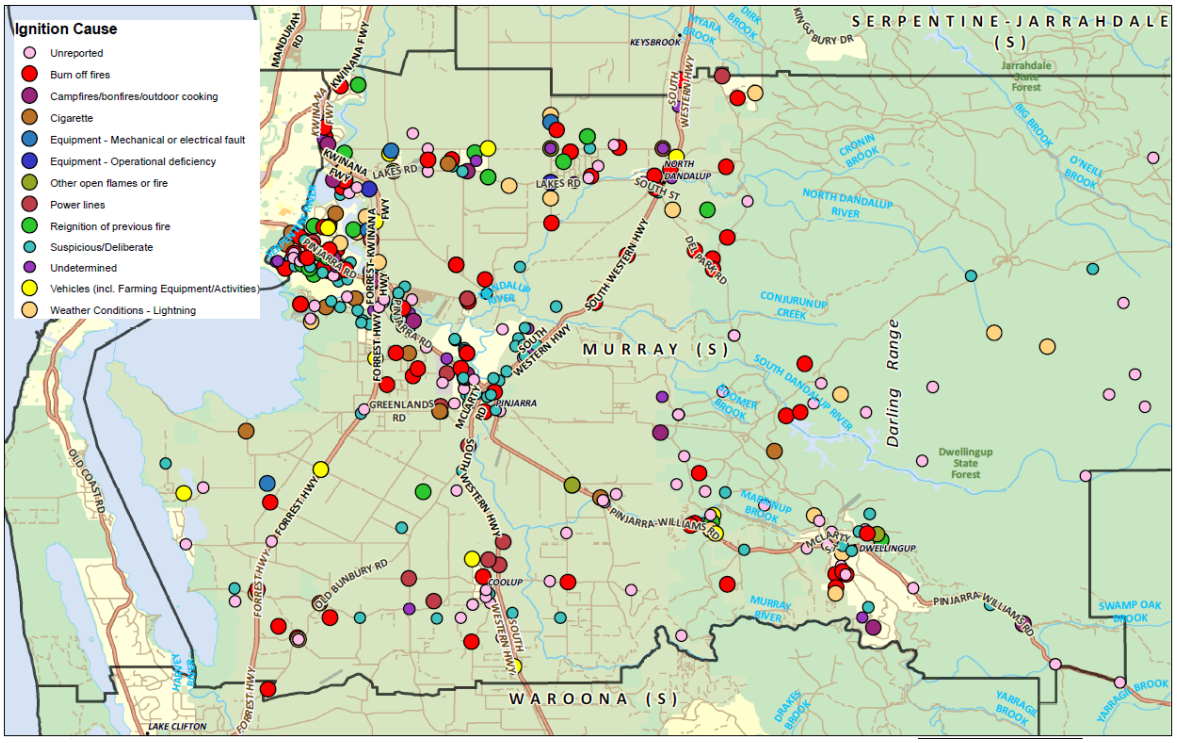


Figure 19 – Total Number of Bushfires within the Shire of Murray

3.2.6. Current Bushfire Management Activities

The Shire of Murray aims to mitigate the destructiveness of bushfire. The Shire is responsible for the inspection and management of fire mitigation/hazard reduction measures on land owned by, or vested to, the Shire which includes local parks and reserves, road reserves, recreation and drainage reserves.

Annually, the Shire implements their Fire Prevention Program and undertakes hazard reduction works on land it owns and controls which include mechanical works, slashing, chemical spraying and pruning. Prescribed burning is also undertaken at intervals that reduce the fuel loads and support biodiversity. Priority is given to populated areas and town sites when undertaking mitigation works.

Local Government Wide Controls are activities that reduce the overall bushfire risk within the Shire of Murray.

These types of activities are not linked to specific assets and are applied across all or part of the local government as part of normal business or due to legislative requirements. Some notable controls currently in place in the Shire of Murray are:

- *Bush Fires Act 1954*, Section 33 notices, including applicable fuel management requirements, firebreak standards and annual enforcement programs;
- Declaration and management of Limited Burning Times and Total Fire Bans for the local government area;
- Declaration and management of Harvest and Vehicle Movement Bans for the local government area;
- Public education campaigns and the use of DBCA and DFES state-wide programs, tailored to suit local needs; including programs such as 5 Minute Fire Chat, Bushfire Action Month and Are You Ready Campaign;
- State wide arson prevention programs developed in conjunction with WA Police and DFES;
- State planning framework and local planning schemes, implementation of appropriate land subdivision and building standards in line with DFES, Department of Planning and Building Commission policies and standards;
- Monitoring performance against the BRM Plan and reporting annually to the local government Council and OBRM;
- Bushfire Advisory Committee meetings as required to review current practices and contemporary bushfire management concepts; and
- Quarterly Local Emergency Management Committee meetings.

Further information about the Local Government Wide Controls and how they will support the treatment of bushfire risk can be found in section 6.1 – Local Government Wide Controls.

Map of Bushfire Prone Areas

The intent of the WA Government's Bushfire Prone Planning Policy is to implement effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. The *State Planning Policy 3.7 – Planning for Bushfire Prone Areas* ensures bushfire risk is given due consideration in all future planning and development decisions. This policy does not apply retrospectively, however the BRM Plan can help address this risk for existing development and establishing an effective treatment plan to manage the broader landscape and any unacceptable community risks. The Shire of Murray Bushfire prone Area is shown in Figure 20.

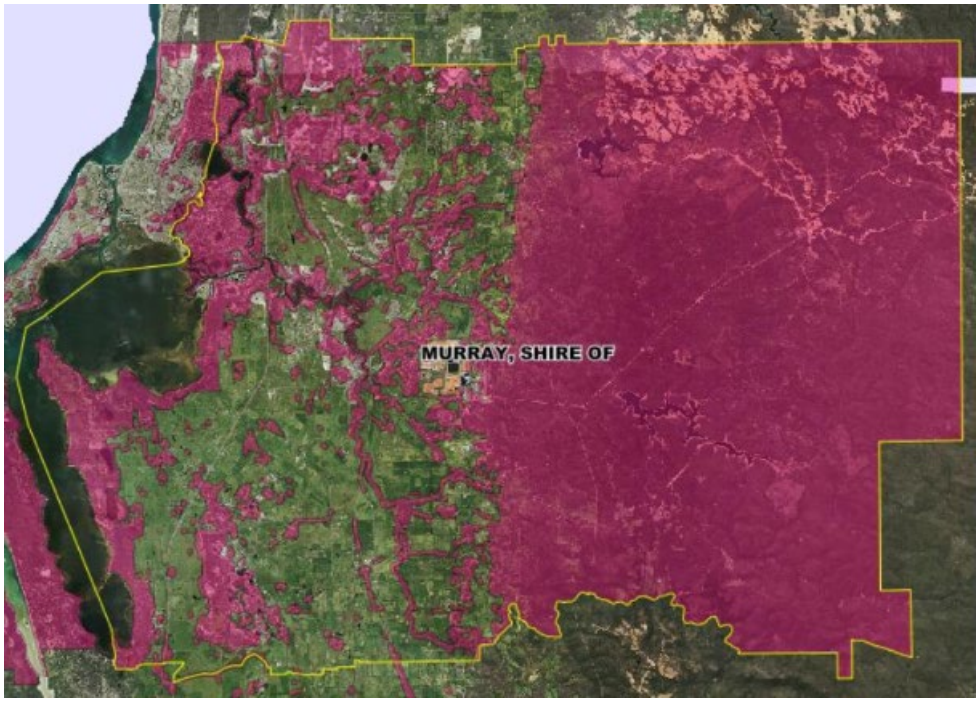


Figure 20 – Map of Bushfire Prone Areas within the Shire of Murray[20]

Volunteer Fire Brigades

The Shire has a volunteer Chief Bushfire Control Officer (CBFCO) appointed by the Local Government under the *Bush Fires Act 1954*. The CBFCO is the most senior Fire Control Officer (FCO) in the Shire.

The primary responsibility of the Chief is to manage, control and direct all operational bush fire-fighting activities within the district. Duties of the CBFCO include:

- Providing leadership to volunteer bush fire brigades;
- Liaising with the local government concerning fire prevention / suppression matters generally and to provide directions issued by the local government to bush fire control officers, bush fire brigades or brigade officers; and
- Issue directions as necessary to a FCO or a brigade member that is planning or conducting burning operations in the district.

The Shire's Community Emergency Services Coordinator is the appointed Deputy Chief Bush Fire Control Officer.

[20] Shire of Murray Intramaps

The Shire of Murray's emergency response is supported by five Volunteer Bush Fire Brigades (VBFB), one Volunteer Fire and Rescue Service (VFRS) and the Department of Biodiversity, Conservation and Attractions – Parks and Wildlife Service (PWS).

The VBFB emergency services fleet consists of 10 fire appliances, one Bulk Water Tanker and a Fire Boat which provides access and response to the Delta Islands. Located at the Yunderup/Ravenswood VBFB, the fire boat is the only one of its kind in the State.

Figure 21 below shows the turn out areas for the respective volunteer emergency services within the local government area.

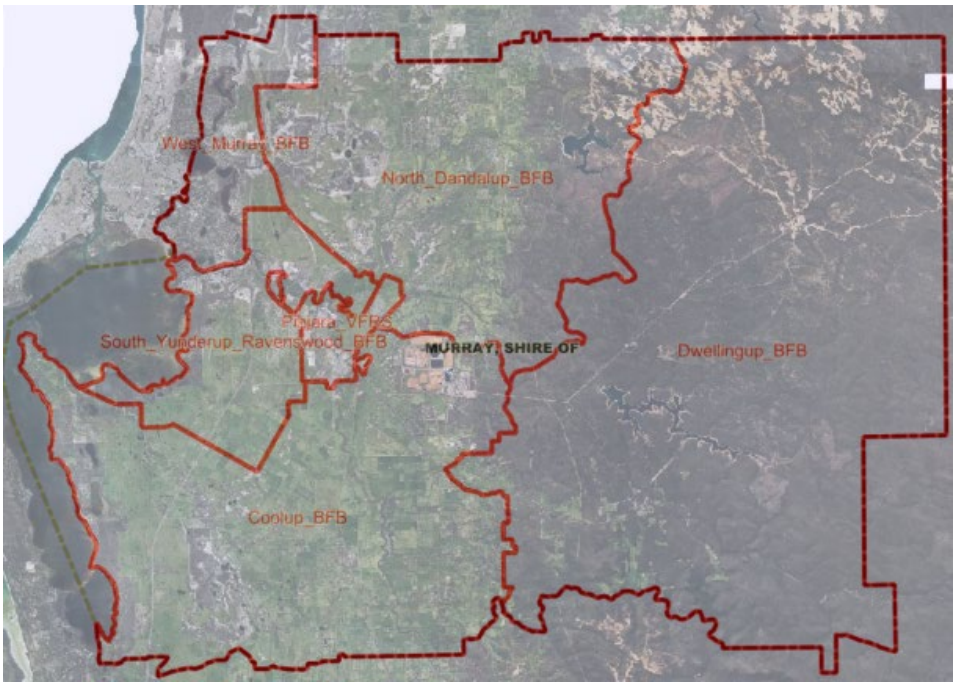


Figure 21 – Shire of Murray brigade turn out areas

Burning Restrictions

The Shire's limited burning times are as follows and may be varied upon unseasonal weather conditions:

- Restricted Burning Time 1 October to 15 May
- Prohibited Burning Time 1 December to 31 March

Permits to Set Fire to the Bush ('Permits') are issued by the Shire of Murray during the Restricted Burning Periods each year.

Permits are issued in an effort to prevent the escape of controlled burns and to ensure property owners safely plan and carry out their burning activities.

Examples of the restrictions and requirements that may be incorporated into a permit cover factors such as:

- Informing the Shire, DFES and neighbours before commencing the burn;
- Restricting burning to coincide with the appropriate weather conditions;
- Implementing precautions to prevent the escape of the burn;
- Having sufficient water, equipment and personnel to control and extinguish the burn; and
- Providing a time limit in which the burn can be carried out.

Permits are issued by authorised Fire Control Officers under the *Bush Fires Act 1954*. All permits are cancelled on days where the fire Danger Rating is "Very High" or above or when a TFB and/or a HVMB has been declared.

Permits are not valid during the prohibited burning time and are issued subject to the provisions of section 46 of the *Bush Fires Act 1954* and may be revoked or suspended by a Bush Fire Control Officer if, in his opinion, the fire, if lit, would become a source of danger.

Bush Fires Act 1954 section 33 Fire Management Notices

The Shire has developed a comprehensive Firebreak Notice that requires landowners/residents to carry out certain minimum preventative measures on their property depending on land zoning.

The statutory requirements of the firebreak notice are required to be completed by 30 November each year and maintained until 30 April the following calendar year. During this time, Ranger Services undertaken an annual firebreak inspection program to ensure compliance.

Shire Rangers are Fire Control Officers appointed by the local government in accordance with the *Bush Fires Act 1954* and are responsible for the administration of the provisions within the Act.

Included in the notice is information about the Limited Burning Times, permits and contact details for the local Fire Control Officers. The notice is sent to residents with their annual rates notice. Additionally, the Shire's website provides the following bushfire related information:

- Firebreaks and variations
- Fire control – prohibited and restricted burning times
- Preparing for fire season information
- Building in bushfire prone areas
- Alternatives to burning
- Bushfire preparedness, preventing, planning and enforcement
- Permits to burn

- Vehicle Identifier Sticker system
- Emergency Management
- Stay informed (Total Fire Bans, Fire Danger Ratings, Harvest & Vehicle Movement Bans)
- Registering for SMS notifications

Community Engagement Activities

Bush Fire Ready groups are people living within a local area, facing the same bushfire threat and who often have existing social networks already in place. The groups are run by Bushfire Ready Facilitators who are volunteer firefighters and play a key role in coordinating their local communities to work together and undertake activities to reduce the risk of bushfires. Bush Fire Ready Groups (BFR) are supported by the Department of Fire and Emergency Services Community Preparedness directorate.

The Bush Fire Ready program is well supported within the Shire with several brigades having active BFR groups and networks in their communities. Brigades also hold Street meets, static displays at events and brigade open days to assist residents with property preparedness, fire prevention advice and Bush Fire Ready information.

The Dwellingup and Coolup Volunteer Bush Fire Brigades have an active Cadet program who also participate in and assist in fire related community events.

The Shire's Bush Fire Brigades and State Emergency Services also support the new DFES Youth Emergency Services Program (YES). This program leverages DFES' established youth programs and community assets to build young people's skills, knowledge of the volunteer emergency services, the hazards in their communities and how best to respond to them. The program is community led with local volunteers and personnel designing the program structure, sourcing needed resources and exposing young people to all the emergency services active in their communities. This program has recently been introduced at Pinjarra Senior High School with students ranging from 13-15 years currently participating.

Other Current Local Government Wide Controls

Local Government Wide Controls are activities that reduce the overall bushfire risk within the Shire of Murray. These types of activities are not linked to specific assets, and are applied across all or part of the local government as part of normal business or due to legislative requirements.

This BRM Plan is a hazard specific plan that addresses significant bushfire risk within the local government. It aims to integrate bushfire risk management programs and activities into the business processes of the Shire, other agencies and land owners. The outcomes of this Plan will be used to inform the Shire when preparing and then implementing bushfire mitigation strategies for Shire managed land.

Bushfire is the highest risk factor to the community from an emergency management perspective in the Shire. The increased fire risk to the community due to a drying climate and existing developments within and around high fuel load areas places increasing pressure on fire brigade volunteers to support fire response requirements.

With the BRM Plan, the Shire will increase efforts to support and promote existing bushfire preparation programs such as community led Bushfire Ready Groups, while educating and providing valuable information to the community.

Existing and future bushfire risk management programs, such as the annual Firebreak notice issued under s.33 *Bush Fires Act 1954*, will utilise the BRM Plan to prioritise resources and influence the decision making process.

The use of social media platforms to communicate bushfire alerts and warnings to the community and provide information about prevention and preparedness is a popular tool with an increasing uptake of subscribers and views. The Shire uses their website, Facebook and Twitter accounts to keep the community informed.

4. Asset Identification and Risk Assessment

4.1. Planning Areas

The Shire of Murray has a single planning area based on the five fire brigade boundaries within the district to determine priorities for asset identification and assessment. Valuable input from the Chief Bushfire Control Officer was gathered to assist with the assessment.

The *Planning Area Assessment Tool* was applied to determine the priorities for asset identification and assessment. Using the tool, each locality was rated against six risk factors, with the highest scoring planning area being the first priority for asset identification and risk assessment.

Assets were identified and assessed in each planning area, based on the results of the planning area assessment outlined in the following table.

Table 9 – Planning Area Assessment Summary

Risk Factor	Coolup	Dwellingup	North Dandalup	South Yunderup	West Murray	Pinjarra
1. % of LG Population in Planning Area	8	10	12	22	18	30
2. Fuel Structures	40	100	60	20	60	40
3. Assets	20	100	100	100	60	80
4. Rural Urban Interface	60	80	80	60	80	40
5. Suppression response times	40	40	40	40	20	20
6. Suppression strategies	20	20	20	20	20	20
TOTAL	188	350	312	262	258	230
PRIORITY	**6**	**1**	**2**	**3**	**4**	**5**

4.2. Asset Identification

Asset identification and risk assessment has been conducted at the local level using the methodology described in the Guidelines using BRMS. Identified assets are categorised into the following categories and subcategories provided in Table 10.

Table 10 – Asset Categories and Subcategories

Asset Category	Asset Subcategories
Human Settlement	**Residential areas** Residential area, including dwellings in rural areas and the rural urban interface. **Places of temporary occupation** Commercial and industrial areas, mining sites or camps and other locations where people may work or gather. **Special risk and critical facilities** Location and facilities where occupants may be especially vulnerable to bushfire for one or more of the following reasons: • Occupants may have limited knowledge about the impact of bushfires; • Occupants may have a reduced capacity to evaluate risk and respond adequately to bushfire event; • Occupants may be more vulnerable to stress and anxiety arising from a bushfire event or the effects of smoke; • There may be significant communication barriers with occupants; • Relocation and/or management of occupants may present unique challenges or difficulties, such as transportation, or providing alternative accommodation, healthcare or food supplies; or • Facilities that are critical to the community during a bushfire emergency.
Economic	**Agricultural** Areas under production, such as pasture, livestock, crops, viticulture, horticulture and associated infrastructure. **Commercial and industrial** Major industry, waste treatment plants, mines (economic interest), mills, processing and manufacturing facilities and cottage industry. **Critical infrastructure** Power lines and substations, water pumping station, tanks/bores and pipelines, telecommunications infrastructure, railways, bridges, port facilities and waste water treatments plants. **Tourist and recreational** Tourist attractions, day-use-areas and recreational sites that generate significant tourism and/or employment within the local area. These assets are different to tourist accommodation described as a Human Settlement Asset (see above). **Commercial forests and plantations** Plantations and production native forests. **Drinking water catchments** Land and infrastructure associated with drinking water catchments.

Asset Category	Asset Subcategories
Environmental	**Protected** Flora, fauna and ecological communities that are listed as a: • Critically Endangered, Endangered or Vulnerable species under the Environmental Protection and Biodiversity Conservation Act 10999 (Cth) (EPBC Act 1999) (including associated critical habitat); • Critically Endangered, Endangered or Vulnerable species under the Biodiversity Conservation Act 2016; • Critically Endangered, Endangered or Vulnerable ecological community under the EPBC Act 1999 (Cth); • Critically Endangered, Endangered or Vulnerable Threated Community (TEC) endorsed by the Minister for Environment (WA); • Fauna protected under international conventions; and • Ramsar wetlands of international importance. **Priority** Flora, fauna and ecological communities that are a: • Priority species listed on the Priority Flora or Priority Fauna Lists held by DBCA (Priority 1-5); • Priority Ecological Community (PEC) (Priority 1-5), and • Wetlands of national or state importance. **Locally important** Species, populations, ecological communities or habitats that the local community or independent scientific experts consider important for the area and for which there is some scientific evidence that protection would be beneficial. Wetlands of local importance. Sites being used for scientific research.
Cultural	**Aboriginal heritage** Places of indigenous significance identified by the DPLH or the local community. **Recognised heritage** Non-indigenous heritage assets afforded legislative protection through identification by the National Trust, State Heritage List or Local Planning Scheme Heritage List. **Local heritage** Assets identified in a Municipal Heritage Inventory or by the community as being significant to local heritage. **Other** Other assets of cultural value to the local community, for example community halls, churches, clubs and recreation facilities.

4.3. Assessment of Bushfire Risk

Risk assessments have been undertaken for each asset or group of assets identified using the methodology described in the Guidelines.

The Shire has elected not to append a copy of the Asset Risk Register to the BRM Plan due to the nature of the information and it being subject to change over time. Data and information relating to the BRM Plan will be maintained in BRMS and made available to key stakeholders through regular reporting processes.

The Shire's CEO is to be consulted prior to any Bushfire Risk Management Planning data being released to the public domain.

To actively encourage and support the implementation, monitoring and review of agreed actions, the Shire of Murray as a matter of course or upon requests, will provide reports to key stakeholders that detail the assets and treatments that the stakeholders, (land owners/managers) have responsibility for.

The percentage of assets within the local government in each asset category at the time of BRM Plan endorsement is shown in the following table.

Table 11 – Asset Category Proportions

Asset Category	Number of identified assets
Human Settlement	742
Economic	111
Environmental	1
Cultural	39

4.3.1. Consequence Assessment

Consequence is described as the outcome or impact of a bushfire event. The approach used to determine the consequence rating is different for each asset category: Human Settlement, Economic, Environmental and Cultural.

The methodology used to determine the consequence rating for each asset category is based on the following:

- **Consequence Rating – Human Settlement, Economic and Cultural Assets**

  The outcome or impact of a bushfire event on the asset, or a group of asserts, measured by the hazard posed by the classified vegetation and the vulnerability of the asset.

- **Consequence Rating – Environmental Assets**

  The outcome or impact of a bushfire event on the asset, or a group of assets, measured by the vulnerability of the asset and the potential impact of a bushfire or fire regime.

4.3.2. Likelihood Assessment

Likelihood is described as the potential of a bushfire igniting, spreading and reaching an asset. The approach used to determine the likelihood rating is the same for each asset category: Human Settlement, Economic, Environmental and Cultural.

4.3.3. Assessment of Environmental Assets

Using available biological information and fire history data, environmental assets with a known minimum fire threshold were assessed to determine if they were at risk from bushfire, within the five year life of the BRM Plan. Environmental assets that would not be adversely impacted by bushfire within the five year period have not been included and assessed in the BRM Plan. The negative impact of a fire on these assets (within the period of this BRM Plan) was determined to be minimal, and may even be of benefit to the asset and surrounding habitat.

4.3.4. Local Government Asset Risk Summary

A risk profile for the local government is provided in the summary table below. This table shows the proportion of assets at risk from bushfire in each risk category at the time the BRM Plan was endorsed.

Table 12 – Local Government Asset Risk Summary

Asset Category	Risk Rating				
	Low	Medium	High	Very High	Extreme
Human Settlement	6.5%	11.5%	41.6%	9.9%	13.7%
Economic	3.0%	4.6%	2.7%	1.7%	0.4%
Environmental	0.0%	0.0%	0.1%	0.0%	0.0%
Cultural	2.0%	1.1%	1.0%	0.1%	0.1%

5. Risk Evaluation

5.1. Evaluating Bushfire risk

The risk rating for each asset has been assessed against the likelihood and consequence descriptions to ensure:

- The rating for each asset reflects the relative seriousness of the bushfire risk to the asset;
- Consequence and likelihood ratings assigned to each asset are appropriate, and;
- Local issues have been considered.

5.2. Risk Acceptability

Risks below a certain level were not considered to require specific treatment during the life of this BRM Plan. They will be managed by routine local government wide controls and monitored for any significant change in risk.

In most circumstances risk acceptability and treatment will be determined by the land owner, in collaboration with local government and fire agencies. However, as a general rule, the following courses of action have been adopted for each risk rating.

Table 13 – Criteria for Acceptance of Risk and Course of Action

Risk Rating	Criteria for Acceptance of Risk	Course of Action
Extreme	Risk only acceptable with excellent controls and all treatment plans are to be urgently explored and implemented where possible, managed by the highest level of authority and subject to continuous monitoring. Senior Shire Staff and Council notified. Urgent treatment action is required.	Routine controls are not enough to adequately manage the risk. Immediate attention is required as a priority. Specific action is required in the first three years of BRM Plan. Priorities will be made for treatments that will have maximum benefit to multiple assets and critical infrastructure. Identification of partnerships with other agencies for strategic mitigations. Communication with stakeholders will be a strong focus of managing extreme risks.

		Assets will be reviewed post treatment.
Very High	Risk only acceptable with excellent controls. Senior Shire Staff notified. Imminent treatment action is required.	Routine controls are not enough to adequately manage the risk. Specific action is required in the first four years of the BRM Plan. Priorities will be made for treatments that will have maximum benefit to multiple assets and critical infrastructure. Identification of partnerships with other agencies for strategic mitigations. Communication with stakeholders will be a strong focus of managing very high risks. Assets will be reviewed post treatment.
High	Risk only acceptable with adequate controls. Managed by specific Shire of Murray procedures. Treatment action may be required.	A specific action is required in the five year life of the BRM Plan. Priorities will be made for treatments that will have maximum benefit to multiple assets and critical infrastructure. Identification of partnerships with other agencies for strategic mitigations. Communication with stakeholders will be a strong focus of managing high risks. Assets will be reviewed post treatment.
Medium	Risk may be acceptable with adequate controls. Managed by routine Shire of Murray wide controls. Treatment action is or may not be required but risk must be monitored regularly.	A specific action may not be required. The risk may be managed with routine controls and monitored periodically throughout the life of the BRM Plan.

Low	The risk is acceptable with adequate controls. Managed by routine Shire of Murray wide controls. Treatment action is not required but risk must be monitored.	Need for specific action is unlikely. Risk will be managed with routine controls and monitored as required.

5.3. Treatment Priorities

The treatment priority for each asset has been automatically assigned by BRMS and recorded in the Treatment Schedule, based on the asset's risk rating. Table 14 shows how consequence and likelihood combine to give the risk rating and subsequent treatment priority for an asset.

Table 14 – Treatment Priorities

Likelihood	Consequence: Minor	Moderate	Major	Catastrophic
Almost Certain	3D (High)	2C (Very High)	1C (Extreme)	1A (Extreme)
Likely	4C (Medium)	3A (High)	2A (Very High)	1B (Extreme)
Possible	5A (Low)	4A (Medium)	3B (High)	2B (Very High)
Unlikely	5C (Low)	5B (Low)	4B (Medium)	3C (High)

6. Risk Treatment

The purpose of risk treatment is to reduce the likelihood of a bushfire occurring and/or the potential impact of a bushfire on the community, economy and environment. This is achieved by implementing treatments that modify the characteristics of the hazard, the community or the environment.

There are many strategies available to treat bushfire risk. The treatment strategy (or combination of treatment strategies) selected will depend on the level of risk and the type of asset being treated. Not all treatment strategies will be suitable in every circumstance.

6.1. Local Government-Wide Controls

Local government wide controls are activities that are non-asset specific, rather they reduce the overall bushfire risk within the Shire of Murray.

A local government wide controls, multi-agency work plan has been developed **(Appendix 2).** The plan details work to be undertaken as a part of normal business (see section 3.2.6) for detailed information on these), improvements to current controls and new controls to be implemented to better manage bushfire risk across the local government area.

These types of treatments are not linked to specific assets, and are applied across all or part of the local government as part of normal business or due to legislative requirements. The following controls are currently in place across the Shire of Murray:

- *Bush Fires Act 1954* Section 33 notices, including applicable fuel management requirements, firebreak standards and annual enforcement program's;
- Declaration and management of Prohibited Burn Times, Restricted Burn Times, Total Fire and Harvest and Vehicle Movement Bans for the local government;
- Public education campaigns, including Shire community education programs, and the use of DFES state-wide programs, tailored to suit local needs; including programs such as 5 Minute Fire Chat, Bushfire Action Month, Are you Ready Campaign etc;
- State-wide arson prevention program's developed in conjunction with WA Police and DFES;
- State planning framework and local planning schemes, implementation of appropriate land subdivision and building standards in line with DFES, Department of Planning and Building Commission policies and standards (including Fire Management Plans and BAL Assessments and compliance with these);
- Monitoring performance against the BRM Plan and reporting annually to the local government sub-committees, Council and OBRM;

- Mitigation and annual works programs undertaken by the Shire of Murray and other state agencies **(See Appendix 2).**

6.2. Asset-Specific Treatment Strategies

Asset-specific treatments are implemented to protect an individual asset or group of assets, identified and assessed in the BRM Plan as being at risk from bushfire. There are five asset specific treatment strategies:

- **Fuel management** – Treatment reduces or modifies the bushfire fuel through manual, chemical and prescribed burning methods;
- **Ignition management** – Treatment aims to reduce potential human and infrastructure sources of ignition in the landscape;
- **Preparedness** – Treatments aim to improve access and water supply arrangements to assist firefighting operations;
- **Planning** - Treatments focus on developing plans to improve the ability of firefighters and the community to respond to bushfire, and;
- **Community Engagement** – Treatments seek to build relationships, raise awareness and change the behaviour of people exposed to bushfire risk.

6.3. Determining the Treatment Schedule

The treatment schedule is a list of bushfire risk treatments recorded within BRMS. The Shire of Murray will be focusing on developing a program of works that covers activities to be undertaken within the first year after the approval of the BRM Plan. The treatment schedule will evolve and develop throughout the life of the BRM Plan.

The treatment schedule was developed in broad consultation with land owners and other stakeholders including DFES and DBCA.

Land owners are ultimately responsible for treatments implemented on their own land. This includes any costs associated with the treatment and obtaining the relevant approvals, permits or licences to undertake an activity. Where agreed, another agency may manage a treatment on behalf of a land owner. However, the onus is still on the land owner to ensure treatments detailed in this BRM Plan's Treatment Schedule are completed.

7. Monitoring and Review

Monitoring and review processes are in place to ensure that the BRM Plan remains current and valid. These processes are detailed below to ensure outcomes are achieved in accordance with the *Communication Strategy* and *Treatment Schedule*.

7.1. Review

A comprehensive review of this BRM Plan will be undertaken at least once every five years, from the date of council approval. Significant circumstances that may warrant an earlier review of the BRM Plan include:

- Changes to organisational responsibilities or legislation;
- Changes to the bushfire risk profile of the local government; or
- Following a major fire event.

7.2. Monitoring

BRMS will be used to monitor the risk ratings for each asset identified in the BRM Plan and record the treatments implemented. Risk ratings are reviewed on a regular basis as described in Table 14 – Criteria for Acceptance of Risk and course of Action. New assets will be added to the *Asset Risk Register* when they are identified.

7.3. Reporting

The Shire of Murray will be requested to contribute information relating to their fuel management activities to assist in the annual OBRM *Fuel Management Activity Report*.

Reporting the progress of mitigation works and the management of bushfire risk through the BRM Plan to the council sub-committees being the Bushfire Advisory Committee (BFAC), Local Emergency Management Committee (LEMC) and other relevant working groups as required.

7.3.1. Privacy and Release of Information

The Bushfire Risk Management System captures information and data considered 'personal' in nature including the names and addresses of landholders.

There is the potential for the data collected through the Bushfire Risk Management System to be used for purposes other than bushfire risk mitigation (ie. Insurance companies using this information to set insurance premiums).

It has been determined, in consultation with the Shire of Murray Council that Bushifre Risk Management System reports, produced for the public domain, are not to include information considered personal in nature.

The Chief Executive Officer is to be consulted prior to any Bushfire Risk Management data being released to the public domain.

In order to actively encourage and support the implementation, monitoring and review of agreed actions, the Shire of Murray, as a matter of course, will provide reports to stakeholders that detail the assets and treatments that the stakeholders (landowners) have responsibility for.

8. Glossary

Asset	A term used to describe anything of value that may be adversely impacted by bushfire. This may include residential houses, infrastructure, commercial, agriculture, industry, environmental, cultural and heritage sites.
Asset Category	There are four categories that classify the type of asset – Human Settlement, Economic, Environmental and Cultural.
Asset Owner	The owner, occupier or custodian of the asset itself. Note: this may differ from the owner of the land the asset is located on, for example a communication tower located on leased land or private property.
Asset Register	A component within the Bushfire Risk Management System (BRMS) used to record the details of assets identified in the Bushfire Risk Management Plan (BRM Plan).
Asset Risk Register	A report produced within the BRMS that details the consequence, likelihood, risk rating and treatment priority for each asset identified in the BRM Plan.
Bushfire	Unplanned vegetation fire. A generic term which includes grass fires, forest fires and scrub fires both with and without a suppression objective.
Bushfire Hazard	The hazard posed by the classified vegetation, based on the vegetation category, slope and separation distance.
Bushfire Risk Management Plan	A development related document that sets out short, medium and long term bushfire risk management strategies for the life of a development.
Bushfire Risk	The chance of a bushfire igniting, spreading and causing damage to the community or the assets they value.
Bushfire Risk management	A systematic process to coordinate, direct and control activities relating to bushfire risk with the aim of limiting the adverse effects of bushfire on the community.
Consequence	The outcome or impact of a bushfire event.
Draft Bushfire Risk Management Plan	The finalised draft BRM Plan is submitted to the Office of Bushfire Risk Management (OBRM) for review. Once the OBRM review is complete, the BRM Plan is called the ‘Final BRM Plan’ and can be progressed to local government council for approval.
Geographic Information System (GIS)	A data base technology, linking any aspect of land-related information to its precise geographic location.

Land Owner	The owner of the land, as listed on the Certificate of Title; or leaser under a registered lease agreement; or other entity that has a vested responsibility to manage the land.
Likelihood	The chance of something occurring. In this instance, it is the potential of a bushfire igniting, spreading and impacting on an asset.
Locality	The officially recognised boundaries of suburbs (in cities and larger towns) and localities (outside cities and larger towns).
Map	The mapping component of the BRMS. Assets, treatments and other associated information is spatially identified, displayed and recorded within the Map.
Planning Area	A geographic area determined by the local government which is used to provide a suitable scale for risk assessment and stakeholder engagement.
Priority	See Treatment Priority.
Recovery Cost	The capacity of an asset to recover from the impacts of a bushfire.
Risk Acceptance	The informed decision to accept a risk, based on the knowledge gained during the risk assessment process.
Risk Analysis	The application of consequence and likelihood to an event in order to determine the level of risk.
Risk Assessment	The systematic process of identifying, analysing and evaluating risk.
Risk Evaluation	The process of comparing the outcomes of risk analysis to the risk criteria in order to determine whether a risk is acceptable or tolerable.
Risk identification	The process of recognising, identifying and describing risks.
Risk Register	A component within the BRMS used to record, review and monitor risk assessments and treatments associated with assets recorded in the BRM Plan.
Risk Treatment	A process to select and implement appropriate measures undertaken to modify risk.
Rural	Any area where in residences and other developments are scattered and intermingled with forest, range, or farmland and native vegetation or cultivated crops.
Rural Urban Interface (RUI)	The line or area where structures and other human development adjoin or overlap with undeveloped bushland.
Slope	The angle of the ground's surface measured from the horizontal.
Tenure Blind	An approach where multiple land parcels are considered as a whole, regardless of individual ownership or management arrangements.

Treatment	An activity undertaken to modify risk, for example a prescribed burn.
Treatment Objective	The specific aim to be achieved or action to be undertaken, in order to complete the treatment. Treatment objectives should be specific and measurable.
Treatment Manager	The organisation, or individual, responsible for all aspects of a treatment listed in the *Treatment Schedule* of the BRM Plan, including coordinating or undertaking work, monitoring, reviewing and reporting.
Treatment Planning Stage	The status or stage of a treatment as it progresses from proposal to implementation.
Treatment Priority	The order, importance or urgency for allocation of funding, resources and opportunity to treatments associated with a particular asset. The treatment priority is based on an asset's risk rating.
Treatment Schedule	A report produced within the BRMS that details the treatment priority of each asset identified in the BRM Plan and the treatments scheduled.
Treatment Strategy	The broad approach that will be used to modify risk, for example fuel management.
Treatment Type	The specific treatment activity that will be implemented to modify risk, for example a prescribed burn.
Vulnerability	The susceptibility of an asset to the impacts of bushfire.

9. Common Abbreviations

AFAC	Australasian Fire and Emergency Services Authorities Council
APZ	Asset Protection Zone
BFAC	Bush Fire Advisory Committee
BRM	Bushfire Risk Management
BRM Branch	Bushfire Risk Management Branch (DFES)
BRM Plan	Bushfire Risk Management Plan
BRMS	Bushfire Risk Management System
BRPC	Bushfire Risk Planning Coordinator
CALD	Culturally and Linguistically Diverse
CBFCO	Chief Bush Fire Control Officer
CEO	Chief Executive Officer
CESM	Community Emergency Services Manager
DBCA	Department of Biodiversity, Conservation and Attractions
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
EPBC Act	Environmental Protection and Biodiversity Conservation Act
FCO	Fire Control Officer
FDI	Fire Danger Rating
FFDI	Forest Fire Danger Index
FMP / BMP	Fire Management Plan / Bushfire Management Plan
FPC	Forest Products Commission
GFDI	Grassland Fire Danger Index
GIS	Geographic Information System
HSZ	Hazard Separation Zone

JAFFA	Juvenile and Family Fire Awareness
LEMA	Local Emergency Management Arrangements
LEMC	Local Emergency Management Committee
LG	Local Government
LMZ	Land Management Zone
MoU	Memorandum of Understanding
OBRM	Office of Bushfire Risk Management
PEC	Priority Ecological Community
PWS	Parks and Wildlife Service
SEMC	State Emergency Management Committee
SLIP	Shared Land Information Platform
TEC	Threatened Ecological Community
UCL	Unallocated Crown Land
UMR	Unmanaged Reserve
WA	Western Australia
WAPC	Western Australian Planning Commission

10. Appendices

10.1. Communication Strategy - Appendix 1

10.2. Local Government-Wide Controls Table - Appendix 2

Shire of Murray

Shire of Murray

Bushfire Risk Management Planning

Communication Strategy

Document Control

Document Name	Bushfire Risk Management Plan Communication Strategy	Current Version	1.0
Document Owner	Shire of Murray Chief Executive Officer	Issue Date	XX XXXXX 20XX
Document Location	Shire of Murray Administration Centre	Next Review Date	XX XXXXX 20XX

Related Documents

Title	Version	Date
Shire of Murray Bushfire Risk Management Plan	DRAFT v1	

Amendment List

Version	Date	Author	Section
DRAFT v1	August 2019	RP	All – Initial Draft

1. Introduction

A Bushfire Risk Management Plan (BRM Plan) is a strategic document that outlines the approach to the identification, assessment and treatment of assets exposed to bushfire risk within the Shire of Murray. This Communication Strategy accompanies the BRM Plan for the Shire of Murray. It documents the communication objectives for the BRM Plan, roles and responsibilities for communication, key stakeholders, target audiences and key messages at each project stage, communication risks and strategies for their management, and communication monitoring and evaluation procedures.

2. Communications Overview

2.1. Communication Objectives

The communication objectives for the development, implementation and review of the BRM Plan for the Shire of Murray are as follows:

1. Key stakeholders understand the purpose of the BRM Plan and their role in the bushfire risk management planning process.
2. Stakeholders who are essential to the bushfire risk management planning process, or can supply required information, are identified and engaged in a timely and effective manner.
3. Relevant stakeholders are involved in decisions regarding risk acceptability and treatment.
4. Key stakeholders engage in the review of the BRM Plan as per the schedule in place for the local government area.
5. The community and other stakeholders engage with the bushfire risk management planning process and as a result are better informed about bushfire risk and understand their responsibilities to address bushfire risk on their own land.

2.2. Communication Roles and Responsibilities

The Shire of Murray is responsible for the development, implementation and review of the Communication Strategy. Key stakeholders support local government by participating in the development and implementation of the Communications Strategy as appropriate. An overview of communication roles and responsibilities follows:

- CEO, Shire of Murray, responsible for endorsement of the BRM Plan Communications Strategy,
- Manager Ranger and Emergency Services, Shire of Murray, responsible for monitoring and reporting on the BRM Plan and Communications Strategy.
- Communications and Marketing Coordinator, Shire of Murray, responsible for external communication with the local government area,

- Community Emergency Services Coordinator (CESC), Shire of Murray, responsible for internal and external communication with LGA, monitoring and reporting on the BRM Plan and Communication Strategy.
- Bushfire Risk Planning Coordinator (BRPC), Shire of Murray, responsible for operational-level communication between the Shire and the Department of Fire and Emergency Services.
- Bushfire Risk Management Officer, Department of Fire and Emergency Services, responsible for operational-level communication between Shire, Department of Fire and Emergency Services and the Office of Bushfire Risk Management
- Chief and Deputy Bushfire Control Officer's, Shire of Murray, responsible for communicating BRM Plan to Shire Volunteer Bushfire Brigades.

3. Key Stakeholders for Communication

The following table identifies key stakeholders in bushfire risk management planning. These are stakeholders that are identified as having a significant role or interest in the planning process or are likely to be significantly impacted by the outcomes.

Stakeholder	Role or interest	Level of impact of outcomes	Level of engagement
Shire of Murray	Significant role in plan and treatment development; Facilitation of BRM Plan, Land Managers	High	Consult, involve, collaborate, inform and empower
Local Governments bordering the Shire of Murray	Significant role in plan and treatment development; Facilitation of BRM Plan, Land Managers	High	Consult, involve, collaborate, inform and empower
Dept. of Fire and Emergency Services (DFES)	Assist LG with development of BRM Plan, technical advice and expertise	High	Consult, collaborate, involve and inform
Office of Bushfire Risk Management (OBRM)	Plan governance and advice	Medium	Consult, involve and inform
Department of Biodiversity, Conservation and Attractions	Significant role in plan and treatment development; asset identification, land manager responsible for treatments	High	Consult, involve and inform
Main Roads WA	Role in plan and treatment development, asset identification; implementation	Medium	Consult, involve, collaborate,

Stakeholder	Role or interest	Level of impact of outcomes	Level of engagement
	and review, land manager responsible for treatments		inform and empower
Shire of Murray Volunteer Bush Fire Advisory Committee (BFAC)	Major role in plan and treatment development, implementation and review	High	Consult, involve, collaborate, inform and empower
Shire of Murray Local Emergency Management Committee (LEMC)	Major role in plan and treatment development, implementation and review	High	Consult, involve, collaborate, inform and empower
Private land owners	Role in plan and treatment development, asset identification; implementation and review, land manager responsible for treatments	High	Consult, involve, collaborate, inform and empower
Asset owners	Land Managers/impact of bushfire on business	Low	Consult inform and empower
Interest Groups	Awareness of BRM Plan, Consultation and expert advice	Low	Consult inform and empower
Telstra	Role in plan and treatment development for assets and areas surrounding assets, asset identification; implementation and review	Medium	Consult, involve, collaborate, inform and empower
Department of Planning, lands and Heritage	Land manager responsible for treatments; Role in plan and treatment development implementation and review	Medium	Consult, involve, collaborate, inform and empower
Landcorp	Role in plan and treatment development implementation and review	Medium	Consult, involve, collaborate, inform and empower
Department of Water and Environmental Regulation	Role in plan and treatment development, asset identification; implementation and review, land manager responsible for treatments	Medium	Consult, involve, collaborate, inform and empower
Water Corporation	Role in plan and treatment development, asset	Medium	Consult, involve, collaborate,

Stakeholder	Role or interest	Level of impact of outcomes	Level of engagement
	identification; implementation and review, land manager responsible for treatments		inform and empower
Western Power	Role in plan and treatment development along powerline corridors and implementation of treatments	Medium	Consult, involve, collaborate, inform and empower
Landcare, Local Community Conservation groups	Advisory role in biodiversity/bushfire issues, fuel reduction (weeding/spraying) treatments, implementation and review	Medium	Consult, involve, collaborate, inform and empower

4. Communications Plan

Timing of Communication	Stakeholder (s)	Communication Objective(s)	Communication Method	Key Message or Purpose	Responsibility	Identified Risks to Communication	Strategy to Manage Risks	Monitoring and Evaluation Method
4.1. Development of the BRM Plan								
Life of Plan	Shire of Murray Councillors, Strategic Leadership Group (SLG) and staff	All (1-5)	Emails, reports, meetings	Informed, consulted, accountable or responsible Review and input into Plan	Shire of Murray Ranger and Emergency Services	Time constraints Unclear messages	Planning and time management	Feedback, questions and level of support received
Life of Plan	Department of Fire and Emergency Services (DFES)	All (1-5)	Emails, telephone calls, face to face meetings	Informed, consulted, accountable or responsible Review and input into Plan	Shire of Murray Ranger and Emergency Services	Time constraints Unclear messages	Planning and time management	Feedback, questions and level of support received
Life of Plan	Parks and Wildlife (Biodiversity and Fire Management)	All (1-5)	Emails, telephone calls, face to face meetings	Informed, consulted, accountable or responsible. Review and input into Plan	Shire of Murray Ranger and Emergency Services	Time constraints Unclear messages	Planning and time management	Feedback, questions and level of support received
Life of Plan	Bushfire Advisory Committee (BFAC) and Local	All (1-5)	Emails, telephone calls, face to face meetings	Engaged in process of BRMP Treatment	Shire of Murray Ranger and Emergency Services	Time constraints Unclear messages	Planning and time management	Feedback, treatments negotiated and supported by the Committees

Timing of Communication	Stakeholder (s)	Communication Objective(s)	Communication Method	Key Message or Purpose	Responsibility	Identified Risks to Communication	Strategy to Manage Risks	Monitoring and Evaluation Method
	Emergency Management Committee (LEMC)		(presentations on progress)	schedule and risk analysis				
Life of Plan	Land Managers	1, 2 and 5	Face to face meetings, social media platforms, Shire website, Community workshops and forums	Inform of the BRMP process Identify valued assets Identify existing controls	Shire of Murray Ranger and Emergency Services	Limited Resources Stakeholder not identified Limited engagement from Stakeholder	Time management Widespread consultation	Engaged throughout process Feedback received Success of outcomes
May 2018 – December 2019	Asset Owners	All (1-5)	Face to face meetings, social media platforms, Shire website, Community workshops and forums	Inform of the BRMP process Identify valued assets Identify existing controls	Shire of Murray Ranger and Emergency Services	Media not reaching majority Workshops and forums could get overtaken by other agendas	Newspaper and website details Chair meetings with strict agenda and purpose	Engaged throughout process Feedback received Success of outcomes
May 2018 – December 2019	Service Providers	1 and 2	Emails, telephone calls, face to face meetings	Inform of the BRMP process Identify valued assets	Shire of Murray Ranger and Emergency Services	Limited Resources Stakeholder not identified Limited engagement	Time management Widespread consultation	level of support received Feedback received

Timing of Communication	Stakeholder (s)	Communication Objective(s)	Communication Method	Key Message or Purpose	Responsibility	Identified Risks to Communication	Strategy to Manage Risks	Monitoring and Evaluation Method
4.2. Implementation of the BRM Plan								
Life of Plan	Shire of Murray Councillors, Strategic Leadership Group (SLG) and staff	3, 4 and 5	Emails, reports, meetings	Risk analysis and prioritised strategic treatments	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding	Clear communication and regular updates Clear purpose	Feedback, questions and level of support received
Life of Plan	Department of Fire and Emergency Services (DFES)	3, 4 and 5	Emails, telephone calls, face to face meetings	Risk analysis and prioritised strategic treatments	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding	Clear communication and regular updates Clear purpose	Feedback, questions and level of support received
Life of Plan	Parks and Wildlife	3, 4 and 5	Emails, telephone calls, face to face meetings	Risk analysis and prioritised strategic treatments	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding	Clear communication and regular updates Clear purpose	Feedback, questions and level of support received
Life of Plan	BFAC and LEMC	3, 4 and 5	Emails, telephone calls, face to face meetings	Risk Analysis and prioritised strategic treatments	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding	Clear communication and regular updates Clear purpose	Good feedback received on works
Life of Plan	Land Managers	3, 4 and 5	Face to face meetings, social media platforms, Shire	Treatment schedule and risk analysis	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding	Well planned and executed sharing of information	Feedback and commitment received to

Timing of Communication	Stakeholder (s)	Communication Objective(s)	Communication Method	Key Message or Purpose	Responsibility	Identified Risks to Communication	Strategy to Manage Risks	Monitoring and Evaluation Method
			website, Community workshops and forums	Negotiation of treatments		Limited engagement from stakeholder Limited resources	Negotiations conducted	implement agreed controls Highly engaged
Life of Plan	Asset Owners	3, 4 and 5	Face to face meetings, social media platforms, Shire website, Community workshops and forums	Empowerment through Provision of risk analysis information	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding Limited engagement from stakeholder Limited resources	Well planned and executed sharing of information Negotiations conducted	Feedback and commitment received to implement agreed controls Highly engaged
Life of Plan	Service Providers	3, 4 and 5	Emails, telephone calls, face to face meetings	Provision of Risk Analysis and Prioritised strategic treatments	Shire of Murray Ranger and Emergency Services	Incorrect information Lack of understanding Limited engagement from stakeholder Limited resources	Well planned and executed sharing of information Negotiations conducted	Feedback and commitment received to implement agreed controls

Timing of Communication	Stakeholder (s)	Communication Objective(s)	Communication Method	Key Message or Purpose	Responsibility	Identified Risks to Communication	Strategy to Manage Risks	Monitoring and Evaluation Method
4.3. Review of the BRM Plan								
Annually	OBRM / BFAC	All (1-5)	Reports, emails, telephone calls, face to face meetings	Review, monitor and progress reporting Endorse minor updates to the BRM plan Compliance	Shire of Murray Ranger and Emergency Services	Poor reporting and recording of information Review not completed by due date	Shire of Murray Ranger and Emergency Services to record data and information appropriately within BRMS	Feedback from Council received Work completed as a result of BRM plan
Major Review every 5 years	Shire of Murray Councillors, Strategic Leadership Group (SLG), staff and stakeholders	All (1-5)	Reports, emails, telephone calls, face to face meetings, social media platforms, Shire website, Community workshops and forums	Conduct major review and additions to BRM Plan	Shire of Murray Ranger and Emergency Services	Lack of response for request's for feedback	Maintain engagement with stakeholders by demonstrating effectiveness / benefits of plan	Feedback from Council / Stakeholders received Review completed and improvement acted upon

Local Government-Wide Controls, Multi-Agency Treatment Work Plan

Control	ID	Action / Activity Description	Lead Agency	Other Stakeholder(s)	Notes and Comments
Risk Analysis	**01**	BRMP extreme risks priority for treatment	SoM DFES	All	Treatments planned for all extreme risks and including in BRMP Treatment Schedule. The review periods are detailed in Part 5.3 –Risk Acceptability.
	02	Maintain and refine BRMP	SoM	All	As per State Hazard Plan – Fire a collaboration with DFES and PWS
	03	SoM and UCL/UMR Reserves Inspection Program	SoM DFES PWS		Fuel reduction program on all SoM, UCL and UMR reserves. This includes firebreak installation and maintenance, weed reduction (slashing, spraying), vegetation thinning and removal and prescribed burning.
	04	Performance monitoring and reporting of BRMP outcomes to the Council and OBRM	SoM	All	Annual reports to the Shire of Murray and OBRM as required.
Town Planning	**05**	Shire of Murray Town Planning Scheme No.2 (TPS4)	SoM	WAPC	Land developers are required to implement a Bushfire Management Plans to ensure risk is managed and other controls implemented and monitored.
	06	State Planning Policy 3.7: Planning in Bushfire Prone Areas	SoM	WAPC DFES	Shire formally recognises bush fire prone areas within the Shire. Bushfire prone mapping reviewed annually. Shire submits amendments through OBRM.
	07	Australian Standard 3959 – *Construction of Buildings in Bushfire-Prone Areas*	SoM		Shire requires all buildings in bush fire prone areas to be constructed in accordance with AS3959.

Control	ID	Action / Activity Description	Lead Agency	Other Stakeholder(s)	Notes and Comments
Bush Fire Act 1954	**08**	Firebreak notice – s.33(1)	SoM	BFAC	Review firebreak notice to ensure it remains contemporary. Publish firebreak notice as required.
	09	Annual firebreak inspection program – s.33	SoM	FCO's	Inspection program is in place to ensure compliance to the firebreak notice and fines apply for non-compliance. Remedial works are also carried out at the owners expense on non-compliant properties
	010	Prohibited and restricted burn times – s.17 & 18	SoM	DFES	Review and update RBT & PBT times as required. Make seasonal variations depending on prevailing weather conditions. Any changes to be published in local newspaper and Shire's website and social media platforms.
	011	Total fire bans – s.22A	DFES	SoM	
	012	Harvest and vehicle movement bans – s.38	SoM	DFES FCO's	All bans will be communicated via Shires SMS system, and ABC local Radio (720AM) at 10.05am, 11.05am, 12.35pm and 2.05pm daily
	013	Permits to set fire to the bush – s.18 & r.15B	SoM	FCO's	Issuing of permits by authorised Fire Control Officer's is completed during the restricted and prohibited burn times.
Community Engagement	**014**	Community engagement initiatives / program's	DFES	SoM PWS	"Are You Ready" State wide campaign and targeted campaigns tailored to suit local needs.
	015	Community Bushfire Ready groups (preparedness, education and information)	DFES	PWS SoM	Bushfire Ready Groups (preparedness, education and information)DFES Community Engagement Initiatives/programs (Bushfire Awareness workshops, Bushfire Information booths, Farm Safe workshops, DFES Monthly themes, Media releases and promotions, Bushfire Patrol at schools and more)

Control	ID	Action / Activity Description	Lead Agency	Other Stakeholder(s)	Notes and Comments
Fuel Management	**016**	Fuel reduction of UCL/UMR	DFES PWS SoM		
	017	Mitigation of rail corridors	ARC Infrastructure		
	018	Mitigation of Main Road corridors	Main Roads		
	019	Shire of Murray annual works program	SoM		Fuel reduction program on all SoM reserves. This includes firebreak installation and maintenance, weed reduction (slashing, spraying), vegetation thinning and removal and prescribed burning.
	020	Bushfire brigade prescribed burning	SoM		
	021	Fuel reduction, asset protection zones, hazard separation zone.	Private Landowners	SoM FCO's	Fuel reduction undertaken by private landowners to comply with the requirements of the Firebreak Notice.
Reduction of Ignition Sources	**022**	Power line / pole maintenance	Western Power	Private Landowners	
	023	Arson control	DFES WA Police PWS	All	SoM actively participates in campaigns for arson prevention.

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