

Bushfire Management Plan 2020-2022

**Livingstone Shire Local Disaster
Management Group**

FOREWORD

Foreword by the Chair, Cr Andy Ireland of the Livingstone Shire Local Disaster Management Group.

The Livingstone Shire area has experienced its fair share of disasters in recent years and among them are bushfires which have caused widespread heartache, devastation as well as economic, social, and environmental impacts.

The Shire's climate and weather are conducive to the occurrence of bushfires, whilst areas of our Shire also contain flammable vegetation.

As a Council working closely with relevant stakeholders, our focus is on a collaborative approach to effectively minimise the impacts from bushfires and to value human life and property, while also protecting cultural assets and the ecosystems that sustain us.

This approach is becoming increasingly important for Livingstone Shire communities, particularly after a sustained drought.

The Local Disaster Management Group (LDMG) and its member agencies have worked hard and positively collaborated to produce this comprehensive plan which guides the management of bushfire hazards, taking a pre-emptive approach.

Bushfire management, risk reduction, and mitigation is an ongoing and shared responsibility across the whole of Livingstone Shire.

The process of developing this plan brought together land managers, Queensland Government, industry, communities, and other key stakeholders to develop a common understanding of bushfire risk across the landscape, and determine appropriate management actions to reduce that risk.

The Livingstone Shire community is a key stakeholder and has contributed to this plan by understanding the risks, preparing, and planning accordingly.

The community has voiced that it is ready to embrace and participate in identifying effective solutions to mitigate the risk.

Deciding which areas to mitigate across a local government area of 11,776 square kilometres requires input from all stakeholders.

Decisions and actions need to be based on plausible explanation and evidence, recognising that community experience and knowledge are valid forms of evidence.

Bushfire will always be a hazard for Livingstone Shire communities, however with a collaborative and co-ordinated plan, together we can be better prepared and mitigate risk in order to increase our community's resilience now and for years to come.

Livingstone Shire Council Mayor Andy Ireland
Chair, Local Disaster Management Group

Date: 19/03/2021

Original document endorsed and signed

Endorsement

The Bushfire Management Plan (BMP) has been prepared by the Livingstone Shire Local Disaster Management Group (LDMG).

Original document endorsed and signed

Original document endorsed and signed

David Mazzaferri
Local Disaster Co-ordinator
Livingstone Shire
Local Disaster Management Group

Cr Andy Ireland
Chair
Livingstone Shire
Local Disaster Management Group

Dated: 19/03/2021

Dated: 19/03/2021

Table of Contents

PART I: DOCUMENT CONTROL	6
1.1 Amendments and Review	6
1.2 Abbreviations List	7
PART 2: PREAMBLE	8
2.1 Aim	8
2.2 Objectives.....	8
2.3 Scope	8
2.4 Out of Scope	8
2.5 Principles.....	8
2.6 Bushfire Priorities	9
2.7 Background	9
2.8 Factors which lead to bushfire	11
2.9 Bushfire hazard and risk	12
2.10 Fire Weather.....	13
2.10.1 Expansion of the Fire Season	15
2.11 Livingstone Bushfire Management Stakeholders.....	17
2.12 Livingstone Shire Council Owned and Trusted Land.....	18
2.13 Stakeholder Network.....	19
PART 3: ADMINISTRATION AND GOVERNANCE	19
3.1 Legislation & Documents	19
3.2 Guidelines	20
3.2.1 Fire Management Guidelines for Regional Ecosystems	20
3.2.2 Bushfire Resilient Building Guidance for Queensland Homes.....	21
3.2.3 Other Regional Fire Management Guidelines.....	21
3.3 Plans and Strategies	21
PART 4: PROCEDURES	22
4.1 Prevention	22
4.1.1 Bushfire Mitigation Strategies	22
4.1.2 Land Use	22
4.1.3 Risk based Planning	23
4.1.4 Reducing the Likelihood of Fire in the Landscape	23
4.1.5 Regulation	27
4.2 Preparedness.....	28
4.2.1 Personal Planning	28
4.2.2 Local Planning.....	28
4.2.3 Regional & State Planning	31
4.2.4 Evacuation Planning	31
4.2.5 Neighbourhood Safer Place.....	31

4.2.6	Community Education	32
4.3	Response	32
4.4	Recovery	33
4.5	LDMG, Stakeholder and Community Consultation	34
4.6	Training and Development	34
4.7	Review & Evaluation	35
PART 5: ANNEXURES		36
	Annexure A: Calculating Slope	36
	Annexure B: Definitions.....	37
	Annexure C: References.....	40

PART I: DOCUMENT CONTROL

1.1 Amendments and Review

The Bushfire Management Plan (BMP) is a controlled document. The controller of the document is the Livingstone Shire Local Disaster Co-ordinator (LDC). Any proposed amendments to this BMP should be forwarded in writing to:

Mr David Mazzaferri
Local Disaster Co-ordinator
Livingstone Shire LDMG
PO Box 2292
Yeppoon QLD 4703

The BMP will be reviewed, exercised, amended and updated where necessary. Contact details will be reviewed and updated regularly by the Livingstone Local Disaster Management Group (LDMG). It is to be reviewed:

- On activation of the Sub Plan;
- After an event requiring recovery;
- As part of the rolling program of review for LDMG's disaster management arrangements.

The LDC of the Livingstone LMDG may approve minor amendments to this Sub Plan.

Proposed amendments that affect the intent of this Sub Plan, roles and responsibilities or external agencies must be endorsed by the LDMG and approved by LDMG. These types of amendments are referred to as major amendments.

Approved amendments are to be listed in the following table. The LDC is to ensure that all copies of this Sub Plan are accurately amended.

Version	Date	Approving Authority	Amendment Number
1	31 July 2020	Internal stakeholder consultation	1.1
1	21 August 2020	Community Consultation	1.2
1	25 November 2020	Livingstone Shire LDMG endorsement	1.3
1	19 March 2021	Chair LDMG approval	1.4

1.2 Abbreviations List

ADF	Australian Defence Force
AFMG	Area Fire Management Group
BAL	Bushfire Attack Level
BMOP	Bushfire Management Operational Plan
BMP	Bushfire Management Plan
BoM	Bureau of Meteorology
BPA	Bushfire Prone Area
BRMP	Bushfire Risk Mitigation Plan
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DDMG	District Disaster Management Group
DOR	Department of Resources
DTMR	Department of Transport and Main Roads
EQ	Energy Queensland
FFDI	Forest Fire Danger Index
I-Zone	Interface Zone - the area where bushland meets buildings
LAP	Local Action Plan
LDC	Local Disaster Co-ordinator
LSC	Livingstone Shire Council
LDCC	Local Disaster Co-ordination Centre
LDMG	Local Disaster Management Group
LDMP	Local Disaster Management Plan
LGA	Local Government Area
NSP	Neighbourhood Safer Place
OCB	Operation Cool Burn
QDMA	Queensland Disaster Management Arrangements
QEMRF	Queensland Emergency Management Risk Framework
QFES	Queensland Fire and Emergency Services
QPWS	Queensland Parks and Wildlife Service
QRA	Queensland Reconstruction Authority
RFS	Rural Fire Service
RIDCB	Regional Inter Departmental Committee for Bushfire
SDMP	State Disaster Management Plan
SPP	State Planning Policy
The Act	<i>Disaster Management Act 2003</i>

PART 2: PREAMBLE

2.1 Aim

The aim of the Livingstone Shire Local Disaster Management Group (LDMG), Bushfire Management Plan (BMP) is to guide the LDMG's management of bushfire hazard through the four phases of the emergency management: prevention, preparedness, response and recovery.

2.2 Objectives

The Objectives of the BMP are to:

- Outline the principles of bushfire management in Livingstone Shire;
- Outline the LDMG's arrangements for the management of bushfire risk through prevention, preparedness, response and recovery;
- Develop a Bushfire Management Operational Plan (BMOP) as a sub plan to the BMP.

2.3 Scope

- The BMP outlines the LDMG's arrangements for bushfire management across four phases aligned to the state's comprehensive approach to disaster management: prevention, preparedness, response and recovery;
- The BMP is a sub-plan to the Local Disaster Management Plan (LDMP). The principles outlined in the LDMP underpin bushfire management within the Shire and as such in any circumstance where this plan does not explicitly provide guidance, reference should be made to the LDMP. The BMP must be read in conjunction with the LDMP;
- The BMP is developed and maintained by the LDMG.

2.4 Out of Scope

- While out of scope for the initial iteration of the BMP, scope will evolve to include, but not limited to, further commentary concerning:
 - Outcomes of contemporary research on matters such as the impact of climate change on future bushfire risk;
 - The outcomes of development in traditional burning practices;
 - Other matters which contribute to effective bushfire management in Queensland.
- Further commentary to these out of scope topics will occur during the next scheduled review.

2.5 Principles

The LDMGs approach to bushfire management is underpinned by the following key principles:

- Protection and preservation of human life is the highest consideration;
- Critical infrastructure and community assets will be protected;
- Protection of cultural assets (Indigenous heritage, non-indigenous heritage and other cultural assets);
- Protect environmental values and conservation assets by promoting ecological resilience and maintain ecosystem services at a landscape level (e.g., mosaic burning approaches);
- Learning to live with fire by understanding, accepting and respecting bushfire whilst involving community in bushfire management;

- As bushfire risk cannot be eliminated, decisions are based on risk analysis. Integrated risk analysis requires the LDMG to be part of a tenure-blind, multi-agency bushfire management approach;
- Operational and scientific evidence coupled with experience and local knowledge will form part of learning and knowledge integration to continually improve practices;
- Bushfire mitigation and management is the shared responsibility of community, governments, industry, land and fire agencies;
- Local area risk assessment and bushfire planning are an important part of achieving the Livingstone Bushfire Strategy.

2.6 Bushfire Priorities

- **Public Safety**
Prioritising public safety enables the LDMG to protect and preserve human life. Public safety strategies are implemented across all four phases of emergency management but are a key focus during the response phase. The LDMG supports the efforts of involved agencies through the Local Disaster Co-ordination Centre (LDCC) & LDMG;
- **Hazard mitigation**
A key priority of the LDMG is hazard mitigation. Hazard mitigation activities must be undertaken to reduce the likelihood, vulnerability and/or consequence of bushfire. A number of strategies can be implemented, which are referred to in greater detail in the BMP. Hazard mitigation is a shared responsibility and will be a sustained focus for LDMG;
- **Co-ordination**
Enabling a co-ordinated and effective response to an active bushfire event. Bushfires have the ability to escalate in intensity, duration and scale, requiring a co-ordinated response to achieve control and ultimately extinguish the bushfire. This will be achieved through a response that is characterised by co-ordination, interoperability, planning and strategies from the LDCC, emergency services and the community more broadly.

2.7 Background

The BMP has been developed as part of the LDMGs overall Bushfire Management Strategy to guide the LDMGs approach to bushfire risk, to take a pre-emptive approach to fire mitigation and to inform the community. Bushfires are a natural part of the Australian environment; they happen over a widespread area with regular occurrence and cannot be eliminated. One source supports the history of fire in Australia can be tracked back to 40,000 years ago attributed to the burning practices of Indigenous Australians (Bowman).

Bushfires can happen at any time of the year in the Livingstone Local Government Area (LGA) however peak bushfire activity occurs after the dry winter and during spring as shown in Figure 1. These bushfires can cause serious social, economic and environmental damage (Forest Fire Management Group, 2014), loss of human life, loss of animals and forests as well as ecological damage & large economic costs (Crompton et al., 2010).



Figure 1. Fire Danger Season (Bureau of Meteorology)

The Livingstone Shire LGA is 11,776 square kilometres and is home to 37,638 people (Australian Bureau of Statistics, 2018). Fires occur across the Shire on a yearly basis however, recent years have proved to be challenging with two significant blazes that were difficult to manage, threatened life, destroyed and damaged infrastructure, livelihoods and the environment. Late in 2018, Livingstone Shire experienced 'catastrophic' fire danger for the first time amidst a heatwave that extended from 23 November to 2 December 2018 as per Figure 2. During this unprecedented weather event, fires were exceptionally difficult to control with structural defence a priority for firefighting crews. The 2019 bushfire season started early with the window for prescribed burning during the Operation Cool Burn (OCB) period very much restricted due to unfavourable conditions. During 2019 a fire started in the Cobraball area on a day of severe fire danger rating and it quickly over came crews destroying 15 homes as well as 38 sheds and other structures, numerous crops, orchards, livestock and machinery and destroyed endangered remnant vegetation and threatened species.

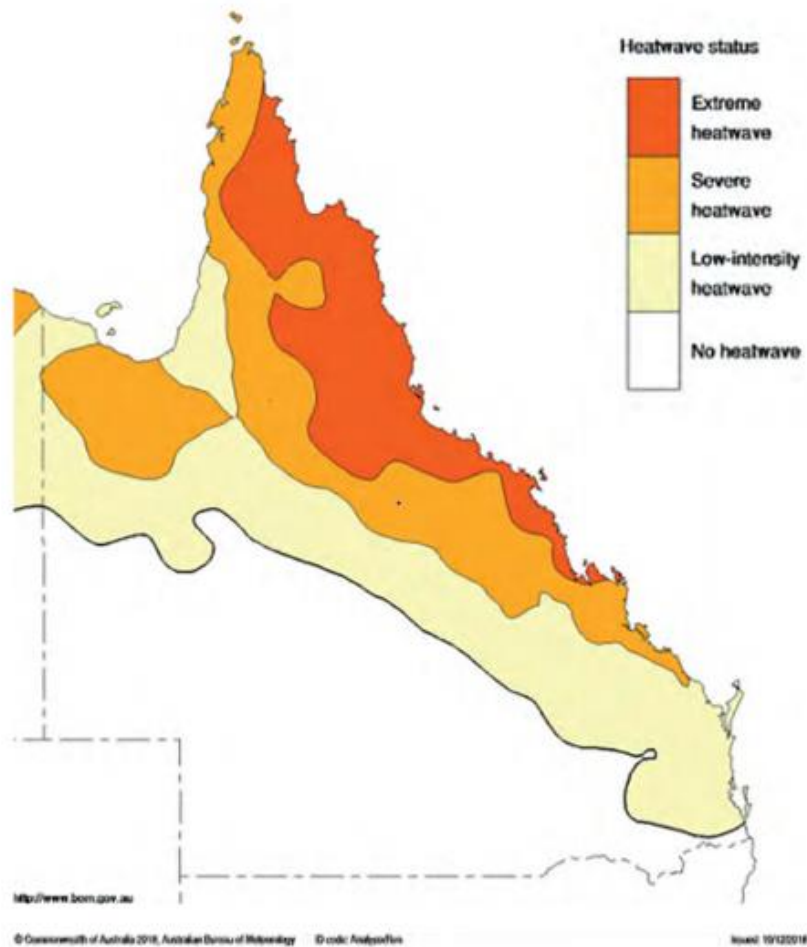


Figure 2. Heatwave severity between 23 November to 2 December 2018 (Bureau of Meteorology)

2.8 Factors which lead to bushfire

Fire requires three essential ingredients to be sustained – oxygen, heat and fuel. Take any one of them away and a fire cannot be sustained. The ‘fire behaviour triangle’ – topography, fuel and weather – represents the three key factors that influence how a bushfire behaves. Weaken any one of these and a bushfire becomes more manageable.

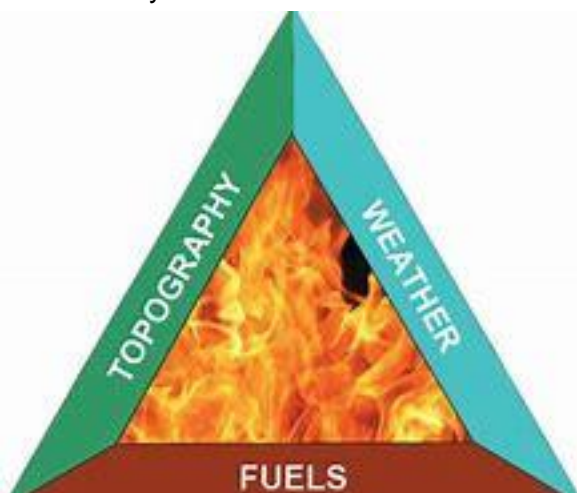


Figure 3. Fire Behaviour Triangle

The topography will influence how a fire travels with the speed of the fire front doubling with every increase in slope of 10 degrees, similarly the speed of the fire should halve with every 10 degrees decrease in slope as per Figure 4. Different aspects determine how dry or wet a slope is. Northerly aspects receive greater amounts of sun than southerly aspects and are therefore by nature dryer. To calculate slope from a topographic map, see Annexure A.

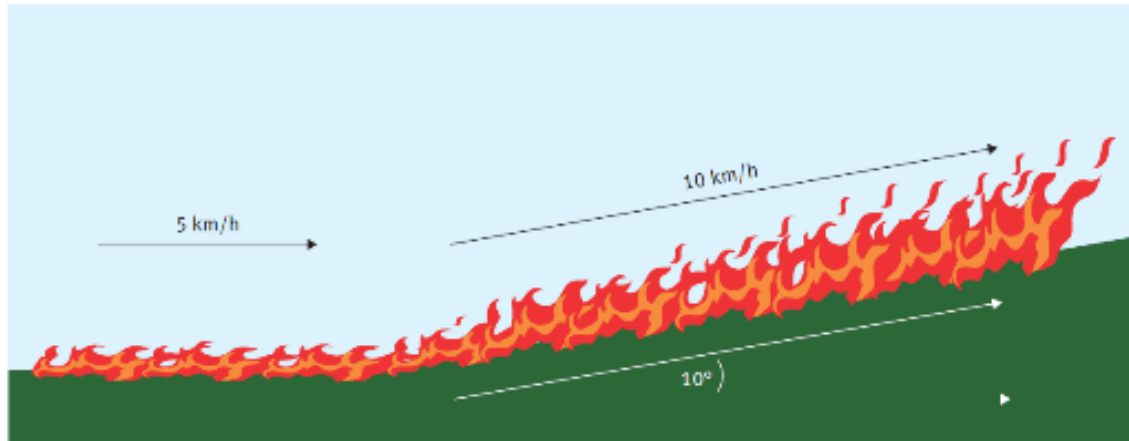


Figure 4. How topography changes fire behaviour

Dry and warm climates create favourable conditions for fires to start and spread, increased wind speed also increases this spread. Conditions of low humidity aids vegetation to lose moisture content and allows this material to burn easier. Lightning can be a source of ignition which when accompanied by the winds of thunderstorms can make the behaviour and movement of a fire very hard to predict.

Some Australian vegetation types have evolved to rely on fire to reproduce and therefore have qualities that promote fire and rate of spread. Qualities such as leaf drop and branch loss build leaf litter depths and assist combustion coupled with oils, waxes and resins in the leaves and stems. Eucalypt forest type is the most common forest type in Australia totalling 77% of Australia's total native forest area (Department of Agriculture, Water & the Environment, 2018). Within Queensland, there are 35 million hectares of eucalypt forests, which accounts for 35% of Australia's total (Department of Agriculture, Water & the Environment, 2018).

There are many different vegetation communities within Australia with some that do not have fire-promoting properties and are sensitive to fire.

2.9 Bushfire hazard and risk

The bushfire interface zone or I-Zone is the area where bushland meets buildings. This area is where fuel loads can be managed by both local and broad scale land management. A building can be bushfire affected by radiant heat, direct flame contact and ember attack. These three factors can be heavily influenced by vegetation management and vegetation modification. Figure 5 below depicts how a building can ignite in the interface zone. Bushfire hazard and risk have connotations within the planning scheme.

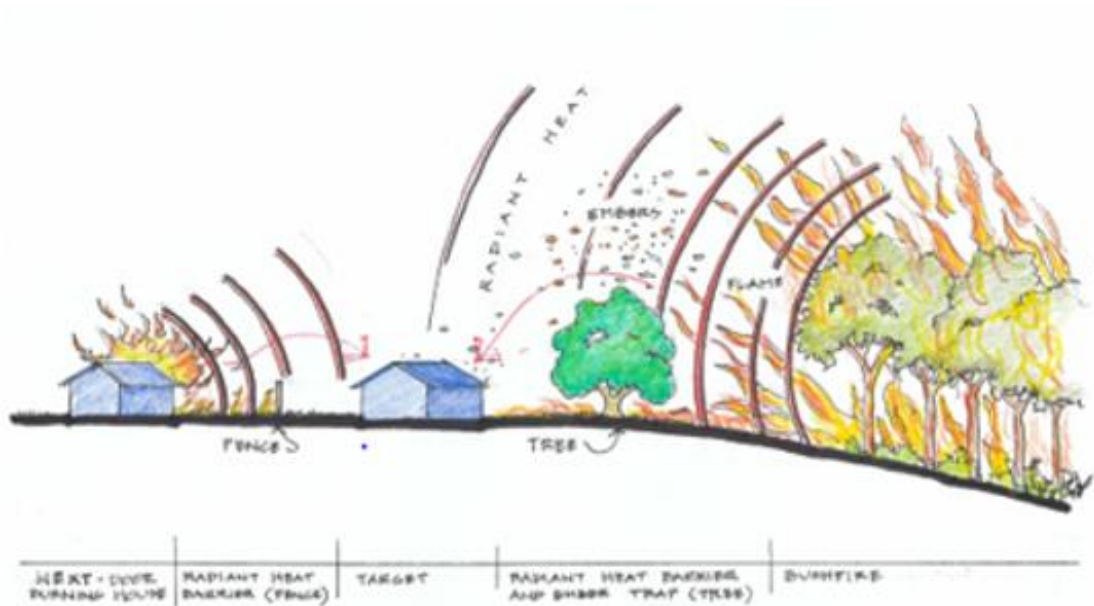


Figure 5. How Buildings Ignite

Commonwealth Scientific and Industry Research Organisation (CSIRO) research by Justin Leonard details how fuel management affects structures in fire events. Vegetation management, fire intensity & behaviour near a home is relevant to not only house loss but also fatalities. The research also details that 80% of fatalities happen within 500m of their own residence. The majority of life and structure losses from bushfires happens on days of extreme and catastrophic rating exceeding Forest Fire Danger Index 75 (FFDI 75).

Design can also be an influential factor in the survival of a structure. The construction standard AS 3959 (*Construction of Buildings in Bushfire Prone Areas*) describes the bushfire safety requirements for building in a bushfire prone area. The AS 3959 standard has different relevant sections to the building requirements. To determine which section is relevant to the situation the Bushfire Attack Level (BAL) needs to be calculated.

2.10 Fire Weather

Fire weather can be described as the conditions that promote bushfire activity and are in line with seasonal weather patterns. According to the Bureau of Meteorology, (BoM) (2018):

The worst conditions occur when deep low-pressure systems near Tasmania bring strong, hot and dry, westerly winds to the coastal districts. The end of the fire season is determined by the onset of moister conditions, sometimes the result of a tropical cyclone developing near the Queensland coast.

Fire weather conditions are changing. The BoM details these changes in their report *Changes to Fire Weather* (2019). The central coast subregion comprises of rainfall districts 33 and 34. Representative locations include Ayr, Bowen, Mackay, Moranbah, Proserpine and Yeppoon. See Figure 6, The Central Coast subregion.

DRAFT

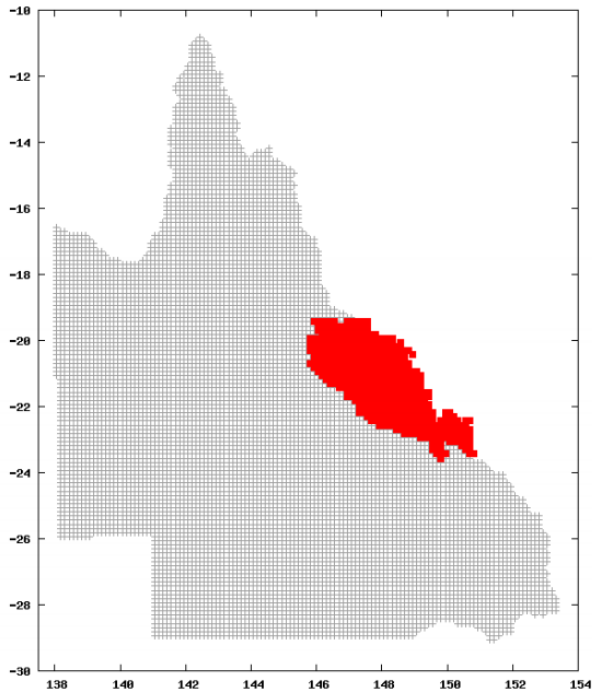
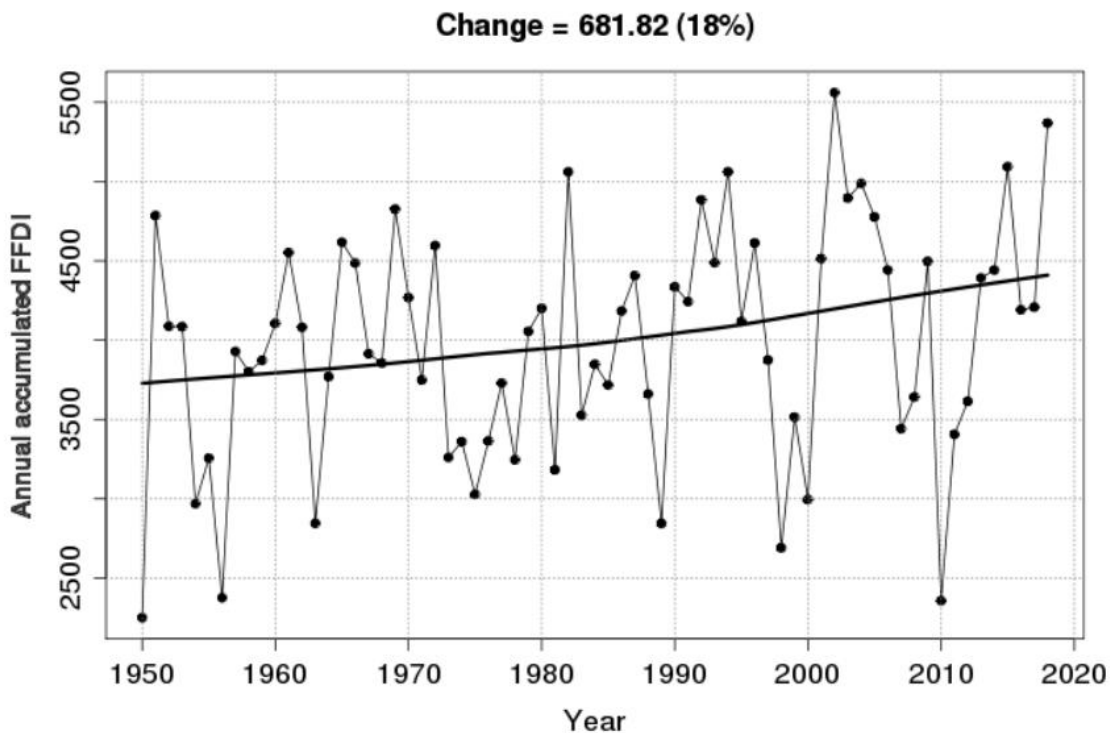


Figure 6. The Central Coast subregion.

This above-mentioned report plots historical data and uses the daily FFDI (2018). The FFDI is a measurement of the degree of danger of fire in Australian forests, which incorporates variables such as dryness, based on rainfall and evaporation as well as wind speed, temperature and humidity. The below Graph 1. demonstrates the FFDI across the Central Coast region with an increase of 18% from 1950 - 2018.



Graph 1. FFDI across the Central Coast region with an increase of 18% from 1950 - 2018.

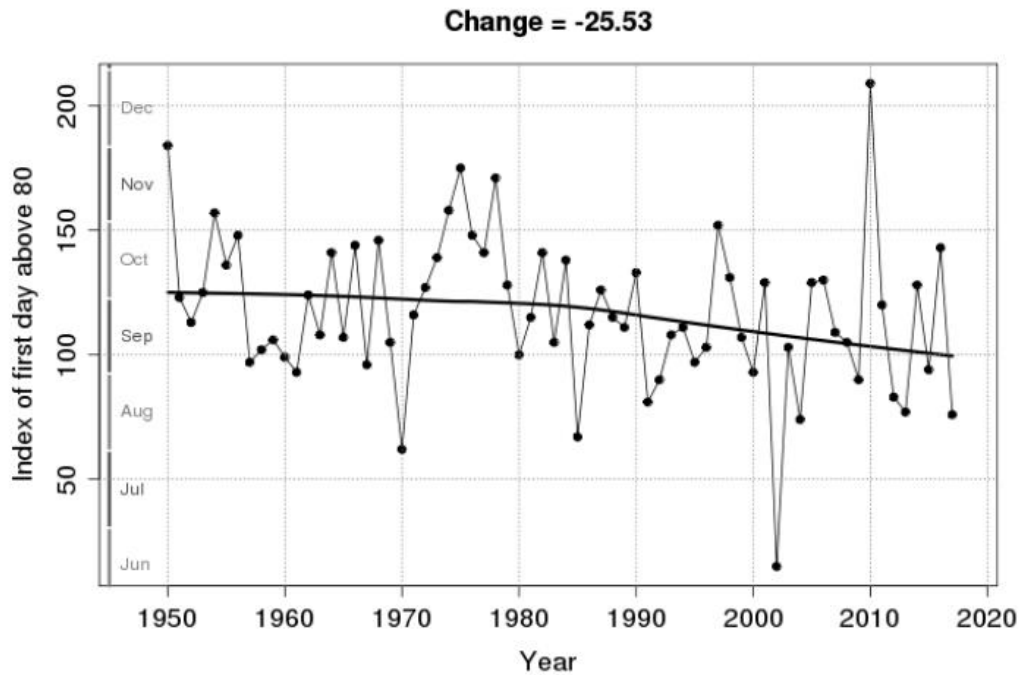
Supporting the previous findings of an 18% increase of annual accumulated FFDI from 1950-2018 is another study reported by the CSIRO Climate Adaption Flagship which analysed data from 1981-2010 and found a 19% local increase in annual cumulative FFDI Index for the Rockhampton site (Murphy, Liedloff, Williams, Williams and Dunlop September 2012). This study, *Queensland's biodiversity under climate change: Terrestrial ecosystems* reports projected changes to the number of days per year with a fire danger rating of 'very high' or 'extreme' in Table 1. It uses two different models to predict the outcomes.

Site	Current No. days	2020 Low Mk2 % Δ	2020 Low Mk3 % Δ	2020 High Mk2 % Δ	2020 High Mk3 % Δ	2050 Low Mk2 % Δ	2050 Low Mk3 % Δ	2050 High Mk2 % Δ	2050 High Mk3 % Δ
Amberley	13.3	8	6	23	18	15	11	70	57
Brisbane airport	5.2	4	2	14	12	9	7	63	45
Charleville	89.0	7	5	22	15	14	9	66	42
Rockhampton	11.2	7	6	17	20	10	14	66	73
Bourke (NSW)	57.2	9	7	25	20	16	13	81	60
Richmond (NSW)	13.3	4	6	14	23	9	13	53	77
Coffs Harbour (NSW)	1.5	6	6	22	20	20	18	57	71

Table 1. Projected changes to number of days per year with a fire danger rating of 'very high' or 'extreme' (FFDI \geq 25) for select stations in Queensland. Figures are the number of days per year under present circumstances (Current) based on records from 1973–2007; and the percentage change (% Δ) from the current value for various model scenarios to 2020 and 2050. Outputs for high and low emissions scenarios and CCAM (Mark 2): 'Mk2' and CCAM (Mark 3) 'Mk3', as per Table 2. Source: Lucas *et al.* (2007).

2.10.1 Expansion of the Fire Season

Fire managers have observed the fire season gradually starting earlier with fewer suitable days for prescribed burning activities. The expansion of the fire season can be indicated by the first occurrence of a FFDI > 80 in Queensland. The study has noted that the conditions of a FFDI > 80 in 2017/2018 is now arriving 26 days earlier than at the start of the study period of 1950/1951. Graph 2. shows this trend from 1950-2018.



Graph 2. Time series of the index of the earliest FFDI > 80 day for Queensland (June-to-May years 1950/1951-2017/2018). The earliest FFDI > 80 day is now arriving around 26 days earlier.

Similar observations can be made about the end of the fire season with the last day of FFDI > 80 arriving around 12 days later in Queensland. By adding these two figures together, an increase of around 38 days is added to the fire weather season.

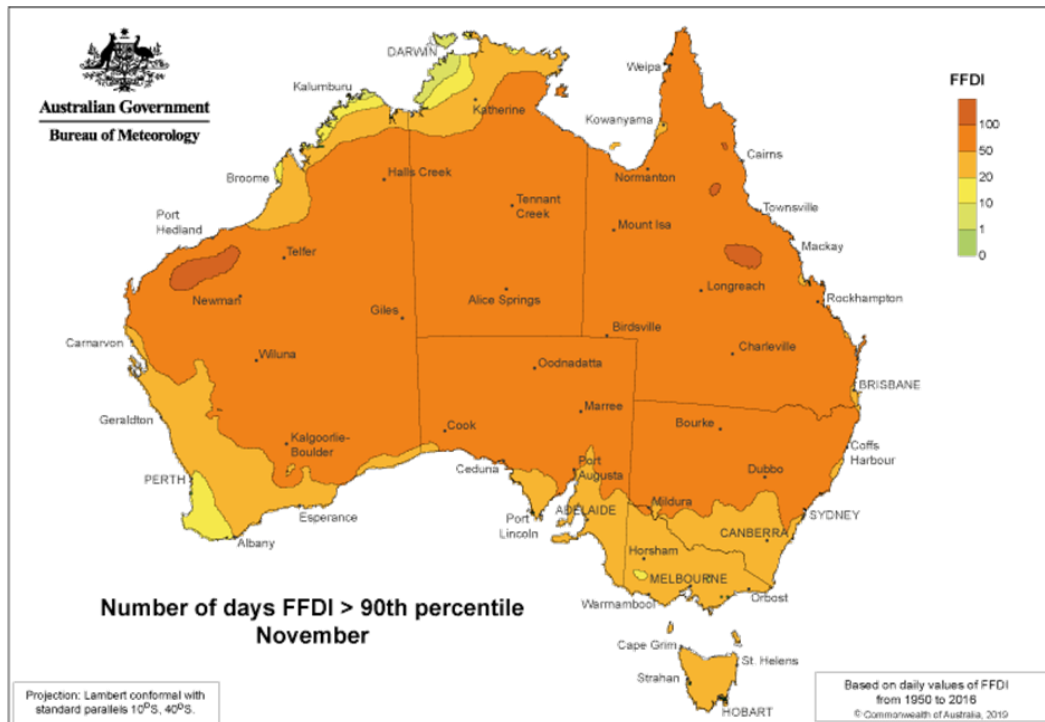


Figure 7. November FFDI values with the number of days above an FFDI of 90

The above diagram Figure 7 shows the percentage of days of FFDI greater than 90 in November. Our region has these FFDI >90 days for over 50% of November.

2.11 Livingstone Bushfire Management Stakeholders

The management and mitigation of bushfires is the shared responsibility of many different groups and agencies. The stakeholders in the Livingstone LGA include:

- Community;
- Darumbal and Woopaburra people;
- Landholders;
- Local Rural Fire Brigades;
- Livingstone Shire Council (LSC);
- Queensland Fire and Emergency Services (QFES);
- Rural Fire Service (RFS);
- Department of Environment and Science - Queensland Parks & Wildlife Service (QPWS);
- HQ Plantations;
- Australian Defence Force (ADF);
- Department of Transport and Main Roads (DTMR);
- Energy Queensland (EQ);
- Department of Resources (DOR);
- Sibelco QMAG;
- Livingstone Shire LDMG and relevant subgroups;
- Aurizon.

Landholders play an important role in the management of bushfires and are responsible for managing the bushfire risk on their own property.

QFES have stations in Yeppoon and Emu Park; the Yeppoon Station (Station 37) is manned 7 days per week, 6:30am to 6:30pm with auxiliary crews providing coverage overnight. The Emu Park Station (Station 32) has a Station Officer present during the week and auxiliary crews providing response for the area.

There are 29 rural fire brigades that cover the Livingstone LGA. These brigades can be classified as I-Zone, village, rural or special brigades. There is a total of 30 rural fire brigade trucks and 8 primary producer brigades that don't have trucks across the area. There are 60 slip on units and 22 trailer units held within the brigades. The below map details the classifications of rural fire brigades and the area they cover.

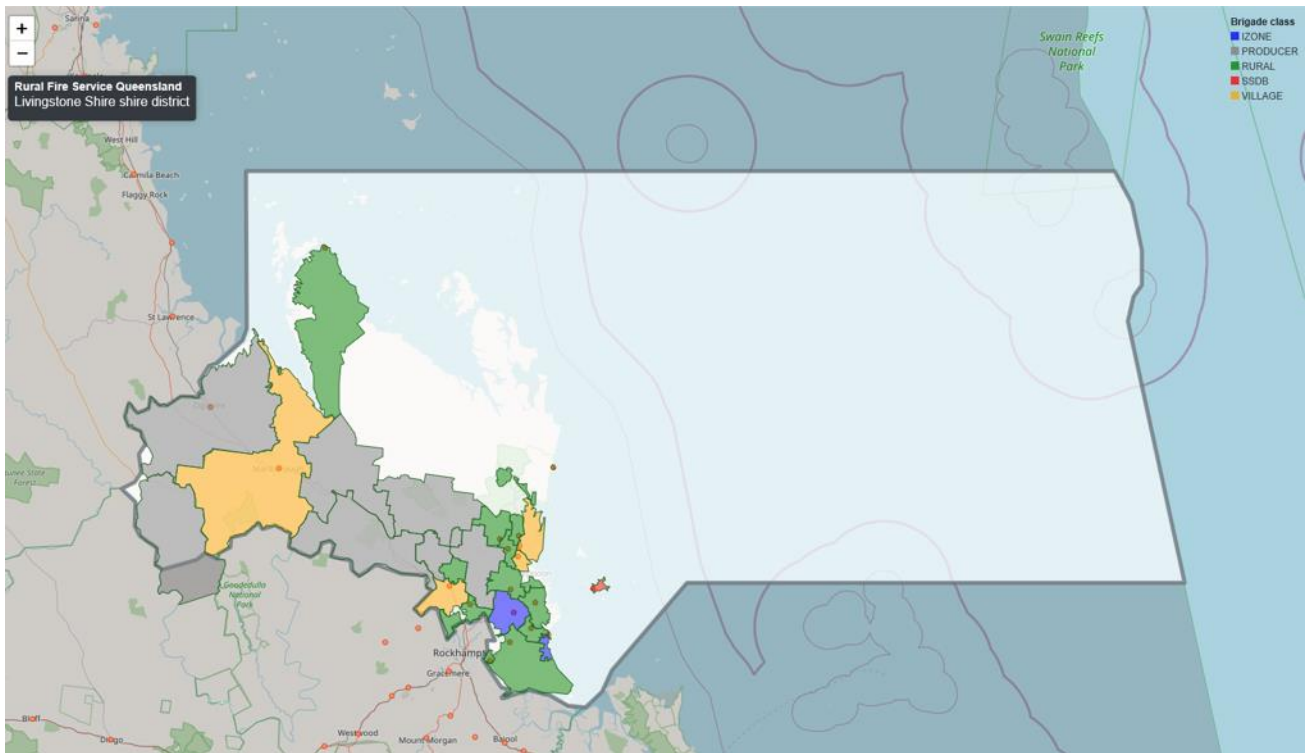


Figure 8. Types of Rural Fire Brigades and their coverage of the Livingstone Shire area

2.12 Livingstone Shire Council Owned and Trusted Land

Livingstone Shire LGA is 11,776 square kilometres of land. There are approximately 1000 individual areas of land which LSC owns, manages or is trustee for, 21,849 hectares of road reserves and 981 hectares of stock routes. The area consists of diverse topographical areas including significant rural, coastal and inland plains and wetlands to natural and cultivated forests and offshore islands (some of which are populated).

2.13 Stakeholder Network

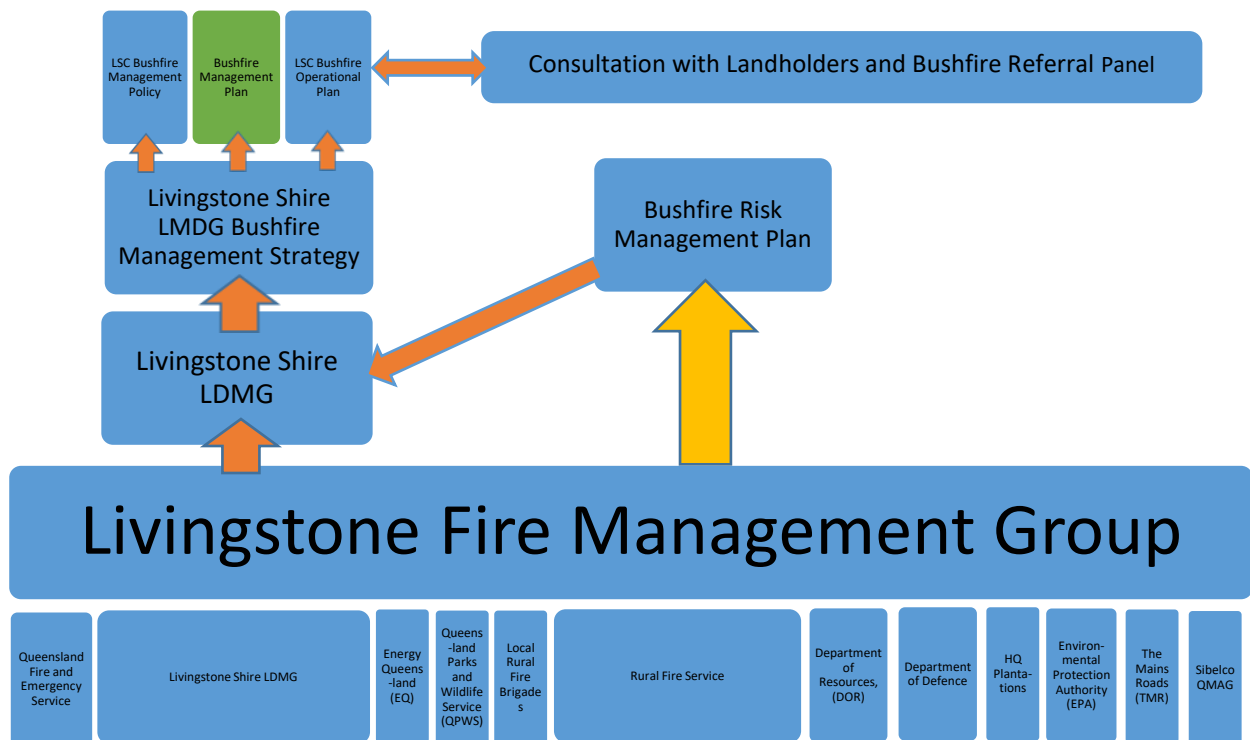


Figure 9. Stakeholder Network

PART 3: ADMINISTRATION AND GOVERNANCE

This BMP forms a sub plan to the Livingstone Shire LDMP and is developed under the authority of the *Disaster Management Act 2003* (the Act). This sub plan has been developed under the guidance of the following documents:

3.1 Legislation & Documents

The legislative instruments relating to bushfire management are:

- *Building Act 1975*;
- *Disaster Management Act 2003*;
- *Fire and Emergency Services Act 1990*;
- *Forestry Act 1959*;
- *Nature Conservation Act 1992*;
- *Planning Act 2016*;
- *Public Safety Preservation Act 1986*;
- *Vegetation Management Act 1999*;
- *Local Government Laws*
 - *Livingstone Shire Council Local Law No. 3 (Community and Environmental Management) 2011*;
 - *Livingstone Shire Council Local Law No. 4 (Local Government Controlled Areas, Facilities and Roads) 2011*.

Further documents that provide guidance on bushfire management include:

- Livingstone Shire Council Bushfire Management Policy;
- Natural hazards, risk and resilience – Bushfire – State Planning Policy – state interest guidance material;
- Bushfire Resilient Communities – Technical Reference Guide for the State Planning Policy State Interest ‘Natural Hazards, Risk and Resilience – Bushfire’;
- National Construction Code;
- *Local Government Act 2009*;
- *Queensland Land Act 1994*;
- QLD Bushfire Hazard Specific Plan.

Local, State and Federal Governments vegetation management laws, regulate the clearing of native vegetation in Queensland. However, certain clearing activities can be undertaken without an approval or notification. Some of the exempt clearing works include fire management lines and firebreaks. Further information about these activities can be found by searching ‘Vegetation Management’ on www.qld.gov.au

3.2 Guidelines

3.2.1 Fire Management Guidelines for Regional Ecosystems

The Queensland Herbarium Regional Ecosystem Fire Management Guidelines (2018) provide information which guides users to manage vegetation from an ecological perspective. Livingstone Shire is mainly classified as the Central Queensland Coast & Brigalow Belt bioregions. These guidelines individually identify a code for a regional ecosystem along with detail about the fire guidelines relevant to that ecosystem type. Table 2. shows an excerpt from the Fire Management Guidelines giving a description of these ecosystems.

RE index	Bioregion	Regional Ecosystem	Description label	Fire guidelines
10304	NWH	1.3.4	Acacia cambagei low open woodland to woodland on alluvium, sometimes with Eucalyptus leucophylla	SEASON: Storm season to early dry season. INTENSITY: Various. INTERVAL: >30 years. STRATEGY: Burn in association with surrounding country. Maintain mosaic burning in surrounding country to mitigate against spread of unplanned fire into acacia woodlands. ISSUES: Acacia communities need fire for recruitment but make sure they occur at long intervals. Acacia communities are sensitive to high frequency intense fires. Sparse ground layer will inhibit the ability to burn. Buffel grass invasion can increase the potential for frequent and damaging fires.
10305	NWH	1.3.5	Corymbia polycarpa, C. bella, C. grandifolia and Eucalyptus chlorophylla in mixed woodlands on sandy levees in the north	SEASON: Storm season to very early dry season. INTENSITY: Low with occasional moderate. INTERVAL: 4 - 10 years. Adjust intervals/frequency according to rainfall-drought cycles, fuel accumulation and previous fire history. STRATEGY: Ensure burns are undertaken across the landscape at a range of frequencies to create a mosaic of times since fire. Apply numerous small burns every year to achieve a mosaic and reduce risks of wildfire across vast areas of the landscape. Maintain burnt areas < 20%. ISSUES: Too frequent fire can promote annual grasses over perennial. Ensure areas with obligate seeders are left so that seed regeneration cycles can be maintained. Mixed shrubby woodlands contain fire-sensitive species and tend to grow in fire-sheltered areas.
10306	NWH	1.3.6	Corymbia aparrerinja, Corymbia terminalis open woodland on sandy levees	SEASON: Storm season to early dry season. INTENSITY: Low to moderate. INTERVAL: 4 - 10 years. Ensure some areas are long (10-20 years) unburnt. Adjust intervals/frequency according to rainfall-drought cycles, fuel accumulation and previous fire history. STRATEGY: Ensure burns are undertaken across the landscape at a range of frequencies to create a mosaic of times since fire. Apply numerous small burns every year to achieve a mosaic and reduce risks of wildfire across vast areas of the landscape. Maintain burnt areas < 20%. ISSUES: Buffel grass can promote high intensity fire. Large hollow trees are important habitat for hollow-dependent fauna. Manage fire for protection of large hollow trees.
10307	NWH	1.3.7	Eucalyptus camaldulensis woodland on channels and levees	SEASON: Do not burn deliberately. INTENSITY: Low. INTERVAL: Do not burn deliberately. May be burnt in association with surrounding spinifex vegetation types. STRATEGY: Do not burn deliberately. Low intensity fire in surrounding fire-adapted areas will reduce fire encroachment. ISSUES: A hydrology-driven habitat (not fire-driven) i.e. fuel loads do not really build up. Do not actively target for prescribed burning but, as these REs are not particularly fire sensitive, they can tolerate occasional burns. Overgrazing can reduce fuel loads and give woody species a competitive advantage.

Table 2. An excerpt from the Fire Management Guidelines

3.2.2 Bushfire Resilient Building Guidance for Queensland Homes

The *Bushfire Resilient Building Guidance for Queensland Homes* is a joint initiative of the Queensland Government and the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The guideline has been established to support a state wide effort to mitigate the catastrophic impacts of bushfires by outlining bushfire resilient design principles, construction, materials & landscaping. LSC along with other local governments collaborated and contributed to this guideline.

3.2.3 Other Regional Fire Management Guidelines

The Queensland Government alongside, QFES, RFS, Reef Catchments, Catchment Solutions and Fire & Landscape Strategies developed the *Capricorn Coast Fire Management Guidelines*. These guidelines were developed post Tropical Cyclone Marcia (20 February 2015) to inform the community about appropriate fire management practices. The guidelines describe four important factors: fire frequency, fire intensity, season and mosaic burning. Consideration also needs to be made for factors such as fuel load, wind speed, humidity, fuel curing, slope and aspect. The 17 landscape types in the Capricorn Coast area are specifically addressed and a management approach documented.

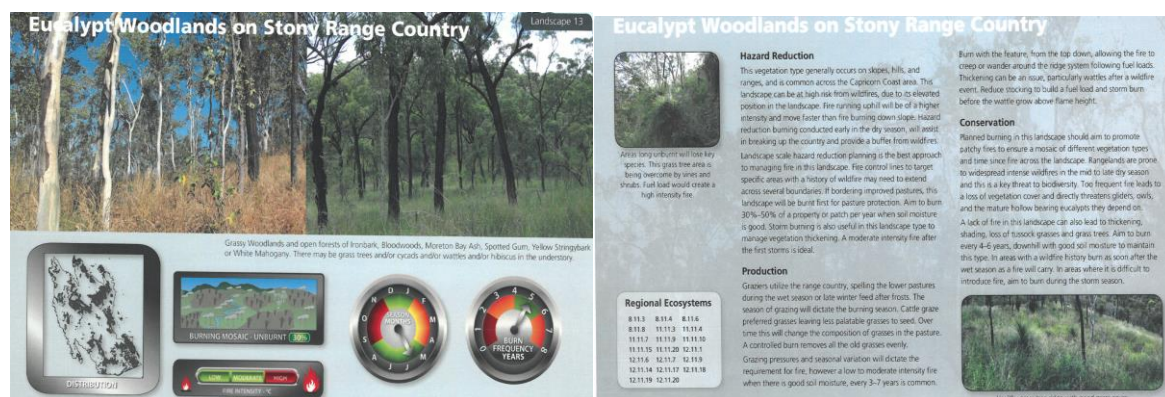


Figure 10. Excerpt from Capricorn Coast Fire Management Guidelines

The *Planned Burn Guidelines* have been developed by QPWS. These guidelines give QPWS rangers and land managers practical information to identify fire management issues as well as plan and implement prescribed burns. The *Building Act 1975* and the Queensland Development Code also contribute towards bushfire risk mitigation through building and construction standards.

3.3 Plans and Strategies

The Livingstone Area Fire Management Group (AFMG) annually produce a *Livingstone Shire LDMG Bushfire Risk Mitigation Plan (BRMP)* for the OCB period. The purpose of the plan is to identify and record high risk localities, high risk hotspots and planned mitigation actions to reduce potential bushfire impacts to vulnerable and exposed communities and infrastructure. It also informs AFMG members to assist them with both operational and forward planning decision making processes. Through the framework established, bushfire mitigation activities are reported for the annual OCB period commencing 1 April until 31 August unless varied because of weather conditions or operational reasons.

The BRMP supports QFES led hazard specific preparation for bushfire mitigation as per the Queensland's Disaster Management Arrangements (QDMA) by informing the LDMP and associated activities of the LDMG. The LDMG has developed the BMOP which is outlined later in this document.

The Caves Community Bushfire Resilience Plan is currently in draft form and is an annexure to The Caves Community Disaster Management Plan. This plan documents methods of bushfire mitigation suitable to The Caves community. It was developed after the November 2018 wildfire event that occurred during catastrophic fire weather conditions. The plan will be available through LDMG and partner agencies.

The rural fire brigades of the Livingstone Shire each have a Local Action Plan (LAP). The LAP is a QFES document that details an approach to take if a fire event happened in the area. It details a communications plan, water supplies, escape routes, safety zones, hazards etc. Rural fire brigade LAPs were last reviewed in 2016/2017.

The *Queensland State Disaster Management Plan (SDMP)*, the *Queensland Recovery Plan (2017)* and *Livingstone Shire LDMG overarching recovery plan (including LDMG event specific Local Recovery and Resilience Implementation Sub Plans)* are instrumental in providing guidance through the recovery process. These plans outline key principles for disaster recovery. The Queensland Recovery Plan acknowledges that local governments, through LDMGs and their communities, are best placed to understand and identify their needs for recovery.

PART 4: PROCEDURES

4.1 Prevention

Prevention strategies should aim to reduce or remove the impact of hazards and strengthen resilience within a community. Multiple mitigation strategies ensure effective disaster prevention outcomes. Outcomes should include reducing social and financial costs to communities as well as improving the built environment and reducing the impact on the environment.

4.1.1 Bushfire Mitigation Strategies

There are many methods that can be used to mitigate the risk of bushfire. Prevention strategies can be taken across the following four mitigation areas:

- Land Use;
- Risk based planning;
- Reducing the likelihood of fire in the landscape;
- Regulation.

4.1.2 Land Use

Land use planning is a mitigation strategy which has the most potential to engage prevention and mitigation measures and assist the response to bushfires. Administration of land use planning and development assessment is done under the *Planning Act 2016*, the *Planning Regulation 2017* and the *Livingstone Shire Planning Scheme*. Further details are held within the State Development Provisions, State Planning Policy (SPP), regional plans and local planning schemes. The *Building Act 1975* and the Queensland Development Code also contribute towards bushfire risk mitigation through building and construction standards.

Queensland Local Governments are required to include bushfire risk in addition to many other matters in the drafting of Local Government Planning Schemes. New development must address risks and look at mitigation of the relevant hazard. New development may include a new industrial development, a rural residential subdivision, a new caravan park, or a new house on a site mapped as bushfire hazard. The mapped areas for use in a councils planning scheme are sourced from the SPP Interactive Mapping System. It should be noted that terms used to describe hazard areas will vary from this BMP document and other regulatory statutory documents and policies. Enquiries for hazard rating and bushfire mapping by the Councils planning scheme can be made to enquiries@livingstone.qld.gov.au or found online at <https://www.livingstone.qld.gov.au/doing-business/building-and-development/town-planning>

QFES identifies Bushfire Prone Areas (BPA) in Queensland and updates a BPA layer on the SPP Interactive Mapping System (located at <https://spp.dsdip.esriaustraliaonline.com.au/geoviewer/map/planmaking>).

The Development Assessment Mapping system and QSpatial. The LDMG further refines bushfire prone areas by conducting a shire wide risk assessment.

4.1.3 Risk based Planning

The LDMG identifies bushfire risk areas during their priority setting process that is conducted every 3 years for Council owned property. This priority setting process will assist officers to develop targeted prevention and preparedness measures. Determining factors of the likelihood of a bushfire could include:

- Expected fire weather conditions;
- Fuel structure, load and re accumulation rates;
- Topography;
- Potential ignition source.

The AFMG develops a BRMP, which identifies bushfire risks within the Livingstone Shire LGA. The BRMP focuses on the LGA bushfire I-zone and is used to inform the LDMP. The LDMG periodically engages a provider to complete a shire wide all hazards approach risk assessment when necessary. This process will take place initially during 2021 and will be undertaken utilising the Queensland Emergency Risk Management Framework (QERMF) methodology.

4.1.4 Reducing the Likelihood of Fire in the Landscape

Fuel Management

The bushfire mitigation strategies for a property will need to consider the individual characteristics of the land. Mitigation practices suitable for one parcel of land will differ to the next depending on many variables that include slope, aspect, vegetation type, proximity to infrastructure, community assets and industry. Hazard Reduction techniques include:

- Prescribed burning;
- Cultural burning practices;
- Mechanical removal/hand removal;
- Spraying e.g. weed management;
- Grazing;
- Fire trails;
- Fire maintenance trails;
- Bushfire resistant landscapes.

Prescribed Burning

Prescribed burning is the planned and deliberate burning of excess ground fuels and fuel hazards under specific conditions to achieve risk reduction, environmental outcomes and management objectives. As fuel is one of the essential ingredients that sustain a fire, reducing the amount of available fuel can lessen the intensity and rate of spread of an unplanned fire in the landscape. By reducing these ground fuels there is a reduced ability for a fire to climb into the upper storey or canopy of the trees. This climbing behaviour of fire is referred to as laddering. Once a fire reaches the canopy of the trees it is referred to as a crowning fire. Crowning fires are very unpredictable and hard to control.

The practice of prescribed burning is distinct from a back burn, which is a firefighting technique used during a bushfire event to remove vegetation on the ground and create a scorched buffer to inhibit the advancement of an active bushfire (Australasian Fire and Emergency Service Authorities 2015). Prescribed burning can achieve many objectives which include:

- Preservation of life;
- Reduce the risk of bushfire impacts on nearby assets;
- Reduce the size and intensity of bushfires in the landscape;
- Maintain, promote or inhibit ecological processes;
- Control weeds;
- Support economic activities such as timber production or pasture regeneration.

Where prescribed burning is undertaken to achieve public safety outcomes it is referred to as hazard reduction burning. Prescribed burning will generally take place during the OCB period. The method for conducting prescribed burns is detailed within the BMOP.

By using the Queensland Government's *Fire Management Guidelines* to determine the time of year, the intensity, burn intervals and strategy, the LDMG ensures the correct management of the various vegetation types that grow within the area. The guidelines also highlight potential issues. These guidelines are further supported by the *Capricorn Coast Fire Management Guidelines* that detail the regional ecosystem codes against appropriate fire management practices. These guidelines do not replace the need to assess each location individually.

Planned prescribed burning will occur only after the priority setting process has taken place or as a response to an assessed customer request. A detailed burn plan will be written for a priority burn with QFES, RFS, Fire Wardens and internal departments consulted. If a burn plan cannot be agreed on the issue will be referred to the Bushfire Referral Panel.

Cultural Burning Practices

The use of traditional fire management or cultural burning has been widely discussed following the catastrophic fires of recent years. This approach to land management focuses on using low-intensity fires to achieve cool burns. The traditional owners of the land have used cultural burning for thousands of years with the thought that it heals 'sick' land. It is quoted to draw on knowledge of ecosystems and how things are interrelated, of fire and water, the significance of the timing of flowers blossoming, the breeding behaviour of animals, the particle nature of trees and the ground they stand on (Chenery & Cheshire 2020).

An expert in traditional Aboriginal burning, Professor Bill Gammage from Australian National University states that fire can rectify a variety of land management issues across the country;

Fire can be used for one of three outcomes. The first, to encourage native grasses to regenerate and produce new feed, the second to reduce scrub and fuel to prevent intense bushfires, and thirdly to promote biodiversity

The LDMG is working to establish a collaboration between the traditional owners of the land, the Darumbal and Woopaburra people, and the bushfire management team. Although currently in the early stages of this process, the LDMG endeavours to incorporate cultural burning practices to reduce fuel load, minimise damage, support ecosystems and cultural outcomes.

Mechanical Removal/Hand Removal

Mechanical or hand removal of vegetation aims to increase the distance between infrastructure and the hazard. Mechanical removal should focus on keeping vegetation at a minimum height around structures. On lots greater than 2500m² it is recommended to reduce the vegetation back to a minimum distance of 1 ½ times the height of the tallest tree. Mechanical methods may include mulching, thinning and slashing. If mulching is used the material needs to be removed from site if in close proximity to structures.

Clearing and associated soil disturbance can increase the risk of soil erosion and weed invasion. Appropriate maintenance of any cleared area is critical to ensure that the hazard is not increased by regrowth of high biomass exotic grasses.



Photograph 1 – Before mechanical removal



Photograph 2 - After mechanical removal

Grazing

The use of livestock to graze an area can have multiple benefits. Grazing will reduce the fuel load which is often flammable grass species. As well as physically removing fuel the remaining fuel is lowered in height. Grazing programs need to be strategic and meet fuel management objectives. Grazing can reduce a hazardous fuel load in close proximity to fire sensitive vegetation thus having the effect of providing protection to those native ecosystems. Crash grazing or rotational grazing are both methods to consider.

Spraying

The application of herbicide to an area can have the effect of prematurely curing the vegetation sprayed, lowering the fuel height and reducing weed infestations. When the sprayed vegetation dries out it can be burnt whilst other vegetation is green. This method gives the operator more flexibility in the burn program. Other vegetation may be sprayed to simply reduce the fuel height as the material collapses with age.

Reducing weeds will help to reduce fuel loads and therefore reduce fire intensity. Some weeds also grow to a significant height which elevates the fuel risk and should be managed to help keep fire more manageable.

Fire Trails

The installation of fire trails assists with containing and managing fires in the landscape as well as improving access. Improved access can mean that the source of a fire is reached sooner, more options are available for control measures and fires can be contained to smaller areas. Multiple fire trails can be constructed in an area to form a strategic network. Necessary fire trails will be constructed in the Livingstone LGA in accordance with vegetation management guidelines.

Bushfire resistant landscapes

The immediate surrounds of a structure can prove vital to its survivability during a bushfire. Both the design and the management of this space is important. The following points are considerations for landscaping that could minimise the effects of a bushfire:

- Solutions that shield the structure;
- Ease of access for firefighting crews to gain access around the structure;
- Trees are spaced apart to not encourage the spread of canopy fires;
- Heavy mulches that the wind and embers won't affect;
- Plants should be kept back from structures;
- Consider the placement of mid story plants away from trees to minimise the potential of crowning;
- Out buildings placed away from the main structure;
- Ground surfaces non-combustible;
- Accesses clear of vegetation;
- Non-combustible fencing and retaining options;
- Green spaces maintained and irrigated close to the structure;
- Water storage options, for e.g. tanks, pools, dams, ponds etc.;
- Vegetation choices that do not promote fire;
- Weed control.

No vegetation is fireproof or completely non-flammable however some plants are more resistant to the effects of fires. Conifers and fibrous barked trees should be avoided (ANPSA 1994). Generally, rainforest trees by nature have limited fire promoting qualities. Maintenance of vegetation should include the removal of dead limbs and the removal of excess leaf drop. A list of fire resistant plants is kept at the LSC nursery.

Particular attention should be focussed on weed control. Some weeds are fire sensitive, eg rubber vine, fire can be used to kill these weeds. Whilst other weeds can respond positively to fire, increasing weed germination and increasing weed biomass. Weed species can invade areas of fire sensitive vegetation and increase fire intensity and frequency. High biomass exotic grasses such as Molasses, guinea and hamil grass as some of the weeds that respond to hot fire with increased germination and growth rate.

4.1.5 Regulation

Permit to Light Fire

The permit to light fire system is managed by QFES; an application is made through the Fire Warden who decides whether to issue a permit. The Fire Warden may add conditions to a permit to reduce risk or nuisance to other people, property or to the environment. The Fire Warden may choose to refuse an application if conditions or the applicant cannot adequately mitigate risk. Details of how to find local Fire Wardens and further information on obtaining a permit to light fire can be found on the Rural Fire Service Website at www.ruralfire.qld.gov.au The process for applying for a permit to light a fire in a road reserve is detailed in this document under 'Roads and Stock Routes'.

Burning Notification

Under the *Fire and Emergency Services Act 1990*, a notification was issued to detail fires which can be lit without the need to obtain a permit, except if the fires are not permitted under a local law or other legislation. QFES details these permit exempt fires as following, provided adequate precautions are taken to prevent the spread of fire:

- A fire in which neither the height, width nor length of the material to be consumed exceeds two metres;
- A fire lit outdoors for the purpose of cooking and warmth, if enclosed in a fireplace so constructed as to prevent the escape of fire or any burning material there from;
- A fire lit for the purpose of burning the carcass of a beast;
- A fire lit at a sawmill for the purpose of burning sawdust or other residue resulting from the operation of a sawmill; or
- A cane fire may also be subject to a notification and may be lit under certain conditions. The cane burning notification provides further information regarding eligibility and burning conditions needed to comply with this notification.

LSC stipulates that in public areas fires can only be lit in a fireplace, barbecue or incinerator that has been constructed by LSC. On privately owned land in Livingstone Shire, fires are only permitted outdoors in a fireplace, which has been constructed to prevent fire or any burning material from escaping, or if permitted by QFES. LSC provides alternative methods for the disposal of green waste materials for households. Most waste transfer facilities accept vegetation waste including the Yeppoon Landfill.

Fire Bans and Restrictions

In Queensland, there are two methods of restricting the use of fire, either a local fire ban or a state of fire emergency. The Commissioner, QFES or their delegate has the authority under the provisions of the *Fire and Emergency Services Act 1990* to impose a local fire ban when predicted conditions pose danger to communities and fire may be difficult to control. When conditions further deteriorate the Commissioner QFES with the approval of the Minister can declare a state of fire emergency.

Enforcement

Persons found lighting fires outside of the permitted circumstances can be prosecuted. QFES is responsible for enforcing offences pursuant to the *Fire and Emergency Services Act 1990*. LSC is responsible for enforcing local laws pertaining to fire.

4.2 Preparedness

Measures taken to strengthen the ability of community, resources and services to endure the occurrence of a bushfire are considered to be preparedness. Planning is the essential component of adequate preparedness. Planning helps all land managers to address complex issues in a manageable way. Community education exposes underprepared community members to information and advice to build their preparedness and offers support to those that have considered their situation. It helps people to successfully prepare for, respond to and recover from a disaster event.

4.2.1 Personal Planning

It is recommended that individuals develop their own Bushfire Survival Plans to develop a strategy that they will enact in the event of a bushfire. These personal plans are available through the Rural Fire Service website. Bushfire survival plans detail your approach to leaving, staying, plan for livestock and pets. The Bushfire Survival plan helps to advise on different ways to tune into warnings, what to have packed in an evacuation & emergency kit, preparations to make and steps to take during & after the event.

Additional to a Bushfire Survival Plan a property plan can be developed. There are various different avenues that a private landholder may take to plan for fire on their property and council will facilitate training opportunities where possible. Council will facilitate property bushfire planning workshops using available funding opportunities. Council will also work to build a support base through stakeholder networks to support the community to develop plans for themselves.

4.2.2 Local Planning

Some local plans are mentioned in the Administration & governance section under plans and strategies. In conjunction with this Livingstone Shire BMP a BMOP will be developed to help implement bushfire mitigation strategies across the Shire.

Bushfire Management Operational Plan

The BMOP will encompass the strategy for the practical application of the BMP. It is a document that will be adjusted yearly dependant on inspections, consultation and review. The BMOP will incorporate the following focuses:

- Goals & Objectives;
- Roles & Responsibilities;
- Priority Properties for Bushfire Management;
- Annual Bushfire Management Program;
- Operational Plan Activity Procedures;
- Annual Inspection;
- BMOP Review.

These areas are outlined in the plan and reporting lines detailed.

Goals and Objectives

Prevention: Bushfire prevention is achieved through consideration of land use, conducting risk-based planning, education, and risk reduction activities to reduce or eliminate the likelihood of fire. The review of Livingstone's BMP every 3 years and the annual review the BMOP will aim to build on preventative strategies.

Preparedness: Through established fire trails and OCB prescribed burning activities preparedness is developed. Inspections of fire trails, maintenance, mapping, data sharing and priority setting all support preparedness. LSC will continue the support of Rural Fire Brigades through the collection of a levy and ongoing engagement, consultation and communication.

Response: During the response phase of a bushfire the LDMG will fulfil the roles outlined in the LDMP including sharing QFES warnings through established communications networks and issuing warnings. The LDMG will support QFES as the lead agency.

Recovery: Through the LDMG, liaise with support agencies and enact the Recovery and Resilience Plan/Implementation Plan.

Roles and Responsibilities

Bushfire management, planning, mitigation roles and responsibilities in regards to LSC owned areas are detailed in the BMOP. They set a guide to accountabilities and allow a clear path to achieving our BMOP goals and objectives.

Priority Properties for Bushfire Management

The LDMG has referred to both the AFMG BRMP and the whole of shire All Hazards Risk Assessment to assist in prioritising properties for bushfire management and mitigation activities. To further determine the high priority areas a desktop assessment and site inspections will take place. The parcels of land which have been assessed as high priority and require bushfire management and mitigation measures are listed in the *Priority Properties for Bushfire Management* section of the BMOP. The method for prioritising properties for bushfire management is detailed within the BMOP.

Annual Bushfire Management Program

The Annual Bushfire Mitigation Program will deliver mitigation measures to high priority and strategic areas of LSC land. Where required LDMG will work with QFES, Rural Fire Brigades, State Government agencies and contractors to deliver the required outcomes. It will include:

- Bushfire management works list;
- LSC roads & stock routes;
- Estimated costs;
- Maintenance log;
- Mapping & data share.

Operational plan activity procedures

The operational plan activity procedures outline the steps required for the construction of a fire trail and for conducting a prescribed burn.

Roads & Stock Routes

LSC is responsible for the management of Council roadside vegetation and stock routes. The LSC has an established roadside slashing program designed to manage the height of the vegetation primarily for visibility purposes. These slashing operations are conducted when vegetation has reached a predetermined height and suspended during the dry season as grass growth is minimal and the risk of starting a fire is high. Another benefit of the roadside slashing program is to reduce fuel loads in the road corridor. Roadsides can become a source of fire due to the traffic and littering. The planned reduction of fuel loads in the road corridor will assist in strategically reducing the hazard and reducing the occurrence and severity of unplanned fire occurring.

A process will be implemented whereby rural fire brigades report annually in their operational plan the high priority LSC roads that they wish to prescribe burn. This information will be supplied to the RFS prior to the February AFMG meeting to allow discussion and prioritisation. The LSC (Infrastructure Services) will then arrange an Information Notice for the applicant as the agent for LSC. The applicant can then approach the fire warden to start the permitting process.

Roadside corridors and stock routes have been identified as important conservation reserves for threatened flora species. It is highly probable that these corridors are also of high conservation significance for fauna, especially in highly altered landscapes. Sometimes the road reserve provides the only native habitat within a highly modified landscape. Land reserved as easements for roads, rail lines and for protection of creeks and rivers often provide vegetated corridors vital to fauna movement. As such management of road reserves is an important tool in management and protection of biodiversity.

Stock routes have traditionally been used to move livestock through the landscape. The management of stock routes are determined under the *Queensland Biosecurity Act 2014*. Under this Act, local governments have a role in the management of weeds and vegetation within stock routes. LSC relies on landholders who use the stock route for cattle grazing and movement to manage the bushfire hazard and risk. Landholders adjacent to stock routes will be encouraged to apply for a fire permit to conduct hazard reduction burns on stock route areas adjacent to their properties in accordance with fire permit conditions.

The identified priority properties will be inspected and assessed by early February to determine fuel load and to prioritise parcels for management. This information is supplied as part of LDMGs report to the FMG meeting in mid February for discussion. The results of the FMG report and subsequent discussion are reported into the February LDMG. The BMOP is adjusted to reflect any required changes. The annual inspections of fire trails and review of the BMOP is undertaken in May with the updated information used as part of the LDMG report at the August FMG meeting.

4.2.3 Regional & State Planning

Regional & State level planning is conducted through QFES, the District Disaster Management Group (DDMG) and the Queensland Government. QFES has an internal operational plan which is developed to meet legislative requirements. The Regional Inter Departmental Committee for Bushfire (RIDCB) develops the Strategic Fire Management Plan for the respective region, focussing on residual bushfire risk as identified by the AFMG, and guiding the arrangements across the prevention, preparedness, response and recovery phases. The RIDCB collaborates with the relevant DDMG to inform planning.

The Queensland Bushfire Plan is developed by QFES as it is the primary agency for bushfire in Queensland. This state bushfire plan has been developed as The Queensland SDMP identifies the need for specific hazard plans.

4.2.4 Evacuation Planning

Evacuations may be any one of three different types:

- Self-evacuation, based on forecasts self-initiated movement;
- Voluntary evacuation, residents self-evacuate in response to information provided;
- Directed evacuation, residents directed to evacuate by authorised officers pursuant to legislation such as the *Fire & Emergency Services Act 1990*, *Disaster Management Act 2003* and *Public Safety Preservation Act 1986*.

The Livingstone Shire LDMG Evacuation plan is sub-plan to the LDMP, it was last updated 29 September 2019. Its purpose is to outline the arrangements for “at risk” persons within the Shire. The implementation of the Evacuation sub-plan will allow the Livingstone Shire LDMG to make informed, timely decisions regarding evacuation, ensure an orderly release of warnings to the community, the safe and managed movement of persons at risk to a safer location, and a structured return. More information regarding planned evacuation can be found in the LDMG Evacuation sub-plan. In the immediate response to a bushfire emergent evacuations may take place.

4.2.5 Neighbourhood Safer Place

A Neighbourhood Safer Place (NSP) is a place of last resort to seek shelter from a bushfire. The concept of a NSP was developed after the 2009 devastating fire season as it was recognised by the Victorian Bushfire Royal Commission that people need a range of options to increase their safety in a bushfire event. QFES assesses the suitability of a proposed location to be used as a NSP in collaboration with local government. Locations of NSP’s can be found on the Rural Fire Queensland website.

A NSP should be used when an individual's Bushfire Survival plan has failed, if a plan was to stay but the extent of the fire means it is no longer an option to shelter at home or if the fire has escalated to extreme or catastrophic levels, leaving may be the safest option.

4.2.6 Community Education

The timely and effective delivery of fire prevention information and education about bushfire saves lives and property. Community education as a fire prevention tool provides great benefit to the community. In general, education is obtainable through 'Get Ready, Get Resilient' days, Hub open days, the Bushfire Resilience officer role, the disaster dashboard, workshops and by aligning with partner agencies. Key topics for community engagement will include the 'Prepare, Act, Survive' messaging which includes the recommendation to community members to have a Bushfire Survival Plan. Community workshops will be held to alleviate identified community concern and address perceived risk. Partner agencies will be asked to be involved and relevant materials sourced to ensure the target audience's expectations are met.

Bushfire management and the education of it should seek to implement measures that are sustainable economically, environmentally and socially. This will be achieved through having clear and agreed objectives; recognising significant features and ecosystems including rainforests, old growth trees, wildlife habitats, historical sites and cultural heritage; locating and constructing fire trails to prevent soil erosion; utilising hazard reduction burning techniques such as fire lighting patterns and optimum conditions with regard to soil moisture and humidity in order to retain vegetation cover and soil carbon.

Community Education can take many forms. From time to time a more detailed message may be required to address a specific concern. A community letterbox drop or messaging through LSC and partner agencies communications networks can aim a tailored message to a target audience.

Community education areas identified as hot spots in the BRMP, which is developed through the AFMG will be the annual basis for community education activities. Once the BRMP is released, the LDMG should engage with the QFES Regional Community Engagement Officer and the Bushfire Safety Officer to jointly coordinate a community engagement plan. QFES will lead the on ground educational activities with a strategy to engage and the LDMG will support. A register of community engagement activities is logged in QFES's Catalyst mapping system. Educational and information sharing activities are often best done whilst the community has a raised consciousness of bushfire. QFES has a volunteer community education network that are trained in delivering community education messaging. By sharing planned burn dates with QFES, educational activities could be carried out just prior or while prescribed burning or other mitigation activities are occurring.

4.3 Response

QFES is responsible for leading response to bushfire in Queensland. The response may involve direct firefighting and control or coordinating with other land managers, who have a direct responsibility for fighting a bushfire occurring on their land as a result of a statutory instrument. QPWS is responsible for responding to bushfires that occur on land it manages and maintains a firefighting capability to meet this responsibility.

HQ Plantations is responsible for responding to bushfires that occur on land it manages. It may also respond to bushfire that is occurring on adjacent land and is posing a threat to the Plantation Licence Area. HQ Plantations maintains a firefighting capability which consists of nine Plantation Rural Fire Brigades. The Plantation Rural Fire Brigades are each commanded by a First Officer, as described in the key positions section of this Plan. All members of a Plantation Rural Fire Brigade are designated as an authorised fire officer as prescribed in the *Fire and Emergency Services Act 1990*.

Some local governments maintain a response capability for fires that occur on their land. This capability may be enacted prior to the arrival of QFES and in response to level 1 incidents. A level 1 incident may be managed by local government providing it has the capacity and capability to respond. In circumstances where human life or property is threatened the responsibility for response will transfer to QFES.

4.4 Recovery

The recovery phase is the immediate period after an emergency event. There are three recognised phases of recovery:

Phase one: Post-impact relief and early recovery

Phase two: Recovery and reconstruction

Phase three: Transition



Figure 11. Three Phases of recovery

Livingstone Shire's LDMG manages the recovery phase through the LDMG plan. It is a stage that requires a co-ordinated response to supporting the community with many different aspects which include psychosocial (emotional and social) and physical well-being; reconstruction of physical infrastructure; and economic and environmental restoration.

Queensland Reconstruction Authority (QRA) works with local government to manage and co-ordinate disaster recovery and reconstruction funding. They are the states lead agency responsible for disaster recovery and resilience policy. They work with QFES officers to undertake damage assessments as soon as it is safe to do so immediately following a disaster and record results as real time data using hand held devices. This is crucial information that helps local and state government to provide assistance to vulnerable communities.

4.5 LDMG, Stakeholder and Community Consultation

The draft Livingstone Shire LDMG, BMP will be presented at an LDMG meeting. The draft will be distributed to both LSC departments and stakeholders for feedback and the amended plan will be presented at a LSC briefing session. The BMOP will then be developed after the risk assessment process. After both plans have been developed community engagement will commence and feedback sought. This engagement is to be held in the form of community based discussions in locations such as:

- Marlborough
- The Caves
- Glenlee
- Stanage Bay
- Ogmoo
- Keppel Sands
- Nerimbera
- Bungundarra
- Yeppoon
- Byfield
- Cawarral
- Emu Park
- Great Keppel Island

The draft plan will be presented via a presentation. These sessions are to be focused on gathering community sentiment and input and the document will be sent to stakeholders.

After adding input from community engagement the Bushfire Management Strategy will then be finalised. This engagement process may reprioritise or add priorities to the list of priority properties for bushfire management. These priority properties will form the basis for the BMOP.

4.6 Training and Development

To implement the BMP and the BMOP there will need to be focus on and evaluate the capacity to deliver these mitigation measures. A dedicated position is required to enact the BMOP and respond to community, departmental and agency requests. The position will be accountable for the inspections, priority setting, reviews and evaluation of both the BMP and BMOP. This incumbent will also need to take a lead role in community education, liaising with agencies and representing the LDMG on the AFMG. In addition, an active role needs to be taken to liaise with rural fire brigades in the LGA to consider if the rural crews have the skills, experience and resources to manage hazard reduction burns on public land. As well as engaging with the rural fire brigades and community to gauge areas of improvement and vulnerability they should be assisted where possible.

The development of fire trails will be based on the view that LSC's own crews will maintain them where possible. If LSC doesn't have the required machinery to develop fire trails or maintain the areas, contractors with the appropriate machinery will be sourced.

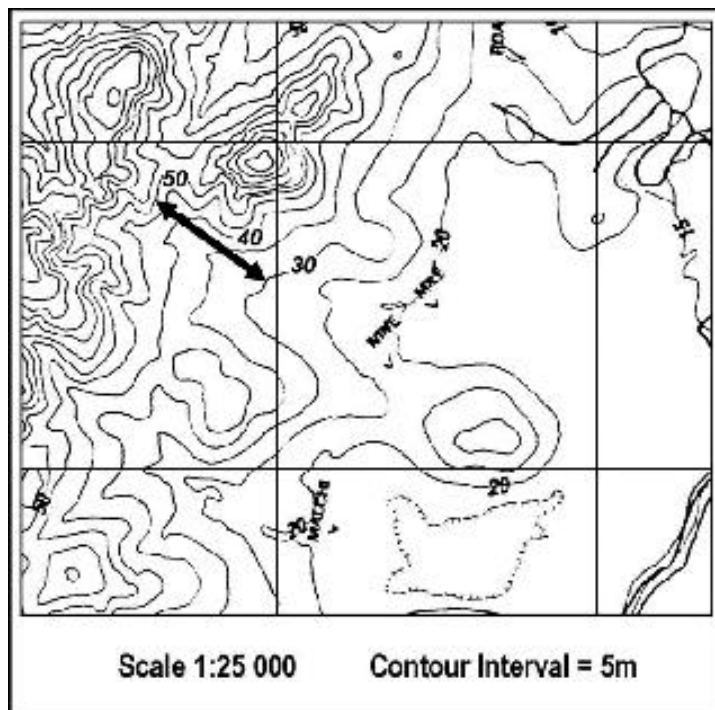
4.7 Review & Evaluation

The BMP will initially be reviewed after 12 months then subsequently every 3 years. The responsible officer will lead the review of the BMP and consult with the relevant agencies, internal LSC departments and seek community feedback.

PART 5: ANNEXURES

Annexure A: Calculating Slope

CALCULATING SLOPE FROM A TOPOGRAPHIC MAP



Length of measured line = 1.7 cm,
 $1.7 \times 25\,000/100 = 425\text{ m}$

Elevation Change = 20 m (read off
contours)

Percentage Slope = $20/425 \times 100$
= 4.7% slope

A10.1 Slope can be described in two different ways, a percent gradient or an angle of the slope. This SPP Guideline uses percent gradient. The methodology for calculating the percent gradient of a slope is as follows:

1. Decide on an area to calculate the slope. Note, it should be an area where the slope direction does not change. Do not cross the top of a hill or the bottom of a valley.
2. When an area of interest is determined, draw a straight line perpendicular to the contours on the slope. For better accuracy, start and end the line on, rather than between, contours on the map.
3. Measure the length of the line drawn and, using the scale of the map, convert that distance to metres.
4. Determine the total elevation change in metres along the line drawn (i.e. subtract the elevation of the lowest contour used from the elevation of the highest contour used). No conversions are necessary on this measurement, because it is a real world elevation change.
5. To calculate a percent slope, divide the elevation change in metres by the distance of the line drawn (after converting it to metres). Multiply the resulting number by 100 to get a percentage value equal to the percent slope of the hill. If the value, that you calculate is, for example, 20, this means that for every 100 metres covered in a horizontal direction, 20 metres will be gained (or lost) in elevation.

Annexure B: Definitions

Access (and ingress and egress): the means to enter (ingress) or exit (egress) a site or location. This may include stairs, steps, walkways, traversable open spaces, driveways, and public and private roads.

Aspect (of slopes): the compass direction that a slope faces. In the context of bushfires, aspect influences the amount of sunlight or solar radiation that a fuel source (vegetation growing on the slope) receives. This will also influence the moisture content of the fuel, making it easier (or more difficult) to ignite.

AS 3959: regulatory construction standards applicable to residential developments in bush fire prone areas within Australia.

Bushfire: an unplanned fire burning in forest, woodland, grassland, or scrub.

Bushfire attack level (BAL): a means of measuring the severity of a building's potential exposure to bushfire attack. BAL is used as the basis for establishing the requirements for construction to improve protection of building elements in the AS 3959 regulatory construction standards.

Bushfire event: any occurrence of a significant, uncontrolled bushfire that threatens life or property.

Bushfire front (also called a fire front): the part of the bushfire within which continuous smouldering or flaming combustion is taking place. The bushfire front is the leading edge of the bushfire's perimeter.

Bushfire hazard: defined as an event or natural phenomenon that may lead to or contribute to the loss of life, injury, infrastructure damage, or socio-economic or environmental disruption. Bushfire hazards include, embers, radiant heat, flame, smoke, toxic gases and particles, winds, and the vegetation or other fuels that support bushfires.

Bushfire risk: defined as the combination of one or more related hazards and exposure to these hazards. Includes an object, person, or systems vulnerability to these hazards.

Bushfire prone area (BPA): an area of land that can support a bushfire or is particularly vulnerable to bushfire attack.

Bushfire mitigation: Activities undertaken for the purpose of minimising the incidence and impact of bushfires.

Bushfire resilient design: the use of materials, construction methods, and design principles that can withstand substantial bushfire attack by actively mitigating hazards and reducing or eliminating vulnerabilities.

Bushfire survival plan: a bushfire survival plan outlines all the decisions that households must make when threatened by a bushfire, including whether to leave early or stay and defend the property, as well as plans for escape and defence, and many other important and potentially life-saving details. A bushfire survival plan should be completed well in advance of the bushfire season.

Canopy (or crown) fire: a fire burning in the upper foliage of a tree.

Debris: fine bushfire fuels, such as dry leave, bark, twigs, scattered mulch, grass clippings, paper, and other light weight combustible materials. Debris can support surface fires and can form embers when spread by winds.

Embers (also called burning debris): any burning twigs, leaves, bark, and other debris that are carried by the wind. Embers can land well ahead or away from the main bushfire front, and as such they represent an especially unpredictable hazard. Ember attack is the most common way that buildings catch fire during bushfires.

Exposure: the state of experiencing or being subjected to a hazard. In the context of bushfire resilience, the goal should be to limit or eliminate exposure to the harmful or damaging effects of bushfires.

Fire: fire is a chemical reaction that occurs when flammable objects combust and produce heat. Three components are necessary to ignite and sustain a fire: fuel to burn, heat to ignite the fuel, and oxygen to sustain the chemical reaction.

Forest Fire Danger Index (FFDI): an index of relative fire danger, developed by CSIRO scientist A. G. McArthur, for Australian forests. FFDI is calculated as a function of a locations air temperature, relative humidity, wind speed and fuel-based moisture content on a given day. The higher the FFDI, the greater the danger should a bushfire occur on the given day.

Fire danger rating (FDR): a descriptive indicator of relative fire danger based on the fire danger index (FDI). The FDR provides a six category (low-moderate, high, very high, severe, extreme, catastrophic) assessment of a fire's behaviour and its potential impacts on the community, should a bushfire occur on a given day.

Fire Trail: A road or path of cleared vegetation used to contain bushfires & give access.

Fuel: a source of fuel is required to sustain and spread bushfires. The most common bushfire fuels include fallen bark, leaf litter, dry grasses and unmanaged vegetation (such as overgrown trees and shrubs).

Fuel load: describes the amount of fuel in a landscape. Generally, the greater the fuel load, the hotter and more intense the bushfire.

Hazard: see definition for bushfire hazard.

Hazard assessment: the process of hazard identification, analysis and evaluation.

Ignition: the process by which a fuel catches fire. In the context of bushfire resilience, the goal should be to reduce the chances of building and landscaping elements igniting.

Laddering: the process by which fire spreads from the ground layer to the crown of a tree, by burning along the surface of the trees bark, up nearby shrubs, or up climbing plants.

Mitigation (also called hazard reduction): actions taken to eliminate a hazard or reduce its harmful effects.

Prescribed burn: The planned application of fire to a predetermined area, under prescribed environmental conditions, to achieve specific land management objectives.

Radiant heat: is the heat produced from combustion, or the burning of a fuel source.

Resilience: describes a building's, environment's or community's ability to withstand and recover from the negative impacts of a hazard.

Surface fire: low to high intensity fire that burn horizontally along the ground, consuming low-lying vegetation, ground litter and other debris.

Topography: also called terrain, describes the shape, arrangement or layout of the earth's surface.

Vulnerability: the characteristic or property of a community, system, or object that makes it susceptible to the damaging effects of a specific hazard.

Annexure C: References

Australian Bureau of Agricultural and Resource Economics And Sciences. (2018). *Australia's State of the Forests Report*. Viewed 6 July 2020

https://www.agriculture.gov.au/sites/default/files/abares/forestsaustralia/documents/sofr_2018/web%20accessible%20pdfs/SOFR_2018_web.pdf

Australian Bureau of Meteorology. (2019). *Changes to Fire Weather in Queensland*. Viewed 6 July 2020 https://www.ruralfire.qld.gov.au/Bushfire_Planning/Documents/QFES-Changes-in-Fire-weather.pdf

Australian Bureau of Statistics. (2018).

Australasian Fire and Emergency Service Authorities (AFAC) (2015), *Overview of prescribed burning in Australasia. Report for the National Burning Project – Subproject 1* viewed 6 July 2020, <https://knowledge.aidr.org.au/media/4893/overview-of-prescribed-burning-in-australasia.pdf>

Australian Native Plants Society (Australia). (1994). *Australian Plants for Fire Prone Areas* viewed 6 July 2020 <http://anpsa.org.au/fire.html>

Bowman, D.M. (1998). *Tansley Review No. 101 The impact of Aboriginal landscape burning on the Australian biota*. <https://nph.onlinelibrary.wiley.com/doi/pdf/10.1111/j.1469-8137.1998.00289.x>

Bush Fire Coordinating Committee. (2008). *Bush Fire Risk Management Planning Guidelines for Bush Fire Management Committees*. NSW Rural Fire Service. Viewed 6 July 2020 https://www.rfs.nsw.gov.au/_data/assets/pdf_file/0018/9603/Policy-1-2008-Annex-B-Bush-Fire-Risk-Management-Plan-Guidelines.pdf

Chenery, S & Cheshire, B. (2020). Fighting fire with fire. *Australian Broadcasting Commission (ABC)*. Viewed 6 July 2020 <https://www.abc.net.au/news/2020-04-13/how-victor-steffensen-is-fighting-fire-with-fire/11866478?nw=0>

Crompton, R, Mcaneney, J, Chen, K & Pielke Sr, R & Haynes, K. (2010). Influence of Location, Population, and Climate on Building Damage and Fatalities due to Australian Bushfire: 1925–2009. *Weather, Climate and Society*, 2(4), pp. 300-310. <https://doi.org/10.1175/2010WCAS1063.1>

Department of Local Government and Planning and Department of Emergency Services. (2003). *State Planning Policy Guideline: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide*. Viewed 6 July 2020 <http://www.dlgrma.qld.gov.au/resources/policy/spp-ifbl-guide.pdf>

Department of Main Roads (2002). *Fauna Sensitive Road Design: Volume 1, Past and Existing Practices*. Viewed 21 August 2020 <https://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Fauna-sensitive-road-design-volume-1>

Department of National Parks, Recreation, Sport and Racing. (2012) *Bioregional Planned Burn Guidelines*. Viewed 6 July 2020 <https://parks.des.qld.gov.au/management/programs/fire-management/guidelines#downloads>

Forest Fire Management Group. (2014). *National Bushfire Management Policy Statement for Forest and Rangelands*. Viewed 6 July 2020, https://knowledge.aidr.org.au/media/4935/nationalbushfiremanagementpolicy_2014.pdf

Gillies, Christopher. (2017), *Traditional Aboriginal burning in modern day land management* viewed 6 July 2020 <https://landcareaustralia.org.au/project/traditional-aboriginal-burning-modern-day-land-management/>

Hardy, S. (2018). *Whitsunday Regional LDMG Bushfire Management Plan*. Viewed 6 July 2020 <https://www.whitsunday.qld.gov.au/DocumentCenter/Home/View/4619>

Leonard, J. (2020) Fuel Management from a house's perspective: Local vs Broadscale. *Commonwealth Scientific and Industrial Research Organisation (CSIRO)*.

Livingstone Area Fire Management Group. (2020). *Bushfire Risk Mitigation Plan*

McCarthy, G, Tolhurst, K, & Chatto, K. (1999) *Overall Fuel Hazard Guide: Fire Management Research Report No 47*, 3rd ed. Viewed 6 July 2020 https://www.ffm.vic.gov.au/_data/assets/pdf_file/0014/21056/Report-47-Overall-Fuel-Hazard-Guide.pdf

Murphy, H.T., Liedloff, A., Williams, R.J., Williams, K.J. & Dunlop, M. (2012) *Queensland's biodiversity under climate change: Terrestrial ecosystems*. CSIRO Climate Adaption Flagship Working Paper No. 12. <http://www.csiro.au/resources/CAF-working-papers.html>

Penman, T. (2015). Saving homes, saving wildlife: Victoria ditches burnoff targets. *The Conversation*. Viewed 6 July 2020 <https://theconversation.com/saving-homes-saving-wildlife-victoria-ditches-burnoff-targets-51114>

Penman, T, Nicholson, A, Bradstock, R, Collins, L, Penman, S & Price, O (2015), Reducing the risk of house loss due to wildfires, *Environmental Modelling and Software*, 67, pp. 12 - 25. <https://doi.org/10.1016/j.envsoft.2014.12.020>

Queensland Disaster Management Committee. (2018). *Queensland State Disaster Management Plan*. Viewed 6 July 2020 <https://www.disaster.qld.gov.au/cdmp/Documents/Queensland-State-Disaster-Management-Plan.pdf>

Queensland Fire and Emergency Services. (2015). *Capricorn Coast Fire Management Guidelines*, Fire and Landscape Strategies.

Queensland Fire and Emergency Services. (2018). *Queensland Emergency Risk Management Framework (QEMRF)*. Viewed 6 July 2020 <https://www.disaster.qld.gov.au/dmg/st/Documents/H1102-QFES-Risk-Assessment-Process-Handbook.pdf>

Queensland Fire and Emergency Services. (2016/2017). *Rural Fire Brigades of Keppel, Local Action Plan (LAP)*.

Queensland Herbarium. (2018). *Regional Ecosystem Fire Management Guidelines*. Queensland Department of Environment and Science: Brisbane. Viewed 6 July 2020 <https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/fire-management>

Queensland Reconstruction Authority. (2017). *Queensland Recovery Plan*. Viewed 6 July 2020 <https://www.gra.qld.gov.au/sites/default/files/2019-08/Queensland-Recovery-Plan-update-August2019.PDF>

Queensland Reconstruction Authority & the Commonwealth Science Industrial Research Organisation. (2020 Draft). *Bushfire Resilient Building Guidance for Queensland Homes*.

State Government Victoria: Department of Sustainability and Environment. (2012). *Code of Practice for bushfire management on public land*. Viewed 6 July 2020,

https://www.ffm.vic.gov.au/_data/assets/pdf_file/0006/21300/Code-of-Practice-for-Bushfire-Management-on-Public-Land.pdf

Teague, B, Pascoe, S, McLeod, R. (2010). *The 2009 Victorian Bushfires Royal Commission final report: summary*. Viewed 6 July 2020 <https://apo.org.au/node/22187>

The Caves Community Stakeholder Group. (2020 Draft). *The Caves Community Bushfire Resilience Plan (Draft)*.

Vigilante, T & Thornton, R. (n.d.). Bushfires 2: Managing landscapes. *Australian Academy of Science*. Viewed 6 July 2020 <https://www.science.org.au/curious/earth-environment/bushfires-managing-landscapes>