



Government of South Australia

Department of Environment,  
Water and Natural Resources

# Strategic Assessment of DEWNR Fire Management

under the Environment Protection and Biodiversity Conservation Act 1999

November 2014



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**Government  
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ISBN

## Executive Summary

The need to protect life, property and environmental values is core to DEWNR's Fire Management Policy (DEWNR, 2013).

Fire management activities undertaken by the Department of Environment, Water and Natural Resources (DEWNR) require approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) if they are likely to have a significant impact on a matter of national environmental significance (MNES). Further EPBC Act approvals are not required if an action or a class of actions have been approved under Part 10 (Strategic Assessments) of the EPBC Act. Endorsement of a policy, plan or program is not an approval under the EPBC Act. Approval of an action or a class of actions under Part 10 of the EPBC Act is a further legal step following endorsement of the policy, plan or program. This strategic assessment seeks endorsement of the *Environmental Assessment and Management Procedure* (DEWNR 2014) (the Policy).

The Policy describes the relevant procedures in DEWNR's *Fire Management Policy and Procedure Manual* (DEWNR 2013) to address impacts on MNES on land directly managed by DEWNR. This assessment report assesses the impacts of implementation of this policy on MNES.

DEWNR managed land includes parks, reserves and unallocated Crown Lands covering 23 per cent of South Australia. Fire management activities undertaken by DEWNR include prescribed burning and other fuel reduction methods, and construction and maintenance of fire access tracks and fuel breaks. These activities address legislative requirements and take account of a number of land management and environmental policies.

MNES on DEWNR managed land include 111 threatened species, seven threatened ecological communities, 40 migratory species, five Ramsar wetlands, two National Heritage places and one World Heritage site (Australian Fossil Mammal Sites).

Environmental and risk assessment and management are implemented by DEWNR Fire Management at two scales:

- regional or landscape scale through the development and delivery of strategies in a Fire Management Plan for a landscape or group of reserves
- at the operation or site-specific scale through the development and delivery of a Burn Plan or Works Plan for a prescribed burn or other fire management activity.

Fire Management Plans provide guidance and direction for fire management decision making, strategies and activities to reduce the impact of bushfires on life, property and the environment. Fire management planning for DEWNR managed land involves a risk assessment to gauge the risks posed by bushfire. The risk assessment process guides the designation of fire management zones (asset protection (A-zones and B-zones) and conservation (C-zones)).

On-ground fire management activities are subject to a separate environmental assessment which considers the condition and diversity of native vegetation, the presence of threatened species and ecological communities (including MNES), and other environmental issues (e.g. soil erosion, water quality, disease). Where needed, mitigation measures will be applied to protect MNES through the Prescribed Burn Plan or Works Plan.

Prescribed burning can be used to achieve conservation management objectives such as promoting regeneration of species, creating a mosaic of successional stages or maintaining specific fauna habitats. Using threatened species recovery plans, expert advice and information from research, DEWNR deliberately uses ecological burning where it can promote biodiversity conservation.

DEWNR has developed Ecological Fire Management Guidelines (EFMG) to inform the planning of prescribed burning in conservation zones. This provides land managers in South Australia with guidance on fire regimes that are appropriate for the maintenance of broad biodiversity values for all fire-prone vegetation types that occur in South Australia, including MNES.

Ecological Fire Management Strategies (EFMS) are being developed for specific fire-vulnerable issues (e.g. threatened species and ecological communities, significant weed species, heritage items, including MNES) that occur in areas where a significant level of fire management activity is planned to occur. EFMS briefly outline the significance and impact of fire to the issue, and the approaches available to managing the risk to this issue when managing fire. This information will provide land managers with guidance on fire regimes that are appropriate for the maintenance of significant biodiversity values.

This assessment report concludes it is likely, on balance, implementation of the Policy will result in:

- a small adverse impact to listed species and communities in A-zones and possibly some minor beneficial impacts
- both adverse and beneficial impacts to listed species and communities in B-zones with the likelihood that net impacts will be minor
- a high likelihood of significant beneficial impacts on listed species and communities in C-zones.

The report further notes C-zones cover over 95% of DEWNR managed land meaning significant benefits are likely to occur across almost all of this land. The report concludes impacts on heritage values will be minimal and fire management potentially may result in better management of some heritage sites.

Importantly, the report notes the 'do nothing' option, i.e. not undertake fire management activities, carries an unacceptable risk of catastrophic damage to MNES along with life and property. Such an approach is not consistent with the principles of ecologically sustainable development.

The Policy will ensure actions are not taken that will adversely impact on Ramsar wetlands or heritage sites. The assessment report notes the Policy focuses on conservation of species and ecological communities at the landscape level. This means adverse impacts could occur at the site level. Where practicable, these impacts are mitigated through the Prescribed Burn Plan and Works Plan procedure.

The Policy contains an effective system of adaptive management that addresses uncertainty and contingency management. This system includes procedures for monitoring, independent auditing and public reporting on implementation. The Policy includes a commitment to formalising and refining adaptive management procedures currently applied in an Adaptive Management Strategy.

DEWNR considers the Policy is suitable for endorsement by the Commonwealth Environment Minister under section 146 of the EPBC Act and that fire management activities undertaken by DEWNR in accordance with the Policy should be approved by the minister under section 146B of the EPBC Act.

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# 1 Introduction

## 1.1 Purpose of this report

This report is a strategic assessment of the Department of Environment, Water and Natural Resources' (DEWNR) *Fire Management Environmental Assessment and Management Procedure* (the Policy). The Policy presents a consolidated and concise description of the policies and procedures that DEWNR uses to address impacts on Matters of National Environmental Significance (MNES) in its fire management activities. The report has been prepared to meet the requirements of the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This chapter provides background on why a strategic assessment is being considered and an overview of the strategic assessment process. It also sets out the scope of the strategic assessment.

**This strategic assessment does not include an assessment of any policies, procedures or activities relating to the suppression of bushfires (including a prescribed burn which escapes beyond the capacity of the resources and contingencies in place to manage it).** These activities are under the control of the South Australian Country Fire Service (SA CFS), not DEWNR.

## 1.2 Drivers of DEWNR Fire Management

Prior to 2003, the approach to fire management in South Australian reserves mainly involved the SA CFS and DEWNR's predecessor agencies responding to, and fighting bushfires as they occurred. Very little prescribed burning was conducted.

A change in approach to fire management occurred in 2002 with the acceptance that a proactive approach was needed to protect life and property. The following events and inquiries led to the recognition that bushfires, which physically cannot (and ecologically should not) be eliminated from the landscape, are likely to increase in the future:

- Sydney bushfires (2001/02; 120 houses lost)
- South Australian Premier's Bushfire Summit (2003)
- Victorian Alpine and Canberra bushfires (2003; four deaths and 500+ houses lost)
- Council of Australian Governments National Inquiry on Bushfire Mitigation and Management (2004)
- National Bushfire Mitigation and Management Principles (Ellis et al 2004)
- Eyre Peninsula bushfire (2005, nine deaths and 93 houses lost)
- SA Coronial Inquiry into Eyre Peninsula bushfire (2007)
- Victorian Great Divide bushfires (2006/07; four deaths and 57 houses lost)
- Kangaroo Island bushfires (2007; one death)
- Black Saturday bushfires (2009; 173 deaths and 2000+ houses lost)
- Victorian Bushfire Royal Commission Inquiry and Report (2009 and 2010)
- National Bushfire Management Policy Statement for Forests and Rangelands (NRMMC/PIMC 2011)<sup>1</sup>.

In response, the South Australian Government directed DEWNR to conduct a program of prescribed burning and other bushfire mitigation activities to reduce bushfire impacts to life and property. In particular, DEWNR, with other South Australian Government land managers,

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<sup>1</sup> This policy was endorsed by all members of COAG, including the Australian Local Government Association, during late 2011 and early 2012.

has been asked to conduct prescribed annual burning on five per cent of high risk public land. *High risk* areas are being accurately defined. The current 'interim' definition is forested land in DEWNR's Adelaide-Mt Lofty Ranges Region. Definition of 'high risk' public land is discussed in section 4.2.1.

### 1.3 Australian Government regulation of fire management

While the Australian Government does not specifically regulate fire management activities by state and territory governments, these may require assessment and approval under the EPBC Act if they are likely to have a significant impact on an MNES. These matters include<sup>2</sup>:

- listed threatened species and ecological communities
- migratory species protected under international agreements
- Ramsar wetlands of international importance
- Commonwealth marine environment
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions
- water resources, in relation to coal seam gas and large coal mining development.

Since the EPBC Act came into force in July 2000, DEWNR has submitted 14 referrals covering 71 prescribed burns to the Commonwealth Department of the Environment (and its predecessors) for a decision on whether assessment and approval was required (Appendix 14.1). While no proposals to date have required approval, both governments have recognised the benefits of addressing such activities in a more strategic manner, rather than on a project by project basis.

### 1.4 Overview of strategic assessment process

Strategic assessments are an approach to protecting MNES at a landscape, regional or state scale. The key difference to an individual project assessment is that a strategic assessment focuses on a policy, plan or program, usually comprised of multiple projects and/or proponents. The strategic assessment provisions of the EPBC Act can enable a range of developments to proceed without further approval if undertaken under a policy, plan or program endorsed under the EPBC Act.

Advantages of undertaking a strategic assessment include (SEWPaC 2013):

- clear 'goal posts' or requirements for protection of MNES are set upfront, at the planning stage
- the capacity to achieve better environmental outcomes and address cumulative impacts at the landscape level
- greater certainty to local communities and proponents over future proposed actions
- reduced administrative burden for governments and proponents.

The strategic assessment process is set out in section 146 of the EPBC Act. In summary:

- The Commonwealth Environment Minister (the minister) enters into an agreement with the person responsible for the policy, plan or program
- Terms of reference for the strategic assessment are approved by the minister following public comment
- The person responsible prepares:

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<sup>2</sup> The Commonwealth marine environment, Great Barrier Reef Marine Park, nuclear actions, and water resources in relation to coal seam gas and coal mining are not impacted by DEWNR fire management activities.

- the policy, plan or program describing the proposed activities and specifying commitments to protect MNES
- a assessment report, in accordance with the terms of reference, assessing the impacts of implementing the policy, plan or program on MNES.
- Release of the assessment report for public comment
- Finalisation of both documents and submission to the minister
- Endorsement by the minister of the policy, plan or program
- Approval by the minister of actions under the endorsed policy, plan or program.

The assessment report was released for public comment from 28 February 2014 to 29 March 2014 although late submissions were received up to 17 April 2014. Nine submissions were received. The issues raised in these submissions are summarised in Appendix 14.9 (separate document) along with a response to each issue.

Further information on the process can be found on the EPBC Act website at <http://www.environment.gov.au/epbc/assessments/strategic.html>.

## 1.5 Scope of this strategic assessment

In January 2010, the South Australian Government entered into an agreement under the EPBC Act with the Commonwealth Environment Minister to undertake a strategic assessment of the 'implementation of fire management policy for lands under the care and control of the Minister for Environment and Conservation' (now Minister for Sustainability, Environment and Conservation). The 2010 agreement was to assess all aspects of DEWNR's fire management relevant to environmental assessment and management. This included eight policy/procedure documents along with a large number of supporting documents. This was found to be an unnecessarily complex task as these documents addressed a number of matters not directly relevant to MNES.

In March 2012, the agreement was amended to assess a consolidated and concise new procedural document, which included only the parts of the original documents relevant to environmental assessment and management. The new document (the Policy) contains all aspects of DEWNR fire management policy, planning and procedures relevant to environmental assessment and management of MNES. This will allow future amendments to DEWNR fire management policy, planning, and procedures *not* relating to environmental assessment and management to occur without impacting on any approvals under the strategic assessment.

The scope of this strategic assessment is therefore restricted to the following document:

- *Environmental Assessment and Management Procedure* (DEWNR 2014) (the Policy)

The Policy describes the relevant procedures in DEWNR's *Fire Management Policy and Procedure Manual* (DEWNR 2013) to address impacts on MNES on land directly managed by DEWNR (see section 2.1). This manual incorporates the overarching DEWNR Fire Management Policy and a number of Fire Management Procedures that direct how the planning and delivery of DEWNR fire management activities are to be undertaken and implemented. The following documents support the implementation of the manual and are referenced in the Policy:

- *Ecological Fire Management Guidelines for South Australian Native Vegetation* (DEWNR 2012)
- *Managing Native Vegetation: Reduce the Impact of Bushfire* (DWLBC 2009)
- *South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines* (GAFM 2013)
- *South Australian Overall Fuel Hazard Guide* (DENR 2011)
- *Code of Practice for fire management on public land in South Australia* (GoSA 2013)
- *Wilderness Code of Management* (DEH 2004).

This strategic assessment report has been prepared in accordance with section 146(2) of the EPBC Act and the terms of reference for the above strategic assessment agreement. It assesses the potential impacts and outcomes of the Policy on MNES. Compliance with the terms of reference is shown in Appendix 14.2. It has been prepared for public consultation and to assist the Commonwealth Environment Minister to make a decision on whether to endorse the Policy. This report describes:

- the Policy
- the relevant MNES
- the likely impacts of the Policy on MNES
- the effectiveness of the proposed avoidance, mitigation, offset and adaptive management measures.

## 2 Fire management in DEWNR

### 2.1 DEWNR Fire Management Area

The Policy applies to all land directly managed by DEWNR. This includes all parks, reserves and unallocated Crown Lands across South Australia and amounts to an area of 22 million hectares or 23% of the State. Table 1 summarises the types of reserves and their extent.

**Table 1: Summary of DEWNR Managed Lands**

Type	Legislation	Primary purpose	Number	Area (hectares)
National Park	National Parks and Wildlife Act 1972	Land that is of national significance by reason of its wildlife or natural features	21	3,995,932
Conservation Park	National Parks and Wildlife Act 1972	Land that is protected or preserved for conserving wildlife or natural or historic features	254	5,859,184
Recreation Park	National Parks and Wildlife Act 1972	Land that is conserved and managed for public recreation and enjoyment	14	3,204
Game Reserve	National Parks and Wildlife Act 1972	Land that is preserved for the conservation of wildlife and management of game	10	25,888
Regional Reserve	National Parks and Wildlife Act 1972	Land that is protected or preserved for conserving wildlife or natural or historic features while, at the same time, permitting the utilisation of natural resources	7	9,342,641
Wilderness Protection Area	Wilderness Protection Act 1992	Land that is protected to conserve ecosystems that have not been affected, or have been affected to only a minor extent, by modern technology; and ecosystems that have not been seriously affected by modern exotic animals or plants or other exotic organisms	14	1,842,071
Conservation Reserve	Crown Land Management Act 2009	Crown land that is specifically managed for conservation by the Government	16	19,480
Unallocated Crown Land	Crown Land Management Act 2009	Crown land that is not specifically managed for a particular purpose by the Government	various	1,118,665
<b>All DEWNR managed land</b>				<b>22,207,067</b>

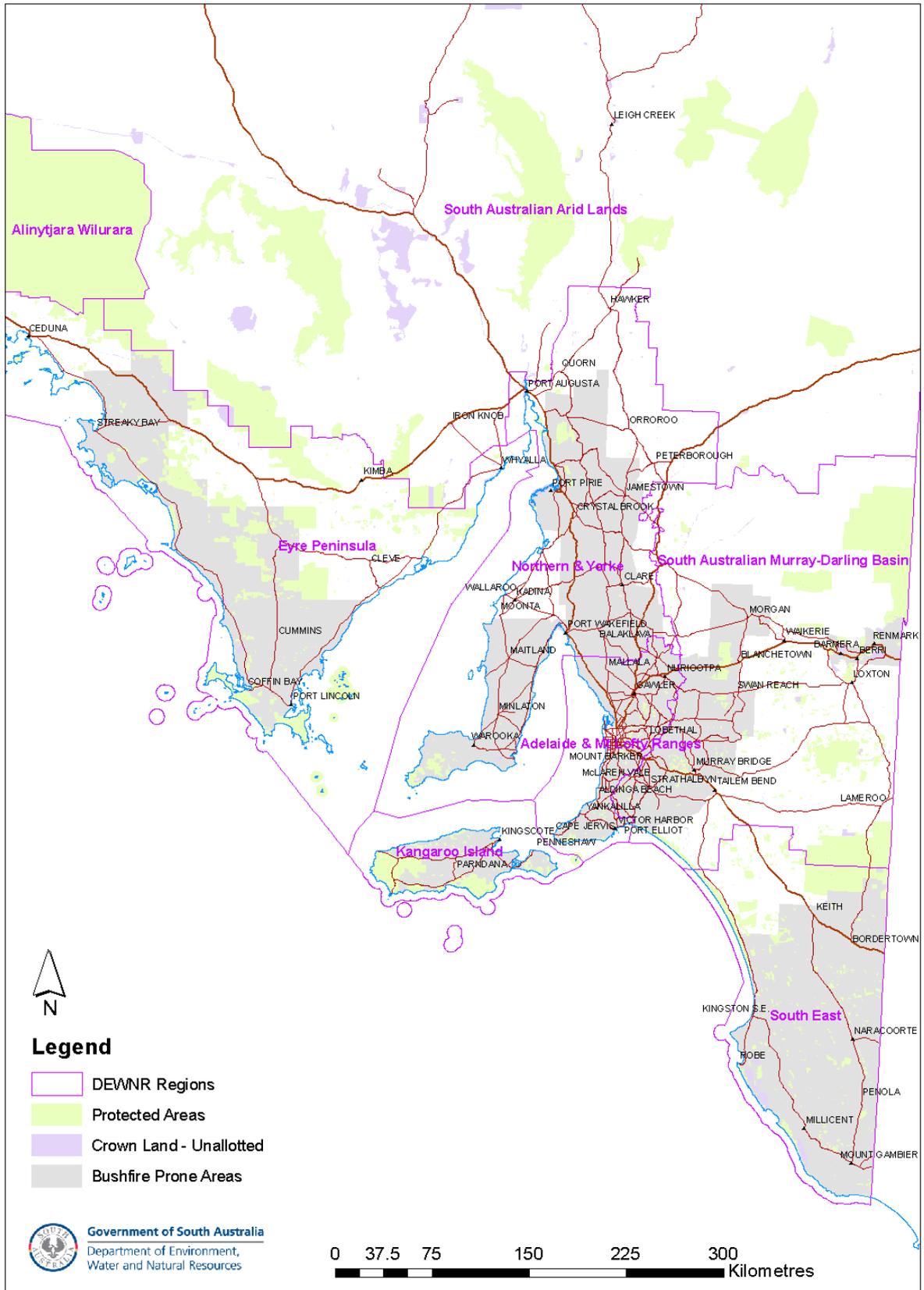
Additional detail of these areas is shown in Appendix 14.3 of this report and Map 1 in the Policy.

The occurrence of fire and fire regimes varies widely across DEWNR managed land. Over 90% of the land managed by DEWNR that occurs in the northern and western parts of the state (approx. 21,000,000 ha) is remote from agricultural areas and towns. While bushfires do occur in these areas, and they can be very large, they occur infrequently and do not pose a significant threat to life or property. For the purposes of this assessment, only those areas in the settled and agricultural parts of the state are described as 'fire-prone'. These areas are where most of DEWNR's fire management activities take place and are shown in Map 1 below.

While the Policy only applies to land directly managed by DEWNR, where adjoining land has shared natural values (including MNES) and/or fire-related risks, DEWNR supports the cooperative or collaborative development of landscape-scale fire management planning to integrate fire management regardless of tenure.

# Map 1: Bushfire prone areas of South Australia

Does not include some parts of DEWNR SA Arid Lands or Alinytjara Wilurara Regions



## 2.2 Fire management strategies

The main focus of DEWNR's fire management activities for reducing bushfire risk is on strategic fuel management in high risk areas, and maintaining easy access and infrastructure for fire suppression. Key activities are:

- prescribed burning
- other manual, chemical or mechanical fuel reduction activities
- construction and maintenance of fire access tracks and fuel breaks
- development and maintenance of infrastructure to assist with rapid and effective responses to bushfires.

### 2.2.1 Prescribed burning

Prescribed burning is the planned application of fire under prescribed environmental conditions and within defined boundaries to achieve a planned management objective. DEWNR uses prescribed burning as the primary tool to effectively and efficiently reduce fuel hazard across the landscape. In South Australia, spring and autumn are generally the optimal seasons for conducting prescribed burning.

The primary objective for a prescribed burn is usually one of the following:

- To reduce fuel hazard immediately adjacent assets
- To create strategic fuel reduced zones across the landscape to impede the spread of large bushfires
- To provide landscape protection (e.g. to prevent fragmented reserve(s) from burning in its/their entirety in a single bushfire event)
- To manage for ecological outcomes (e.g. regeneration of species, maintain specific habitat for fauna, assist to control pest species)
- To conduct research into fire behaviour or ecological responses to fire.

Prescribed burns may be applied in isolation or in conjunction with other fire management activities such as mechanical and/or chemical treatments. For the purposes of this strategic assessment, prescribed burning does not include back-burning or burning out operations used during the control of bushfires.

A prescribed burn that is undertaken to primarily achieve an ecological or biodiversity management objective is called an *ecological burn* by DEWNR. The procedures and methods used to achieve the ecological objective are the same as for prescribed burns, however, the outcome differs and a clear statement of, and justification for, burn objectives is required.

### 2.2.2 Other fuel reduction methods

Other fuel reduction methods are used in areas where prescribed burning may be undesirable (i.e. poses a high risk of impact to life, property or environmental values including MNES) or is operationally not practical. These usually involve physically removing plants contributing to fuel hazard by hand, using machinery (such as a slasher) or chemical means (i.e. herbicides), and are usually confined to relatively small treatment areas due to the intensive nature and higher cost of these methods.

#### ***Mechanical treatments***

A range of mechanical treatments for reducing or modifying fuel arrangements and hazard are used. These may include methods using machinery such as slashing, hydro-axing, mowing, grooming, rolling, or hand methods, such as selective litter or shrub removal, pruning, raking, trimming or thinning.

The type of treatment selected will depend on a number of factors, including the sensitivity of the area and type of fuel hazard. Methods such as hydro-axing or mowing will generally be

chosen in areas with coarse fuels<sup>3</sup> present. In areas where sensitivity is required to protect listed species, including MNES, treatments such as trimming, pruning or raking may be preferred.

### **Chemical treatments**

Herbicide spraying is used to manage fuel hazard, particularly in areas of heavy weed infestation or as an alternative when mechanical treatment is not possible or inappropriate. The use of herbicides also allows selective control, which reduces the impact to non-target plant species.

Herbicide treatments are often used in combination with prescribed burning activities and the decision to use chemical treatments is identified during the prescribed burn planning process. Herbicide treatments can be conducted pre-burn to ensure the fuel is dead for burning. This is done well in advance of burning to prevent seed set or post-burn to control unwanted weed germination. Prescribed burning also provides increased access opportunities, particularly in areas heavily infested with woody weeds. This is often the optimum time for applying herbicides for weed control in dense bushland when plants are regenerating and growing vigorously.

### **2.2.3 Fire access tracks and fuel breaks**

Fire access tracks provide vehicular access for fire suppression and prescribed burning. These are a small, but important strategy for the protection of assets from bushfire as they facilitate access for faster fire suppression.

Fuel breaks (sometimes referred to as firebreaks) are fuel reduced areas of land that will decrease the intensity and rate of spread of fires, should they burn into them.

While the effectiveness of tracks and fuel breaks in stopping bushfires on days of highest fire danger is limited, they are essential for providing fire fighters with safer access and opportunities for bushfire suppression when fire behaviour subsides. The access track network is also vital for conducting prescribed burning operations as it forms control lines from which burns can be safely conducted and controlled.

The construction, maintenance and upgrade of roads, fire access tracks and associated fuel breaks is guided by the *South Australian Firebreak, Fire Access Track and Sign Standards Guidelines* (GAFM 2013) developed by the Government Agencies Fire Management Committee.

### **2.2.4 Fire management infrastructure**

Fire management infrastructure that may be installed by DEWNR include water points (dams), tanks, gates, signs, airstrips and helipads.

## **2.3 Legislative and policy context for fire management**

### **2.3.1 Legislation**

Legislation relevant to fire management is outlined in section 2.1 of the Policy. Of particular importance, the *Fire and Emergency Services Act 2005* requires that all landholders (including DEWNR) take reasonable steps to:

- prevent or inhibit the outbreak of fire on the land
- prevent or inhibit the spread of fire through the land
- protect property on the land from fire
- minimise the threat to human life from a fire on the land.

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<sup>3</sup> *Coarse fuels* are dead plant material with a diameter of greater than 6 mm or live plants with a diameter of more than 2 mm. Plant material less than these sizes are called *fine fuels* and contribute most significantly to the spread of a fire.

State legislation provides protection to species which are rare or threatened at the state level (of state significance). Fire management activities such as fuel reduction burning or fuel break construction are only deemed lawful actions if undertaken in accordance with park management plans and fire management plans that have been approved by the Director of National Parks and Wildlife. DEWNR is required to prepare reserve management plans under the *National Parks and Wildlife Act 1972* and the *Wilderness Protection Act 1992*. Management plans must describe how DEWNR proposes to achieve the objectives of the respective Act in relation to the reserve. In addition to conservation measures, reserve management plans may also identify the requirement for a fire management plan based on the nature of the fire-related issues within a reserve.

The main legislation influencing fire management in South Australia is summarised in Table 2.

**Table 2: Legislation influencing fire management in South Australia**

Legislation	Sec.	Relevance to fire management
<i>Fire and Emergency Services Act 2005</i> (SA)	105H-1	Conveys the fire management responsibilities of DEWNR through requirements to minimise the risk of fire threatening life and property and to reduce the likelihood of fire ignitions and fire spreading through the land that they manage.
	97-6	States that CFS should consider the provisions of a management plan and make reasonable attempts to consult with the relevant land manager when responding to an incident within a government reserve.
<i>National Parks &amp; Wildlife Act 1972</i> (SA)	37	Defines overarching management objectives for proclaimed reserves managed by DEWNR, which includes 'the prevention and suppression of bushfires and other hazards', and provides protection for listed terrestrial flora and fauna.
<i>Wilderness Protection Act 1991</i> (SA)	12	Directs DEWNR to prepare a <i>Wilderness Code of Management</i> (DEH 2004b), which establishes principles for fire management and provides provisions for fire management in Wilderness Protection Areas and Zones if deemed an 'essential management operation'.
<i>Crown Land Management Act 2009</i> (SA)	9c	Assigns DEWNR, through the Minister for Sustainability, Environment and Conservation, with responsibilities for the on-ground management of unalienated Crown land and any Crown land dedicated to, owned by or under the care and control of the Minister.
<i>Native Vegetation Act 1991</i> (SA)	29	DEWNR must meet the provisions of the Act if intending to modify native vegetation on their land (this includes burning). Clearance applications are assessed by Native Vegetation Council in accordance with Schedule 1 of the Act.
	23	Outlines the provisions for the establishment of native vegetation Heritage Agreements for conservation purposes on private land.
<i>Native Vegetation Regulations 2003</i> (SA)	5A-1	Clarifies which actions can be undertaken to modify native vegetation without approval from the Native Vegetation Council. This includes fuel reduction: for asset protection, on DEWNR reserves or during bushfire emergencies, when establishing or maintaining fire access tracks or fuel breaks for fire control or if required by bushfire prevention plans.
	5(1)(zi)	Where clearance is to preserve or enhance ecological processes (e.g. prescribed burning for ecological reasons), a management plan needs to be approved by the Native Vegetation Council, as per the <i>Interim Guidelines for Ecological Prescribed Burning</i> (Native Vegetation Council 2013).
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cwlth)	18	Regulation of actions likely to impact nationally-listed species and ecological communities.
	269AA	Describes when Recovery Plans should be prepared for nationally-listed species and ecological communities.

### 2.3.2 Policy context

DEWNR has a role in implementing a range of environmental and sustainable land management policies that influence its fire management. These include the following, which are discussed in the subsections below:

- ecosystem conservation
- reserve system
- sustainable land management
- climate change
- wetlands.

### **Ecosystem conservation**

The *Native Vegetation Act 1991* ensures that areas of high conservation value are protected and that minor clearance is subject to a thorough assessment process. The Native Vegetation Council is responsible for providing advice and making decisions about the removal and re-establishment of native vegetation in line with the Act.

DEWNR and the Council have a strong focus on landscape restoration and delivering significant environmental benefits that offset the clearance of native vegetation. The Government is committed to protecting native vegetation as part of a broader nature conservation strategy which includes the *No species loss - a nature conservation strategy for South Australia 2007-2017* and the establishment of five biodiversity corridors, known as *NatureLinks*.

### **Reserve system**

*Conserving Nature 2012-2020: A strategy for establishing a system of protected areas in South Australia* is the strategic framework for the establishment of protected areas on public and private land in South Australia. It guides targeted additions to the protected area system to improve the long-term sustainability of South Australia's environment.

### **Sustainable land management**

The challenges to sustainable land management are being tackled through a range of state and regional level strategies, including:

- *South Australia's Strategic Plan*
- *Tackling Climate Change - South Australia's Greenhouse Strategy 2007-2020*
- *Natural Resources Management Act 2004*
- *State Natural Resources Management Plan*
- Regional Natural Resources Management plans.

### **Climate change**

In response to the challenges of climate change, DEWNR provides strategic policy advice, programs and support for a landscape scale approach to conservation and sustainable land use and management. This includes contributing to the delivery of the State Government's climate change strategies:

- *Tackling Climate Change: South Australia's Greenhouse Strategy (2007-2020)* Natural Resources Sector goal: South Australia's natural resources sector and ecosystems will be managed sustainably with optimum resilience and capacity to adapt to climate change
- State NRM Plan guiding target 4: improve capacity of individuals and community to respond to climate change
- *Climate Change Adaptation Framework for South Australia*, objective 3: resilient, well-functioning natural systems and sustainable, productive landscapes.

## Wetlands

The *Wetlands strategy for South Australia* provides a framework for the sustainable use of South Australia's wetland ecosystems. Its goal is to see wetlands recognised and managed as ecological and community assets for the benefit of present and future generations.

The above policies are taken into account in fire management planning.

## 2.4 Overview of the fire management policy

The Policy applies to all land directly managed by DEWNR. Where there is bushfire risk, it will be managed through strategies set out in a Fire Management Plan (FMP). Activities to deliver these strategies are conducted in accordance with the DEWNR Fire Management Policy and Procedure Manual (DEWNR 2013). These activities, together with the process for preparing FMPs and plans for prescribed burning and other works are described in detail in Section 2.1.3, 3.1 and 3.2 of the Policy.

Environmental assessment and management measures are implemented by DEWNR Fire Management at two scales:

- regional or landscape scale through the development and delivery of strategies in a FMP for a landscape or group of reserves
- at the operation or site-specific scale through the development and delivery of a Burn Plan or Works Plan for a prescribed burn or other fire management activity.

A summary of the Policy follows. Implementation of the policy to protect MNES is discussed in more detail in section 4.

A range of procedures and supporting documents are used in implementing the Policy. They include:

- Ecological Burning Procedure (DEWNR 2013)
- Ecological Fire Management Guidelines (DEWNR 2012)
- Ecological Fire Management Strategies (DEWNR various dates)
- Fire Access Tracks Procedure (DEWNR 2013)
- Fire Management Planning Project Management and Consultation Procedure (DEWNR 2013)
- Fire Management Zoning Procedure (DEWNR 2013)
- Prescribed Burning Procedure (DEWNR 2013)
- Risk Assessment in Fire Management Planning Procedure (DEWNR 2013)
- South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines (GAFM 2013)
- Overall Fuel Hazard Guide for South Australia (DENR 2011)
- *Code of practice for fire management on public land in South Australia* (GoSA 2012)
- *Guide for Managing Native Vegetation to Reduce the Impact of Bushfire* (DWLBC 2009)
- DEWNR Fire Management Plans ([www.environment.sa.gov.au/firemanagement/Fire\\_Management/Fire\\_planning/Adopted\\_fire\\_mgt\\_plans](http://www.environment.sa.gov.au/firemanagement/Fire_Management/Fire_planning/Adopted_fire_mgt_plans))
- Wilderness Code of Management (DEH 2004)
- Wilderness Fire Management Procedure (DEWNR 2013)
- *Australian Standard for Risk Management AS/NZS ISO 31000:2009* (Standards Australia 2009a)
- *Australian Standard for Construction of buildings in bushfire prone areas AS3959* (Standards Australia 2009b) and
- *National Emergency Risk Assessment Guidelines* (Emergency Management Australia 2010).

### **2.4.1 Fire Management Plans**

FMPs provide guidance and direction for fire management decision making, strategies and activities to reduce the impact of bushfires on life, property and the environment.

In summary, fire management planning for DEWNR managed land involves a risk assessment to gauge the risks to human life, property and environmental assets posed by bushfire. The risk assessment process guides the designation of fire management zones.

### **2.4.2 Environmental Assessment of activities**

The environmental assessment process for on-ground fire management activities is described in Section 3.2 of the Policy. As part of this assessment process, an Environmental Assessment (EA) is prepared which considers the condition and diversity of native vegetation, the presence of threatened species and ecological communities (including MNES), and other environmental issues (e.g. soil erosion, water quality, disease).

### **2.4.3 Fire Management for Biodiversity**

Prescribed burning can be used to achieve conservation management objectives such as promoting regeneration of species, creating a mosaic of successional stages or maintaining specific fauna habitats. Using threatened species recovery plans, expert advice and information from research, DEWNR deliberately uses ecological burning where it can promote biodiversity conservation (Policy section 4.3).

DEWNR has developed Ecological Fire Management Guidelines (EFMG) to inform the planning of prescribed burning in Conservation Zones (DENR 2012) (section 4.1 of the Policy). This provides land managers in South Australia with guidance on fire regimes that are appropriate for the maintenance of broad biodiversity values for all fire-prone vegetation types that occur in South Australia, including MNES.

Ecological Fire Management Strategies (EFMS) (Policy Section 4.2) are being developed for specific fire-vulnerable issues (e.g. threatened species and ecological communities, significant weed species, heritage items, including MNES) that occur in areas where a significant level of fire management activity is planned to occur. EFMS briefly outline the significance and impact of fire to the issue, and the approaches available to managing the risk to this issue when managing fire. This information will provide land managers with guidance on fire regimes that are appropriate for the maintenance of significant biodiversity values.

### **2.4.4 Community consultation**

Community consultation occurs during the fire management planning process. A consultation strategy identifies the consultation phases to be undertaken during the planning process and accounts for variations such as extended consultation periods for key stakeholders or landowners (e.g. Co-management Boards, Aboriginal communities).

Individuals and organisations likely to have a strong interest in or knowledge of the area will be advised that preparation of a FMP is commencing and invited to provide input. These are likely to include:

- Friends of Park(s)
- Local Community Association(s)
- Lessee(s)
- Local Aboriginal Heritage Group(s) and Association(s)
- Natural Resources Management Board(s) and District Groups (where they exist)
- Local Council(s)
- Local CFS Group Officer(s)
- Regional CFS Commander(s)
- Bushfire Management Area Committee(s)

- Relevant Local, State or National Conservation, Community and Recreation, Non-Government Organisations (NGOs)
- Regional Consultative Committee
- Neighbours and neighbouring landowners
- Other land managers and stakeholders (including government agencies, commercial agencies, etc.)
- Owners of Heritage Agreements considered for inclusion in the plan.

The preparation of a Draft FMP will also be advertised in relevant newspapers (local and state) and groups and individuals invited to register interest.

A Stakeholder Reference Group is also used as a conduit for information and feedback during the development of a FMP for individuals, groups or organisations that have a vested interest in the plan or relevant technical expertise. The Reference Group generally includes:

- South Australian Country Fire Service (CFS) Regional representative
- CFS Group Officer(s)
- Bushfire Management Committee representative(s)
- Elected members of relevant NRM boards
- Aboriginal traditional owners
- Relevant local community groups
- Groups or individuals with a commercial interest in the planning area
- Friends of Parks.

It may also include groups with a general or specific interest in fire such as the Conservation Council of SA or Threatened Species Recovery Teams, where relevant, and individuals or groups who expressed interest during pre-planning consultation.

Draft FMPs are also advertised for public comment. Draft and approved plans are made available on the DEWNR website.

#### **2.4.5 Fire management governance in DEWNR**

The **Chief Executive, DEWNR** is the responsible officer under the *Occupational Health, Safety and Welfare Act 1986* and must ensure that safe work practices are followed during fire management activities and must ensure reasonable steps are undertaken to comply with relevant legislation pertaining to research, risk modification, readiness, response and recovery (the '5 Rs') activities relating to fire management.

The **Director of National Parks and Wildlife**<sup>4</sup> has legal responsibility for the management of all DEWNR-managed lands set aside under the *National Parks and Wildlife Act 1972* and *Wilderness Protection Act 1992*.

The **Group Executive Director, Partnerships and Stewardship**, is responsible for the delivery of fire management on DEWNR-managed land.

The **Director, Regional Coordination** is responsible for providing strategic direction to the Manager, Fire Management Branch in the development and coordination of DEWNR fire management.

The **Manager, Fire Management Branch**, is responsible for the development and coordination of DEWNR fire management across the state.

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<sup>4</sup> The *Director of National Parks* is a statutory role under the *National Park & Wildlife Act 1972*. This role is appointed by the SA Government and is not tied to any particular position in the DEWNR organisational structure. The role is currently held by Mr Greg Leaman.

**Regional Managers** are responsible for all aspects of the delivery of all DEWNR fire management activities in their Region in a manner that is compliant with the legislation, principles and objectives stated within the DEWNR Fire Management Policy and Procedures Manual (DEWNR 2013).

The **Managers Public Land** are responsible for approving fire management works programs and low impact burn plans in their region in a manner that is compliant with the legislation, principles and objectives stated within the DEWNR Fire Management Policy and Procedures Manual (DEWNR 2013).

The **Regional Fire Management Officers** are responsible for managing, preparing and delivery fire management works programs and burn plans in their region.

The **Regional Ecologists** are responsible for overseeing and endorsing the environmental assessment of fire management works and burns in their region. Each region has nominated an appropriate officer, with ecological knowledge and networking relevant to the region, to perform this role (i.e. it is a role, not a specific position).

## 3 Matters of National Environmental Significance and fire threats

### 3.1 MNES on DEWNR land

The native vegetation in the areas managed by DEWNR ranges from temperate grasslands, *Eucalyptus* forest and woodlands and mangroves in the south-east, Mount Lofty Ranges and Southern Flinders; through Mallee woodlands and shrublands in the semi-arid Mallee and western parts of the State; to arid *Acacia* woodlands, shrublands and chenopod shrub in SA's central and northern Pastoral areas. This wide range of habitats occurs across 17 IBRA<sup>5</sup> bioregions and 56 sub-regions. This wide variety of habitats supports a range of MNES.

MNES occurring on DEWNR managed land include:

- listed threatened species and ecological communities
- listed migratory species
- Ramsar wetlands of international importance
- world heritage properties
- national heritage places.

These fall into 3 broad types of groups of matters: *biological* (threatened species and ecological communities, migratory species), *wetlands* (Ramsar wetlands) and *heritage* sites (world heritage properties and national heritage places). This report will assess DEWNR's fire management specifically in relation to these classes of MNES.

Table 3 summarises the classes of MNES with records occurring on DEWNR managed land (current as at November 2014).

**Table 3: Classes of MNES occurring on DEWNR managed land**

Class of MNES	Number Occurring on DEWNR Managed Land
Threatened Fauna - amphibian	1
Threatened Fauna - bird	27
Threatened Fauna - mammal	20
Threatened Fauna - reptile	5
Threatened Fauna - Total	53
Threatened Flora	58
Threatened Species - Total	111
Threatened Ecological Community	7
Migratory Species	35
World Heritage Site	1
National Heritage Sites	2
Ramsar Wetlands	5

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<sup>5</sup> Interim Biogeographic Regionalisation for Australia ([www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra](http://www.environment.gov.au/topics/land/national-reserve-system/science-maps-and-data/australias-bioregions-ibra))

## 3.2 Biological matters (threatened species and ecological communities, migratory species)

### 3.2.1 Threatened Species

Section 14.1 lists threatened species that occur on DEWNR land. In total, 111 species are listed occupying a wide variety of habitats. Nearly all plant species and approximately half of the fauna species occur in fire prone habitats. Six plant species and 16 fauna species have been specifically addressed in FMPs to date.

### 3.2.2 Ecological communities

Seven threatened ecological communities are listed under the *EPBC Act* and occur in reserves:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (Endangered)
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (Endangered)
- Iron-grass Natural Temperate Grassland of South Australia (Critically endangered)
- Peppermint Box (*Eucalyptus odorata*) Grassy Woodland of South Australia (Critically endangered)
- Swamps of the Fleurieu Peninsula (Critically endangered)
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin (Endangered)
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (Critically endangered).

The first four of these communities are temperate grasslands or grassy woodlands, while the last three are wetland communities. Further information is provided in Section 14.1.

#### ***Grassy woodlands and grasslands***

The four threatened temperate grassy woodland/grassland ecological communities (listed above) occur on more fertile soils on flat terrain of South East SA, the Adelaide Mount Lofty Ranges and the Mid-North/Southern Flinders Ranges areas of SA. These communities were selectively cleared and grazed in the past and are highly prone to weed invasion. Most surviving examples are very small and highly degraded with understoreys consisting mostly of exotic species. The communities which are in good or moderate condition meet EPBC listing criteria and defined as MNES.

#### ***Wetland communities***

The three threatened wetland ecological communities occur as small isolated patches scattered across wide landscapes. None of these ecological communities is considered fire-prone.

### 3.2.3 Migratory Species

A significant proportion of migratory species occurring in South Australia only occur off the coast, or on lakes, beaches or estuarine mudflats well away from areas where fire management activities generally occur. Of the 40 listed migratory species occurring in South Australia, only eight species occur in highly fire-prone vegetation types (Section 14.5). Of these fire-prone migratory species, all are birds and many are also listed as endangered under the EPBC Act.

### 3.2.4 Threats from fire to biological MNES

Fire is a natural component of the South Australian environment and plays an important role in determining the biodiversity and maintenance of ecosystem processes in our native vegetation. To effectively manage fire and biodiversity, it is necessary to have an understanding of how fire interacts with these environments – this is what is termed *fire regime*. Fire regime is based on the history of fires that have occurred in an area, in particular, the differences in the *interval* between fires (fire frequency), *intensity* or severity of fires, the *extent* and mosaic of fires, the *season* (relative to annual climatic cycles) of fires and the *type* of fire (peat/below ground or above ground) (Kershaw et al. 2002, Gill 1975, Bradstock et al 2002). Variation in any or all of these elements can result in differing effects on patterns of abundance and distribution of organisms in fire-prone ecosystems. Careful consideration of the different elements of fire regime is therefore needed when determining what the appropriate fire regime should be for an area. A single fire event is not a fire regime, and cannot be considered as an inappropriate fire regime. It is the sequence of fire events occurring at a site and across a landscape that make up fire regime, and may be inappropriate.

Many species are able to persist under a large range of fire regimes (generalists); others have life history attributes which make them only able to persist under certain fire regimes. This latter group of species are likely to be threatened by changes in fire regimes and fire management practices which may lead to a change in fire regime. Many species and communities listed under the EPBC Act fall into this category.

Three key factors (*vital attributes*) have been found to influence the response of plant species to a particular fire regime (Noble and Slatyer, 1981; Fire Ecology Working Group, 2004):

- the method of persistence on a site after fire
- the environmental conditions required for re-establishment
- the relative longevity of the various life stages.

Typically, species that are most susceptible to frequent fire are those where the adults are killed by fire, regenerate solely from seed in a single germination pulse, have a long juvenile period without seed available, and have limited seed dispersal. These are the species most likely to be affected in areas where the high frequency burning is used to reduce fuel load with the chief aim of protecting life and property (Tolhurst and Friend, 2001).

For fauna, shelter, food and breeding requirements largely determine a species' response to fire and its post-fire successional patterns (Fire Ecology Working Group, 2004). Those species which have highly specific or complex habitat requirements are those most likely to be affected by changes in fire frequency resulting from fire management. Red-tailed Black Cockatoo (*Calyptorhynchus banksii graptogyne*), for example, feed mainly on the seeds of Brown Stringybark (*Eucalyptus baxteri*) trees in SW Victoria and SE South Australia. Burning these low woodlands often results in tree canopies being either burnt or scorched (leaves not burnt, but affected by heat from the fire below). This can reduce seed set for up to seven years, reducing the already limited food source for the Black Cockatoo.

The mechanisms by which fire regimes may contribute to species extinction are summarised in Table 4.

**Table 4: Fire regimes which may contribute to species extinction (adapted from Keith 1996)**

Fire Regime Characteristic	Mechanism of Extinction
High Fire Frequency	Depletion of obligate seeders due to insufficient time between successive fires for these species to reach reproductive maturity
	Depletion of those species which are susceptible to mechanical damage or injury caused by recurrent fire
	Depletion of those species which only develop mechanisms which enable them to survive when they are older
	Depletion of species due to exhaustion of dormant bud or seed pools
	Depletion of species due to physical change in habitat
	Deletion of those species susceptible to competition from opportunistic exotics
	Low plant nutrient availability due to loss of nutrients through smoke and erosion
Low Fire Frequency	Depletion of those species which are dependent upon fire for their regeneration (e.g., fire or smoke is required to reduce the competition from other species, to stimulate flowering or to stimulate seed release or germination)
	Low plant nutrient availability due to nutrients being held in forms which cannot be used by plants
	Depletion of species due to physical changes in habitat
High intensity	Depletion of standing plant and animals through heat induced death of vital organs and tissues
	Depletion of species due to destruction of soil seed bank and dormant bud pools
	Depletion of species due to physical changes in habitat
Low intensity fire	Depletion of those species in which higher intensity fire is required to stimulate the release or germination of seed
	High post-fire seedling mortality due to predation
	Depletion of species due to physical changes in habitat
Spring/Summer fire (fire when soil is moist or moving out of wet period)	Depletion of species due to disruption to plant and animal breeding
	High post-fire seedling mortality due to desiccation
	Depletion of hollows-dwelling animals due to increased destruction of tree hollows and fallen logs
	Depletion of species due to physical changes in habitat
Autumn fire (fire when soil is dry or moving into of wet period)	High post-fire seedling mortality due to frost
	Depletion of hollows-dwelling animals due to increased destruction of tree hollows and fallen logs

Fire management activities can also have the following impacts:

#### ***Phytophthora cinnamomi***

*Phytophthora cinnamomi* (Pc) is a soil pathogen that is widespread in temperate areas of SA (Mt Lofty Ranges, South East, and Lower Eyre Peninsula). Pc is listed under the EPBC Act as a threatening process and a Threat Abatement Plan (Environment Australia 2001) has been prepared. Pc can be spread through movement on vehicles and people from infected to uninfected areas.

#### ***Predation by pest animals***

*Predation by European Red Fox* (DEWHA 2008a) and *Predation by feral cats* (DEWHA 2008b) have both been listed as a Key Threatening Process under the EPBC Act. Foxes and feral cats occur in high numbers in many areas of South Australia. Densities are particularly high in the

peri-urban areas in the Adelaide Hills and around other towns. These areas are also where significant areas of prescribed burning are used to reduce bushfire risk to life and property values. The opening up of understoreys following burning and the construction of fuel breaks and access tracks may allow easier access into dense native vegetation by foxes, feral cats and other pest animals. This is likely to increase predation on faunal MNES such as Southern Brown Bandicoot (*Isoodon obesulus obesulus*) (Long 2009, Long 2010).

### **Weeds**

Weed invasion may also increase where prescribed burning occurs at sites where the soil contains high densities of weed seed of species readily stimulated by burning, such as Boneseed (*Chrysanthemoides monilifera*) and Montpellier Broom (*Genista monspessulana*) (both Weeds of National Significance). Significant resources are invested in assessing weed potential and post-burn weed management following burning, particularly in parts of the Mount Lofty Ranges where high weed levels exist in native vegetation.

### **Loss of Hollow-bearing Trees**

Several MNES occurring in woodland and forest habitats rely on tree hollows for their shelter and nesting. The removal of trees with nesting hollows or thick bark during fuel break construction or their loss during prescribed burning may locally affect bird, mammal, or reptile species dependent on such habitat trees for nesting or shelter.

### **Prescribed burning escapes**

Prescribed burning carries an element of risk. Escapes from prescribed burning can result in unintended impacts on species and communities of conservation significance.

## **3.2.5 Threats from other fire management activities to biological MNES**

Other fire management activities, such as construction of fire access tracks and fuel breaks, slashing or use of chemicals, can also threaten biological MNES in the following ways:

- direct disturbance of habitat
- introduction of weeds and pathogens through construction equipment
- construction noise
- sedimentation
- disturbance through public use of fire tracks and increased fire risk
- providing pathways in dense vegetation for movement of pest animals.

## **3.3 Ramsar wetlands**

There are five EPBC Act listed Wetlands of International Importance (wetlands listed under the Ramsar Convention) occurring in DEWNR reserves:

- Coongie Lakes wetlands in the far north-east of SA
- the Coorong, Lakes Alexandrina and Albert wetlands at the River Murray mouth
- Piccaninnie Ponds Karst Wetlands
- the Riverland wetlands on the River Murray
- Bool and Hacks Lagoon wetlands in the South East of SA.

Wetlands can be threatened by fire and fire management through:

- areas of the wetland being destroyed or substantially modified by fire or fire management activities
- changes in the hydrological regime of the wetland, for example, by fire access roads changing surface water flows
- impacts on the water quality of the wetland, for example, from ash run-off from fires

- encouraging spread of an invasive species that is harmful to the ecological character of the wetland.

### 3.4 Heritage Values (World and National Heritage)

#### 3.4.1 Heritage places

One World Heritage property (Australian Fossil Mammal Sites - Naracoorte) and two other National Heritage places (Ediacara Fossil Site – Nilpena and Witjira-Dalhousie Springs) occur on DEWNR managed land.

##### *Australian Fossil Mammal Sites (Naracoorte)*

The cool caves at Naracoorte contain fossils which document a distinctive fauna, and illustrate faunal change spanning several ice ages, highlighting the impacts of both climatic change and humankind on Australia's mammals from at least 350,000 years before the present. Together with the Riversleigh (Queensland) site, the Naracoorte site forms the World Heritage Australian Fossil Mammal Site.

##### *Ediacara Fossil Site – Nilpena*

The Ediacara Fossil Site at Nilpena contains fossil imprints in rocks in the Flinders Ranges at the old Ediacara mining site. The fossilised remains of an entire community of soft-bodied creatures are found here. The fossils are in greater abundance here than anywhere else in the world.

##### *Witjira-Dalhousie Springs*

Witjira-Dalhousie Springs is a 'supergroup' (a large cluster of freshwater pools) of artesian springs. Springs can range in size from only a few metres across to large lakes. The Witjira-Dalhousie Springs complex contains around 60 springs, extending over an area of more than 50,000 hectares. Groundwater flows from springs and deposits calcium and other salts from the mineral-rich waters around the springs. These deposits, combined with wind-blown sand, mud and accumulated plant debris, settle around the spring outflow forming mounds that resemble small volcanos. The springs provide a significant refuge for a number of plants and animals which, due to the springs' isolation, have evolved into distinct species not found anywhere else in the world. The springs' area also includes significant Aboriginal sites.

#### 3.4.2 Threats from fire to heritage sites

Heritage sites can be susceptible to physical damage from burning or the construction of fuel breaks. Table 5 summarises the potential threats from fire and fire management activities to various types of heritage values.

**Table 5: Threats from fire to heritage sites**

General heritage value type	Threats from bushfire and fire management operations
Constructions, foundations, building remains	Fire may directly remove combustible material such as timber structures.
	Post fire soil erosion may lead to displacement of foundations.
	High impact could result if the site is struck by a vehicle.
Artefacts	Post fire soil erosion may lead to artefact movement and damage to archaeological deposits.
Wells, Mines and Quarries	Low impact except where post-fire erosion causes artefact movement or changes to site.
	High impact if driven over especially with earth moving equipment.
Earthworks, drainage lines, retaining walls etc.	High intensity fires may cause spalling of rock constructions.
	Removal of protective vegetation may promote erosion especially along drainage lines.
	Earth moving equipment may alter historic earthworks.

Gardens and exotic vegetation	Depending on the intensity, fire may cause vegetation death and erode stability.
	This may also lead to decline in vegetation health.
Stone arrangements	May cause spalling of stones in an arrangement. Post fire soil erosion may lead to displacement of stones.

## 4 Impacts of the Policy on MNES

The previous chapter discussed how fire and fire management activities could potentially impact on MNES. This chapter outlines how the Policy seeks to mitigate those impacts and assesses the likely residual impacts on MNES, taking into account those measures.

### 4.1 Risk assessment in Fire Management Plans

Risk to a range of life, property and environmental values (and potential threats) are considered in preparing a FMP. In addition to human life and property, issues such as visitor use; built, natural and cultural assets and values; invasive species; presence of *Phytophthora cinnamomi*; catchment values; threatened flora and fauna species, and ecological communities (local, regional, State and EPBC Act listed) are assessed (if present). This includes MNES that are “known to occur” or “likely to occur” in or adjacent to the planning area.

A comprehensive literature and data review, using sources described in Section 10.1 and substantiated by expert opinion, is conducted to identify issues of concern. Field validation is undertaken for identified MNES with a high likelihood of occurring in the planning area, using appropriate survey methods (such as those listed in EPBC conservation advice, recovery plans, listing advices, and species or ecological community specific guidelines). This results in a comprehensive “issues and values paper” for the fire management planning area that is the subject of a thorough risk assessment.

In recognition of the inherent differences in identifying and assessing the risks to environmental values compared to the risks to life and property, DEWNR conducts the assessments for life and property values separately to those for environmental values. The risk assessments are conducted by the Planning Team (see Glossary) in consultation with DEWNR technical staff, including ecologists, local rangers, and key external stakeholders (e.g. recovery teams). This approach ensures that the risks to life, property and the environment are identified at an appropriate scale and relevant strategies are developed for managing those risks.

The likely fire-related risks to environmental values are identified by the Planning Team for analysis in the environmental risk assessment. These fire-related risks usually include:

- the potential environmental impacts of bushfire and likely duration of the impacts
- number of wildlife deaths that may arise and the scale of these deaths
- potential for the displacement of birds and other animals
- impacts to the population viability of flora and fauna
- impacts to habitats and the scale and duration of these impacts
- potential for local extinction of a population or permanent extinction of a species/ecological community/habitat in the planning area
- changes to threatening processes
- the level of rehabilitation required.

Risks to cultural and heritage values are assessed during the risk assessment process, in line with the *DEWNR Protection of Cultural Heritage Procedure* (DEWNR 2013).

#### 4.1.1 Risk assessment procedure/processes

Risk assessments are undertaken on the values identified in the issues and values paper in accordance with the *DEWNR Fire Risk Assessment Procedure* (DEWNR 2013). This procedure has been developed in accordance with the *Australian Standard for Risk Management AS/NZS ISO 31000:2009* (Standards Australia 2009a); *Australian Standard for Construction of buildings in bushfire prone areas AS3959* (Standards Australia 2009b); and *National Emergency Risk Assessment Guidelines* (Emergency Management Australia 2010).

Risk assessment in FMPs considers risk in terms of the likelihood of impacts occurring and the consequence of that impact on human life, property and environmental assets at the broad

regional or landscape scale. Conducting risk assessments at the landscape scale during the development of FMPs allows for the consideration of 'whole of population' approaches for the protection of threatened species and for the larger landscape extent of occurrence of ecological communities to be considered.

DEWNR has developed criteria for determining likelihood and consequences, based on the *Australian Standard for Risk Management*, which are tailored for assessing bushfire risk to life, property and environmental value(s). Justification for the rankings, given for likelihood and consequence, are documented in the risk assessment to support strategy and decision-making. The assessment of likelihood considers the possibility that a fire-related impact will occur. Considerations of factors, such as known fire history for the area, anecdotal evidence and evidence from comparable areas, previous fire behaviour, suppression capacity, and access and egress, are given consideration in assessing likelihood (Table 6).

**Table 6: Categories for determining likelihood of a fire related risk occurring**

Likelihood	Description for Life and Property, Environmental Values
<b>Almost Certain (sure to happen)</b>	Is expected to occur in most circumstances; and/or high level of recorded incidents and/or strong anecdotal evidence; and/or strong likelihood the event will recur; and/or great opportunity, reason or means to occur; for example, may occur once every fire season or more.
<b>Likely (probable)</b>	Will probably occur in most circumstances; and/or regular recorded incidents and strong anecdotal evidence; and/or considerable opportunity, reason or means to occur; for example, may occur once every five years.
<b>Possible (feasible but &lt; probable)</b>	Should occur at some stage; and/or few, infrequent, random recorded incidents or little anecdotal evidence; and/or very few incidents in associated or comparable organisations, facilities, parks, habitats, populations or communities; and/or some opportunity, reason or means to occur; for example, may occur once every twenty years.
<b>Unlikely (improbable, not likely)</b>	Could occur; and/or no recorded incidents or anecdotal evidence; and/or no recent incidents in associated organisations, facilities, parks, habitats, populations or communities; and/or little opportunity, reason or means to occur; for example, may occur once every one hundred years.
<b>Rare (very unusual)</b>	May occur only in exceptional circumstances; for example, may occur once every five hundred or more years.

The assessment of consequence considers specific impacts on the environmental values, including MNES (Table 7). Recovery plans, conservation advices, significant impact guidelines and specific species or ecological community guidelines are also applied in determining consequence ratings for MNES. A separate consequence table is used for life and property.

**Table 7: Categories of consequence of fire-related risk to environmental values**

Consequences	Description for Life and Property, Environmental Values
<b>Insignificant</b>	No measurable impact on environment; inconsequential or no environmental damage. No loss of flora and fauna populations, species, communities or habitats. Little or no disruption to ecological processes.
<b>Minor (of little importance)</b>	Small impact on environment with no permanent effects. Minor impact on habitat(s). Small number of wildlife deaths. Some local displacement of wildlife. Minor changes to threatening processes (weed invasion, feral animals, etc.). Minor rehabilitation required.
<b>Moderate (not extreme or excessive)</b>	Some impact on environment with no long-term effect or small impact on environment with long-term effect. Short-term local impact on habitat(s). Local death and short-term displacement of wildlife. Noticeable changes to threatening processes. Some rehabilitation required.
<b>Major (very serious or significant)</b>	Some impact on environment with long-term effects. Large scale death and long-term displacement of wildlife. Local extinction of a population. Very serious impact on habitats at a district or regional scale. Significant changes to threatening processes. Long term rehabilitation required.
<b>Critical</b>	Extensive impact on environment and/or permanent damage at the regional or state scale on habitat(s) and populations. Extinction of a species/ecological

**(extensive disaster)** community/habitat. Extensive number of deaths and displacement of wildlife. Highly significant changes to threatening processes. Extensive and ongoing rehabilitation required.

Resultant risk ratings are assigned for all risks in accordance with the *DEWNR Fire Risk Assessment Procedure* (DEWNR, 2013) and Table 8.

**Table 8: Risk Rating Matrix**

		Likelihood				
		Rare	Unlikely	Possible	Likely	Almost Certain
Consequence	Critical	High	High	Very High	Extreme	Extreme
	Major	Medium	Medium	High	Very High	Extreme
	Moderate	Medium	Medium	Medium	High	Very High
	Minor	Low	Low	Medium	Medium	High
	Insignificant	Low	Low	Low	Medium	Medium

#### 4.1.2 FMP risk mitigation, prioritisation and allocation of strategies

The fire management planning process brings together all of the risk assessments to determine strategies to address the risks identified. Options to address risks, as outlined in Section 3.1.2 of the Policy, include:

- Avoidance
- Control (mitigation)
- Assumption (accept risk)
- Risk transfer
- Knowledge & research.

Risks that are identified as *Extreme*, *Very High* and *High* require mitigation strategies; *Low* and *Moderate* risks may have mitigation strategies specified, but are usually considered a lower priority for delivery. The key strategies for managing risks to environmental values (including MNES) are:

- designation of fire management zones (asset, buffer and conservation zones)
- mechanical and/or chemical treatments
- application of Ecological Fire Management Guidelines at the regional and/or local scale
- application of Ecological Fire management Strategies at the local scale
- post-fire weed and feral animal control
- community education
- research and adaptive management to improve future decision making.

The application of mitigation strategies during the fire management planning process ensures that recommended risk treatments can be clearly communicated to DEWNR staff and stakeholders. This provides a higher level of certainty they will be implemented ensuring a greater level of confidence MNES will be protected.

## 4.2 Fire management zoning

### 4.2.1 Description

The allocation of appropriate fire management zoning during the development of FMPs is the most important treatment DEWNR applies to mitigate risk at the landscape scale. The risk assessment process guides the designation of fire management zones as shown in Table 9.

Table 9: Fire management zones

Zone	Purpose
<b>Asset Protection Zone (A-zone)</b>	The aim of this zone is to provide the highest level of protection to human life and highly valued built and environmental assets. This is implemented by undertaking intensive fuel management strategies (burning, slashing, weed removal, etc.) aimed at keeping fire fuel at low to moderate levels at ground level. The extent of A-zones is verified using the Bushfire Attack Level described in the Australian Standard 3959:2009 Construction of buildings in bushfire-prone areas (Standards Australia 2009a).
<b>Bushfire Buffer Zone (B-zone)</b>	Such areas aim to provide a buffer area in bushland at the urban fringe or close to rural assets (e.g. cropland) to assist in reducing the rate of spread, intensity and spotting potential of a bushfire. It may also be used in larger areas of remnant native vegetation to provide strategic fuel reduction in the landscape. Prescribed burning is aimed at preventing ground fuel levels exceeding high.
<b>Conservation Zone (C-zone)</b>	This is the default zone for all natural areas within a reserve and allows for fire management activities to meet ecological and conservation management objectives. Fire regimes in these areas will be managed to be consistent with the relevant Ecological Fire Management Guideline

The current approach to allocating zones in FMPs and implementation of zones in burn programs is:

- All FMPs will have zones to identify priorities for addressing risk from bushfires using fuel management (all FMP areas will be in a zone)
- Where a greater than High risk to life and property is identified, A-zones (asset protection) and B-zones (buffer protection) will be allocated to prioritise risk management works
- Where the burning of a whole reserve/ remnant block in one event is identified as a High risk, a B-zone to strategically reduce this risk through fuel management is an appropriate mitigation measure
- Burns and other fuel management activities will be scheduled to ensure the minimum fuel levels for each zone are achieved:
  - A-zone - Reduce the overall fuel hazard below Moderate and burn >70% of the fuel across >70% of the planned burn area
  - B-zone - Reduce the overall fuel hazard below High and burn >70% of the fuel across >70% of the planned burn area.
- Additional burning for landscape protection can occur in C-zones (e.g. to support A- & B-zones or to protect specific values), but this will be planned so that the relevant EFMGs are met across the landscape:
  - Burns, where identified in C-zones in FMPs for Landscape Protection, should ensure the minimum fuel levels are achieved, i.e. reduce overall fuel hazard to below High over >50% of the planned burn area.

The application of these zones adjoining an urban boundary is shown in Figure 1.

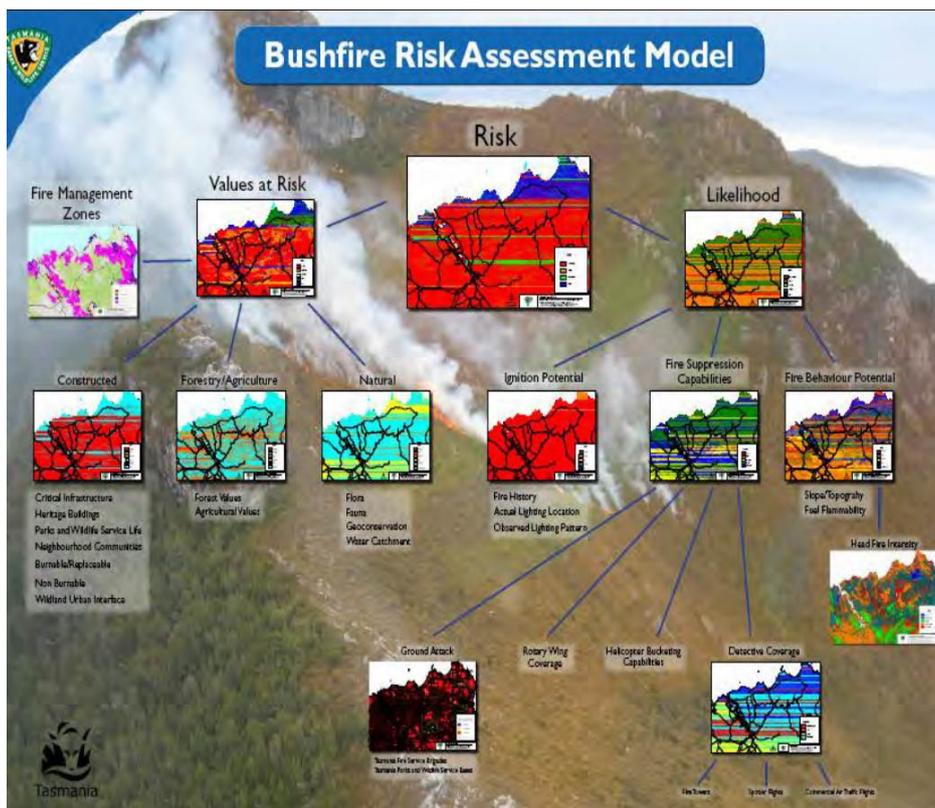
**Figure 1: Typical zoning at urban boundary**



The allocation of zoning in FMPs is currently strongly driven by the Government goal of achieving 5% of high risk areas of public land treated annually, (GoSA 2012) - i.e. annual A-zone + B-zone + C-zone burning in *High Risk* areas = 5% of *High Risk* area. *High Risk* areas are being accurately defined. The current 'interim' definition is forested land in DEWNR's Adelaide-Mt Lofty Ranges Region. FMPs and Prescribed Burning Programs are developed consistent with these approaches.

A project to refine "High Risk" areas across South Australia will commence in 2015 using the Bushfire Risk Assessment Model approach developed by the Tasmanian Department of Primary Industries, Parks, Water & the Environment. Areas of bushfire risk classes will be defined using spatial information for a range of elements of bushfire likelihood and consequences (Taylor & Wallace, 2011) (see Figure 2).

**Figure 2: Bushfire Risk Assessment Model (Taylor & Wallace 2011)**



In addition, levels of fuel treatment required (Fire Management Zones) and their potential effectiveness will be reviewed using the Bushfire Risk profile method developed by the Victorian Department of Environment & Primary Industries (DEPI 2013). A measure of landscape bushfire risk is based on simulating a set of severe bushfires across the landscape. The simulated bushfires are ignited at points on a systematic grid across the area. Fires are ignited and simulated individually, that is, they are not modelled as if they are burning simultaneously. The measure of landscape bushfire risk for a particular set of bushfires is then produced by

calculating the average modelled property impact of all fires in that set. Different scenarios (e.g. fuel treatment) can then be simulated and their impact on risk measured by comparing the impact on properties in a maximum risk scenario (no treatment) with the impact on properties in the modified risk scenario. The difference between the maximum risk and modified risk scenarios is referred to as residual risk – that is, residual risk represents the percentage of maximum bushfire risk that remains in the landscape following a treatment under a particular bushfire history.

#### 4.2.2 Impacts on MNES

Allocation of A-zones and B-zones to areas containing MNES could potentially result in significant impacts on those matters. As noted in Table 4, high fire frequency can result in extinction of threatened species such as obligate seeders that have insufficient time between successive fires to reach reproductive maturity. While, as described above, allocation of A-zones and B-zones is heavily determined by threats to life and property, there is some flexibility in the location of these zones, more so in the case of B-zones. To the extent practicable, A-zones and B-zones will not be located in important areas for MNES.

Case study 1 (Section 14.6) describes how the risk assessment process can inform the development of fire management zones in a way that minimises impacts on MNES while still addressing the high bushfire risk to life and property. In this case, it was identified that the proposed location of B-zones could result in threatened orchid species being subjected to inappropriate fire regimes. A revised allocation of B-zones greatly reduced this threat while still meeting the objective to break up fuel loads across the landscape.

Where a sensitive MNES is present across the landscape, making it difficult to avoid impacts, fire management planning can avoid the long term (i.e. several decades) allocation of a single area to a B-zone. For example, B-zones could be shifted in subsequent FMP revisions (i.e. plans reviewed every 10 years, shift B-zones every new plan).

It is important to note that in FMPs to date, A-zones and B-zones have made up less than five percent of the landscape. Consequently, over 95 per cent of areas managed by DEWNR and subject to the Policy are in a C-zone where conservation is the primary objective. A-zones make up less than one per cent of the landscape. These have generally been on the edge of urban areas meaning they have already been subject to impacts such as past fuel reduction activities, weed invasion, noise intrusion, changed hydrology and microclimate changes. Consequently, these areas are unlikely to contain important habitat for EPBC listed species and communities.

Zoning can also be used to directly protect or enhance MNES are set out in Table 10.

A-zones and B-zones have not been applied to Ramsar wetlands and heritage places listed under the EPBC Act to date, as they do not contain significant human assets. Prescribed burning in these areas would only be used for ecological purposes or for protection of the Ramsar values from bushfire (Landscape Protection).

**Table 10: Applications of zoning to protect or enhance MNES**

Zone	Potential use in protecting MNES
<b>A- Zone</b>	Intensive fuel reduction to protect a highly vulnerable species/ecological community surrounded by areas with higher fire hazard and frequency (rarely used to date)
<b>B-Zone</b>	Strategic fuel reduction to reduce the likelihood of an isolated area of remnant vegetation containing fire sensitive species/communities all burning in a single bushfire event  Strategic fuel reduction to protect an isolated occurrence of fire sensitive species/communities
<b>C-Zone</b>	Ecological burning to regenerate a threatened species/habitat at risk through lack of regeneration  Maintenance of fire regimes appropriate for conservation of biodiversity (including threatened species and communities) consistent with relevant Ecological Fire Management Guidelines for MNES.

## 4.3 Prescribed Burn and Works Plans

### 4.3.1 Description

While zoning addresses MNES at the landscape level, prescribed burn and works plans ensure:

- there is further investigation and identification of MNES at the site level
- specific mitigation measures are implemented to address impacts on MNES.

Each DEWNR Region develops an Annual Works Program of activities that implement the strategies outlined in FMPs for the area. Works are delivered on a strategic priority basis (i.e. those that address highest risk are prioritised to be completed first) and may include priority works in areas not yet covered by FMPs. An individual Prescribed Burn Plan is prepared and approved for all prescribed burns. A Works Plan is prepared and approved for all significant other fire management works. Plans for prescribed burns and other fire management work include environmental assessment of impacts to MNES which occur in or around the burn or other fire management activity. Refer to Section 3.2 of the Policy for more detailed descriptions of Prescribed Burn and Work Plans.

Risk assessment at the site scale (e.g. individual prescribed burn) follows a risk-based assessment approach. This is similar process to that for FMPs, except the information sourced is more detailed and specific to the area of the proposed burn or other activity.

Using information provided in the FMP and information from the various data resources, a desktop survey for the target area identifies:

- plant diversity and fauna (particularly MNES)
- threatened vegetation communities (particularly MNES)
- heritage sites (particularly MNES)
- other MNES (such as Ramsar wetlands), significant biodiversity and heritage issues.

An onsite validation (ramble survey) of issues identified in the desktop study is required for all areas that include native vegetation. A ramble survey (DENR 2010) is undertaken to collect data to inform the environmental assessment and data collected in the survey includes:

- all plant species detected and as many fauna species as possible from observations and other signs
- distribution and abundance of threatened plants
- distribution of habitat for threatened fauna (e.g. vegetation structure, hollows, specific habitat)
- distribution and condition of vegetation communities
- potential for erosion
- potential to introduce or increase pest plants and animals, or diseases (e.g. *Phytophthora*)
- on-ground validation of past fire history
- potential for actions to exacerbate flooding
- distribution and abundance of significant weeds (especially Weeds of National Significance and weeds declared under the *Natural Resources Management Act 2004*).

Additional surveys, using appropriate methods, are conducted if significant flora, fauna and/or ecological communities are found to be present (including MNES), or if it is likely for them to be located at the proposed site. These surveys are to confirm the presence (or absence) of the specific threatened species or ecological communities identified. Best practice methods are used as determined by relevant experts (e.g. from species recovery plans, species recovery teams, species specific guidelines, Herbarium/Museum/University, relevant DEWNR experts).

Similar to the fire management planning process, information from the desktop and ramble survey data is used to collate a list of issues of concern. Those issues that are identified as potentially vulnerable to proposed fire regimes or management activities are then targeted for

specific assessment. MNES that are known or likely to occur in the burn area are automatically included in the issues for assessment.

Risks to identified MNES are assessed using the risk framework, as outlined above, using the Environmental Assessment (EA) in DEWNR's Fire Management Information System (refer to Section 3.2.1 of the Policy).

Where fire management activities (particularly prescribed burning) are identified as likely to impact on MNES in an EA, appropriate mitigation measures and strategies will be specified that will reduce the level of impact to an acceptable level. Site specific mitigation measures are then identified and evaluated for their effectiveness in reducing the level of risk to as low as reasonably achievable. The following are examples of possible mitigation strategies:

- the use of alternate mechanical and/or chemical treatments in place of burning (possible in small areas)
- exclusion of parts of the planned burn from the burning operation
- conduct of weed or pest control post-burn
- protection of key habitat elements from burning e.g. active suppression, use of fire fighting chemicals (foam, retardant)
- reschedule the burn to a different year/season.

Where mitigation is used, monitoring of the success of the strategies will be conducted, so that Ecological Fire Management Guidelines (see below) can be developed and applied to future fire management planning and operations.

Case study 2 (Appendix 14.7) demonstrates how this process works in practice utilising the Fire Management Information System. A proposed landscape burn had the potential to significantly impact two threatened fauna species (Southern Brown Bandicoot and Chestnut-rumped Heathwren) and a threatened ecological community (Peppermint box grassy woodland of South Australia). These matters were identified in the EA flagging the need for mitigation measures. With adoption of appropriate mitigation measures, the residual risk was reduced from high to low.

Following the application of relevant mitigation strategies, the residual risk forms the basis for decision making. The Regional Ecologist (refer to Glossary) is required to endorse the environmental assessment, offering assurance that:

- the most up to date and relevant data has been used to inform the assessment outcomes
- the assessment process is appropriate from an environmental perspective
- the proposed mitigation measures are appropriate and likely to be effective from an environmental perspective.

Recovery plans, significant impact guidelines, and species or ecological community specific conservation advices are used for MNES to determine whether an unacceptable impact is likely to occur. The Regional Ecologist is the most appropriate staff member in a DEWNR Region to perform this validation, as they have the knowledge and experience to validate the assessment and its outcomes, particularly in relation to threatened species and ecological communities, and have access to appropriate experts for a range of environmental and heritage issues. Performance measures are developed using information from the risk assessment. Most performance measures relate to the mitigating actions.

Decisions on whether to proceed with the fire management activity are based on the residual risk rating, which is the risk remaining following the application of mitigation strategies on the assessed environmental values. Risk-based decisions for each residual risk rating are shown in Table 11 in accordance with the Policy.

**Table 11: Risk assessment rating table**

Initial Risk	NVC Risk Category <sup>6</sup>	Residual Risk	Outcome	Endorsement/Approval
Low or Moderate	Low	Low	Proceed with activities as proposed	Regional Manager
High - mitigation to reduce risk possible	Low with mitigation	Low	1) Proceed with activity, with exclusions/modifications or 2) Proceed, with mitigation measures	Director
Very High - mitigation to reduce risk not possible	High	High	1) Plan returned to the planning process for review to see if the activity can be redesigned to remove/reduce the risk issues. or 2) Risk considered acceptable to enable proposed activity to proceed, with specific monitoring – to specifically provide opportunity for adaptive management (opportunity to learn from long term or cumulative impacts). Generally applies in cases where impacts are locally significant but not widespread/resulting in change in status.	Native Veg Council
Extreme	Extreme	Extreme	Do not proceed with proposed activity	n/a

The application of a Burn Risk Assessment Tool (BRAT) (Section 3.2.3 of the Policy) provides a third level of risk assessment prior to undertaking the on-ground fire management activity. BRAT is used to evaluate the inherent risk in conducting prescribed burning (risk of burn escape, potential for damage to MNES (outside the planned burn area), effect of mitigation strategies in reducing fire escape probability) and assesses the burn’s potential to meet fire management objectives. The BRAT must be approved by the Incident Controller (in consultation with the State Coordinator if the operational risk is very high).

### 4.3.2 Impacts on MNES

The identification of issues of concern and threats at both the fire management planning and on-ground planning stages offers a significant level of redundancy. While the identification process initially attempts to identify all issues of concern at the landscape-scale, it is acknowledged that issues may be overlooked. However, the subsequent site-specific identification process sources more detailed information specific to the area of the proposed activity, thereby ensuring their thorough treatment. This provides a high level of confidence that any MNES likely to occur within a fire management planning area will have any potential threats associated with DEWNR fire management activities identified and addressed in the subsequent FMP and Operational Plan development.

The effectiveness of these processes for biological MNES could be compromised by:

- surveys being undertaken at suboptimal times of the year for the detection of all plant species and other issues
- the ramble survey not identifying all relevant matters
- the need for specialist plant and animal identification skills and awareness of which habitats to search
- mitigation measures proving to be ineffective.

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<sup>6</sup> Risk category described in DEWNR’s delegation under the Native Vegetation Act.

While it is acknowledged such problems may occur, the risk of significant impact to MNES is considered to be low. Given the processes that are in place, it is highly unlikely an important population of a species or habitat critical to the survival of a species would not be identified. DEWNR uses best available information and ensures all new information is entered into appropriate databases so that it informs future prescribed burns and other fire management activities. DEWNR also has processes in place to evaluate the effectiveness of mitigation measures. Given the purpose of this strategic assessment is to enable the Commonwealth Environment Minister to approve fire management activities taken in accordance with the Policy, it is important to note these uncertainties would remain even if proposals continued to be individual referred to the Department of the Environment.

## **4.4 Ecological Fire Management**

As discussed above, DEWNR uses three zones at the landscape level in fire management planning: Asset zone (A-zone), Buffer zone (B-zone) and Conservation zone (C-zone). A- and B-zones are determined by fuel management objectives for the protection of life and property and other values, whereas C-zones are designated to assist in the conservation and enhancement of biodiversity. This occurs through the application of appropriate fire regimes, primarily to achieve specified ecological objectives (ecological burning). The management of fire to maintain or enhance biodiversity is based on accumulating knowledge of flora and fauna species, populations and communities and their response to fire regimes, and then applying this knowledge to fire management practices to maximise biodiversity outcomes. Fundamental to this approach is development of Ecological Fire Management Guidelines (EFMGs).

### **4.4.1 Ecological Fire Management Guidelines**

DEWNR has developed EFMGs (Table 12) to inform prescribed burning in South Australian native vegetation (DEWNR 2012). This document provides land managers in SA with guidance on fire regimes that are appropriate for the maintenance of broad biodiversity values for all fire-prone vegetation types that occur in South Australia, including MNES. These guidelines are a recommended approach to developing ecological fire regimes, i.e. fire regimes to maintain and enhance biodiversity. Specifically, the guidelines identify five aspects of fire regimes (interval, frequency, spatial, intensity and season) for each major vegetation sub-group (MVS) in a planning area. The EFMG are not designed to be used as prescriptions; instead they define a window of "acceptable" fire regime suitable for the conservation of the vegetation type.

The underlying approach used in determining the South Australian EFMG is based on those being developed and implemented in Victoria (FEWG, 2004), Western Australia (Burrows & Abbott 2003), South East Queensland (Watson, 2001) and New South Wales (Kenny, et al., 2004).

Table 12: Ecological Fire Management Guidelines for South Australian Major Vegetation Groups

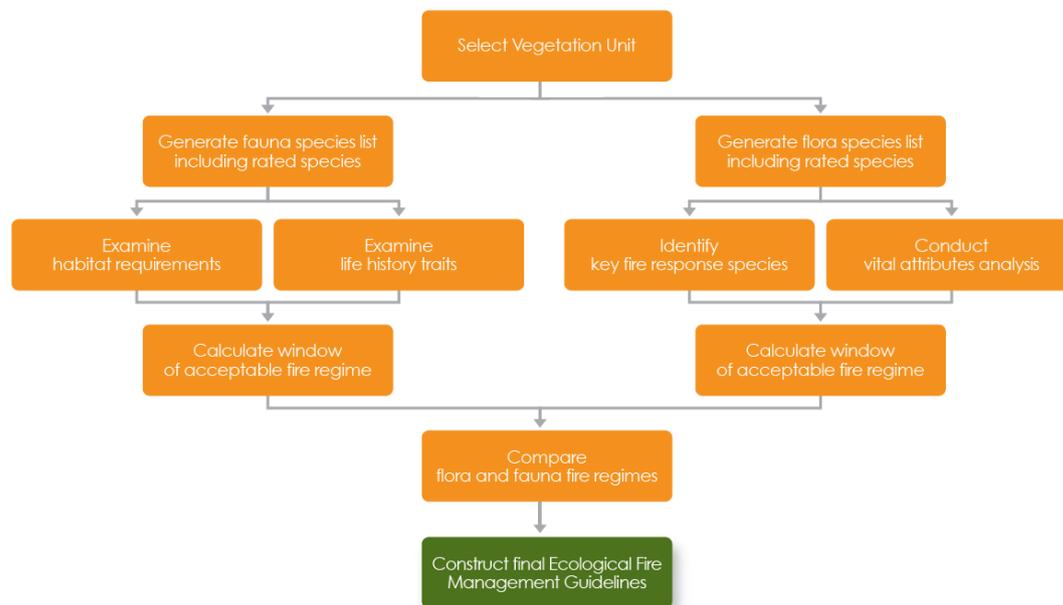
ECOLOGICAL FIRE REGIME										
MVS No	MVS NAME	Interval		Spatial Criteria		Frequency	Intensity		Season	
		TPC1: Lower threshold in years	TPC2: Upper threshold in years	inter-fire intervals within TPC1 & TPC2 across more than X% of the extent of this MVS within the planning area	% > TPC2	Avoid more than 2 fires within a period of X years	Avoid more than 2 successive fires of low intensity (Yes/No)	Some medium to high intensity fire needed to regenerate some species (Yes/No)	Avoid more than 1 successive fires in season	
4	<i>Eucalyptus</i> forests with a shrubby understorey	20	50	40	30	40	Y	Y	Spring or during & following drought	
5	<i>Eucalyptus</i> forests with a grassy understorey	5	50	40	30	30	N	N	Spring or during & following drought	
8	<i>Eucalyptus</i> woodlands with a shrubby understorey	20	50	40	30	40	Y	Y	Spring or during & following drought	
9	<i>Eucalyptus</i> woodlands with a grassy understorey	5	50	40	30	30	Y	Y	Spring or during & following drought	
12	<i>Callitris</i> forests and woodlands	15	60	40	30	70	Y	Y	During & following drought	
15	<i>Melaleuca</i> open forests and woodlands	15	60	40	30	70	N	N	During & following drought	
19	<i>Eucalyptus</i> low open woodlands with tussock grass	5	50	40	30	60	Y	Y	Spring or during & following drought	
26	<i>Casuarina</i> and <i>Allocasuarina</i> forests and woodlands	20	50	40	30	60	N	N	During & following drought	
27	Mallee with hummock grass	20	50	40	30	60	Y	Y	During & following drought	
28	Low closed forest or tall closed shrublands (including <i>Acacia</i> , <i>Melaleuca</i> and <i>Banksia</i> )	15	40	40	30	50	Y	Y	Same season	
29	Mallee heath and shrublands	20	40	40	30	40	Y	Y	Spring or during & following drought	
30	Heath	15	40	40	30	50	Y	Y	Same season	
33	Arid and semi-arid hummock grasslands	10	50	40	30	60	Y	Y	During & following drought	
36	Temperate tussock grasslands	3	10	40	30	20	N	N	Autumn	
37	Other tussock grasslands	3	15	40	30	20	N	N	Autumn	
47	<i>Eucalyptus</i> open woodlands with a shrubby understorey	20	50	40	30	60	N	N	During & following drought	
48	<i>Eucalyptus</i> open woodlands with a grassy understorey	10	40	40	30	40	Y	Y	Spring or during & following drought	
49	<i>Melaleuca</i> shrublands and open shrublands	20	60	40	30	70	N	N	Spring	
55	Mallee with an open shrubby understorey	20	40	40	30	40	Y	Y	Spring or during & following drought	
61	Mallee with a tussock grass understorey	10	40	40	30	50	N	N	During & following drought	

There are five steps to determine the EFMG for a vegetation type.

- Identify vegetation unit/s
- Compile species list (flora and fauna) for each MVS
- Identify significant species (flora and fauna) for each MVS
- Identify Key Fire Response species for each MVS
  - a. using flora species
  - b. review using fauna fire response and habitat requirement data
  - c. review using rated threatened species requirements
- Specify fire regime for each MVS using minimum/maximum fire interval, range of season, minimum/maximum intensity and extent of most vulnerable Key Fire Response Species.

These are shown in Figure 3. The Key Fire Response Species are those most susceptible to decline from changed fire regimes, based on the available knowledge of plant vital attributes and life histories. These species and their needs in relation to the components of fire regime provide a guide to the acceptable thresholds of fire regime for the community.

**Figure 3: EFMG process**



Of particular importance are two thresholds of potential concern (TPCs) relating to the **fire interval** component of the fire regime:

- **TPC1** is the lower threshold for fire interval (in years) for a particular vegetation type. That is, vegetation within this MVS will be represented predominantly by early successional species if the inter-fire interval is less than the time specified, and those species that require longer to flower and set seed can disappear from an ecological community.
- **TPC2** is the upper threshold for fire interval (in years) for a particular MVS. That is, populations of some species (e.g. obligate seeders) are likely to reduce within this vegetation type if fire is absent for more than the time specified.

Other factors considered in developing the fire regime for each MVS within the EFMG include:

- **Spatial Criteria:** Spatially, a minimum of 40% (unless otherwise stated) of the area of an MVS in a landscape (or planning area in the case of a fire management plan) will be between TPC1 and TPC2

- Long unburnt habitat: Populations of some species (particularly some fauna) are likely to reduce within this vegetation type if 'long unburnt' habitat is not maintained. Spatially, a minimum of 30% (unless otherwise stated) of the area of an MVS in a landscape (or planning area in the case of a fire management plan) will be greater than TPC2
- Frequency: For each MVS, more than two fires within a specified period (years) can severely impact on some species and habitats (significantly more than a single fire) and are to be avoided, if possible
- Intensity: For some MVS there is a need to avoid or maintain successive fires of varying intensity (low, moderate or high) to avoid the decline of some species. Consideration needs to be given to ensuring that appropriate intensity and frequency of fires is applied
- Season: Many flora and fauna are more vulnerable to fire impacts during particular seasons (spring, summer, autumn, winter) or climatic cycles (periods of 'drought' and 'wet years' in arid and semi-arid areas).

#### **4.4.2 Ecological Fire Management Strategies**

DEWNR is developing a series of ecological fire management strategies (EFMS) for several significant threatened or pest species for which fire is a critical threat or management tool.

The objective of the strategies is to develop a consistent approach to ecological fire management (across all tenures) for significant species. The strategies are developed using the same risk assessment methodology applied in DEWNR fire management planning.

In summary, an EFMS contains the following information:

- basic species information
- risks posed by inappropriate fire regimes
- fire management objectives and strategies
- actions to mitigate the assessed risks.

To date, EFMS have been prepared for:

- Yellow-footed Rock-wallaby
- Southern Brown Bandicoot
- Sandhill Dunnart
- Kangaroo Island Dunnart
- South-eastern Red-tailed Black Cockatoo
- Mount Lofty Ranges Southern Emu-wren
- Broom and Gorse (weeds).

The following EFMSs are in preparation or planned:

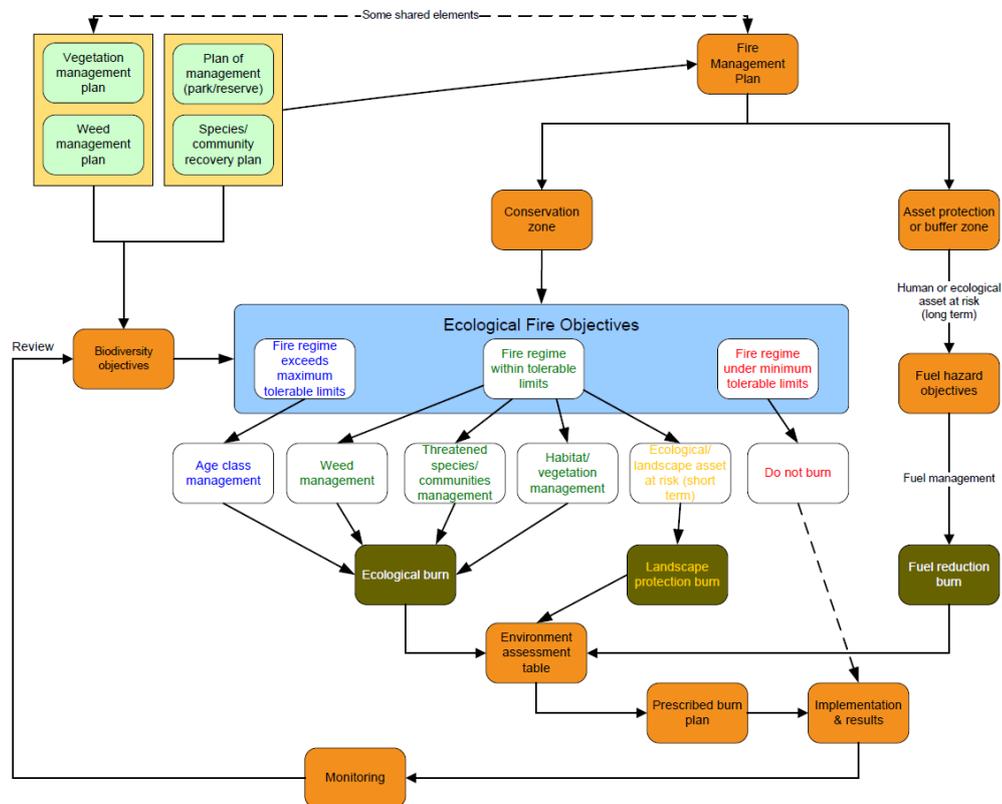
- Mt Lofty Ranges Block Threatened Orchids
- Southern Emu-wren (Mount Lofty Ranges)
- Declining woodland birds of Mount Lofty Ranges
- Grey Box Woodlands
- *Phytophthora cinnamomi*

#### **4.4.3 Ecological Burning**

Fire is a natural part of many of South Australia's ecosystems and important for maintaining biodiversity over time, Ecological burning can be used to manage a particular plant species, vegetation communities and/or native animal habitat. Ecological burning is the treatment of vegetation in nominated areas by the use of fire, primarily to achieve specified ecological objectives. There are four main management objectives for ecological burning: vegetation age-class or 'mosaic' management; weed management; threatened species or ecological community management and fauna habitat or vegetation management (DEWNR 2012). These

are shown in Figure 4 and discussed further below. As landscape protection burns still have fuel management as their primary objective, they are not strictly ecological burns. However, they are also discussed below given it is in an objective for prescribed burning that may occur in C zones.

Figure 4: The 'logic flow' of prescribed burning in fire management



Ecological burns require the same processes and assessments as all other prescribed burns (as described in the Policy). In addition, an Ecological Burn Rationale is required for all ecological burns which are not implementing recommendations of an approved FMP or species/ecological community recovery plan. This is used to state and assess the overall objectives and ecological merits of the burn. An Ecological Burn Rationale requires the justification of ecological burns in relation to:

- recommendations in relevant recovery plans, conservation advices, threat abatement plans, wildlife conservation plans, species and ecological community specific guidelines, reserve management plans and EFMS
- findings from peer reviewed scientific literature, where this exists
- specific and measurable ecological objectives to be achieved
- the fire regime required to achieve these objectives
- planned monitoring, outlining what and how the success of the ecological objectives are to be measured, assessed and reported.

Hence where ecological burning is proposed for the management of any MNES, the Ecological Rationale will specifically outline the requirement for burning and specify the resulting fire regime in terms of outcomes to the species or ecological community in question. An Ecological Rationale will not be endorsed, if the proposal is not likely to enhance the condition, extent or population of the MNES.

### ***Vegetation age-class or 'mosaic' management***

EFMGs are used to set targets for the percentage of each vegetation type that should be below, within, or above TPC1 (lower threshold for fire frequency) and TPC2 (upper threshold for fire frequency) as well as fire frequency limits using available environmental knowledge and expert opinion. Planning for future burning therefore takes into account the distribution of each vegetation type relative to TPC1 and TPC2, previous fire history, and the allowable number of fires in a given time interval as dictated by the life histories of the component species. Historically, the collection of fire history information has been poor in some areas and good in others. Current mapping of new fire scars (particularly in reserves) is now done more efficiently, allowing future analyses to be more robust. New advances in ageing of some vegetation types (Clarke, et al., 2010) will also prove useful in analyses where fire history is lacking, particularly when considering TPC2.

Having fire management targets defined as ranges rather than optima offers greater flexibility to deal with uncertainty and potential conflicts between species (Keith, et al., 2002). It is also important to incorporate climate reliability (principally rainfall, especially in semi-arid areas) and the population states across the landscape, not just at a location to minimise the risk of extinction.

DEWNR Fire Management has developed a GIS based spatial tool that allows the analysis of the landscape in terms of the 'fit' of the EFMG for each MVS. Analyses can be conducted at a range of scales from reserve to large scale landscape applications. Metrics calculated in graphical and tabular format include the percentage of each MVS that occurs below TPC1, between TPC1 and TPC2, and above TPC2. It also allows the mapping of the 'hidden mosaic' by displaying the number of fires that have occurred in the period stipulated in the frequency column of the EFMG for each MVS. This allows for strategic planning of prescribed burning by allowing the combination of time since last fire data with number of fires occurring over a known time period.

Parcels of land are then identified as being available to burn or needing to be left unburnt until a specified time into the future. Impacts of the planned prescribed burn program can be analysed in terms of the effects on the distribution of each MVS in relation to the TPC1 and TPC2 figures.

### ***Weed management***

Fire can be an effective tool in weed management, particularly against woody weed species, including Weeds of National Significance. However, weed mortality and impact on weed seed banks can depend to a great degree on the fuel loads present. Fire can stimulate the germination of some weed seeds with hard seed coats (e.g. legumes), while increased temperatures or increased time exposed to heat can lead to mortality. Some shrub species are killed by fire, leaving their persistence to seedling germination while others re-sprout from dormant buds rather than stimulating recruitment.

Fire alone will not control invasive plants species, but when integrated with other treatments can be very successful. These additional treatments may be mechanical, biological or chemical and may also include the application of more fire.

For example, Bridal creeper, *Asparagus asparagoides* is a Weed of National Significance that has strong capacity to invade undisturbed native ecosystems. It crowds out native species because of an extensive belowground tuber system and a dense mat of climbing annual shoots. The dense mat of tubers has the capacity to remain in the soil for some years after herbicide treatment. Fire is potentially a useful strategy for management of this weed by consuming young annual shoots and increasing the decay rate of underground tubers,

Turner and Virtue (2009) investigated the post-fire recovery of Bridal creeper infested mallee vegetation near Meningie, south east of Adelaide. They monitored plots with no post-fire weed control and plots with post-fire herbicide application. Native species were dominating both the controlled and uncontrolled plots ten years after fire but there were significantly more small native shrubs, creepers and climbers at the herbicide sites. They concluded that fire was an important restoration tool because it promoted the germination of native species, which had a better chance of recovery if there was some form of post-fire control of bridal creeper density.

### ***Threatened species or ecological community management***

Altered fire regimes have been identified as a significant cause for the observed rise in the number of threatened species and communities since European settlement. Hence, implementation of ecologically appropriate fire regimes has a significant role to play in the management of threatened species and communities. Target fire regimes may be prescribed for the conservation of a single species through to communities. These must conform with any State or Federal recovery plans or conservation advices and be in consultation with the relevant recovery team if it exists. They will also take account of any relevant ecological fire management strategy.

For example, the Small-flowered Daisy-bush, *Olearia microdisca*, is a nationally endangered obligate seeding species that is endemic to fragments of remnant vegetation in eastern Kangaroo Island. *O. microdisca* is an early successional species (Davies, 1996; Jusaitis, 1993) with the majority of sub-populations found in areas regenerating from a significant disturbance event such as vegetation clearing or fire.

The exclusion of fire from *O. microdisca* habitat has been identified as a key component in the senescence of this species. To examine the response of *O. microdisca* to fire, a 3.9 ha area of habitat adjacent to Kingscote Airport was prescription burnt and fenced from grazing in October 2003. The number of *O. microdisca* within monitoring plots in the burn area increased from an average of 3.6 per m<sup>2</sup> prior to the burn to 1031.6 per m<sup>2</sup> two years after burning. In contrast, the number of *O. microdisca* in adjacent unburnt (control) habitat fell over the same time period from 3.2 per m<sup>2</sup> to 1.0 per m<sup>2</sup> (EPFTWG, 2008).

### **Fauna habitat or vegetation management**

Fauna habitat management for more common species uses the same principles as threatened species management.

### ***Landscape fire management***

Landscape protection burns are prescribed burns which primarily aim to reduce fuel hazard across a range of areas in a landscape to reduce the likelihood of a whole reserve or large contiguous block of vegetation burning in a single fire event. The short term goal of this form of burn is fuel reduction (for the benefit of broad landscape/ecological values). The frequency of burning for landscape protection burns must comply with the EFMG for the MVS in which it is conducted. This, therefore, separates this type of fuel reduction burn from those used for A- and B-zones.

#### **4.4.4 Impacts on MNES**

The implementation of the ecological fire management measures in the policy is expected to result in significant beneficial impacts to MNES. Inappropriate fire regimes, including absence of fire, is a threatening process for many threatened species and ecological communities. An example is provided above for the Small-flowered Daisy-bush. The Sandhill Dunnart (*Sminthopsis psammophila*) has been shown to favour large spinifex (*Triodia* species) hummocks that have started to die off in the centre as nest sites. These only form at 5 – 10 years post fire, and at present only comprise about five per cent of the available hummocks. It is believed altered fire regimes (reduction in Aboriginal burning practices) have resulted in long unburnt patches of the landscape with a high proportion of senescent *Triodia* hummocks that are unsuitable for nesting. Many other examples can be provided where the absence of ecological burning may result in the regional or national extinction of a species or ecological community.

It cannot be assumed, however, that prescribed burning undertaken in accordance with an EFMG will be beneficial to all MNES. While an EFMG is designed to achieve conservation objectives at a landscape level, adverse impacts could still occur at a site level. Species requiring different fire regimes can co-exist at a site. A fire regime which favours one species may eventually result in the loss of the other species. Some fauna species may even prefer long unburnt habitat for denning and recently burnt habitat for feeding. Consequently, it is impossible to meet the needs of all MNES at every site. Of more relevance is whether MNES are conserved at the landscape level.

On balance, it is considered the Policy will result in good conservation outcomes for MNES across the landscape. In particular:

- the Policy ensures there is a diversity of fire regimes across a landscape
- the EFMG allow for unplanned events (i.e. bushfire) ensuring the Policy is flexible in adapting to changed circumstances
- MNES are still considered at the site level through Prescribed Burn Plans. Prescribed burns detrimental to MNES would have mitigation measures or would not proceed if the risk was unacceptable
- While species may have desired fire regimes, they may still persist in areas with less desirable regimes.

The process for ecological burning is comprehensive and informed by best available information. There are still large knowledge gaps relating to the vital attributes of many flora species and the habitat requirements and life history traits of fauna species. The EFMG and EFMS represent the current best knowledge and will be updated as new data and information becomes available. DEWNR will review the EFMGs in five years' time or sooner if there is a significant change in the underpinning knowledge. EFMSs will be reviewed every 10 years, or at the request of the relevant Recovery Team/experts, or if significant new knowledge about the issue/species becomes available.

#### 4.5 Other measures

A procedure for the management of earthmoving equipment used in fire management activities is included in the *DENWR Fire Management Policy and Procedure Manual* (DEWNR, 2013). DEWNR has disinfection units available to be used when activities need to occur in Pc infected areas. DEWNR also has a *Standard Operating Procedure on Phytophthora Threat Management* (DEH 2002) which applies to all activities in Pc risk areas. A risk approach to decisions to conduct prescribed burning in Pc risk areas is used when MNES occur in areas proposed for prescribed burning.

#### 4.6 Summary and conclusion

The Policy ensures impacts on MNES are considered at both the landscape and site scale. The measures used to avoid or mitigate impacts on MNES are summarised in Table 13.

**Table13: Fire Management Mitigation Tools**

Tool	Outcomes
<b>Fire management planning (Section 3.1 of the Policy)</b>	
Fire management zones for asset protection, buffer and conservation zones are applied to manage identified risks to the MNES (Section 5.1 of the <i>Policy</i> )	MNES are zoned in zone where management of fire regimes for conservation outcomes is priority (C-zone)
Application of alternative treatments (such as mechanical or chemical) (Section 2.2.2 of the <i>Policy</i> )	Minimal impacts methods are used to reduce/avoid impact to MNES
Application of EFMGs and EFMSs (Section 5.2 and 5.3 of the <i>Policy</i> )	Appropriate ecological fire regimes are identified for the conservation of MNES
Undertake invasive species control	Impact to MNES from invasive species is minimised (particularly post burning)
Apply adaptive management (Section 5.5 of the <i>Policy</i> ).	Uncertainty (lack of knowledge) is reduced by learning from management actions
<b>Operational Planning (Section 3.2 of the Policy)</b>	
Use alternative fuel reduction methods (Section 2.2.2 of the <i>Policy</i> )	Minimal impacts methods are used to reduce/avoid impact to MNES
Apply EFMGs and EFMS at the local scale	Appropriate ecological fire regimes are identified for

(Section 5.2 and 5.3 of the Policy)	the conservation of MNES
Exclusion of particular areas from and activity	Avoid unacceptable impacts to MNES
Protection of key environmental values	Protect MNES from impacts from fire management activities
Undertake weed control post-burn	Impact to MNES from invasive species is minimised (particularly post burning)
Undertake disease prevention measures	Impacts to mattes of NES from the introduction or spread of <i>Phytophthora cinnamomi</i> is minimised
<b>Burn Risk Assessment</b>	
BRAT provides a standardised framework to assess the immediate short term risk of implementing the on-ground fire management activity	Potential impacts to MNES in areas adjacent to prescribed burning are considered when assessing the risk of conducting burning (including impacts of escapes from burning)
The BRAT is used by the Incident Controller in approving the final decision to implement the burn	Risks to MNES are considered in operational decisions

Likely impacts on MNES are summarised below.

#### 4.6.1 Impacts on biological matters

The identification of issues of concern, and of potential threats to listed species and communities occurs at a number of stages during the implementation of the Policy: firstly, at the landscape level to develop the FMP; and secondly, at the site-specific level to develop on-ground operational plans. Application of the risk assessment for fire management activities at differing spatial scales ensures that:

- a 'whole of population' approach to fire management occurs for the protection of threatened species and for the full extent of occurrence of ecological communities at the landscape scale during the development of FMPs
- consistent fire management planning is applied across the broader-scale landscape. This includes where adjoining land has shared natural and heritage values (including MNES) and/or fire-related risks, regardless of tenure
- detailed site-specific threats are identified and fire management approaches applied to protect local populations and sub-populations of threatened species and for local extent of occurrence of ecological communities at the local scale for on-ground fire management activities
- information from recovery plans, conservation advices, species or ecological community specific guidelines, peer reviewed scientific literature and expert advice is taken into account
- achievable, peer reviewed and DEWNR endorsed avoidance and mitigation measures at the appropriate scale within FMPs and operational plans are set.

The effectiveness of the management and mitigation measures applied, through all stages of the fire management process, will be determined through an evaluation, monitoring and reporting framework as part of the adaptive management process resulting in continuous improvement of avoidance and mitigation measures applied by DEWNR.

On balance, it is likely implementation of the Policy will result in:

- a small adverse impact to listed species and communities in A-zones and possibly some minor beneficial impacts
- both adverse and beneficial impacts to listed species and ecological communities in B-zones with the likelihood that net impacts will be minor
- a high likelihood of significant beneficial impacts on listed species and ecological communities in C-zones.

In considering the above analysis, it is important to recognise A-zones cover less than one percent of the DEWNR fire management area whereas C-zones cover over 95 per cent. Consequently, the Policy is likely to be resulting in significant beneficial impacts to listed species and communities at the state level and a small number of localised adverse impacts that are unlikely to be significant.

The other critical consideration is the cost of not implementing fire management measures in the policy. If fuel reduction measures are not undertaken, the risks to MNES from catastrophic wildfires increases. For example, the RSPCA estimates that well over one million animals (wildlife and domestic animals) died during the 2009 Victorian bushfires (RSPCA 2009). While cooler fires will leave a mosaic of burnt and unburnt land, providing some refuge and residual populations to recolonise burnt areas, severe fires can result in complete scorching of a landscape with loss of local populations of threatened species and potentially a major impact on regional populations. Critical impacts can also occur to other MNES. While fire management measures will not prevent bushfires, they can significantly reduce their number, extent and severity. It is clear that a 'do nothing' option presents a high risk of unacceptable impacts on MNES.

As noted in section 4.3.1, fire management activities with a residual risk of High are referred to the Native Vegetation Council for approval. All of these proposed actions were referred under the EPBC Act. Since 2000, when the EPBC Act came into effect, 14 referrals (covering 70 prescribed burns) have been referred to the Commonwealth for determination (see Section 14.1) from the DEWNR Fire Management program. These covered a range of species:

- Chestnut-rumped Heath-wren
- Fleurieu Peninsula Swamps
- Grey Box Grassy Woodland
- Kangaroo Island Dunnart
- Malleefowl
- Red-tailed Black Cockatoo
- Sandhill Dunnart
- Southern Brown Bandicoot
- Southern Emu-wren
- Yellow-footed Rock Wallaby.

In all cases, the delegate of the Commonwealth Environment Minister determined these referrals were unlikely to have a significant impact on a MNES and therefore did not require EPBC Act approval. All of these actions (burns) were planned and conducted using the normal DEWNR processes (as outlined in the Policy). This strongly supports the conclusion that the use of the processes and measures in the Policy will ensure the identification and appropriate management of MNES in conducting DEWNR's fire management activities.

#### **4.6.2 Impacts on wetland MNES (Ramsar wetlands)**

Other than the Bool and Hacks Lagoon, Ramsar wetlands in South Australia are in areas of low fire risk due to the large expanse of the lake (Coorong) or the remote, arid areas where they occur (Coongie Lakes). Bushfires occur infrequently in these areas, generally only in times of low water levels or during periods of drought when normally submerged areas are exposed and carry fuel. Hydrological changes due to fire management activities such as prescribed burning are unlikely.

Bool and Hacks Lagoon wetlands are surrounded by agricultural land and are perceived as a bushfire risk by surrounding landowners. The Reserves of the South East FMP has designated both Bool and Hacks Lagoons to be in Conservation Zones (C-zone) as there are no significant assets nearby. As such, any burning in these areas will be for ecological outcomes and the required EA and Ecological Rationale will ensure any significant impact to the ecological character of this wetland will be unlikely.

Unlike threatened species and ecological communities, where there may be uncertainty over whether they occur in an area, the location of Ramsar wetlands is mapped and known to fire

management planners. Consequently, they will be identified in the EA and impacts on their ecological character carefully considered.

#### **4.6.3 Impacts on heritage MNES (world and national heritage)**

The fossil and geological sites contained in the three EPBC Act listed heritage MNES occur in caves (Naracoorte), in rock deposits in very open vegetation (Nilpena) and in artesian pools surrounded by less fire-prone vegetation (Witjira-Dalhousie). They are also located in remote, arid areas of low bushfire risk. Thus there is a very low likelihood of impact to these values from prescribed burning and other fire management activities.

Prescribed burning could be used to assist weed management at Witjira-Dalhousie (and thereby enhance protected values). Otherwise, fire management activities are not likely to have any impact on the heritage values of these areas. Again, if prescribed burning was proposed, appropriate mitigation actions would be identified in the environmental assessment under the Policy.

## 5 Social and economic impacts

Since 1965, bushfires have caused 11% of insurance losses due to disaster in Australia (Insurance Council of Aust. data 2012). For South Australia, this proportion is 63% - the most significant single type of disaster. During the same period, 328 deaths (44 in SA) have occurred during severe bushfires. These economic and social losses, particularly during such catastrophic events, has shocked the community and cause both public and political outrage. In response to this, the principle of *Primacy of Life* was advocated by the Victorian Bushfire Royal Commission (VBRC 2009). This (giving the highest priority to reducing the risk of loss of life in high bushfire risk areas) has been incorporated into both the National (COAG 2012) and State (GoSA 2012) bushfire policy.

The DEWNR fire management program has, as its primary purpose, the reduction of risks to life and property from impact by bushfire. DEWNR's statutory obligation under the *Fire and Emergency Services Act*, to take *all reasonable steps to protect life and property*, strongly influences the application of fire management activities. The recently approved Code of Practice for Fire Management on Public Land (GoSA 2012) outlines the South Australian Government's goals for this.

This precedence of life will result in some impacts to MNES occurring, particularly in areas close to urban and residential areas. **This risk is acknowledged and accepted by this strategic assessment.** Implementation of the Policy will minimise any potential impacts to MNES, while achieving this outcome.

The policy is consistent with the principles of ecologically sustainable development as contained in section 3A of the EPBC Act. The principles, and how they have been addressed, are discussed below:

***Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations***

The zones applied through FMPs adopt a risk based approach that recognises the need to protect life and property but in a way that is targeted to ensure intensive fire protection measures are applied across relatively small areas. The environmental assessment and development of mitigation measures, where required, for prescribed burns and other fire management activities further ensures a high level of environmental protection while still meeting objectives to protect life and property. Consequently, the Policy seeks to achieve an acceptable balance between DEWNR's conservation objectives and the social and economic costs that would be incurred through inadequate fire protection.

**If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation**

The Policy adopts an adaptive management approach, to be formalised in an Adaptive Management Strategy, to ensure fire management is based on the best available science. Risks to MNES are considered through FMPs and through environmental assessments at the site level and action taken to mitigate risks, where needed. As noted in section 4.3.1, fire management activities with an Extreme residual risk are not permitted to proceed. Activities with a High residual risk can only proceed with the approval of the Native vegetation Council.

**The principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations**

The Policy seeks to maintain and improve conservation of biodiversity through FMPS and, in particular, application of the EFMGs. The Policy ensures that fire management activities directed at protection of life and property minimise their impact on the environment. Fire management activities, as provided for by the Policy, are required to reduce the risk of catastrophic bushfires. As noted in section 4.6.1, these can have major impacts on the health, diversity and productivity of the environment.

**The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making**

This is a fundamental consideration at both the landscape level and the site level. The way in which biodiversity and ecological integrity are addressed is described in section 4. As noted in section 4.6.1, on balance, it is likely implementation of the Policy will result in:

- a small adverse impact to listed species and communities in A-zones and possibly some minor beneficial impacts
- both adverse and beneficial impacts to listed species and communities in B-zones with the likelihood that net impacts will be minor
- a high likelihood of significant beneficial impacts on listed species and communities in C-zones.

**Improved valuation, pricing and incentive mechanisms should be promoted.**

This principle is not considered relevant to implementation of the Policy.

## 6 Assurance framework

### 6.1 Conservation commitments

The Policy ensures impacts on MNES are addressed in fire management activities. Section 5.2 of the Policy presents an assurance framework to provide a high degree of confidence to the Commonwealth Environment Minister that the Policy and associated treatments, management measures and controls will be implemented and will not result in unacceptable impacts on MNES. This section describes the commitments that DEWNR has made in the policy and describes how achievement of these commitments will be monitored and evaluated.

#### ***Commitment 1: Fire management will be based on the best available evidence relating to MNES***

DEWNR uses adaptive management to deal with the considerable uncertainty involved in both fire management and biodiversity conservation. Adaptive management involves:

- a process that allows mitigating actions for MNES to proceed while learning about the underlying uncertainty
- a feedback between current learning and future decision making
- monitoring of outcomes against specified performance indicators.

Monitoring conducted as part of an adaptive management approach informs future management actions by:

- providing data to improve fire prescriptions and planning
- providing data to improve ecological knowledge about fire effects
- using the prescribed burn program as a framework to inform knowledge of temporal components of fire regime.

Monitoring methods used for this purpose include:

- *All-species Assessment* to determine the effectiveness of using Key Fire Response Species as surrogates for all species
- *Fire Severity Assessment* to estimate the amount of vegetation impacted (including vegetation structure) following fire
- *Flora Indicator-species Assessment* to assess the effect of fire management actions in achieving objectives; verifying predictions with regard to the response of Key Fire Response Species; and improving understanding of confounding factors such as fire season, fire severity, drought and grazing on timing of life stage relative dominance on species that are indicators of overall vegetation condition
- *Habitat Assessment Survey* to identify changes in habitat across space and time which will assist in improving knowledge of habitat parameters and time since fire and also incorporate the needs of fauna into fire management planning at a landscape scale
- *Life-stage Assessment* to predict whether the vegetation in an area is likely to respond positively to burning at a particular time, ultimately assisting in the selection of burn areas
- *Vital Attributes Assessment* to determine tolerable fire intervals for different vegetation types by examining the vital attributes of component species, and determining the effects of confounding factors such as fire season, fire severity, drought and grazing.

Monitoring measures and indicators will be evaluated after a suitable period to enable a judgement of whether any management actions directed to MNES had the desired outcome(s) in protecting or promoting the MNES that occur in the area of activity. If successful, the activity may be applied again to other areas or similar situations. If not successful, an understanding of why the desired outcome was not achieved needs to be found, so that similar management activities can be avoided or conducted again (with appropriate modification) without impacting on the relevant matter(s) of MNES. This use of monitoring to facilitate learning is part of the adaptive management cycle and will lead to improvements in protection or enhancement of MNES values through time. Additional long term

monitoring will be conducted to collect data required to improve decision-making and facilitate improved knowledge.

As noted in Section 4.4 of the Policy, DEWNR intends to formalise its approach to adaptive management by developing an Adaptive Management Strategy. The DEWNR Adaptive Management Strategy will reduce levels of uncertainty around the Policy's commitments to MNES by improving knowledge through research, monitoring and performance evaluation, and by supporting a range of fire management options that can provide some resilience to natural variation. This will ensure monitoring and learning informs future policy, procedures and strategies. Implementation will commence in the Adelaide Mount Lofty Ranges region, where a significant part of the prescribed burning program is occurring. Implementation of the Adaptive Management Strategy will be extended to the rest of the state based on risk to significant values (including MNES) and available resources.

The Adaptive Management Strategy will be submitted for approval to the Commonwealth Minister within an agreed timeframe. Once approved by the Commonwealth Minister, the Adaptive Management Strategy will be implemented.

An important procedure for imparting current knowledge on MNES is through development of EFMS. DEWNR will continue to develop EFMS for MNES in fire prone areas that are regularly impacted by fire management activities.

***Commitment 2: MNES will be protected and enhanced at the landscape level (IBRA sub-region and FMP) through implementation of the Policy***

The policy will ensure MNES will be protected and enhanced at the landscape level (IBRA subregion and FMP), noting that some adverse impacts may occur at the site level due to the need to protect life and property, or give preferential treatment to some MNES at the expense of others. The primary mechanisms for achieving this outcome will be through development of fire management plans and implementation of the EFMG in C zones.

DEWNR Fire Management has developed methods to analyse and present evaluations of landscape fuel management achievements and assessments of the status of landscape ecological fire regime (from EFMG). Annual analyses commenced in 2012. Presenting ecological fire regime analyses (maps) gives fire managers, for the first time, a spatial indicator of where in the landscape habitats and vegetation types of young, intermediate and old growth stages are and if the spatial requirements (in EFMG) can be sustained. Areas more vulnerable to bushfires or frequent burning can be identified and protection or mitigation measures focused there. Similarly, areas that are long unburnt and require protection (to maintain this stage) or may contain senescing habitat and be suitable for ecological burning, can be seen. This same landscape approach will be applied, where appropriate, to MNES. For example, Red-tailed Black Cockatoo feeds in habitats that have not been severely burnt for at least ten years. Fire management would seek to protect sufficient suitable areas in this condition.

It is proposed (once developed), to extend this evaluation approach beyond DEWNR lands to form a more effective indicator informing environmental monitoring and reporting processes beyond parks and reserves (e.g. SA State of the Environment Report, which currently lacks comprehensive performance indicators for fire, NRM Annual Reports, DEWNR Annual Report).

***Commitment 3: Fire management activities that present a high residual risk of significant impact to MNES will not proceed without endorsement of the Native Vegetation Council.***

Where a residual risk of significant impact to environmental values, including MNES, from a proposed fire management activity is high, approval must be sought from the Native Vegetation Council. In A- and B-zones, (where the residual risk to life and property, after considering all practicable mitigation measures, is very high or extreme) the Council may approve activities for the protection of life and property.

DEWNR will report annually to the Department of the Environment on the outcome of and rationale for all prescribed burns that significantly impacted MNES where approval was sought from the Council.

***Commitment 4: Other than in circumstances specified in Outcome 3, fire management activities will not significantly impact on MNES***

DEWNR conducts monitoring in association with prescribed burns and other fire management activities (where relevant) to determine if:

- objectives for the burn/activity were met
- ecological objectives and mitigation actions identified in the relevant environmental assessment have been achieved.

The typical monitoring required for a Prescribed Burn is:

- *Ramble Surveys* to identify issues likely to be affected by a proposed burn/activity and inform the EA
- reporting of burn results (burn outcome, fuel hazard, fire behaviour, outcome of EA issues and completion of follow-up works), particularly where these are related to the protection of or impact on MNES
- monitoring of key issues identified in the environmental assessment (including MNES)
- collection of vital attribute data for flora & fauna (particularly for species with incomplete data and for all MNES)
- mapping area burnt & burn severity (where possible).

Ecological burns require specific monitoring relating to the objectives and achievements of the burn to be developed (See Section 4.3 of the Policy). These need to measure the relevant aspects of condition or distribution that relate to the fire regime or other fire management outcome being implemented and demonstrate whether the improvement planned was, or was not, achieved. Where MNES are the subject of ecological burning, monitoring methods will be based on those outlined in the conservation advice, recovery plans or advice from recovery teams. Other monitoring requirements to address key fire management issues and knowledge gaps will be identified in the DEWNR Fire Adaptive Management Strategy (Section 4.4 of the Policy) and in annual fire delivery programs.

## 6.2 Reporting

Reports summarising the outcomes of the Prescribed Burn/ Significant Works environmental assessments conducted each year (financial) are submitted to the Native Vegetation Council. This report includes all burns, significant new works conducted, assessment outcomes, mitigation measures conducted, and monitoring results (where relevant).

Public reporting of DEWNR fire management activities has been confined to bushfire occurrence and prescribed burning performance statistics supplied in the DEWNR Annual Report (e.g. DENR 2012). These give summary information on the areas of prescribed burning conducted and highlight achievements of the DEWNR Fire Management program. In 2010, DEWNR commenced reporting prescribed burning goals set by the South Australian Government (now in the *Code of Practice for Fire Management on Public Land*, GoSA 2012), along with other South Australian land management agencies.

DEWNR will also report annually to the Department of the Environment as specified in Table 3 in the Policy.

## 6.3 Auditing

Regular formal audits of implementation and compliance of the Policy, as set out in Section 5.4 of the Policy, have not commenced to date. On successful completion of this strategic assessment and endorsement of the Policy, DEWNR Fire Management will audit samples of the standards, procedures and achievements annually. Audits of local areas or parts of the Policy can be conducted more frequently, particularly in response to previous performance evaluation. These audits will be conducted internally by DEWNR as a peer review using staff not involved in the fire management activities being audited and with appropriate knowledge of MNES, other biodiversity matters, the Policy and fire management activities. The results of audits will be forwarded to the DEWNR Group Executive Director, Partnerships and Stewardship and to the Department of the Environment. A summary of the audit report will be publically available by request. Audit findings will be used to inform, identify and improve areas of implementation of the Policy not meeting required standards. The Group Executive Director will ensure audit recommendations are implemented by the appropriate DEWNR staff.

A major audit of all aspects of implementation of the Policy will be conducted every five years using an independent expert agreed to by the Commonwealth Minister and the resulting report will be forwarded to the Department of the Environment. The Group Executive Director will ensure audit recommendations and any Department of the Environment response are implemented by the appropriate DEWNR staff.

The results from longer term monitoring (i.e. not performance monitoring) will be published at regular intervals (e.g. a summary of results at 3-5 years or when significant data has been collected and analysed) and when significant results are available (after formal analysis has been undertaken). Where appropriate, results will be submitted to a peer-reviewed scientific journal – where this is not appropriate, results will be published in DEWNR reports and made available on DEWNR's web site.

The reporting provisions to the Department of the Environment outlined in Section 5.2 of the Policy are new, and will be implemented once the Policy is endorsed.

The findings and recommendations from annual reporting, audit and long term monitoring will form an important component of the continuous learning and adaptive management process of the Policy.

## 7 Uncertainty, risk and adaptive management in fire management

### 7.1 Uncertainties relating to fire management treatments

Systematic assessment of risk is a difficult process involving the integration of data analysis, expert opinion and significant uncertainties. While DEWNR uses the best available data, together with available expert opinion, to develop specific assessments of the risks from fire management activities to MNES, uncertainties will still exist.

There are three types of uncertainties which affect fire management assessments and decisions:

- incomplete knowledge
- alternate knowledge frameworks (i.e. differing opinions on how information should be interpreted)
- unpredictability (caused by natural variation that occurs in nature).

All three types of uncertainties can contribute towards reduced predictability in relation to potential impacts of fire management treatments. For example, unexpected weather conditions can result in fire conditions during prescribed burning being different than predicted. Other factors requiring consideration include:

- the existence of a wide range of public opinion for and against prescribed burning, despite the growing scientific knowledge about its key role in Australian ecology
- the response of a specific species to a planned fire may be different to what was expected, due to ecological uncertainties, variation in climatic and edaphic factors
- the significant uncertainties around the interpretation of available information
- the importance of addressing issues through community engagement programs.

DEWNR attempts to reduce the levels of uncertainty by:

- using the best available data/information and expert advice
- improving knowledge through research, monitoring and performance evaluation
- supporting a range of fire management strategies that provide some resilience to natural variation
- applying the principles of adaptive management.

### 7.2 Uncertainties relating to climate change

A major area of uncertainty relating to the effectiveness and environmental impacts of DEWNR's fire management relates to the impacts of climate change. Hennessy et al (2005) found that rainfall in south-east Australia has decreased since 1950, a phenomenon associated with an increase in both drought severity and incidence of extremely hot days. Lucas et al (2007) predict this trend will increase under climate change and will result an increase in higher fire danger days at key sites in the south-east region in SA. In southern SA, it is predicted that frequencies of days with very high or extreme Forest Fire Danger Index (FFDI) ratings will increase by:

- 2–8 per cent by 2020
- 3–26 per cent by 2050.

Lucas et al. (2007) also predict more intense fire seasons, starting earlier and ending slightly later. The window for prescribed burning will narrow towards winter with higher fire-weather risk in spring, summer and autumn.

Major increases in fire weather are projected in southern winter-rainfall dominated regions of Australia. Projections of large-scale changes in mean and extreme FFDI are not consistent enough between models to provide unequivocal conclusions for 2050, although there is some indication of an earlier fire season (Clarke et al 2010). In an analysis that extended beyond fire weather to the other drivers of Australian fire regimes (biomass growth, availability to burn and ignition), Bradstock (2010) concluded

that future change may be limited in the tropics, but fire activity may increase in temperate forests in the south of the country. This study also suggested increasing dryness may lead to a decrease in fire activity in dry woodlands, which occupy much of SA. Changes in the frequency of fires on an annual or fire-season basis will not be detectable (in a statistical sense) from the natural variability for at least many decades. However, it is possible that observed warming is already moving the fire season forward in ways that could be detectable (Clarke et al 2010).

Bradstock (2010) and Williams et al (2009) have investigated the interactions of impact of climate change on the management of fire in areas managed for biodiversity conservation and suggest the future climate, biodiversity and fire regime impacts in Table 13.

**Table 13: Predicted Impacts of Climate Change (adapted from Bradstock 2010)**

Global change attribute	Arid woodlands	Temperate grassy Woodlands	Temperate dry sclerophyll forests
Rainfall	decrease	decrease	decrease
Temperature	increase	increase	increase
Evaporation	increase	increase	increase
Fire danger (very high to extreme days per year)	Increase‡	increase	increase
Sensitivity (direction of change in mass) of main fuel types to: (1) climate change and (2) elevated CO <sup>2</sup>	Perennial grasses and annual herbs/grasses (1) decrease (2) decrease	Perennial grasses and annual herbs/grasses (1) decrease (2) decrease	Woody plant litter (1) decrease (2) increase
New plant functional types	Buffel grass	Tree plantations	Exotic grasses
Trend in ignitions	+Anthropogenic	-Anthropogenic	+Anthropogenic

The primary implication of this analysis is that the interaction of fire regimes and biodiversity under future climates is very complex, with different ecosystems responding differently. Any future affects due to climate change will be addressed by implementing the Policy's adaptive management strategy and principles.

## 8 Consultation

Public and stakeholder feedback has been sought on the Assessment Report for four weeks (this commenced on 28th February 2014). Nine public submissions were received. There was general support for the approach of the *Policy* and Assessment Report. Many comments were of a minor nature which required clarification, or DEWNR agrees with the comment. These have been incorporated into or clarified in this final report.

The allocation of adequate resources to DEWNR to implement the *Policy* was raised as a concern by several submissions. While this issue is strictly outside of the scope of this assessment (only the *Policy* is being assessed), DEWNR acknowledges that for the *Policy* to be successful in protecting MNES, sufficient resources are required to implement it.

The most significant feedback issues were:

1. The apparent lack of independence and transparency in the audit process proposed and
2. The potential clash of the 5% Government burning target with ecologically appropriate fire regimes in C-zones, particularly in the Mt Lofty Ranges.

### 8.1 Audit

Audits will be conducted in line with SA Government Policy and general best practice. Annual audits will not be conducted by staff directly involved in the areas being audited (as per general practice in internal auditing). DEWNR considers the cost of third party annual auditing would not be warranted by the benefits achieved, given information on ecological impacts of fire management activities needs to be collected over a number of years. Five years is an appropriate interval for a third party audit. However, to ensure greater transparency, DEWNR will make the audit criteria, results of annual and third party audits publically available.

DEWNR is happy to provide a range of reporting to interested stakeholders and will take this issue up directly with key stakeholder groups. In addition, as noted in section 5.2 of the *Policy*, annual reports to the Commonwealth Department of the Environment will be made publically available.

### 8.2 5% Burning Target

The 5% burning target arose from an expert panel convened by the Victorian Bushfire Royal Commission (VBRC). Based on this advice, the VBRC recommended that *the State (Victoria) fund and commit to implementing a long-term program of prescribed burning based on an annual rolling target of 5 per cent minimum of public land*. In response to this the SA Government has directed that *a rolling program of strategic fuel management works is implemented annually across 5% of high risk areas of native vegetation on public lands*.

Several points need to be made in implementing this in SA: 1) the recommendation does not address fuel reduction burning on private land and public land managers only manage 27% of native vegetation in the Mt Lofty Ranges; 2) for prescribed burning to be effective, a risk based approach needs to be adopted across the landscape, considering conservation and biodiversity values with risk to life and property given highest priority.

There has been a significant level of research in fire science since 2009 and the findings of this research support prescribed burning as an effective risk reduction tool, but also identifies that it is not effective alone to reduce bushfire risk. Given this, it is timely to review where and how prescribed burning can be best used to reduce the risk of impact by bushfire.

It is proposed that a working group will be tasked to define 'High Risk' areas for impact from bushfire. These areas will be mapped as accurately as possible. This Working Group will report to the Ecological & Technical Reference Group of the State Bushfire Coordinating Committee. The group will also review the levels of fuel treatment required (for each Fire Management Zone). Potential fuel treatment effectiveness will be reviewed using the Bushfire Risk profile method developed by the Victorian Department of Environment & Primary Industries.

## 9 Conclusion

This assessment report has been prepared to meet the requirements of a strategic assessment of DEWNR's *Fire Management Environmental Assessment and Management Procedure* (the *Policy*), consistent with agreed *Terms of Reference*. In determining whether to endorse the policy, the Commonwealth Environment Minister will have regard to the extent to which the policy, plan or program meets the Objects of the EPBC Act, in particular, that it:

- protects the environment, especially matters of national environmental significance
- promotes ecologically sustainable development
- promotes the conservation of biodiversity
- provides for the protection and conservation of heritage.

Impacts on MNES are summarised in section 4.6 of this assessment report. This notes that, on balance, it is likely implementation of the Policy will result in:

- a small adverse impact to listed species and communities in A-zones and possibly some minor beneficial impacts
- both adverse and beneficial impacts to listed species and communities in B-zones with the likelihood that net impacts will be minor
- a high likelihood of significant beneficial impacts on listed species and communities in C-zones.

The report further notes C-zones cover over 95% of DEWNR managed land meaning significant benefits are likely to occur across almost all of this land. The report concludes impacts on heritage values will be minimal and fire management potentially may result in better management of some heritage sites.

Importantly, the report notes the 'do nothing' option, i.e. not undertake fire management activities, carries an unacceptable risk of catastrophic damage to MNES along with life and property. Such an approach is not consistent with the principles of ecologically sustainable development.

The Commonwealth Environment Minister's endorsement criteria also require that the policy, plan or program should avoid actions being taken in any location that have an impact on matters of national environmental significance. Where potential impacts cannot be avoided, then the impacts should be reduced to an acceptable level through effective mitigation.

The Policy will ensure actions are not taken that will adversely impact on Ramsar wetlands or heritage sites. The assessment report note the Policy focuses on conservation of species and ecological communities at the landscape level. This means adverse impacts could occur at the site level. These impacts are mitigated through the Prescribed Burn Plan and Works Plan procedure described in section 4.3 of this report.

Finally, the endorsement criteria require the policy, plan or program to contain an effective system of adaptive management that also includes addressing uncertainty and contingency management. This system should include procedures for monitoring, independent auditing and public reporting on implementation.

This system is described in Chapter 6 of this report. An assurance framework is included in section 5.2 of the Policy. The Policy includes a commitment to formalising and refining adaptive management procedures currently applied in an Adaptive Management Strategy.

DEWNR considers the Policy is suitable for endorsement by the Commonwealth Environment Minister under section 146 of the EPBC Act and that fire management activities undertaken by DEWNR in accordance with the Policy should be approved by the minister under section 146B of the EPBC Act.

## 10 Information Sources

### 10.1 Data

The key data sources used in the preparation of this Strategic Assessment and for implementation of the *Policy* are:

Protected matters search tool (<http://www.environment.gov.au/epbc/pmst/index.html>);

DEWNR / State of South Australia data:

- Biological Database of South Australia (BDBSA) known species records in SA
- SA Biological Survey records
- State Herbarium of SA (Adelaide) records
- SA Museum records
- SA Frog Atlas (SA Frog Census) records
- Birds SA records
- Birds Australia records
- Australasian Wader Study Group records
- DEWNR staff and public opportune records
- DEWNR SDE (spatial data and databases)
- data shared spatial data sets from other Agencies;
- DEWNR regional datasets;
- The Australian Ramsar wetlands database (<http://www.environment.gov.au/water/topics/wetlands/database/index.html>)
- Recovery plans, conservation advices and species and ecological community specific guidelines;
- Relevant technical experts;
- Published scientific literature;
- Register of Aboriginal Heritage Sites and Objects;
- South Australian Heritage Register (<http://www.planning.sa.gov.au/go/SAheritagedatabase>); and
- Interested and known stakeholders (identified through pre-planning public advertising).

Uncertainty due to incomplete knowledge may be due to *bona fide* deficiencies in ecological or other knowledge, difficulties in accessing the existing literature, databases, or “experts”, and errors in existing data sources. All fire management planning, assessments and evaluations must use the best available information. All environmental assessments will be based on data stored in the various DEWNR corporate datasets, Department of the Environment data (Protected matters search tool ([www.environment.gov.au/epbc/pmst/index.html](http://www.environment.gov.au/epbc/pmst/index.html))) and supplemented with appropriate local expert knowledge. All data generated by Fire Management assessment and monitoring activities must be stored in the appropriate DEWNR corporate dataset.

DEWNR, including the State Herbarium of SA, is primarily responsible for managing and maintaining the state's core biodiversity data in collaboration with the SA Museum. Together the agencies maintain the state's reference collections of plants and animals, which support DEWNR biological databases. DEWNR has the primary responsibility in the Government of South Australia for:

- collecting, storing, maintaining, reporting and distributing South Australia's biodiversity information;
- encouraging high standards of biodiversity data management across the community; and
- ensuring appropriate scientific and ethical standards are met for diversity research and data collection.

National datasets, such as the National Vegetation Information System (NVIS), the EPBC Protected Matters Search Tool and other Commonwealth Environmental Resources Information Network (ERIN) hosted Information services use BDBSA data as a primary source of data for SA.

Responsibility for the storage and maintenance of SA data is held by the Science, Knowledge and Monitoring Branch within DEWNR. Well established relationships with SA Museum and State Herbarium curators and taxonomists support this function. Regular data exchanges occur with other SA Agencies and Commonwealth & inter-state data managers (e.g. Geoscience Australia, Department of the Environment, Department of Environment and Primary Industries Victoria, Office of Environment & Heritage NSW, Department of Parks and Wildlife WA). Commonwealth data is held by the Environmental Resources Information Network (ERIN), within the Office of Environmental Science and Economics of the Department of Environment. Ongoing data management and continuous review, taking account of periodic taxonomic revision, preserves record integrity and ensures the highest quality biological information is available to collectors, custodians and users alike.

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## 12 Glossary

**Annual Works Schedule** (Operations Plan) The regional plan that includes all works and activities to be implemented by a DEWNR Region over a year.

**Burn Risk Assessment Tool** Used in prior to commencing prescribed burn operations to assess prescribed burning risks versus benefits.

**Conservation Council of SA** An independent, non-profit and non-party political organisation representing over 50 member groups whose main purpose is conservation and protection of the environment

**Country Fire Service** Volunteer based fire and emergency service organisation working in South Australia's regional and semi-metropolitan areas. The CFS is the lead combatant agency for fire suppression in these areas.

**DEWNR Region** Eight areas of the state divided by DEWNR for management purposes. The regions are: Adelaide Region, South East Region, West Region, Outback Region, Murraylands Region, Kangaroo Island Region, Northern and Yorke Region and Alinytjara Wilurara Region). Responsibility for regional operations lies with each Regional Manager.

**Ecological Burn** Treatment of vegetation in nominated areas using fire, primarily to achieve specified ecological objectives

**Ecological Burn Rationale** Document outlining the relevant conservation strategy/plan, ecological objectives, and the fire regime required to achieve the objectives of an Ecological Burn.

**Ecological Fire Management Guidelines** Guidelines that identify appropriate fire regime components (interval, frequency, spatial criteria, intensity and season) that are compatible with the conservation of broad flora and fauna identified within vegetation types in South Australia

**Ecological Fire Management Strategies** Strategies that identify appropriate fire management for the conservation of specific significant flora, fauna, communities or other identified issue.

**Environmental Assessment** Completed for all prescribed burns (as part of the Prescribed Burn Plan) and other fire management works where native vegetation is being cleared and not exempt under the *Native Vegetation Act 1991 (SA)*.

**Fire Access Track** A track designed, constructed and maintained for the safe passage of fire fighting vehicles.

**Fire Break** see Fuel Break

**Fire Prone Vegetation** Vegetation which is likely to carry fire, during summer months or drier periods of the year, each year (on average, most years).

**Fire Reporting Database** Repository for the official records of bushfires attended by DEWNR staff and prescribed burns conducted by DEWNR staff. Includes but not limited to the fire location, time, date, status, area burnt, etc.

**Forestry SA** The South Australian Government's plantation forest management agency.

**Friends of Parks** An independent state body representing the interests of 141 individual volunteer community groups and over 7000 individual volunteers in South Australia, who are each affiliated with a specific national park or historic site.

**Fuel Break** An area or strip of land where vegetation has been removed or modified to reduce the risk of fires starting and reduce the intensity and rate of spread of fires that may occur (GAFLC, 2005). Sometimes called a 'fire break'.

**Heritage Agreement** Private conservation areas established through an agreement between the SA Minister for Environment and Conservation and the landholder under the SA *Native Vegetation Act 1991*.

**Incident Controller** Officer responsible for all bushfire control activities at a bushfire.

**Key Fire Response Species** These are the species most susceptible to decline due to inappropriate fire regimes: either too frequent or too infrequent fire, low or very high intensity fire, or fire in a particular season.

**Landscape Protection Burns** A Landscape Protection Burn plans to reduce the likelihood of a whole Park Reserve or large contiguous block of vegetation burning in a single large fire event by reducing fuel hazard at strategic locations in the landscape

**Life History** The combination of attributes with respect to growth, shelter, food/nutrients and reproduction which determine species' requirements for existence (FEWG, 2004).

**Native Vegetation Council** Established under the provisions of the *Native Vegetation Act 1991* responsible for making decisions on a wide range of matters concerning native vegetation management in SA (including significant flora, fauna & plant communities, significant wetland environments, areas which have been extensively cleared, and impact from salinity & soil erosion). The Council in making assessments accesses the expertise of staff of DEWNR (Herbarium, Threatened Species Unit, Science Monitoring & Knowledge Branch), as well as State & National Recovery Teams, appropriate University researchers and other experts on the above issues.

**Native Vegetation Council's Fire Sub-committee** Responsible for making decisions on matters concerning fire management in native vegetation in SA.

**National Parks and Wildlife Council** established under the *National Parks and Wildlife Act 1972 (SA)* as South Australia's peak advisory body on the management of the state's iconic parks and wildlife.

**Natural Resources Management Boards** eight regional boards established under the SA *Natural Resources Management Act 2004* to provide an integrated and coordinated approach to the management of soil, water, coastal and biodiversity assets.

**Overall Fuel Hazard** The sum of the influences of bark fuel, elevated fuel and surface fine fuel (DENR, 20011a).

**Phytophthora** (*Phytophthora cinnamomi*) A soil and waterborne mould that causes disease and death of a variety of native and introduced plant species.

**Planning Team** Group established to provide information, advice, technical and scientific expertise into a DEWNR Fire Management Plan. The Planning Team assists in decision-making throughout the DEWNR planning process

**Prescribed Burn Plan** The plan which is approved for the conduct of prescribed burning. It contains a map identifying the area to be burnt and an environmental assessment. It incorporates the specifications and conditions under which the operation is to be conducted.

**Protected Areas** Land proclaimed or reserved for conservation purposes pursuant to the *National Parks and Wildlife Act 1972 (SA)*, *Crown Lands Management Act 2009 (SA)* or the *Wilderness Protection Act 1992 (SA)* in South Australia.

**Ramble Survey** A field survey conducted to compile an annotated inventory of vegetation types and vascular plant taxa for the proposed prescribed burn area.

**Ramsar Convention** The Convention on Wetlands of International Importance especially as Waterfowl Habitat done at Ramsar, Iran, on 2 February 1971, as amended and in force for Australia from time to time.

**Recovery Plan** Adopted by the Commonwealth Environment Minister for species and ecological communities listed under Section 269A of the Environment Protection and Biodiversity Conservation Act

1999 (Cwth). The plan contains strategies to maximise the long term survival in the wild of threatened species or communities.

**Regional Consultative Committee** Nominated stakeholder reference group dealing providing advice on conservation and park management issues.

**Regional Ecologist** DEWNR officer responsible for biodiversity and ecological management matters in a DEWNR Region. The title of officers performing this role may vary from region to region, e.g. *Manager Conservation Programs, Manager Biodiversity Programs*. In Adelaide Mt Lofty Ranges Region, the *Fire Ecologist* performs this role for specifically for the fire management program.

**Regional Manager** DEWNR Manager responsible for each of the eight DEWNR regions.

**Reserve Management Plan** Plan written to identify the vision for the reserve and the objectives and strategies necessary to meet that vision. Adopted by the Minister for Environment and Conservation (SA) under the *National Parks and Wildlife Act 1972 (SA)* and *Wilderness Protection Act 1992 (SA)*.

**Stakeholder Reference Group** Key interest groups or individuals consulted during the development of a fire management plan.

**Thresholds of Potential Concern** The limits of tolerance to a particular fire regime.

**Vital Attributes** The key life history features which determine how a species lives and reproduces. With respect to fire, these attributes govern how a species responds to fire and/or persists within a particular fire regime (FEWG, 2004).

**Weed of National Significance** 20 priority weeds that pose future threats to primary industries, land management, human or animal welfare, biodiversity and conservation values at a national level.

## 13 Abbreviations / Acronyms

BRAT	Burn Risk Assessment Tool
CAMBA	China Australia Migratory Bird Agreement
COAG	Council of Australian Governments
DEH	(The former) Department for Environment and Heritage (SA); now Department of Environment, Water and Natural Resources
DENR	(The former) Department of Environment and Natural Resources (SA); now Department of Environment, Water and Natural Resources
DEWHA	(The former) Department of Environment, Water, Heritage and the Arts (Cwth); now Department of the Environment
DEWNR	Department of Environment, Water and Natural Resources
DWLBC	(The former) Department of Water, Land and Biodiversity Conservation: now Department of Environment, Water and Natural Resources
EA	Environmental Assessment
EFMG	Ecological Fire Management Guidelines
EFMS	Ecological Fire Management Strategies
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FFDI	Forest Fire Danger Index
FMP	Fire Management Plan
GAFM	South Australian Government Agencies Fire Management committee
IBRA	Interim Biogeographic Regionalisation of Australia
JAMBA	Japan Australia Migratory Bird Agreement
MNES	Matters of National Environmental Significance
MVS	Major Vegetation Sub-Group
NRM	Natural Resources Management
NRMMC/PIMC	Natural Resources Management Ministerial Council & Primary Industries Ministerial Council
Pc	<i>Phytophthora cinnamomi</i>
SA CFS	South Australian Country Fire Service
SEWPaC	(The former) Department of SEWPaC, Environment, Water, Population and Communities; now Department of the Environment
TPC	Thresholds of Potential Concern

## 14 Appendices

### 14.1 Past referrals by DEWNR under the EPBC Act of fire management activities

Location	Proposed Action	Date	Reference	Principle Matter of NES	Determination
Stipiturus Conservation Park, Fleurieu Peninsula	Prescribed burning in Autumn 2012	29 Feb 2012	2012/6300	Southern Emu Wren Fleurieau Swamp	Not Controlled Action a
Central Mount Lofty Ranges SA (Belair NP, Sturt Gorge RP, Onkaparinga River NP)	Prescribed Burning in Grey Box Grassy Woodlands (3 Prescribed Burns)	08 Nov 2011	2011/6184	Grey Box Grassy Woodlands	Not Controlled Action a
Central Mount Lofty Ranges	Prescribed burning in Grey Box Grassy Woodlands	04 Oct 2011	2011/6135	Grey Box Grassy Woodlands	Proposal withdrawn
Eastern Kangaroo Island Plains,	Phase 3 Eastern Plains Fire Trial (6 Prescribed Burns)	16 Aug 2011	2011/6076	15 threatened plant species	Not Controlled Action a
Parndana Kangaroo Island CP,	Parndana SWER Line Prescription Burn	04 Feb 2011	2011/583	Southern Brown Bandicoot	Not Controlled Action a
Upper South East	Prescribed Burn for Messent Conservation Park	14 Oct 2009	2009/5130	Malleefowl	Not Controlled Action a
Eastern Kangaroo Island Plains,	Phase 1 Eastern Plains Fire Trial (40 Prescribed Burns)	04 Mar 2009	2009/4780	15 threatened plant species	Not Controlled Action a
Scott Creek Southern Mount Lofty Ranges CP,	Prescribed burn	14 Feb 2007	2007/3291	Southern Brown Bandicoot	Not Controlled Action, if undertaken in a particular manner a
Eastern Kangaroo Island Plains,	Prescribed research burns (5 Prescribed Burns)	05 Sep 2005	2005/2294	15 threatened plant species	Not Controlled Action a
Hog Bay Road, Dudley Peninsula, Kangaroo Island	Prescribed burn	14 Sep 2004	2004/1782	15 threatened plant species	Not Controlled Action a
Kangaroo Island	Ecological Burn To Stimulate Endangered Plant	10 Sep 2003	2003/1184	15 threatened plant species	Not Controlled Action a
Rocky River Precinct, Flinders Chase NP, Kangaroo Island	Controlled Burning Regime (8 Prescribed Burns)	21 Sep 2001	2001/450	Kangaroo Island Dunnart	Not Controlled Action a
Gosse-Ritchie Rd, Flinders Chase National Park, Kangaroo Island	Planned Burning Event	21 Sep 2001	2001/448	Kangaroo Island Dunnart	Not Controlled Action a
Rocky River Precinct, Flinders Chase NP, Kangaroo Island	Controlled Burn	2000	unavailable	unavailable	Not Controlled Action a

## 14.2 Compliance with Terms of Reference

Requirement in Terms of Reference	Relevant section of report
<b>1. PURPOSE, DESCRIPTION AND APPLICATION</b>	
The Report, referred to in clause 5.3 of the Agreement, must describe the Policy including:	
(a) component policies and procedures	1.5
(b) processes for implementing the Policy, including through relevant environment, nature conservation, planning and natural resource management legislation	1.5
(c) how the Policy has been developed and its legal standing	2.3
(d) the location and conservation values of lands under the care and control of the Minister for Environment and Conservation;	2.1, 14.3
(e) the person/s or authority/ies responsible for implementing the Policy and the Report	2.4.5
(f) land tenure to which the Policy applies	2.1, 14.3
(g) the actions or classes of action (i.e. treatments, e.g. planned burning, fuel break construction), including their short, medium and long term aspects, that are implemented under the Policy's provisions. This should include: <ul style="list-style-type: none"> <li>(i) a description of where in the State treatments are applied</li> <li>(ii) the timing, interval, extent and intensity of treatments;</li> <li>(iii) the circumstances in which those treatments are applied (the why and where); including for multiple treatments in the same location, and the reasons for the treatment/s being considered necessary; and</li> <li>(iv) the forecast response and relative effectiveness of those treatments in achieving fire management objectives.</li> </ul>	2.2
<b>2. PROMOTING ECOLOGICALLY SUSTAINABLE DEVELOPMENT</b>	
<b>2.1 Social and Economic Matters</b>	
The Report should describe the environmental, social and economic need for the Policy, and identify and analyse any socio-economic issues associated with implementing the Policy. This should include identifying and analysing social and/or economic risks of implementing the Policy, and describe how those risks will be avoided or mitigated.	5
<b>2.2 Management planning for ecological sustainability</b>	
The Report must describe how implementing the Policy will maintain or enhance ecological integrity and the conservation of biodiversity. To this end, the Report should describe of how the Policy gives effect to national strategies developed by the Council of Australian Governments, including for:	
<ul style="list-style-type: none"> <li>(a) the national reserve system;</li> <li>(b) pest plants and animals;</li> <li>(c) managing native vegetation;</li> <li>(d) biodiversity conservation;</li> <li>(e) climate change adaptation; and</li> <li>(f) wetland and water resource management.</li> </ul>	2.3, 7.2, 8
The Report should also explain how State strategies, laws, action plans and approvals processes relate to the Policy so as to achieve ecologically sustainable fire management.	2.3
<b>3. PROTECTING AND CONSERVING BIODIVERSITY AND HERITAGE VALUES, AND MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE</b>	
<b>3.1 Nature of potential impacts.</b>	

The Report must analyse the potential impacts of implementing the Policy and associated treatments on lands with biodiversity and/or heritage values, and matters of national environmental significance. The analysis must include:	
(a) the nature and location of lands managed by the State Minister, and attendant biodiversity and/or heritage values, including those values listed or potentially listed under State legislation;	2.1, 3, 14.3
(b) matters of national environmental significance, including those potentially eligible for listing;	3
(c) a description of potential direct and indirect impacts (as defined by Section 527E of the EPBC Act) and associated consequences, including beneficial impacts, on (a) and (b)	4
(d) an assessment of whether potential impacts and associated consequences identified in (c), are likely to be short, long term or irreversible, local or regional, discrete or cumulative, or exacerbated by the potential impacts of climate change	4
(e) an assessment of the probability and scientific confidence of potential impacts identified in (c) occurring, including reference to technical data and other information used in identifying and assessing those impacts	4
(f) an analysis of the potential impacts described in (c) – with reference to the EPBC Act Policy Statement 1.1 Significant Impact Guidelines and other relevant guidelines or policy advice or Recovery Plans, Conservation Advice and Threat Abatement Plans	4
(g) an assessment of the predictability of the potential impacts described in (c); and	4
(h) any assumptions underpinning the above.	4
3.2 Avoiding and mitigating potential impacts.	
The Report must identify and describe the management measures (i.e., on-ground actions) and controls (i.e. regulatory interventions, area-specific policies and plans) that will be implemented prior, during or following a treatment (Item 1.(g)), and document how they are intended to avoid and mitigate potential impacts on biodiversity and/or heritage values, and matters of national environmental significance.	4
The Report must also set out:	
(a) consultative arrangements with stakeholder groups, for example traditional owners and adjacent landowners/land managers, to be implemented prior to any treatment that might impact on biodiversity and/or heritage values, and matters of national environmental significance	4
(b) the predicted effectiveness of management measures and controls, and related assumptions, to avoid and mitigate impacts on matters identified in Items 3.1(a) and (b). Claims regarding effectiveness must be supported by best available knowledge (indigenous and non-indigenous), including a description of the methodology used to formulate these predictions	4
(c) evaluate available or prospective treatments, as alternatives to proposed treatments, and the relative costs and benefits of those treatments	2.2
(d) the “whole of State Government” approach taken to addressing the impacts of the treatments	4
(e) maintenance and operational requirements associated with implementing the proposed management measures	4
(f) compliance and enforcement requirements associated with implementing the proposed management controls	4, 6.3
(g) the resourcing, regulatory and programmatic arrangements in place, anticipated or proposed by the South Australian Government to implement Items (e) and (f) above;	2.3, 2.4.5 (also Section 5.6 of the Policy)
(h) timelines and accountabilities for implementing (e) and (f)	2.4.5, 4, 6
(i) regional case studies describing the treatments used in fire management across the state, the proposed management measures and controls and,	14.6, 14.7, 14.8

how impacts on matters identified in Items 3.1(a) and (b) will be avoided.	
3.3 Addressing uncertainty and managing risk. The Report must identify key uncertainties associated with implementing the Policy related to:	
(a) the potential impacts of identified treatments;	7.1
(b) the timing and nature of management measures and their maintenance/operation;	4, 6.1
(c) the timing and nature of management controls and their enforcement/compliance;	4, 6.1
(d) the effectiveness of proposed management measures or controls to avoid or mitigate potential impacts; and	4, 6.1
(e) the capacity of agencies to correctly implement, monitor and adapt treatments for ecological outcomes, and associated management measures and controls, and maintenance, operational, compliance and enforcement requirements; and	4, 6.1
(f) the capacity to avoid implementing treatments likely to impact on biodiversity or heritage values, and matters of national environmental significance, where unacceptable risks have been identified	4.6.1
For key uncertainties the Report must set out:	
(g) how these uncertainties have influenced the design of the Policy and associated treatments, management measures and controls;	6.1
(h) how these uncertainties will be responded to, including recommendations for alternative treatments, management measures and controls; and	6.1
(i) arrangements for review of (a)-(d) in light of anticipated new information.	6.1
The Report must demonstrate how the processes for managing the risks associated with the Policy meet AS/NZS ISO 31000:2009 Risk management - Principles and guidelines	4.1
<b>4. REASONABLE ASSURANCE</b>	
The Report must include a "reasonable assurance statement" that gives a high degree of confidence that the Policy and associated treatments and management measures and controls:	
(a) will be implemented; and,	6.1 (also Section 5.6 of the Policy)
(b) will not result in unacceptable impacts on matters of national environmental significance.	6.1
<b>5. ADAPTIVE IMPLEMENTATION</b>	
The Report must describe an adaptive implementation strategy which:	
(a) identifies, monitors and responds to potential impacts on biodiversity, heritage values and matters of national environmental significance from implementation of the Policy. To this end the strategy should include indicators and/or criteria that will be applied to measure success in achieving these environmental protection objectives, and as far as possible mitigating any adverse impacts;	6.1
(b) identifies knowledge gaps in scientific understanding, and associated key uncertainties;	6.1
(c) demonstrates how key uncertainties, including those in (b) above, are addressed as part of the Policy's implementation;	6.1
(d) includes a process for interim treatments, measures or controls where uncertainty and risk are deemed unacceptable;	6.1
(e) demonstrates that monitoring for the purposes of (a) and (b) is designed with a view to generating statistically reliable information for decision-making;	6.1
(f) identifies environmental, socio-cultural and economic action/s that will be	6.1

taken if monitoring results indicate implementation of the Policy is causing unacceptable impacts on biodiversity, heritage values or matters of national environmental significance;	
(g) includes processes and accountabilities for monitoring, analysing and contributing to adaptive management and continuous improvement processes;	6.1
(h) accounts for direct and indirect impacts of wildfire, and implications for fire management practices in the affected area; and	6.1
(i) contains governance, third party auditing and consultative arrangements to maximise scientific input in the implementation of the Policy.	6.1. Also 2.4.4, 2.4.5
<b>6. REVIEW, MODIFICATION AND ABANDONMENT</b>	
The Report must identify and analyse circumstances and procedures that may result in the review, modification or abandonment of the Policy, such that changing community standards or new information relating to the impacts of the Policy may be introduced, reassessed and accounted for in Policy implementation.	6.1
<b>7. ENDORSEMENT CRITERIA</b>	
The Report must describe how the Policy, in association with the Report, meets the criteria set out in Attachment B (Strategic Assessment - Endorsement Criteria).	9
<b>8. INFORMATION SOURCES</b>	
For information used in the assessment, the Report must state:	
(a) the source of the information; (b) how recent the information is; (c) how the reliability of the information was tested; and (d) what uncertainties are in the information.	10.1

### 14.3 DEWNR land

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Aberdour (CP)	III	SE	145.1	yes	yes
Acraman Creek (CP)	VI	EP	3952.4	no	no
Aldinga Scrub (CP)	III	AMLR	265.7	yes	yes
Althorpe Islands (CP)	Ia	N&Y	162.6	no	no
Angove (CP)	III	AMLR	5.2	yes	yes
Anstey Hill (RP)	III	AMLR	361.2	yes	yes
Avoid Bay Islands (CP)	Ia	EP	31.6	no	no
Baird Bay Islands (CP)	IV	EP	10.7	no	no
Bakara (CP)	Ia	SA MDB	2029.1	no	in prep.
Bandon (CP)	VI	SA MDB	650.2	no	no
Bangham (CP)	III	SE	868.6	yes	yes
Barwell (CP)	VI	EP	10142.3	yes	in prep.
Bascombe Well (CP)	VI	EP	33429.5	yes	in prep.
Baudin (CP)	III	KI	309.8	yes	in prep.
Baudin Rocks (CP)	Ia	SE	5.8	no	yes
Beachport (CP)	VI	SE	875.3	no	yes
Beatrice Islet (CP)	Ia	KI	102.9	no	no
Belair (NP)	II	AMLR	835.5	yes	yes
Belt Hill (CP)	III	SE	9.6	no	yes
Bernouilli (CR)	VI	SE	266.2	yes	yes
Beyeria (CP)	IV	KI	187.7	yes	yes
Big Heath (CP)	VI	SE	2472.3	no	yes
Billiatt (CP)	VI	SA MDB	801.5	no	yes
Billiatt (WA)	Ib	SA MDB	59125.4	no	yes
Bimbowrie (CP)	VI	N&Y	71824.3	no	no
Bird Islands (CP)	VI	N&Y	357.7	no	no
Black Hill (CP)	III	AMLR	704.5	yes	yes
Black Rock (CP)	III	N&Y	169.4	no	no
Blackwood Forest (RP)	III	AMLR	20.8	yes	yes
Bool Lagoon (GR)	VI	SE	3103.2	no	yes
Boondina (CP)	VI	AW	12554.5	no	yes
Breakaways (CP)	VI	SAAL	14903.2	no	no
Brookfield (CP)	Ia	SA MDB	5515.5	no	in prep.
Brownhill Creek (RP)	III	AMLR	50.7	yes	yes
Buckleboo (CR)	VI	EP	280.9	no	no
Bucks Lake (GR)	VI	SE	138.1	yes	yes
Bullock Hill (CP)	III		221.4		
Bunbury (CR)	VI	SE	1944.6	no	yes
Bunkers (CR)	VI	SAAL	14061.9	no	in prep.
Busby Islet (CP)	Ia	KI	17.0	no	no
Butcher Gap (CP)	III	SE	180.3	yes	yes

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Calectasia (CP)	IV	SE	14.2	no	yes
Calpatanna Waterhole (CP)	Ia	EP	3644.2	yes	no
Canunda (NP)	VI	SE	9623.6	yes	yes
Cap Island (CP)	Ia	EP	9.3	no	no
Cape Blanche (CP)	III	EP	809.8	yes	no
Cape Bouguer (WA)	Ib	KI	5297.9	yes	yes
Cape Gantheaume (CP)	Ia	KI	4213.5	yes	yes
Cape Gantheaume (WA)	Ib	KI	20099.1	yes	yes
Cape Torrens (WA)	Ib	KI	939.7	yes	yes
Cape Willoughby (CP)	N/A	KI	18.4	yes	in prep.
Caralue Bluff (CP)	VI	EP	2156.7	no	no
Carappee Hill (CP)	III	EP	850.4	no	in prep.
Caratoola (RP)	III	EP	54.0	no	no
Carcuma (CP)	Ia	SA MDB	2927.1	no	yes
Caroona Creek (CP)	III, VI	SE	5422.2	yes	yes
Carpenter Rocks (CP)	VI	SA MDB	32.8	no	no
Carribie (CP)	III	N&Y	15.0	no	yes
Chadinga (CP)	VI	EP	11853.9	no	no
Charleston (CP)	III	AMLR	54.1	yes	yes
Chowilla (GR)	VI	SA MDB	18176.4	no	yes
Chowilla (RR)	VI	SA MDB	75220.6	no	yes
Christmas Rocks (CP)	III		19.0		
Cleland (CP)	II	AMLR	1024.9	yes	yes
Clements Gap (CP)	III	N&Y	790.2	yes	no
Clinton (CP)	III	N&Y	1915.3	no	no
Cobbler Creek (RP)	III	AMLR	266.2	yes	yes
Cocata (CP)	VI	EP	16761.9	yes	no
Coffin Bay (NP)	II	EP	30975.6	yes	yes
Cooltong (CP)	VI	SA MDB	3710.3	yes	yes
Coorong (NP)	II	SE	49016.2	yes	yes
Corrobinnie Hill (CP)	III	EP	208.4	no	no
Cortlinye (CR)	VI	EP	208.1	no	no
Cox Scrub (CP)	III	AMLR	543.5	yes	no
Cox Scrub (CR)	VI	AMLR	21.3	yes	yes
Cromer (CP)	III	AMLR	44.0	yes	yes
Cudlee Creek (CP)	III	AMLR	48.8	yes	yes
Cunyarie (CR)	VI	EP	94.3	no	no
Currency Creek (GR)	VI	SE	127.8	yes	yes
Custon (CP)	III	SE	28.4	no	yes
Cygnet Estuary (CP)	III		139.2		
Danggali (CP)	Ia	SA MDB	48416.4	no	yes
Danggali (WA)	Ib	SA MDB	202814.7	no	yes
Darke Range (CP)	VI	EP	699.6	no	in prep.

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Deep Creek (CP)	II	AMLR	4495.5	yes	yes
Desert Camp (CP)	III	SE	50.9	yes	yes
Desert Camp (CR)	VI	SE	881.8	yes	yes
Dingley Dell (CP)	N/A	SE	5.9	no	yes
Douglas Point (CP)	VI	SE	60.4	no	yes
Dudley (CP)	Ia	KI	1768.3	yes	in prep.
Eba Island (CP)	Ia	EP	133.6	no	no
Ediacara (CP)	VI	SAAL	2211.8	no	in prep.
Elliot Price (CP)	Ia	SAAL	63453.3	no	no
Eric Bonython (CP)	Ia	AMLR	5.8	yes	yes
Ettrick (CP)	VI		478.5		
Eurilla (CP)	III	AMLR	7.5	yes	yes
Ewens Ponds (CP)	III	SE	36.1	yes	yes
Fairview (CP)	Ia	SE	1394.2	yes	yes
Ferguson (CP)	III	AMLR	8.0	no	yes
Ferries - McDonald (CP)	III	SA MDB	842.2	no	in prep.
Finniss (CP)	III	AMLR	122.8	yes	no
Flinders Chase (NP)	II	KI	34646.1	yes	yes
Flinders Ranges (NP)	II	SAAL	93383.5	no	in prep.
Fort Glanville (CP)	N/A	AMLR	5.0	no	no
Fowlers Bay (CP)	VI	EP	9731.3	no	no
Franklin Harbor (CP)	Ia	EP	1356.1	no	in prep.
Furner (CP)	III	SE	289.1	no	yes
Gambier Islands (CP)	Ia	EP	100.0	no	no
Gawler Ranges (CP)	VI	EP	15480.1	no	no
Gawler Ranges (NP)	VI	EP	162874.7	no	no
Geegeela (CP)	III	SE	857.8	yes	yes
Giles (CP)	III	AMLR	108.6	yes	yes
Glen Roy (CP)	III	SE	544.0	no	yes
Goose Island (CP)	III	N&Y	34.8	no	no
Gower (CP)	III	SE	40.4	yes	yes
Granite Island (RP)	IV	AMLR	25.8	no	no
Grass Tree (CP)	III	SE	15.8	no	yes
Great Australian Bight Marine (NP)	II	EP	123322.2	no	no
Greenhill (RP)	III	AMLR	23.9	yes	yes
Greenly Island (CP)	Ia	EP	167.7	no	no
Guichen Bay (CP)	III	SE	127.1	yes	yes
Gum Lagoon (CP)	VI	SE	8906.2	yes	yes
Gum Tree Gully (CP)	III		111.3		
Hacks Lagoon (CP)	IV	SE	201.7	no	yes
Hale (CP)	III	AMLR	188.7	yes	yes
Hallett Cove (CP)	III	AMLR	50.8	no	yes
Hambidge (WA)	Ib	EP	37908.3	yes	in prep.

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Hanson Scrub (CP)	VI	SE	394.3	no	yes
Hardings Springs (CR)	VI	SA MDB	6.8	yes	yes
Heggaton (CP)	VI	EP	6475.9	no	in prep.
Hesperilla (CP)	IV	SA MDB	10.9	yes	no
Hincks (CP)	VI	EP	878.1	yes	in prep.
Hincks (WA)	Ib	EP	66657.6	yes	in prep.
Hogwash Bend (CP)	III	SA MDB	402.2	yes	in prep.
Hopkins Creek (CP)	VI	SA MDB	514.8	no	no
Horsnell Gully (CP)	III	AMLR	137.2	yes	yes
Innamincka (RR)	VI	SAAL	1354053.8	no	no
Innes (NP)	II	N&Y	9415.5	yes	yes
Investigator Group (WA)	Ib		439.7		
Ironstone Hill (CP)	VI	SAAL	19650.0	no	no
Jip Jip (CP)	III	SE	139.7	yes	yes
Kaiserstuhl (CP)	III	AMLR	402.0	yes	yes
Kapunda Island (CP)	III	SA MDB	1.1	no	in prep.
Karte (CP)	Ia	SA MDB	3589.6	no	yes
Kathai (CP)	III	EP	80.7	yes	yes
Kati Thanda-Lake Eyre (NP)	II, VI	EP	1349126.1	yes	yes
Kellidie Bay (CP)	Ia	KI	1783.5	yes	yes
Kelly Hill (CP)	III	SE	2176.1	no	yes
Kelvin Powrie (CP)	III	AMLR	17.1	yes	yes
Kenneth Stirling (CP)	III	EP	243.8	yes	yes
Kulliparu (CP)	VI	EP	45002.8	yes	no
Kungari (CP)	VI	SE	563.6	yes	yes
Kyeema (CP)	III	AMLR	346.2	yes	no
Lacroma (CR)	VI	EP	45.1	no	in prep.
Lake Eyre (NP)	II	SAAL	1348839.6	no	no
Lake Frome (CP)	VI	SE	1025.6	yes	no
Lake Frome (RR)	VI	SAAL	258239.7	yes	no
Lake Gairdner (NP)	VI	EP	553176.8	no	no
Lake Gilles (CP)	VI	EP	65527.4	no	no
Lake Hawdon South (CP)	VI	SE	3185.2	yes	yes
Lake Newland (CP)	VI	EP	8879.8	yes	no
Lake Robe (GR)	VI	SE	405.5	yes	yes
Lake St Clair (CP)	VI	SE	188.5	yes	yes
Lake Torrens (NP)	VI	SAAL	567668.1	no	no
Lashmar (CP)	III	KI	359.0	yes	in prep.
Latham (CP)	Ia	KI	1175.1	yes	no
Laura Bay (CP)	III	EP	282.1	no	no
Lesueur (CP)	Ia	KI	1408.8	no	in prep.
Leven Beach (CP)	III	N&Y	550.5	no	yes
Lincoln (CP)	VI	EP	1033.9	yes	yes

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Lincoln (NP)	II	EP	21638.0	yes	yes
Lipson Island (CP)	III	EP	7.5	no	no
Little Dip (CP)	VI	SE	2150.1	yes	yes
Loch Luna (GR)	VI	SA MDB	2062.7	no	in prep.
Long Island (RP)	III	SA MDB	7.5	no	in prep.
Lowan (CP)	III	SA MDB	675.4	no	in prep.
Lower Glenelg River (CP)	VI	SE	128.6	yes	yes
Maize Island Lagoon (CP)	III	SA MDB	214.3	no	in prep.
Malgra (CP)	VI	EP	65.6	no	in prep.
Malkumba-Coongie Lakes (NP)	II	SAAL	26669.3		no
Mamungari (CP)	Ia	AW	2128944.9	no	yes
Mantung (CP)	III		1695.8		
Marino (CP)	III	AMLR	30.2	no	yes
Mark Oliphant (CP)	III	AMLR	189.5	yes	yes
Marne Valley (CP)	III	SA MDB	93.6	no	in prep.
Martin Washpool (CP)	III	SE	2850.9	no	yes
Martindale Hall (CP)	N/A	N&Y	19.5	no	no
Mary Seymour (CP)	III	SE	340.2	no	yes
Media Island (CP)	III	SA MDB	1.8	no	in prep.
Memory Cove (WA)	Ib	EP	8941.2	yes	yes
Messent (CP)	III	SE	11582.8	no	yes
Middlecamp Hills (CP)	Ia	EP	835.3	no	in prep.
Minlacowie (CP)	VI	N&Y	28.5	no	yes
Moana Sands (CP)	III	AMLR	21.7	no	yes
Mokota (CP)	VI	N&Y	465.2	no	no
Monarto (CP)	III	SA MDB	239.8	yes	in prep.
Montacute (CP)	III	AMLR	193.8	yes	yes
Moody Tank (CP)	III	EP	78.4	no	in prep.
Moongi (CR)	VI	EP	232.1	no	no
Moorook (GR)	VI	SA MDB	1244.1	no	in prep.
Mootra (CR)	VI	EP	948.7	no	no
Morgan (CP)	VI	SA MDB	375.8	no	in prep.
Morialta (CP)	III	AMLR	583.8	yes	yes
Mount Billy (CP)	VI	AMLR	198.5	yes	no
Mount Boothby (CP)	Ia	SE	4092.8	no	yes
Mount Brown (CP)	VI	N&Y	2264.4	yes	yes
Mount Dutton Bay (CP)	Ia	EP	9.2	no	yes
Mount George (CP)	III	AMLR	84.7	yes	yes
Mount Magnificent (CP)	III	AMLR	89.7	yes	no
Mount Monster (CP)	VI	SE	126.0	yes	yes
Mount Remarkable (NP)	VI	N&Y	18271.1	yes	yes
Mount Scott (CP)	Ia	SE	1267.2	yes	yes
Mount Taylor (CP)	III	KI	18.2	yes	no

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Mowantjie Willauwar (CP)	III	SA MDB	143.0	no	in prep.
Mud Islands (GR)	VI	SE	125.5	no	yes
Mullinger Swamp (CP)	IV	SE	12.4	no	yes
Munyaroo (CP)	VI	EP	20138.7	no	in prep.
Murray River (NP)	VI	SA MDB	13591.6	yes	in prep.
Murrunatta (CP)	III	EP	515.8	yes	yes
Mylor (CP)	III	AMLR	45.0	yes	yes
Myponga (CP)	III	AMLR	167.3	yes	no
Naracoorte Caves (NP)	II	SE	660.1	yes	yes
Nene Valley (CP)	III	SE	391.6	yes	yes
Nepean Bay (CP)	III	KI	32.4	yes	yes
Neptune Islands (CP)	Ia	EP	14570.4	no	no
Newland Head (CP)	III	AMLR	1166.9	yes	no
Ngarkat (CP)	Ia	SA MDB	266622.4	yes	yes
Ngaut Ngaut (CP)	III	SA MDB	49.3	no	in prep.
Nicolas Baudin Island (CP)	Ia	EP	94.0	no	no
Nixon - Skinner (CP)	III	AMLR	7.8	yes	no
Nullarbor (NP)	VI	AW	32309.7	no	yes
Nullarbor (RR)	VI	AW	1919850.7	no	yes
Nullarbor (WA)	Ib		894291.0		
Nuyts Archipelago (CP)	Ia	EP	8819.7	no	no
Nuyts Archipelago (WA)	Ib		2462.4		
Nuyts Reef (CP)	Ia	EP	46.8	no	no
O'Halloran Hill (RP)	III	AMLR	253.1	no	yes
Olive Island (CP)	Ia	EP	20.9	no	no
Onkaparinga River (NP)	II	AMLR	1541.6	yes	yes
Onkaparinga River (RP)	III	AMLR	266.9	yes	yes
Padthaway (CP)	III	SE	980.7	yes	yes
Pandappa (CP)	III	N&Y	1051.2	no	no
Para Wirra (RP)	III	AMLR	1512.2	yes	yes
Paranki Lagoon (CP)	III		530.0		
Parndana (CP)	III	KI	625.2	yes	no
Peachna (CP)	VI	EP	4583.5	yes	in prep.
Peebinga (CP)	Ia	SA MDB	3361.3	no	yes
Pelican Lagoon (CP)	Ia	KI	449.4	yes	in prep.
Penambol (CP)	VI	SE	180.4	yes	yes
Penguin Island (CP)	Ia	SE	5.5	no	yes
Penola (CP)	III	SE	227.0	no	yes
Piccaninnie Ponds (CP)	VI	SE	862.5	yes	yes
Pigface Island (CP)	Ia	EP	15.7	no	no
Pike River (CP)	III	SA MDB	288.0	yes	in prep.
Pine Hill Soak (CP)	III	SE	50.7	yes	yes
Pinkawillinie (CP)	VI	EP	130151.2	no	no

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Pinkawillinie Reservoir (CR)	VI	EP	279.4	no	no
Point Bell (CP)	III	EP	546.5	no	no
Point Davenport (CP)	III	N&Y	247.4	yes	yes
Point Labatt (CP)	III	EP	50.8	yes	no
Poocher Swamp (GR)	VI	SE	77.2	no	yes
Pooginook (CP)	Ia	SA MDB	2851.0	no	yes
Poolgarra (CR)	VI	EP	169.5	no	no
Poonthie Ruwe (CP)	IV	SA MDB	241.1	no	in prep.
Port Gawler (CP)	III	AMLR	417.7	no	no
Porter Scrub (CP)	III	AMLR	104.0	yes	yes
Pualco Range (CP)	VI	SAAL	7877.3	no	no
Pullen Island (CP)	Ia	AMLR	2.2	no	no
Pureba (CP)	VI	AW	226403.4	no	yes
Ramco Point (CP)	III	SA MDB	30.5	no	in prep.
Ramsay (CP)	VI	N&Y	145.3	no	yes
Ravine des Casoars (WA)	Ib	KI	41362.5	yes	yes
Red Banks (CP)	III	N&Y	1030.3	no	no
Reedy Creek (CP)	IV	SE	147.3	no	yes
Ridley (CP)	III	SA MDB	413.9	no	in prep.
Rilli Island (CP)	III	SA MDB	5.6	no	in prep.
Rocky Island (North) (CP)	Ia	EP	17.1	no	no
Rocky Island (South) (CP)	Ia	EP	21.5	no	no
Roonka (CP)	III	SA MDB	101.5	no	in prep.
Rudall (CP)	III	EP	357.3	no	in prep.
Salt Lagoon Islands (CP)	Ia	SE	76.5	no	yes
Sandy Creek (CP)	III	AMLR	158.4	yes	yes
Sceale Bay (CP)	III	EP	526.6	yes	no
Scott (CP)	III	AMLR	209.8	yes	no
Scott Creek (CP)	III	AMLR	712.3	yes	yes
Seal Bay (CP)	VI	KI	6366.6	yes	yes
Searcy Bay (CP)	III	EP	867.9	yes	no
Seddon (CP)	III	KI	22.2	yes	no
Shannon (CP)	VI	EP	543.5	yes	in prep.
Sheoak Hill (CP)	Ia, VI	EP	2426.9	no	in prep.
Shepherds Hill (RP)	III	AMLR	76.9	yes	yes
Simpson (CP)	Ia	KI	976.7	yes	in prep.
Simpson Desert (CP)	Ia	SAAL	690387.6	no	no
Simpson Desert (RR)	VI	SAAL	2923952.9	no	no
Sinclair Island (CP)	Ia	EP	0.5	no	no
Sir Joseph Banks Group (CP)	Ia	EP	47690.1	no	no
Sleaford Mere (CP)	III	EP	595.0	yes	yes
Spring Gully (CP)	III	N&Y	396.4	yes	no
Spring Mount (CP)	III	AMLR	279.3	yes	no

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Stipiturus (CP)	IV	AMLR	66.9	yes	yes
Strzelecki (RR)	VI	SAAL	810421.2	no	no
Sturt Gorge (RP)	III	AMLR	243.8	yes	yes
Swan Reach (CP)	Ia	SA MDB	2018.3	no	in prep.
Talapar (CP)	III	SE	481.8	yes	yes
Talisker (CP)	VI	AMLR	211.4	yes	yes
Tallaringa (CP)	VI	SAAL	1268858.8	no	no
Tantanoola Caves (CP)	III	SE	14.0	yes	yes
Telford Scrub (CP)	III	SE	169.7	yes	yes
Telowie Gorge (CP)	III	N&Y	1966.8	yes	yes
The Dutchmans Stern (CP)	VI	N&Y	3695.1	no	yes
The Knoll (CP)	III	AMLR	1.7	yes	yes
The Pages (CP)	Ia	KI	7023.4	no	no
The Plug Range (CP)	VI	EP	2582.2	no	in prep.
Tilley Swamp (CP)	III	SE	1514.9	yes	yes
Tola (CR)	VI	EP	30.2	no	no
Tolderol (GR)	VI	SE	427.6	yes	yes
Torrens Island (CP)	III	AMLR	635.1	no	no
Totness (RP)	III	AMLR	40.9	yes	yes
Troubridge Island (CP)	III	N&Y	259.4	no	no
Tucknott Scrub (CP)	VI	EP	362.8	no	yes
Tumby Island (CP)	Ia	EP	48.1	no	no
Venus Bay (CP)	VI	EP	6376.2	yes	no
Verran Tanks (CP)	III	EP	118.9	no	in prep.
Vivigani Ardune (CP)	III	SE	41.0	no	yes
Vivonne Bay (CP)	Ia	KI	1565.3	yes	yes
Vulkathunha-Gammon Ranges (NP)	II	SAAL	125723.3	no	in prep.
Wabma Kadarbu Mound Springs (CP)	III	SAAL	12015.5	no	no
Wahgunyah (CP)	VI	EP	48319.6	no	no
Waitpinga (CP)	III	AMLR	2.5	yes	yes
Waldegrave Islands (CP)	Ia	EP	394.1	no	no
Vanilla (CP)	III	EP	280.2	yes	yes
Vanilla Land Settlement (CP)	III	EP	17.0	yes	yes
Warren (CP)	III	AMLR	364.2	yes	yes
Warrenben (CP)	Ia	N&Y	4057.5	yes	yes
West Island (CP)	Ia	AMLR	15.6	no	no
Western River (WA)	Ib	KI	2467.3	yes	yes
Wharminda (CP)	III	EP	267.8	no	in prep.
Whidbey Isles (CP)	Ia	EP	304.3	no	no
White Dam (CP)	Ia	SA MDB	890.8	no	in prep.
Whyalla (CP)	III	N&Y	1980.5	no	no
Wills Creek (CP)	VI	N&Y	2297.5	yes	no
Winninowie (CP)	Ia	N&Y	7855.5	no	no

RESERVE NAME	IUCN	Region	AREA	Fire-prone	Fire Mgt Plan
Witjira (NP)	VI	SAAL	771507.1	no	no
Wittelbee (CP)	III	EP	169.8	no	no
Woakwine (CP)	VI	SE	424.3	yes	yes
Wolseley Common (CP)	III	SE	24.0	no	yes
Yalpara (CP)	III	N&Y	42.7	no	no
Yeldulknie (CP)	Ia	EP	3282.6	no	in prep.
Yellabinna (RR)	VI	AW	2000897.1	no	yes
Yellabinna (WA)	Ib	AW	500703.8	no	yes
Yulte (CP)	III	AMLR	41.4	yes	no
Yumbarra (CP)	VI	AW	324351.7	no	yes

Source: DEWNR Protected Areas Information System, 27 November 2014

### Other Areas Managed by DEWNR

NRM Region	Total Area (Ha)
Adelaide & Mt Lofty Ranges	6,624
Alinytjara Wilurara	22,103
Eyre Peninsula	39,898
Kangaroo Island	3,921
Northern & Yorke	40,412
South Australian Arid Lands	933,727
South Australian Murray-Darling Basin	42,852
South East	31,400
<b>Total</b>	<b>1,120,938</b>

Source: DEWNR Spatial Information System, 27 November 2014

## 14.4 Threatened species and ecological communities protected under EPBC Act on DEWNR land

**Table 1: EPBC Listed Flora on DEWNR Managed Land**

SPECIES	COMNAME	EPBC	Occurs in potentially fire-prone habitats	Susceptible to <i>Phytophthora</i>	FMP Rec.	EFMS
<i>Acacia araneosa</i>	Spidery Wattle	VU				
<i>Acacia carneorum</i>	Needle Wattle	VU				
<i>Acacia enterocarpa</i>	Jumping-jack Wattle	EN	Y		Y	
<i>Acacia menzeli</i>	Menzel's Wattle	VU				
<i>Acacia pinguifolia</i>	Fat-leaf Wattle	EN				
<i>Acacia praemorsa</i>	Senna Wattle	VU				
<i>Acacia rheticarpa</i>	Resin Wattle	VU	Y			
<i>Acacia spilleriana</i>	Spiller's Wattle	EN				
<i>Allocasuarina robusta</i>	Mount Compass Oak-bush	EN	Y			
<i>Asterolasia phebaloides</i>	Downy Star-bush	VU	Y			
<i>Beyeria subtecta</i>	Kangaroo Island Turpentine Bush	VU	Y	Y		
<i>Caladenia argocalla</i>	White Beauty Spider-orchid	EN	Y	Y		
<i>Caladenia behrii</i>	Pink-lip Spider-orchid	EN	Y			
<i>Caladenia brumalis</i>	Winter Spider-orchid	VU	Y	Y		
<i>Caladenia calcicola</i>	Limestone Spider-orchid	VU				
<i>Caladenia colorata</i>	Coloured Spider-orchid	EN	Y	Y		
<i>Caladenia conferta</i>	Coast Spider-orchid	EN	Y			
<i>Caladenia formosa</i>	Elegant Spider Orchid	VU	Y	Y		
<i>Caladenia gladiolata</i>	Bayonet Spider-orchid	EN	Y	Y		
<i>Caladenia macroclavia</i>	Large-club Spider-orchid	EN	Y			
<i>Caladenia ovata</i>	Kangaroo Island Spider-orchid	VU	Y	Y		
<i>Caladenia richardsiorum</i>	Little Dip Spider-orchid	EN	Y			
<i>Caladenia rigida</i>	Stiff White Spider-orchid	EN	Y	Y		
<i>Caladenia</i> sp. Southeast (R.Bates 66283)	Sand Spider-orchid	EN*				
<i>Caladenia tensa</i>	Inland Green-comb Spider-orchid	EN	Y			
<i>Caladenia versicolor</i>	Grampians Spider-orchid	VU				
<i>Caladenia woolcockiorum</i>	Woolcock's Spider-orchid	VU	Y	Y		
<i>Caladenia xanthochila</i>	Yellow-lip Spider-orchid	EN	Y	Y		
<i>Caladenia xantholeuca</i>	Flinders Ranges White Caladenia	EN				
<i>Cassinia tegulata</i>	Sticky Cassinia	CR				
<i>Cheiranthra volubilis</i>	Twining Hand-flower	VU	Y			
<i>Codonocarpus pyramidalis</i>	Slender Bell-fruit	VU				

SPECIES	COMNAME	EPBC	Occurs in potentially fire-prone habitats	Susceptible to <i>Phytophthora</i>	FMP Rec.	EFMS
<i>Correa calycina</i> var. <i>calycina</i>	Hindmarsh Correa	VU*	Y			
<i>Correa calycina</i> var. <i>halmaturorum</i>	Hindmarsh Correa	VU*				
<i>Corybas dentatus</i>	Finniss Helmet-orchid	VU	Y	Y		
<i>Dodonaea procumbens</i>	Trailing Hop-bush	VU	Y			
<i>Dodonaea subglandulifera</i>		EN				
<i>Eucalyptus paludicola</i>	Mount Compass Swamp Gum	EN	Y			
<i>Euphrasia collina</i> ssp. <i>osbornii</i>	Osborn's Eyebright	EN	Y		Y	
<i>Frankenia plicata</i>		EN				
<i>Glycine latrobeana</i>	Clover Glycine	VU	Y		Y	
<i>Grevillea treueriana</i>	Mt Finke Grevillea	VU				
<i>Halragis eyreana</i>	Prickly Raspwort	EN				
<i>Hibbertia crispula</i>	Ooldea Guinea-flower	VU				
<i>Hypolepis dicksonioides</i>	Downy Ground-fern	VU*				
<i>Ixodia achillaeoides</i> ssp. <i>arenicola</i>	Sand Ixodia	VU	Y		Y	
<i>Leionema equestre</i>	Kangaroo Island Phebalium	EN				
<i>Lepidium hyssopifolium</i>	Small Peppercross	EN				
<i>Lepidium pseudopapillosum</i>	Erect Peppercross	VU				
<i>Limosella granitica</i>	Granite Mudwort	VU				
<i>Logania insularis</i>	Kangaroo Island Logania	VU	Y			
<i>Microlepidium alatum</i>		VU				
<i>Olearia microdisca</i>	Small-flower Daisy-bush	EN	Y	Y	Y	
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	VU	Y			
<i>Phebalium lowanense</i>	Lowan Phebalium	VU				
<i>Pleuropappus phyllocalymmeus</i>	Silver Candles	VU				
<i>Pomaderris halmaturina</i> ssp. <i>halmaturina</i>	Kangaroo Island Pomaderris	VU	Y			
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	EN	Y	Y		
<i>Prasophyllum goldsackii</i>	Goldsack's Leek-orchid	EN	Y	Y		
<i>Prasophyllum murfetii</i>	Maroon Leek-orchid	CR				
<i>Prasophyllum pallidum</i>	Pale Leek-orchid	VU	Y	Y		
<i>Prasophyllum pruinatum</i>	Plum Leek-orchid	EN				
<i>Prasophyllum validum</i>	Mount Remarkable Leek-orchid	VU	Y	Y		
<i>Prostanthera calycina</i>	West Coast Mintbush	VU	Y			
<i>Prostanthera eurybioides</i>	Monarto Mintbush	EN	Y		Y	
<i>Pterostylis arenicola</i>	Sandhill Greenhood	VU	Y			
<i>Pterostylis bryophila</i>	Hindmarsh Greenhood	CR	Y	Y		
<i>Pterostylis chlorogramma</i>		VU				

SPECIES	COMNAME	EPBC	Occurs in potentially fire-prone habitats	Susceptible to <i>Phytophthora</i>	FMP Rec.	EFMS
<i>Pterostylis cucullata</i> ssp. <i>sylvicola</i>	Leafy Greenhood	VU	Y	Y		
<i>Pterostylis</i> sp. Hale (R.Bates 21725)	Hale Greenhood	EN	Y	Y		
<i>Pterostylis tenuissima</i>	Swamp Greenhood	VU	Y	Y		
<i>Pterostylis xerophila</i>	Desert Greenhood	VU	Y			
<i>Ptilotus beckerianus</i>	Ironstone Mulla Mulla	VU	Y	Y		
<i>Pultenaea trichophylla</i>	Tufted Bush-pea	EN				
<i>Pultenaea villifera</i> var. <i>glabrescens</i>	Splendid Bush-pea	VU	Y			
<i>Senecio helichrysoides</i>	George's Groundsel	EX*				
<i>Senecio macrocarpus</i>	Large-fruit Groundsel	VU	Y			
<i>Senecio megaglossus</i>	Large-flower Groundsel	VU	Y			
<i>Senecio psilocarpus</i>		VU	Y			
<i>Spyridium coactilifolium</i>	Butterfly Spyridium	VU	Y			
<i>Spyridium eriocephalum</i> var. <i>glabrisepalum</i>	Macgillivray Spyridium	VU	Y			
<i>Stackhousia annua</i>	Annual Candles	VU	Y			
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	VU	Y			
<i>Taraxacum cygnorum</i>	Dandelion	VU				
<i>Tecticornia flabelliformis</i>	Bead Samphire	VU				
<i>Thelymitra cyanapicata</i>		CR				
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	EN	Y	Y		
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	VU	Y	Y		
<i>Veronica derwentiana</i> ssp. <i>homalodonta</i>	Mt Lofty Speedwell	CR				

Plants (excluding doubtful records) (Source: EPBC Protected Area Search Tool (2014), Biological Survey Database of SA (2014); Briggs & Leigh (1996); Davies (2000d, 1995; 1992, 1990, 1986; DEWNR Plant Population Database; R. Davies unpublished data; D. Bickerton unpublished data).

**Table 2: EPBC Listed Fauna on DEWNR Managed Land**

CLASSNAME	SPECIES	COMNAME	EPBC	Occurs in potentially fire-prone habitats	FMP Rec.	EFMS
AMPHIBIA	<i>Litoria raniformis</i>	Southern Bell Frog	VU	Y	Y	
AVES	<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western ssp)	VU	Y		
AVES	<i>Amytornis modestus</i>	Thick-billed Grasswren	VU	Y		
AVES	<i>Anthochaera phrygia</i>	Regent Honeyeater	EN	Y		
AVES	<i>Botaurus poiciloptilus</i>	Australasian Bittern	EN			
AVES	<i>Calamanthus (Hylacola) pyrrhopygius</i>	Chestnut-rumped Heathwren	EN	Y	Y	
AVES	<i>Calyptorhynchus banksii graptogyne</i>	Red-tailed Black Cockatoo (south-east subspecies)	EN	Y	Y	
AVES	<i>Calyptorhynchus lathami halmaturinus</i>	Glossy Black-Cockatoo (Kangaroo Island ssp)	EN	Y	Y	
AVES	<i>Cinclosoma punctatum anachoreta</i>	Spotted Quail-thrush (Mount Lofty Ranges ssp)	CR	Y		
AVES	<i>Diomedea epomophora sanfordi</i>	Northern Royal Albatross	EN			
AVES	<i>Diomedea exulans</i>	Wandering Albatross	VU			
AVES	<i>Halobaena caerulea</i>	Blue Petrel	VU			
AVES	<i>Lathamus discolor</i>	Swift Parrot	EN	Y	Y	
AVES	<i>Leipoa ocellata</i>	Malleefowl	VU	Y	Y	
AVES	<i>Macronectes giganteus</i>	Southern Giant Petrel	EN			
AVES	<i>Macronectes halli</i>	Northern Giant Petrel	VU			
AVES	<i>Manorina flavigula melanotis</i>	Black-eared Miner	EN	Y	Y	
AVES	<i>Neophema chrysogaster</i>	Orange-bellied Parrot	CR	Y	Y	
AVES	<i>Pachycephala rufogularis</i>	Red-lored Whistler	VU	Y		
AVES	<i>Pedionomus torquatus</i>	Plains-wanderer	VU			
AVES	<i>Phoebastria fusca</i>	Sooty Albatross	VU			
AVES	<i>Polytelis alexandrae</i>	Princess Parrot	VU			
AVES	<i>Polytelis anthopeplus</i>	Regent Parrot	VU	Y		
AVES	<i>Psophodes nigrogularis leucogaster</i>	Western Whipbird (Eastern subspecies)	VU	Y	Y	
AVES	<i>Pterodroma mollis</i>	Soft-plumaged Petrel	VU			
AVES	<i>Rostratula australis</i>	Australian Painted-snipe	EN			
AVES	<i>Sternula nereis</i>	Fairy Tern	VU			
AVES	<i>Stipiturus malachurus intermedius</i>	Southern Emu-wren (Mt Lofty Ranges ssp)	EN	Y	Y	Y
AVES	<i>Stipiturus malachurus parimeda</i>	Southern Emu-wren (Eyre Peninsula ssp)	VU	Y	Y	
AVES	<i>Stipiturus mallee</i>	Mallee Emuwren	EN	Y	Y	
AVES	<i>Thalassarche bulleri</i>	Buller's Albatross	VU			
AVES	<i>Thalassarche cauta</i>	Shy Albatross	VU			
AVES	<i>Thalassarche chlororhynchus</i>	Yellow-nosed Albatross	VU			
AVES	<i>Thalassarche chrysostoma</i>	Grey-headed Albatross	EN			
AVES	<i>Thalassarche melanophris</i>	Black-browed Albatross	VU			
AVES	<i>Thalassarche salvini</i>	Salvin's Albatross	VU			
MAMMALIA	<i>Bettongia penicillata ogilbyi</i>	Brush-tailed Bettong	EN	Y		

CLASSNAME	SPECIES	COMNAME	EPBC	Occurs in potentially fire-prone habitats	FMP Rec.	EFMS
MAMMALIA	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara (Ampurta)	EN	Y		
MAMMALIA	<i>Isoodon obesulus nauticus</i>	Southern Brown Bandicoot (Nuyts Archipelago ssp)	VU			
MAMMALIA	<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot (SA mainland and KI ssp)	EN	Y	Y	Y
MAMMALIA	<i>Leporillus conditor</i>	Greater Stick-nest Rat	VU			
MAMMALIA	<i>Macropus eugenii eugenii</i>	Tammar Wallaby	EX *	Y		
MAMMALIA	<i>Macrotis lagotis</i>	Greater Bilby (Bilby)	VU			
MAMMALIA	<i>Miniopterus orianae bassanii</i>	Large Bent-winged Bat	CR			
MAMMALIA	<i>Notomys fuscus</i>	Dusky Hopping-mouse	VU			
MAMMALIA	<i>Notoryctes typhlops</i>	Southern Marsupial Mole (Itjaritjara)	EN			
MAMMALIA	<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	VU			
MAMMALIA	<i>Petrogale lateralis pearsoni</i>	Black-footed Rock-wallaby	VU		Y	
MAMMALIA	<i>Petrogale xanthopus xanthopus</i>	Yellow-footed Rock-wallaby	VU	Y	Y	Y
MAMMALIA	<i>Pseudomys australis</i>	Plains mouse	VU			
MAMMALIA	<i>Pseudomys shortridgei</i>	Heath Mouse	VU	Y		
MAMMALIA	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	VU			
MAMMALIA	<i>Sminthopsis aitkeni</i>	Kangaroo Island Dunnart	EN	Y	Y	Y
MAMMALIA	<i>Sminthopsis psammophila</i>	Sandhill Dunnart	EN	Y		Y
REPTILIA	<i>Aprasia pseudopulchella</i>	Flinders Worm-lizard	VU	Y		
REPTILIA	<i>Delma impar</i>	Striped Snake-lizard	VU	Y	Y	
REPTILIA	<i>Notechis ater ater</i>	Krefftt's Tiger Snake	VU	Y		
REPTILIA	<i>Ophidiocephalus taeniatus</i>	Bronzeback Legless Lizard	VU			

\*Re-released populations

Fauna (excluding doubtful records) (Source: EPBC Protected Area Search Tool (2014), Biological Survey Database of SA (2014)).

**Table 3: EPBC Listed Ecological Communities on DEWNR Managed Land**

Ecological Community	EPBC Rating	DEWNR Reserves (area of community)	FMP Recommendation
Peppermint Box ( <i>Eucalyptus odorata</i> ) Grassy Woodland of South Australia	Critically Endangered	Mount Remarkable NP (212 ha); Mount Brown CP (42 ha); Spring Gully CP (50 ha); Para Wirra RP (0.11 ha); Tucknott Scrub CP (1.4 ha); Black Hill CP (2ha); Bullock Hill CP <sup>1</sup> ; Para Woodland Reserve (46.5 ha) <sup>1</sup> ; Sandy Creek CP (32 ha); Mount Monster CP	Y
Iron-grass Natural Temperate Grassland of South Australia	Critically Endangered	Mokota CP (455 ha); Poonthie Ruwe CP (242 ha);	
Swamps of the Fleurieu Peninsula	Critically Endangered	Deep Creek CP (20 ha); Stipiturus CP (70 ha); Cleland CP (Wilson Bog) (15ha); Eurilla CP (0.08ha)	Y
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Nil	Y
Grey Box ( <i>Eucalyptus microcarpa</i> ) Grassy Woodlands and Derived Native Grasslands of South- eastern Australia	Endangered	Mount Brown CP (700 ha); Mount Remarkable NP (100 ha); Belair NP (163 ha); Onkaparinga River NP; Wolseley Common CP (24 ha); Sturt Gorge RP (62 ha) <sup>1</sup> ; Shepherds Hill RP (32 ha) <sup>1</sup> ; Greenhill RP (27 ha) <sup>1</sup>	Y
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	Endangered	Witjira NP (18 ha); Wabma Kadarbu CP (3 ha)	
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Critically Endangered	Data not yet available	

<sup>1</sup> Very degraded.

Information correct as of June 2014

## 14.5 Migratory species on DEWNR land

Species Name	Common Name	Listing *	Fire-Prone Habitat	Habitat potentially affected by fire management activities
<i>Acrocephalus stentoreus</i>	Clamorous Reed-Warbler	BCJR-M	N	Reed & rush swamps
<i>Ardea modesta</i> ( <i>Egretta alba</i> )	Great Egret, White Egret	B	N	Wetland margins
<i>Actitis hypoleucos</i> ( <i>Tringa hypoleucos</i> )	Common Sandpiper	CJ	N	Estuary & stream banks
<i>Apus pacificus</i>	Fork-tailed Swift	BCJR-M	N	Vicinity inland lakes
<i>Ardea ibis</i> ( <i>Ardeola ibis</i> , <i>Bubulcus ibis</i> )	Cattle Egret	CJR-M	N	Trees & shrubs near water
<i>Ardenna tenuirostris</i> ( <i>Puffinus tenuirostris</i> )	Short-tailed Shearwater	CJ	N	Offshore islands
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	JR-M	N	Coastal & inland swamps
<i>Calidris ferruginea</i>	Curlow Sandpiper	BCJR-M	N	Swamps & lake edges
<i>Calidris melanotos</i>	Pectoral Sandpiper	BCJR-M	N	Edges of swamps and streams
<i>Calidris minuta</i>	Little Stint	BJR-M	N	Wetland margins
<i>Calidris ruficollis</i>	Red-necked Stint	R-M	N	Edges of coastal & freshwater swamps
<i>Calidris subminuta</i>	Long-toed Stint	BCJR-M	N	Edges of coastal & freshwater swamps
<i>Calidris tenuirostris</i>	Great Knot	BCJR-M	N	Edges of estuarine areas
<i>Charadrius bicinctus</i>	Double-banded Plover	J	N	Wetland margins
<i>Gallinago hardwickii</i>	Latham's Snipe, Japanese Snipe	B	N	Thick growth at edges of swamps and rivers
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	BCJR-M	Y	Along large rivers and around inland lakes
<i>Hirundapus caudacutus</i> ( <i>Chaetura caudacuta</i> )	White-throated Needletail	C	N	Forested hills
<i>Limosa lapponica</i>	Bar-tailed Godwit	J-E	N	Wetland margins
<i>Limosa limosa</i>	Black-tailed Godwit	BCJR-M	N	Wetland margins
<i>Merops ornatus</i>	Rainbow Bee-eater	J	Y	Range of habitats
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	J	Y	Forests
<i>Onychoprion anaethetus</i> ( <i>Sterna anaethetus</i> )	Bridled Tern	J	N	Coastal vegetation
<i>Pandion cristatus</i> ( <i>Pandion haliaetus</i> )	Osprey	CJ	N	Along large open rivers
<i>Philomachus pugnax</i>	Ruff (Reeve)	B	N	Swamps
<i>Plegadis falcinellus</i>	Glossy Ibis	BCJR-M	N	Swamp and lake margins
<i>Pluvialis fulva</i>	Pacific Golden Plover	BC	N	Wetlands margins
<i>Pluvialis squatarola</i>	Grey Plover	BCJR-M	N	Wetlands margins
<i>Rhipidura rufifrons</i>	Rufous Fantail	BCJR-M	Y	Swamp woodlands
<i>Rostratula australis</i> ( <i>Rostratula benghalensis</i> s.	Painted Snipe	B	N	Wetlands margins

lat.)				
<i>Sterna caspia</i> (Hydroprogne caspia)	Caspian Tern	C	N	Edges of large rivers and wetlands
<i>Sterna hirundo</i>	Common Tern	CJ	N	Wetlands margins
<i>Tringa glareola</i>	Wood Sandpiper	J	N	Wetlands margins
<i>Tringa nebularia</i>	Common Greenshank, Greenshank	BCJR-M	N	Swamp and lake margins
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank	BCJR-M	N	Wetlands margins
<i>Tringa totanus</i>	Common Redshank, Redshank	BCJR-M	Y	Woodlands, open plains and mallee

\* B = Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), C = China-Australia Migratory Bird Agreement (CAMBA), J = Japan Australia Migratory Bird Agreement (JAMBA), & R-M = Republic of Korea - Australia Migratory Bird Agreement (ROKAMBA).

## 14.6 Case study 1: Avoiding significant impacts on MNES in DEWNR Risk Assessment and Fire Management Zoning

**Case study objective:** To illustrate how the risk assessment process informs the development of fire management zones in areas identified as high bushfire risk to life and property while avoiding impacts on matters of NES.

**Location:** Mount Gawler Native Forest Reserve (Mount Gawler Block, South Para Fire Management Plan).

**MNES:** The relevant MNES are two endangered plant species: Pink-lipped Spider-orchid (*Caladenia Behrii*) and White Spider-orchid (*Caladenia rigida*).

**Risk to MNES:** Populations of both the Pink-lipped Spider-orchid and White Spider-orchid are located within the Mount Gawler Block. While both species are not fire sensitive, little is known about their fire response. An inappropriate fire regime could result in a significant impact on the two *Caladenia spp.*

**Background:** The need to develop the South Para Fire Management Plan was identified as a priority due to the potential for bushfires to build into landscape-scale events and the potential impacts on life, property and the environment. To develop the South Para Fire Management Plan (SP FMP), a planning team made up of representative from DEWNR, ForestrySA, SA Water and the South Australian Country Fire Service, including ecologists and fire management officers, was formed.

The planning area was broken down into blocks (compartments) which were then the focus of individual risk assessments. Where risks were identified as high or above, fuel management would be undertaken through a number of fuel reduction methods including prescribed burning. This case study focuses on the Mount Gawler Block of the SP FMP.

**Fire planning:** The DEWNR Fire Policy and Procedure Manual outlines the risk assessment process. It was identified there was:

- a high/medium risk that the whole of Mount Gawler Block could be burnt during a bushfire event (Attachment 1)
- a very high risk there could be an impact on the viability of threatened orchid populations due to an inappropriate fire regime (Attachment 2).

To mitigate the risks in Attachment 1, the planning team proposed B-zones across the Mount Gawler Block in an attempt to break up fuel loads across the landscape, potentially mitigating a bushfire burning the whole block in a single event (Figure 1).

As a result of further consultation and surveys, the fire ecologist and fire management officers identified that the proposed B-zone arrangement in Figure 1 could potentially contribute to impacts identified in the risk assessment (Attachment 2) for the Pink-lipped Spider-orchid (*C. Behrii*) and White Spider-orchid (*C. rigida*), specifically through inappropriate fire regimes.

To mitigate this potential impact, amended B-zones (Figure 2) were drafted seeking to reduce the occurrence of *C. Behrii* and *C. rigida* populations within B-zones, while still meeting fire protection objectives. Placing a greater percentage of the known *Caladenia* populations within a C-zone ensures that the introduction of fire to these areas is for ecological purposes. This significantly reduces the potential for impact from inappropriate fire regimes to occur. For the above reasons the amended Mount Gawler Block zoning was endorsed by the planning team.

**Discussion/Conclusion:** The development and implementation of the risk assessment policy and fire management zone policy has enable DEWNR to identify early in the planning process where the potential for significant impacts on MNES may occur. This provides the ability to amend zoning and/or implement mitigating processes to significantly reduce the identified risk. This case study displays the department's method of avoidance of significant impacts on MNES whilst also undertaking fire management to reduce the risk across the landscape to life, property and the environment.

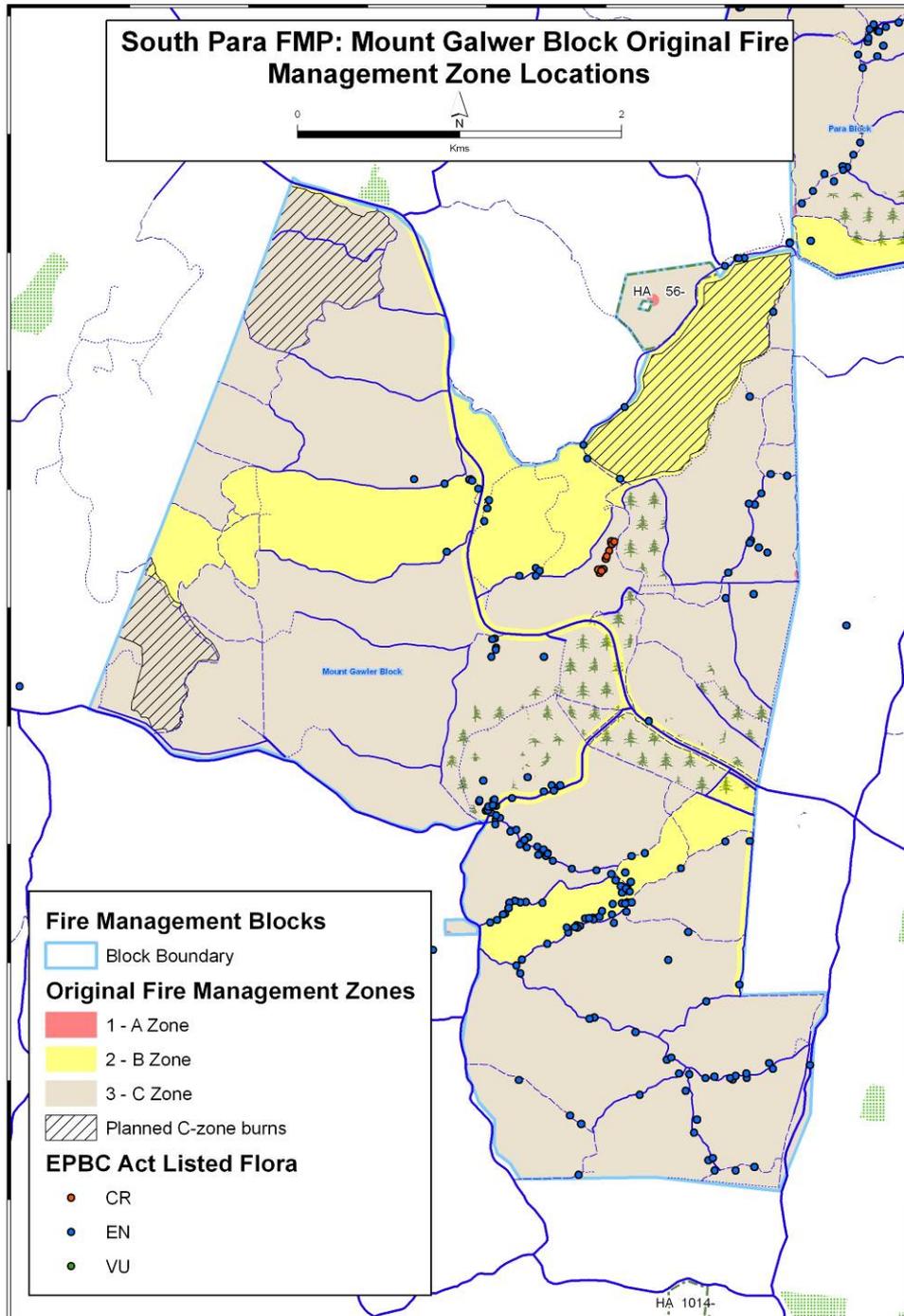


Figure 1 – Original proposed Mount Gawler Block Zoning and Caladenia spp. locations

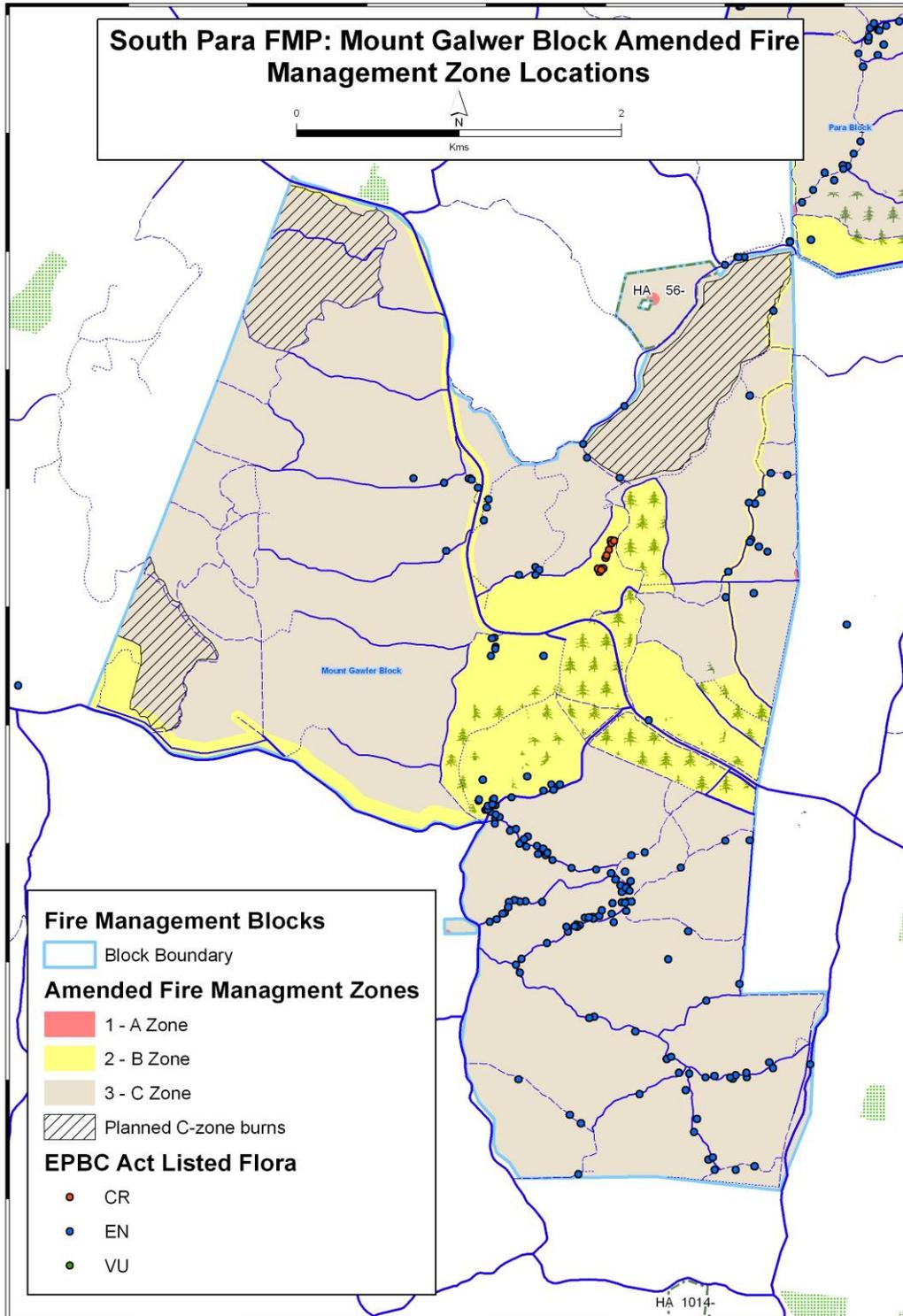


Figure 2 – Amended Mount Gawler Block Zoning and Caladenia spp. locations

### Attachment 1: Mount Gawler Block Risk Assessment for South Para Fire Management Plan Planning Area

ENVIRONMENT							
Risk to	Cause	Likelihood	<input type="checkbox"/> Justification	Consequence	Justification	Risk rating	Strategy to lower risk
<b>Whole Block:</b>	Loss of whole block due to a major fire event.	Possible	Suppression opportunity on main bitumen road. But may not be successful	Moderate/ Major	Environmental impact could be Major if local extinction of a population occurs and recolonisation not possible.	<b>HIGH/ MEDIUM</b>	Implement identified A, B & C-zones throughout the Fire Management Block (Figure 1). Implement recommended C-zone burns and track upgrades.
<b>Adjacent Native Vegetation:</b> To the north of the block – private vegetation (potential Heritage Agreement) and Para Block To the south of the block – Millbrook Block (+HAs)	Loss of habitat in adjacent native vegetation if fire escapes the block. Loss of habitat in the block if fire escapes adjacent native vegetation.	Likely	Contiguous fuels, lack of suppression opportunity between forest and adjacent vegetation. Prevailing weather	Minor	Environmental impact only minor. Some local displacement of fauna expected in the short term.	<b>MEDIUM</b>	Recommend the implement an A-zone to a minimum 40 m width surrounding structure.  Recommend the upgrade the track from Sheoak Road to the asset within the centre of Heritage Agreement 56 to a Standard Track at a minimum  Consider protection of assets during prescribed burn planning if HA is applied.

## Attachment 2: Environmental Value Risk Assessment for South Para Fire Management Plan Planning Area – Mount Gawler Block

THREATENED FLORA							
Risk To	Cause	Likelihood	Justification	Consequence	Justification	Risk Rating	Strategy to lower risk
Threatened Flora: <b>Threatened orchids</b>	Impact on viability of populations due to inappropriate fire regime (prescribed burning)	Likely	<ul style="list-style-type: none"> <li>▪ White Beauty Spider-orchid</li> <li>▪ Pink-lip Spider-orchid</li> <li>▪ White Spider-orchid</li> <li>▪ Pale Leek-orchid</li> <li>▪ Behr's Cowslip-orchid</li> <li>▪ Plum Leek-orchid</li> </ul> Also includes the Fitzgerald's Leek-orchid, Self-pollinating Leek-orchid, Sweet Onion-orchid, Yellow Onion-orchid and Dune Helmet-orchid.  At risk from burning and slashing between May and November Track management works are also a threat	Major	Local extinction of populations may occur if species do not favour disturbance regime – i.e. lack of fire, etc. A few undescribed orchid species in the area – Pterostylis sp. Warren. Some recently described orchids Thelymitra sp. By Bob Bates. Joe to provide. Area is a stronghold for behrii and rigida  Timing of prescribed burning has an impact.	<b>VERY HIGH</b>	Ecological Fire Management Guidelines to address each species.
	Impact on viability of populations due to inappropriate fire regime (bushfire)	Unlikely	See above. Summer bushfire not a great threat	Major	Local extinction of populations may occur if species do not favour disturbance regime – i.e. lack of fire, etc	<b>MEDIUM</b>	Implementation of B and C Zones (Figure 2) along with proposed prescribed burns, mechanical fuel reduction and upgrading of fire infrastructure to mitigate the risk to populations or loss of whole block.

## 14.7 Case study 2: DEWNR Fire Management Information System (FIMS) Environmental Assessments (EA) procedure

**Case study objective:** To illustrate how the DEWNR Fire Information Management System (FIMS) Environmental Assessment (EA) process identifies potential significant impacts on MNES and specifies mitigating actions to reduce prescribed burning impacts.

**Location:** Morialta Conservation Park, Mount Lofty Ranges.

**MNES:** Southern Brown Bandicoot (*Isoodon obesulus obesulus*), Chestnut-rumped Heathwren (*Calamanthus Hylacola pyrrhophgius*) and Peppermint box (*Eucalyptus odorata*) grassy woodland of South Australia. **Status:** Endangered.

**Risk to MNES:** Inappropriate fire regimes and landscape scale bushfires could have a significant impact on these MNES. If the entire habitat patch is burnt out in a fire event, localised extinctions may occur. Recolonisation of the habitat may occur if there is sufficient habitat connecting vegetation patches to nearby population.

**Background:** It was identified by DEWNR that a landscape protection burn would be required along Chapman Track in Morialta Conservation Park due to high fuel levels and contiguous native vegetation. As per the DEWNR Fire Policy and Procedure Manual, an EA was required prior to the approval of the Prescribed Burn plan. This procedure ensures that any MNES identified within the affected area are addressed early in the Prescribed Burn planning process, allowing DEWNR to implement the following mitigation methods: avoidance, control (mitigation), assumption, risk transfer and/or research & knowledge.

**Fire planning:** The proposed burn along Chapman Track was entered into FIMS by the Fire Management Officer (Figure 1). By entering the affected area of the proposed burn into FIMS, all relevant information from within the affected areas from the Biological Databases of South Australia and other sources is inserted into the EA (Figure 2). The two threatened species and Peppermint box grassy woodland were potentially identified as present within the prescribed burn area, recognising the potential for a significant impact on MNES. The FIMS EA table allows the assessing officer to enter in actions to mitigate impacts on MNES (Figure 3). FIMS also identifies any relevant Ecological Fire Management Strategies (EFMS) that exist. The Southern Brown Bandicoot EFMS was identified and it includes a number of strategies and actions to mitigate impacts.

A Ramble Survey was conducted and expert advice sought on Chestnut-rumped Heath-wren habitat. The advice concluded habitat in the burn area was degraded, so the burn would have minimal impacts. However, it was noted that habitat in adjoining areas is in better condition and should not be burnt until habitat in the burn area recovers. Further advice was not sought on the Southern Brown Bandicoot as the Regional Ecologist was the local expert on this species. This was entered into FIMS (Figure 4). The listed ecological community (peppermint box grassy woodland) was also identified in FIMS. It is addressed under a separate table in FIMS where condition class and mitigation actions can be entered and amended to suit the site (Figure 5).

In the absence of mitigation actions for MNES, the 'Residual Risk' will be classified as 'high', and endorsement of the prescribed burn would be required by the Native Vegetation Council. FIMS allows the Fire Management Officer(s) or Regional Ecologist to apply mitigating works to the prescribed burn plan, either pre-, during or post-burn to mitigate impacts on MNES. When mitigating actions are applied, the residual risk is reduced to 'low' (Figure 6). Where the residual risk is 'low' the Regional Fire Management Officer is responsible for endorsing the prescribed burn. FIMS also allows the Fire Management Officer or Regional Ecologist to determine the appropriate season for the prescribed burn to be undertaken, in this case during autumn. Once the mitigating actions for MNES have been proposed (Figures 7, 8) the Prescribed Burn Plan is ready for endorsement (Figure 9).

**Discussion/Conclusion:** The FIMS EA procedure assists in the development of fire management activities through the early identification during the planning process of MNES. As demonstrated by this case study, the FIMS EA assisted in identifying appropriate mitigation methods for pre-, during and post-burn fire management activities. This reduced the risk to MNES from 'high' to 'low'. This case study displays the department's ability to implement the mitigation methods of avoidance, control (mitigation), risk transfer and knowledge and research for significant impacts on MNES whilst, also undertaking a prescribed burn to reduce risk to life, property and the environment.

**Fire Information MANAGEMENT SYSTEM**

Prescribed Burns Bushfires Signed In: [ ]

New Burn My Burns

Summary Environmental Assessment Operational Post Burn Activity **Burn Program** Search Reports

**Prescribed Burn: Morialta (Chapman Track) (370)** Final Boundary Set

**Description**

Agency	DEWNR
Region	Adelaide
District	Northern Lofty
Reserve	Morialta (CP)
Non-Reserve Info	
Reporting Officer	[ ]
Total Assessment Area (ha)	60
Planned Objective Area (ha)	60
Total Treated Area (ha)	0
EA Officer	ecologist ecologist
Burn Impact	[ ]
Endorsed Season	[ ]
Burn Deferred	<input type="checkbox"/>
Spatial Status	Final
Tenure Coverage	DEWNR

Fire Management Maps

Figure 1: The affected area is entered in FIMS

**Fire Information MANAGEMENT SYSTEM**

Prescribed Burns Bushfires Signed In: [ ]

New Burn My Burns

Summary Environmental Assessment Operational Post Burn Activity **Burn Program** Search Reports

**Prescribed Burn: Morialta (Chapman Track) (370)** Final Boundary Set

**Fauna Environmental Assessment**

Summary Lists

Fauna species richness within proposed burn boundary (total number of species)	33	Number of indigenous Fauna species within proposed burn boundary	31	Number of non-indigenous Fauna species (both exotic and native) within proposed burn boundary	2
--	----	--	----	---	---

MVS Definitions Vital Attributes

1-25 of 99

Species ID	Species Name	Common Name	Last Sighted	Location	Data Source	Nat.	State	Reg.	Habitat	Response To Fire	Indicator Species	Vul.	Strategy	Relevant	Mitigating Action	Residual Risk
G04375	Isodon obesulus obesulus	Southern Brown Bandicoot (SA mainland and KI ssp)	31/10/2011	Both	BDBSA	EN	V				Yes	H		<input checked="" type="checkbox"/>	No Action	High
M00498	Calamanthus (Hyalaea) pyropygius	Chestnut-rumped Heathwren	29/08/1999	Buffer	BDBSA	ssp	ssp				No	M		<input checked="" type="checkbox"/>	No Action	Moderate
K04369	Calamanthus (Hyalaea) pyropygius parkeri	Chestnut-rumped Heathwren (ML Ranges ssp)	28/11/2007	Both	BDBSA		E				No	M		<input checked="" type="checkbox"/>	No Action	Moderate
Y02408	Egernia cunninghami	Cunningham's Skink			BDBSA		E				No	L		<input checked="" type="checkbox"/>	No Action	Low
Z00307	Neophema elegans	Elegant Parrot			BDBSA		R				No	M		<input checked="" type="checkbox"/>	No Action	Moderate
U04178	Turnix variegatus	Painted Buttonquail	27/10/2012	Buffer	BDBSA		R				No	M		<input checked="" type="checkbox"/>	No Action	Moderate
Q04140	Zoothera lunulata	Bassian Thrush	13/05/2005	Buffer	BDBSA		R				Yes	H		<input checked="" type="checkbox"/>	No Action	High
G00267	Calyptorhynchus funereus	Yellow-tailed Black Cockatoo	27/10/2012	Both	BDBSA		V				Yes	H		<input checked="" type="checkbox"/>	No Action	High
Y00380	Petroica boodanga	Scarlet Robin	18/11/2012	Buffer	BDBSA		ssp				Yes	H		<input checked="" type="checkbox"/>	No Action	High

Figure 2: After the affected area is entered, FIMS populates the EA with all relevant information from environmental databases, including on MNES

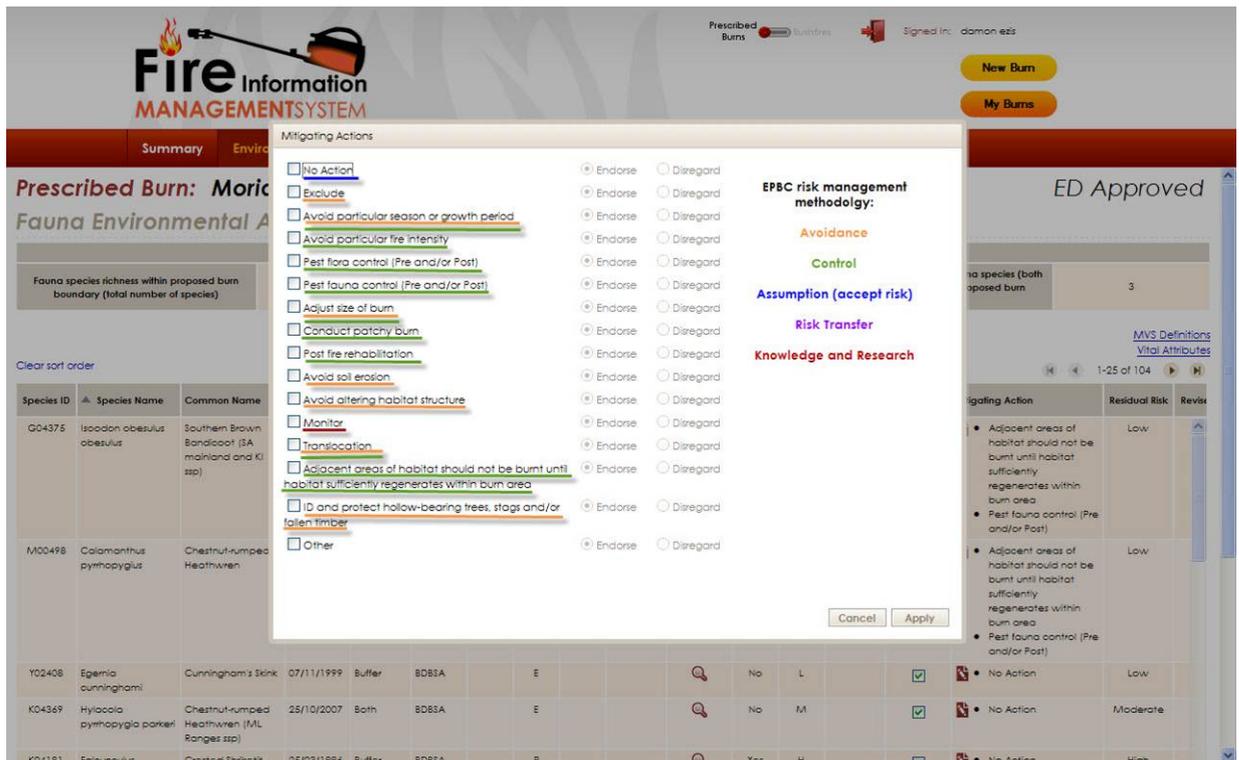


Figure 3: The FIMS Fauna EA table identifies a number of potential mitigation actions. Any relevant EFMS are also identified.

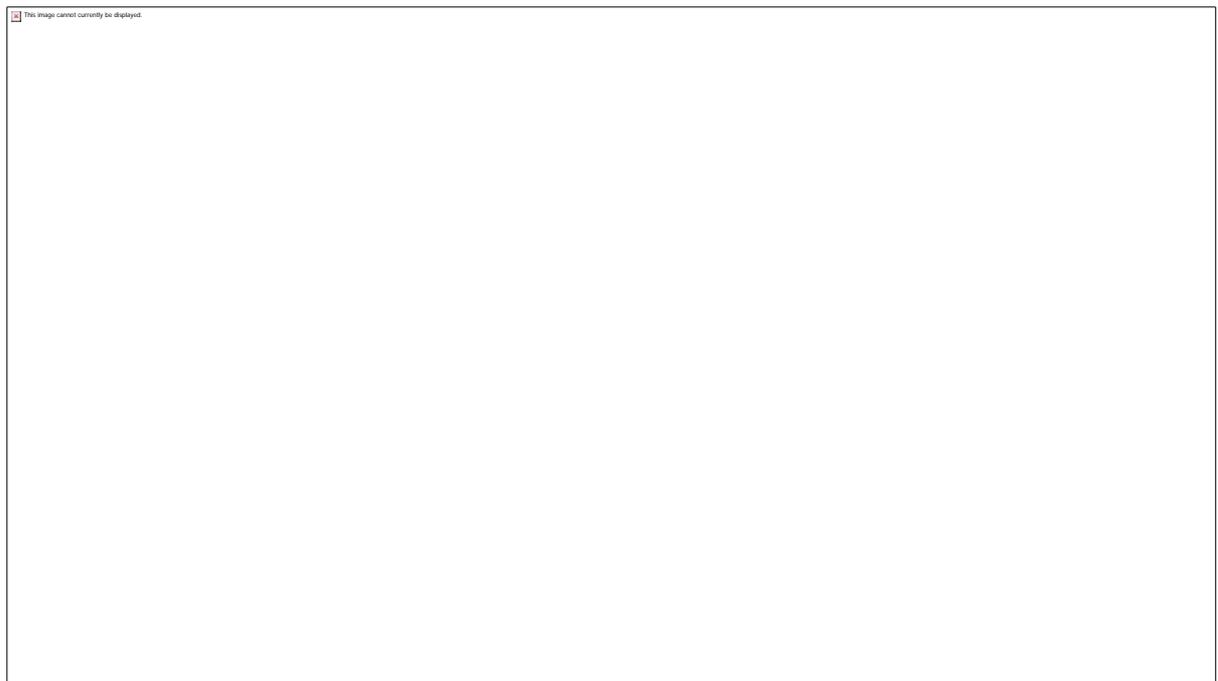


Figure 4: Mitigation measures for fauna are entered into FIMS

**Fire Information MANAGEMENT SYSTEM**

Prescribed Burns: ● Bushfires Signed In:  

**New Burn**  
**My Burns**

Summary Environmental Assessment Operational Post Burn Activity Burn Program Search Reports

**Prescribed Burn: Morialta (Chapman Track) (370)** Final Boundary Set

**Ecological Community** The environmental assessment displays all relevant data on the ecological communities found within the affected area.

Clear sort order

Type	Ecological Community	Conservation Status	Condition Class	Data Source	Response To Fire	Strategy	Mitigating Action	Residual Risk	Revised Risk	Comments	Delete?
EPBC Threatened Ecological Community	Peppermint box grassy woodland of South Australia	Critically Endangered	GOOD	Spatial			No Action	High			

Add Delete Save

Department of Environment, Water and Natural Resources Government of South Australia

**Figure 5: The FIMS Ecological Communities EA Table allows the condition of the ecological community to be entered along with mitigation measures. In this case, if no mitigating actions are implemented, the residual risk will be identified as 'high'**

**Fire Information MANAGEMENT SYSTEM**

Prescribed Burns: ● Bushfires Signed In:  

**New Burn**  
**My Burns**

Summary Environmental Assessment Operational Post Burn Activity Burn Program Search Reports

**Prescribed Burn: Morialta (Chapman Track) (370)** Final Boundary Set

**Ecological Community** The environmental assessment displays all relevant data on the ecological communities found within the affected area.

Clear sort order

Type	Ecological Community	Conservation Status	Condition Class	Data Source	Response To Fire	Strategy	Mitigating Action	Residual Risk	Revised Risk	Comments	Delete?
EPBC Threatened Ecological Community	Peppermint box grassy woodland of South Australia	Critically Endangered	GOOD	Spatial			Avoid particular fire intensity	Low			

Add Delete Save

Department of Environment, Water and Natural Resources Government of South Australia

**Figure 6: When mitigation actions are entered for the ecological community, the residual risk is reduced to 'low'**

Prescribed Burns Signed In: Simeon Telfer

**Fire Information MANAGEMENT SYSTEM**

All selected actions required to mitigate impacts on matters on NES defined in the Morialta (Chapman Track) environmental assessment are listed on this page.

Summary Environmental Assessment Operational Post Burn Activity Burn Program Search Reports

Prescribed Burn: **Morialta (Chapman Track) (370)** RFMO Endorsed

Mitigating Actions

Mitigating Action	Record	Species / Type	Completed	Ongoing	Not Addressed	Comments	Did Mitigating Action meet desired outcome?	Comme
Avoid particular fire intensity	Ecological Community	Peppermint box grassy woodland of South Australia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input type="radio"/> No <input type="radio"/>	
Adjacent areas of habitat should not be burnt until habitat sufficiently regenerates within burn area	Fauna	Calamanthus (Hylaeola) pynhopygus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input type="radio"/> No <input type="radio"/>	
Pest fauna control (Pre and/or Post)	Fauna	Calamanthus (Hylaeola) pynhopygus	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input checked="" type="radio"/> No <input type="radio"/>	
Adjacent areas of habitat should not be burnt until habitat sufficiently regenerates within burn area	Fauna	Isodon obesulus obesulus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input type="radio"/> No <input type="radio"/>	
Conduct patchy burn	Fauna	Isodon obesulus obesulus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input type="radio"/> No <input type="radio"/>	
Pest fauna control (Pre and/or Post)	Fauna	Isodon obesulus obesulus	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>		Yes <input checked="" type="radio"/> No <input type="radio"/>	

Pre and post burn mitigating actions are assessed and identified as complete to evaluate if the desired outcomes have been met.

**Figure 7: Once all mitigating actions have been entered in FIMS, a table in FIMS shows the consolidated actions and their status**



**Fire Information  
MANAGEMENT SYSTEM**

Prescribed Burns  Bushfires  Signed In:

[New Burn](#)

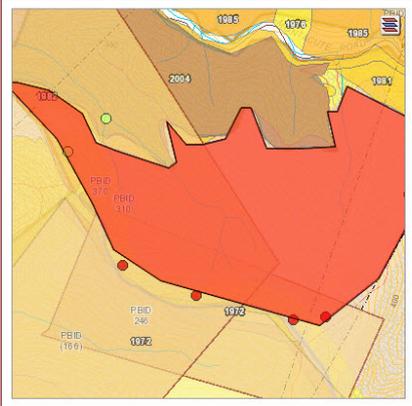
[My Burns](#)

Summary
Environmental Assessment
Operational
Post Burn Activity
Burn Program
Search 
Reports

### Prescribed Burn: Morialta (Chapman Track) (370) Final Boundary Set

**Description**

Agency	DEWNR
Region	Adelaide
District	Northern Lofy
Reserve	Morialta (CP)
Non-Reserve Info	
Reporting Officer	<input type="text"/>
Total Assessment Area (ha)	60
Planned Objective Area (ha)	60
Total Treated Area (ha)	0
EA Officer	ecologist ecologist
Burn Impact	Low Impact w/ Mitigation
Endorsed Season	<input type="text"/>
Burn Deferred	<input type="checkbox"/>
Spatial Status	Final
Tenure Coverage	DEWNR



[Fire Management Maps](#)

<b>Significant Issues &amp; Mitigating Actions</b>	This burn contains significant bandicoot and chestnut-rumped heathwren habitat (southern portion of this site) that is being degraded by goat grazing. Grazing impacts on this habitat are likely to be exacerbated post-fire when the vegetation is regenerating. Grazing impacts therefore need to be reduced markedly prior to or immediately after this burn occurring to prevent long-term impacts (which would potentially trigger the EPBC Act). Pc hygiene will also be required to
<b>Location</b>	This burn is in the centre of Morialta CP in an area bounded by Moores Tk, Fox Hill Tk and Chapmans Tk. The majority of the area is a C zone but a Buffer zone runs along the southern boundary adjacent to Moores Tk.
<b>Vegetation</b>	characterised by an area of Stringybark woodland with a dense shrubby understorey of variable density (also in very good condition). The northern two thirds of the site is comprised of a degraded heathland/blue Gum grassy woodland in which the mistletoe and understorey in most areas are dominated by alien species.

Once the environmental assessment is completed, a summary of the significant issues and mitigating actions is presented on the summary description page.

### Operations Plans

Plan Name	Year / Season	Priority	Timing	Objective Area (ha)	Operational Reason	Operational Status	Copy	Locked	Delete
Ops Plan 1	2012/2013 / Spring			60	Planned Operation	New Operations Plan			

**Figure 8: The final boundary for the prescribed burn, significant issues and mitigating actions can then be displayed in FIMS. The draft EA can now be endorsed by the Regional Ecologist, ensuring that all relevant data and issues have been considered and the assessment of impacts on MNES has been fair and reasonable.**

**Fire Information MANAGEMENT SYSTEM**

Signed In: ecologist ecologist

New Burn  
My Burns

Summary Environmental Assessment Operational Post Burn Activity Burn Program Search Reports

**Prescribed Burn: Morialta (Chapman Track) (370) Burn Ready For Endorsement**

**Description**

Agency	DEWNR
Region	Adelaide
District	Northern Lofty
Reserve	Morialta (CP)
Non-Reserve Info	
Reporting Officer	
Total Assessment Area (ha)	60
Planned Objective Area (ha)	60
Total Treated Area (ha)	0
EA Officer	ecologist ecologist
Burn Impact	Low Impact w/ Mitigation
Endorsed Season	Autumn
Burn Deferred	<input type="checkbox"/>
Spatial Status	Final
Tenure Coverage	DEWNR

Burn season selected based on appropriate fire regime to minimise impacts on matters of NES.

Significant Issues & Mitigating Actions: This burn contains significant bandicoot and chestnut-rumped heathwren habitat (southern portion of this site) that is being degraded by goat grazing. Grazing impacts on this habitat are likely to be exacerbated post-fire when the vegetation is regenerating. Grazing impacts therefore need to be reduced markedly prior to or immediately after this burn occurring to prevent long-term impacts (which would potentially trigger the EPBC Act). Po hygiene will also be required to...

Location Comments: This burn is in the centre of Morialta CP in an area bounded by Moores Tk, Fox Hill Tk and Chapman's Tk. The majority of the area is a C zone but a buffer zone runs along the southern boundary adjacent to Moores Tk.

Vegetation Type & Condition Summary: Vegetation in the southern third of the site is characterised by an area of Stringybark woodland with a dense shrubby understorey of variable density (also in very good condition). The northern two thirds of the site is comprised of a degraded Red Gum/Blue Gum grassy woodland in which the midstorey and understorey in most areas are dominated by alien species.

**Figure 9: The proposed fire management activity is now ready for final endorsement. FIMS assists in identifying the appropriate burn season and shows the DEWNR staff that have contributed to the EA.**

**Fire Information MANAGEMENT SYSTEM**

Signed In: Mike Wouters

New Burn  
My Burns

Summary Environmental Assessment Operational Post Burn Activity Burn Program Search Reports

**Prescribed Burn: Morialta (Chapman Track) (82) ED Approved**

**Set Status**

Status: ED Approved  
Date: 05/06/2014 14:37  
Next Approver: Grant Felton  
Comments: [Empty]  
Clear Save

**Status History**

Status	Updated by	Date	Notified User	Comments
ED Approved	Grant Felton	22/10/2013 17:14		Comments noted and endorsed - in particular the impacts on any relevant EPBC Act listed species. Approved under the following conditions: 1) That a goat control program is developed and approved prior to the burn by the Manager Public Lands; 2) That all mitigating actions listed are realised and implemented pre and post the burn as required; 3) That the Friends of Moores Road are consulted well in advance of the burn being implemented.
RFAO Endorsed	Ian Tonner	22/10/2013 09:54	Grant Felton	Low impact with mitigating actions requires this burn to be approved outside the region. This burn is likely to be politically sensitive due to the Friends of Moores Road and the presence of EPBC listed species. The burn will need to be well considered before final approval and may need to be postponed in order to minimise environmental impacts. This burn has been postponed a number of times due to other areas being burnt (tracked) within the same general area.
RE Endorsed	Randall Johnson	14/08/2013 16:23	Ian Tonner	Note Category 2 (Low Impact with Mitigation). Goat management must be undertaken either in the lead up, immediate post-burn or both to reduce herbivory impacts on post-fire regeneration. Po

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Updated May 21, 2014

**Figure 10: The proposed burn is approved and any required conditions noted**

**Fire Information MANAGEMENT SYSTEM**

Burn/Fires Prescribed Burns Other Works Signed in: Mike Wouters

New Burn My Burns

Summary Environmental Assessment Operational **Post Burn Activity** Burn Program Search Reports

**Prescribed Burn: Stoneyfell Quarry (14)** Post Burn Activities Complete

**Mitigating Actions**

Mitigating Action	Record	Species / Type	Comments	Completed	Ongoing	Not Addressed	Comments	Did Mitigating Action meet desired outcome?	Comments
Adjacent areas of habitat should not be burnt until habitat sufficiently regenerates within burn area	Mitigating Action	Antechinus flavipes	良	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	良	Yes <input type="radio"/> No <input type="radio"/>	良
Adjacent areas of habitat should not be burnt until habitat sufficiently regenerates within burn area	Fauna	Calamantus pythopygius	良	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	良	Yes <input type="radio"/> No <input type="radio"/>	良
Avoid particular season or growth period	Fauna	Calamantus pythopygius	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Pest flora control (Pre and/or Post)	Fauna	Calamantus pythopygius	良	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
ID and protect hollow-bearing trees, stags and/or fallen timber	Fauna	Calyptorhynchus lunereus	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Adjacent areas of habitat should not be burnt until habitat sufficiently regenerates within burn area	Fauna	Isoodon obesulus obesulus	良	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	良	Yes <input type="radio"/> No <input type="radio"/>	良
Pest flora control (Pre and/or Post)	Fauna	Petroica boodang	良	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Pest flora control (Pre and/or Post)	Flora	Chrysanthemoides monilifera ssp. monilifera	良	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	良	Yes <input type="radio"/> No <input type="radio"/>	良
Monitor	Flora	Pentameris pallida	良	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	良	Yes <input type="radio"/> No <input type="radio"/>	良
Pest flora control (Pre and/or Post)	Flora	Rubus anglocandicans	良	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Monitor	Flora	Spyridium spathulatum	良	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Pest flora control (Pre and/or Post)	Habitat	Declining Woodland Birds	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Hygiene	Threatening Process	Phytophthora	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Notification	Threatening Process	Vineyard	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良
Other	Threatening Process	Vineyard	良	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	良	Yes <input checked="" type="radio"/> No <input type="radio"/>	良

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**Figure 11: Once conducted, the fire management activity is assessed for outcomes, including effective mitigation (note this image comes from another burn – Morialta (Chapman Track) had not been completed at the time of writing. FIMS assists in identifying the actions not carried out (& why) and those that are required to be conducted over a longer time period. Reporting will be based on the data collected.**

## 14.8 Case study 3: DEWNR Ecological Fire Management Strategies and C-Zone Prescribed Burning

**Case Objective:** Illustrate how the DEWNR Ecological Fire Management Strategies (EFMSs) guide the implementation of on ground fire management works and post works to mitigate the potential for significant impacts on matters of NES.

**Matters of NES:** South-eastern Red-tailed Black-Cockatoo (*Calyptorhynchus banksii graptogyne*) (RtBC). **Location:** Small area of south-eastern Australia delimited in South Australia, by Keith to Lucindale and Mt Gambier. **Status:** Endangered.

**Risk:** RtBC are restricted to Desert Stringybark (*Eucalyptus arenacea*) and Brown Stringybark (*E. baxteri*) woodlands. Fire that scorches or consumes some of the stringybark canopy significantly reduces feed availability and can reduce fruit production for 9 to 11 years post fire (DENR, 2011a).

**Detail:** Where prescribed burning activities occur within a C-zone, they must meet the Ecological Fire Management Guidelines and EFMSs.

The overall aim of an RtBC EMFS is to guide the planning and implementation of prescribed burns in known or potential habitat of RtBC. The Department develops new EFMSs for significant fire sensitive species as required. The process to develop an EFMS is as follows:

- Through the development of DEWNR Fire Management Plans it is identify that a fire sensitive species of conservation significance occurs within the planning area and may be impacts by fire events.
- Where the impact of prescribed burning is identified as a risk on a species of conservation significance, the development of an EFMS for a species is recommended as a Fire Management Plan Management Strategy.
- DEWNR prioritises the development of new strategies based on the species of highest conservation significance and the MVS types regularly burnt or require ongoing ecological burning for conservation.
- Once the development of a new EFMS is determined, the DENWR Fire Management Unit collaborates with the DEWNR Threatened Species Unit and any associated Recovery Team or other relevant expert(s), in this case the RtBC Recovery Team, to develop a comprehensive draft strategy.
- The draft strategy is released for comment from interested parties, submission are reviewed and the draft amended if applicable.
- Finally the DEWNR Fire Management Unit and DEWNR Threatened Species Unit seeks endorsement from the relevant Recovery Team (RtBC Recovery Team) before the strategy is approved, published online and distributed internally to Fire Management Officers.

The final [RtBC EMFS](#) identifies risks that fire events, both bushfires and prescribed burning, pose. Mitigating strategies and actions are identified that can be implemented to mitigate any potential significant impacts.

Once approved, the RtBC EFMS mitigating strategies and actions are incorporated into the Fire Information Management System (FIMS) Environment Assessment (EA) process. Where a species or their habitat has been recorded within the burn plan area, the matter of NES is automatically inserted into the EA and the relevant EFMS referred to (Figure 1). Mitigating actions can then be applied to the prescribed burn plan to mitigate significant impacts to matters of NES and habitat where relevant. RtBC mitigating strategies and actions include:

- Ensure that at least 85% of the RtBC stringybark feeding habitat remains free of crown-scorch for at least 10 years.
- Protect known nesting sites from burning.
- Protect trees with known large hollows (entrance >15cm width) or artificial hollows by ensuring a mineral earth break or foam line surrounds the base of the tree (refer to Figure 2).

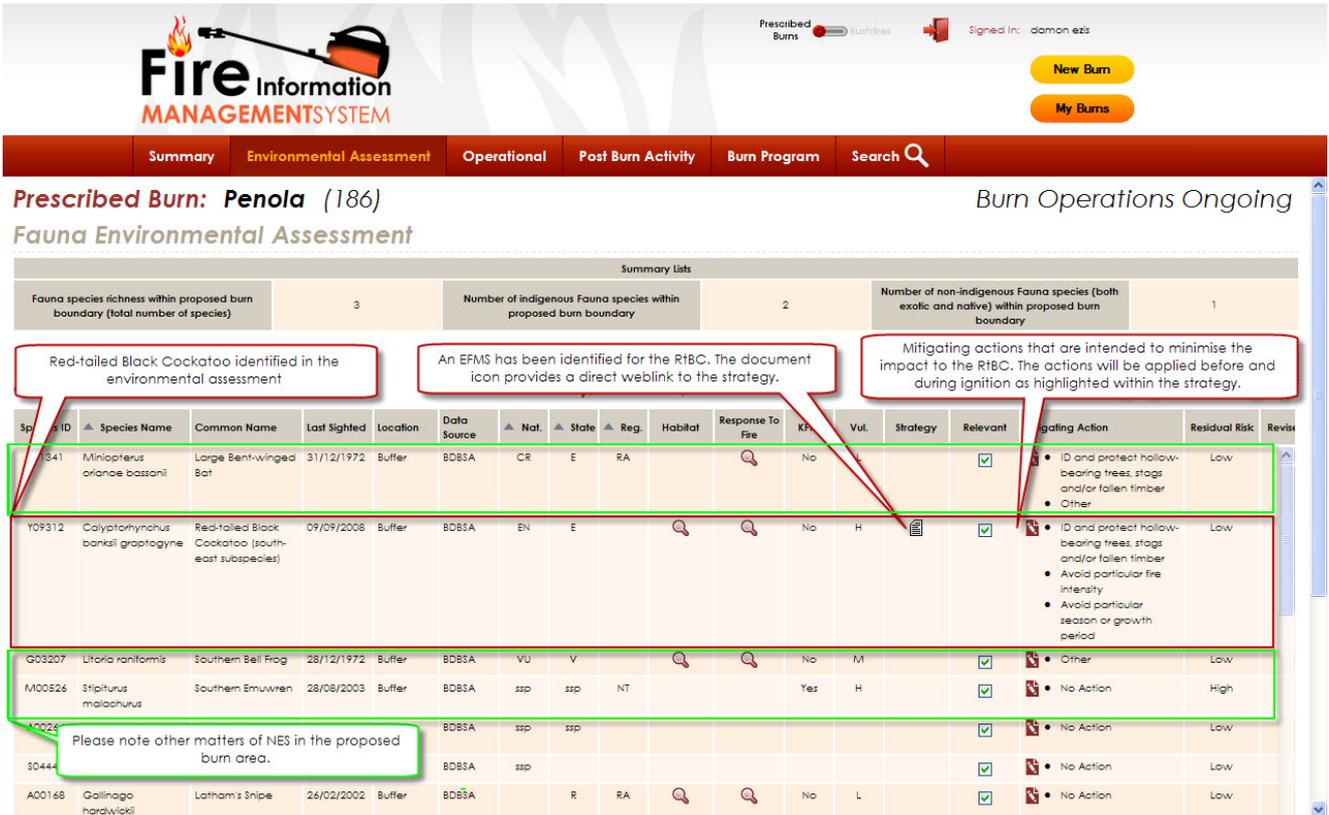


Figure 1: RtBC Identified in the FIMS Fauna EA Table

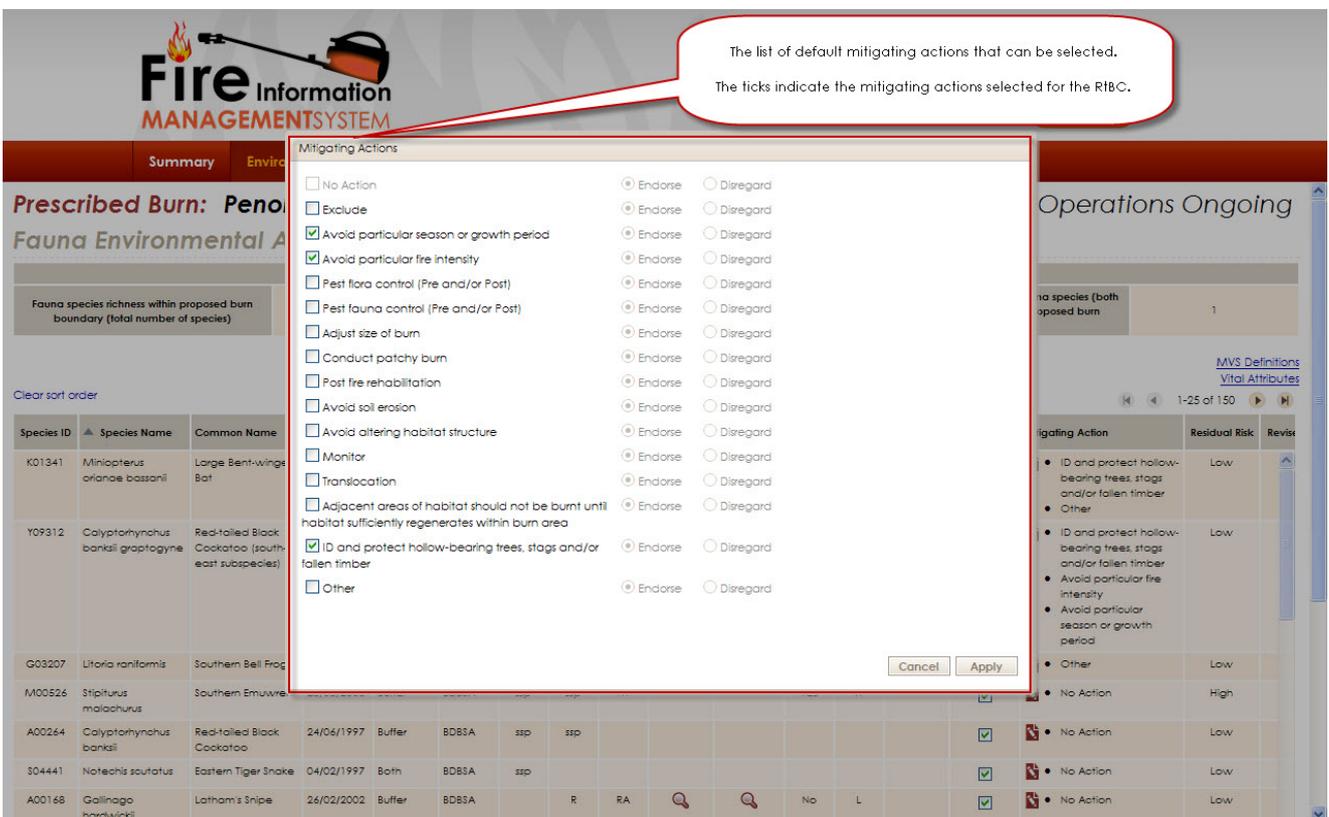
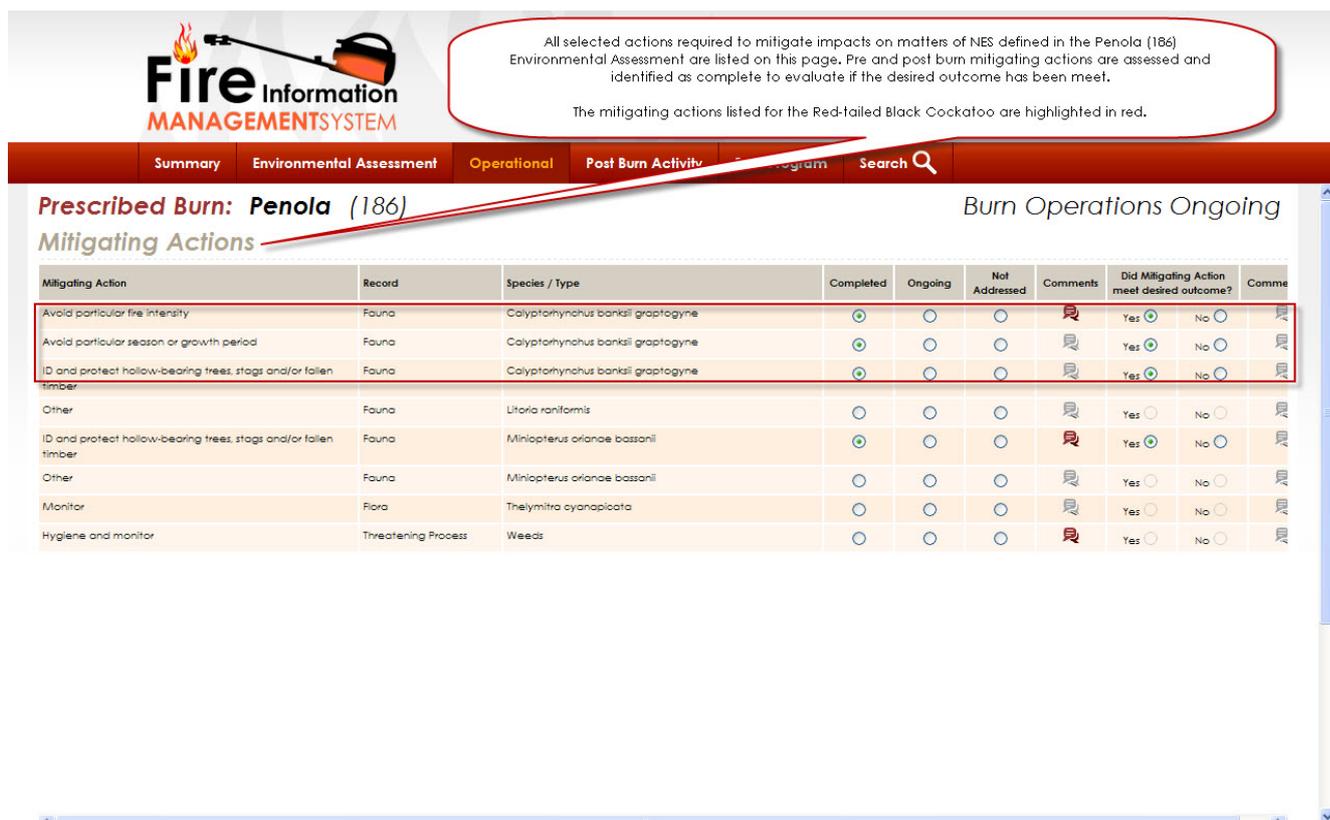


Figure 2: RtBC EFMS Mitigating Actions Selected



**Figure 3: List of RtBC EFMS Mitigating Actions Selected**

All mitigating actions (pre and post fire) are listed (Figure 3), ensuring that the ecological outcomes set out in the strategy are adhered. Any new observations or findings are recorded and incorporated into the vital attributes database.

An annual/quarterly update on prescribed burning is provided to the RtBC Recovery Team during the annual/quarterly meeting where relevant to the RtBC so that area burnt and any impacts are recorded.

**Discussion/Conclusion:** The development of the RtBC EFMS and its implementation through the FIMS EA enables DEWNR to identify early in the prescribed burn planning process where the potential exists for significant impacts on matters of NES to occur. The RtBC EFMS recommends mitigating actions pre, during and post prescribed burn to mitigate the potential for a significant impact on the RtBC. This case study displays the department's method of control (mitigation) and research & knowledge for significant impacts on matters of NES whilst, also undertaking fire management to reduce the risk across the landscape to life, property and the environment