Fire Management Plan

Reserves of the South East

Department
for Environment
and Heritage

PREPARE. ACT. SURVIVE. BUSHFIRE READY

Government
of South Australia

Included Department for Environment and Heritage Reserves

Aberdour CP	Custon CP	Lake Frome CP	Padthaway CP
Bangham CP	Desert Camp CP	Lake Hawdon South CP	Penambol CP
Baudin Rocks CP	Desert Camp CR	Lake Robe GR	Penguin Island CP
Beachport CP	Dingley Dell CP	Lake St Clair CP	Penola CP
Belt Hill CP	Douglas Point CP	Little Dip CP	Piccaninnie Ponds CP
Bernouilli CR	Ewens Ponds CP	Lower Glenelg River CP	Pine Hill Soak CP
Big Heath CP	Fairview CP	Martin Washpool CP	Poocher Swamp GR
Big Heath CR	Furner CP	Mary Seymour CP	Reedy Creek CP
Bool Lagoon GR	Geegeela CP	Messent CP	Salt Lagoon Islands CP
Bucks Lake GR	Glen Roy CP	Mount Boothby CP	Talapar CP
Bunbury CR	Gower CP	Mount Monster CP	Tantanoola Caves CP
Butcher Gap CP	Grass Tree CP	Mount Scott CP	Telford Scrub CP
Calectasia CP	Guichen Bay CP	Mud Islands GR	Tilley Swamp CP
Canunda NP	Gum Lagoon CP	Mullinger Swamp CP	Tolderol GR
Carpenter Rocks CP	Hacks Lagoon CP	Naracoorte Caves CR	Vivigani Ardune CP
Coorong NP	Hanson Scrub CP	Naracoorte Caves NP	Woakwine CR
Currency Creek GR	Jip Jip CP	Nene Valley CP	Wolseley Common CP

CP = Conservation Park
NP = National Park
GR = Game Reserve
CR = Conservation Reserve

The Native Vegetation Council approved extension of this plan as a bushfire management plan until 31 December 2028 through the *Native Vegetation Regulations 2017*, Reg 9(1) Sch 1(17).

Please note that the Department for Environment and Heritage is now the Department for Environment and Water.

For further information please contact:

Department for Environment and Heritage
Phone Information Line (08) 8204 1910, or
see SA White Pages for your local
Department for Environment and Heritage office.

This Fire Management Plan is also available from: https://www.environment.sa.gov.au/topics/fire-management/fire-science-and-planning/fire-management-plans/current-fire-management-plans

Front Cover: Mount Scott Conservation Park prescribed burn by Kay Richardson

Government of South Australia
Department for Environment and Heritage

EXECUTIVE SUMMARY

This Fire Management Plan for Reserves of the South East includes 68 Department for Environment and Heritage (DEH) reserves, as well as adjoining dedicated Crown land or other Crown land under the care and control of the Minister for Environment and Conservation. This plan has been developed to provide direction for fire management activities, through the inclusion of strategies for risk minimisation and bushfire suppression considerations within these reserves. The plan emphasises the protection of life and property as well as providing direction for land managers in the protection and enhancement of the natural and cultural heritage of the South East reserves. It is important to note there will be a transitional phase while the activities and works proposed in the plan are implemented and implementation will be dependant upon ongoing prioritisation of fire management and regional resources. Some degree of flexibility will need to remain for fire suppression in those areas where there has only been partial implementation of works.

The Reserves of the South East were identified as a priority for fire management planning within DEH South East Region, to address the following issues:

- High visitor numbers to some of the reserves (such as the Coorong NP, Canunda NP, Naracoorte Caves NP, Piccaninnie Ponds CP, Ewens Ponds CP, Little Dip CP) within the region, particularly during the fire season.
- Protection of significant fauna and flora species, some of which are unique to the region.
- General protection of life, property and environmental values.
- High fuel levels in some areas of the reserves due to the long-term absence of fire and modification of the natural vegetation.
- Regeneration and revegetation processes changing fuel hazards.
- Landscape protection of reserves to reduce the likelihood of a whole reserve, or large portion of a reserve, burning in a single fire event.
- Likelihood of arson and accidental fire ignitions.

These issues are addressed by:

- applying a risk assessment process to identify life, property and environmental values that may be threatened by bushfires
- applying DEH Fire Management Zoning principles to guide the management of fuel in Asset and Buffer zones and designating Conservation zones
- applying DEH Ecological Fire Management Guidelines to determine appropriate fire regimes in Conservation zones
- auditing tracks within the reserves of this plan using the Government Agencies Fire Liaison Committee's (GAFLC) guidelines for firebreaks and fire access tracks in South Australia.

A number of actions as a result of applying the above processes are recommended.

- Fuel reduction:

    - in Asset and Buffer zones using a variety of methods including prescribed burning and mechanical modification
    - in strategic areas within the Conservation zone to provide some landscape protection within the reserves and increase patchiness within the vegetation (this reduces the possibility of a reserve burning in a single fire event)
    - to complement weed management strategies.
- Alteration and/or upgrade of fire access points and track classifications to increase the:
    - safety of firefighting personnel involved in a fire suppression effort
    - response time of fire suppression agencies
    - type of resources that can safely be deployed to assist in a fire suppression effort.
- Identification of suppression considerations that may assist bushfire suppression operations and to contribute to improved fire management.

The community and Country Fire Service (CFS) volunteers have contributed time, energy and resources to fire suppression in the South East Region and they are to be commended for this contribution. The co-operation of the local community will be critical to the successful implementation of the plan. Neighbours of DEH managed land will need to implement fire management strategies around their own assets to complement the work to be undertaken by DEH.

This plan was released for public comment for a period of four weeks. Comments were evaluated and incorporated where considered appropriate. A major review of this plan will occur after ten years of implementation, or earlier if required.

CONTENTS

List of Tables

List of Figures

Fire Management Maps

Maps supporting this fire management plan are interactive and are provided via the internet. To access this site please enter www.dehfire.sa.gov.au into your internet browser and follow the links to 'Fire Management Maps'.

Fire Management Maps is designed to illustrate the text in the plan using four standard thematic maps. Users can view maps referred to in the text by selecting the appropriate map. Data displayed on each map becomes more detailed at larger scales. Once zoomed to an area of interest, it is possible to move between map themes and also print A3 maps of areas of interest. Please note that data will be updated from time to time, therefore what is shown on the maps is likely to be more current than what is described in the plan.

Map 1 – Terrain, Tenure and Infrastructure
Map 2 – Vegetation Communities
Map 3 – Fire History
Map 4 – Fire Management and Access

1 SCOPE AND PURPOSE

The intention of this plan is to provide strategic direction and a framework for fire management activities in reserves of the South East. This plan incorporates 68 DEH reserves, as well as adjoining dedicated Crown land or other Crown land under the care and control of the Minister for Environment and Conservation. The plan defines objectives for ecological fire management and the protection of life and property, particularly in relation to visitors and adjacent landholders. Strategies and works are suggested in order to allow those objectives to be met. Pre-suppression works and activities will increase the level of preparedness for bushfires and will guide management and suppression during bushfire incidents.

The reserves of the South East were identified as a priority for fire management planning within the DEH South East Region due to a number of factors, including:

- High visitor numbers to some of the reserves (such as the Coorong NP, Canunda NP, Naracoorte Caves NP, Piccaninnie Ponds CP, Ewens Ponds CP, Little Dip CP) within the region, particularly during the fire season.
- Protection of significant fauna and flora species and ecological communities, some of which are unique to the region.
- General protection of life, property and environmental assets within the plan area.
- High fuel levels in some areas of the reserves due to a lack of fire in the past and modification of the natural vegetation.
- Landscape protection of reserves to reduce the likelihood of a whole reserve, or large portion of a reserve, burning in a single fire event.
- Likelihood of arson and accidental fire ignitions.

This Fire Management Plan aims to:

- Assess the level of risk (particularly in relation to the above issues) and the existing fire management and reserve management objectives.
- Identify objectives for fire management within the reserves.
- Outline strategies for risk mitigation and propose operational works to increase the level of bushfire preparedness and guide suppression management during bushfire incidents.
- Inform the preparation of Response Plans for the reserves in the South East Region, which provide specific operational information useful in the early stages of an incident.

Operational works outlined in this plan will be implemented in a staged manner, depending on available resources. Adjoining lands are considered in the plan, but only in the context of works required to minimise the risk to assets from fires originating in the plan area. Fire management planning for land use outside of the reserves is the responsibility of the relevant Bushfire Management Committee (BMC), in accordance with the requirements of the *Fire and Emergency Services Act 2005*. DEH is represented on these committees, along with local government and the Country Fire Service (CFS).

In recent years DEH has reviewed and updated fire management planning to appropriately address issues such as safety, protection of life and property, ecological management and mitigation of fire risk. This approach has been carefully considered to ensure that the gap is bridged between planning, on-ground actions and outcomes. Mechanisms are in place to allow the plan to evolve and improve. Consultation with the community and stakeholders is seen as critical to successful planning and as such has been built into the planning process.

1.1 Objectives

1.1.1 General Objectives for Fire Management

DEH has a responsibility for fire management within the reserves incorporated into this fire management plan. Fire management objectives that apply to all of the reserves in the plan area are as follows.

- To provide for the protection of human life and property during bushfire events.
- To ensure that sound conservation and land management principles are applied to fire management activities (where information is available on species, habitat, cultural and built heritage, it will then be taken into account during suppression activities).
- To complement Bushfire Risk Management Plans (formerly District Bushfire Prevention Plans).
- To undertake bushfire suppression activities in a safe and professional manner.
- To provide for the strategic containment of bushfires (eg to minimise the likelihood of a fire entering/exiting a reserve).
- To prevent or inhibit the spread of fire through DEH managed land.
- To manage fire regimes to ensure consistency with the fire management guidelines in Conservation zones (refer to Table 5 – Page 49).

1.1.2 Objectives for Fire Management in the South East

- To reduce the impact of bushfire in the reserves by:
    - minimising the likelihood of a significant portion of a reserve burning in a single fire event
    - working with relevant stakeholders and other land management agencies to minimise the likelihood of a landscape scale fire in the South East planning area.
- To maintain or improve the viability of species populations, flora and fauna communities and ecosystems in reserves by:
    - reducing the likelihood of fire suppression operations impacting on the viability of species populations, flora and fauna communities and ecosystems
    - reducing the likelihood of contiguous remnants of significant ecological communities burning in their entirety during a single fire event
    - creating a mosaic of areas with a range of different 'time since last fire' to benefit a range of species populations, flora and fauna communities and ecosystems.

- To establish and maintain an appropriate level of preparedness (including employee and equipment resources) that will enable rapid and effective response for fire management by:
    - preparing response actions considering the bushfire risk, including the prevailing weather, topography, overall fuel hazard, available resources, fire location and the current situation
    - assessing each fire and determining strategies promptly
    - maintaining a safe working environment during fire operations in compliance with the *Occupational Health Safety and Welfare Act 1986* and consistent with the DEH Policy
    - using the functions, roles and responsibilities of the Australasian Interagency Incident Management System (AIIMS).
- To improve knowledge of how species populations, flora and fauna communities and ecosystems respond to fire by filling gaps in knowledge and contributing new information and concepts to the adaptive management process.
- To use fire as part of an integrated weed management strategy in order to reduce the abundance of environmental weeds posing a threat to the integrity of significant habitats and ecological communities.

2 THE PLANNING FRAMEWORK

The policy and planning framework for fire management on DEH managed land is shown in Figure 1 (below). Reserve Management Plans provide the overarching strategy for all management activities in DEH reserves and are prepared as a requirement under the *National Parks and Wildlife Act 1972*. Fire Management Plans are produced for DEH managed land in accordance with Fire Management Policy and Procedures. An outcome of the fire management planning process is the identification of strategies and operational works for risk mitigation over a 10 year period (as set out in Appendix 1). These works are prioritised and programmed into a works schedule, which is prepared on an annual basis. Response Plans provide a greater level of detail in regards to fire suppression. Response Plans are used in the early stages of an incident and are reviewed annually to ensure currency.

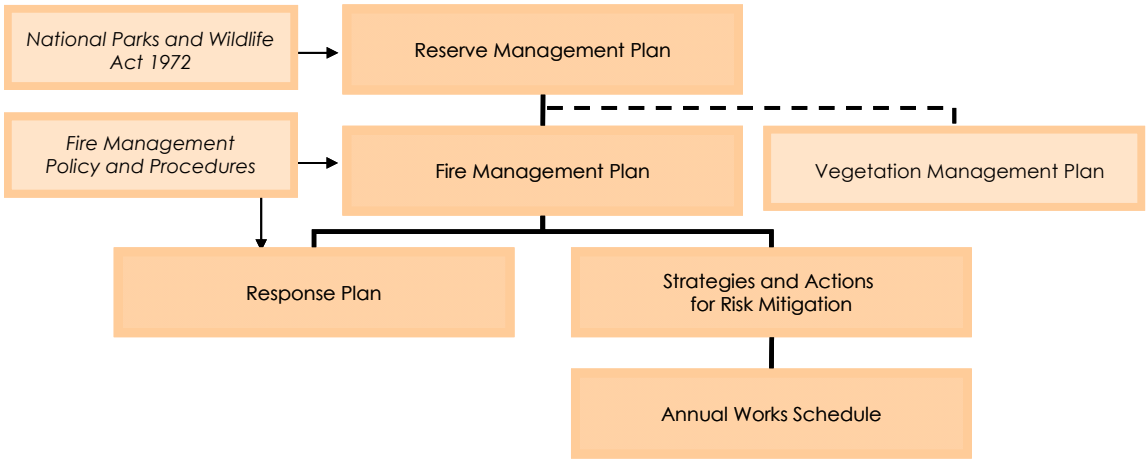

FIGURE 1 – THE PLANNING FRAMEWORK

2.1 Legislation

2.1.1 Federal Legislation

The Federal legislation *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) describes the assessment and approval process required for actions likely to impact matters of national environmental significance (e.g. nationally listed species and ecological communities).

2.1.2 State Legislation

Under the provisions of the South Australian *National Parks and Wildlife Act 1972* (NPW Act 1972) and *Wilderness Protection Act 1992*, DEH has responsibilities for fire management activities within reserves constituted under these Acts. The preparation of Fire Management Plans is not a statutory requirement under these Acts, but a Departmental Policy.

Underlying the *Wilderness Protection Act 1992* is a *Wilderness Code of Management* (DEH, 2004a) that includes requirements for fire, emergency and essential management operations in wilderness areas.

DEH is required to meet the provisions under the *Native Vegetation Act 1991* when prescribing any works that involve the clearance of native vegetation, or the use of fire

(note that fire is a form of 'clearance' under the Act). All prescribed burns must be approved through the process delegated to DEH by the Native Vegetation Council (NVC).

Under the *Crown Lands Management Act 2009* Crown land is described as either:

- dedicated Crown land (land that has been dedicated as a reserve for a specified purpose to a Minister, person or body – including local government or community groups). For the purpose of this plan any dedicated Crown land will be described as a 'dedicated reserve'
- Crown leasehold land
- Crown land owned by, or under the control of the Minister for Environment and Conservation
- unalienated Crown land (land that has not been alienated from the Crown, not including those as defined above).

DEH has responsibilities for fire management on unalienated Crown land and any Crown land dedicated to, owned by or under the care and control of the Minister for Environment and Conservation. The Minister for Environment and Conservation is not responsible for fire management on Crown leasehold land or land dedicated to another government Minister, person or body.

The South Australian *Fire and Emergency Services Act 2005* outlines the responsibilities of DEH and other fire authorities in relation to fire management within proclaimed reserves. Under this Act, the Chief Officer of the CFS must take steps to have any relevant provisions of a management plan for a government reserve brought to the attention of members of CFS who might exercise powers under this section with respect to the reserve.

All landholders are obliged to comply with the *Fire and Emergency Services Act 2005*, which outlines responsibilities for fire preparedness. DEH will implement works for fire management on DEH managed lands within the planning area; however adjoining landholders are also required to implement works on their own property to minimise the threat of fire. Note that the *Fire and Emergency Services Act 2005* is currently undergoing review. Changes to the Act have been recommended within the Ministerial Review of Bushfire Management in South Australia (Monterola, 2007) report.

2.2 Policies and Procedures

2.2.1 DEH Fire Management Policy

The DEH *Fire Management Policy* (DEH, 2009b) outlines the agency's fire management responsibilities and provides a framework for bushfire suppression, prescribed burning and fuel management on DEH managed land.

Under this Policy, DEH is responsible for:

- fire management on reserves dedicated under the *National Parks and Wildlife Act 1972* or *Wilderness Protection Act 1992*

- fire management on any land under the *Crown Lands Management Act 2009* where the Minister for Environment and Conservation has fire management responsibilities (as defined within Section 2.1.2 of this plan)
- fire suppression on other government lands where DEH has entered into a Memorandum of Understanding (MoU) or Heads of Agency Agreement (HOAA) with other government agencies.

The Policy states that DEH will undertake fire management activities to protect life, property and environmental assets and will enhance the conservation of natural and cultural heritage values. Furthermore, it is recognised that fire is a natural component of the environment and the maintenance of biodiversity and ecosystem processes is dependent on appropriate fire regimes. Prescribed burning will be used as a management tool on DEH managed land for reducing fuel hazards to protect life, property and biodiversity values, and for ecological management.

The Policy specifies that Fire Management Plans will provide the framework for:

- the management of bushfire suppression, including identification of strategic access and control lines
- prescribed burning for ecological management and fuel reduction purposes.

2.2.2 Policy and Procedure for Fire Management Planning

DEH has a Zoning Policy that outlines the zoning standard that is used for fire management planning on DEH managed lands (DEH, 2009c). Zoning is derived from:

- the level of perceived risk, using the *Policy and Procedure for Risk Assessment in DEH Fire Planning* (DEH, 2009d)
- the Overall Fuel Hazard, which is assessed using the *Overall Fuel Hazard Guide for South Australia* (DEH, 2006e), in accordance with the *Fire Policy and Procedure for Fuel Hazard Assessment* (DEH, 2009e)
- the activities considered appropriate to mitigate the threat that fire poses to life, property and environmental assets.

Three distinct zones exist (Asset zone (A-zone), Buffer zone (B-zone) or Conservation zone (C-zone)) and these are applied according to landscape objectives. A- and B-zones are determined by fuel management objectives, whereas C-zones are designated to assist in the conservation of biodiversity through the application of appropriate fire regimes. For more information on zoning, refer to Section 5.3.3 of this plan and the *Policy and Procedure for Fire Management Zoning in DEH Fire Planning*.

2.2.3 Policies and Procedures for Fire Response

The following Policies and Procedures are to be used in conjunction with this Fire Management Plan during an incident:

- *DEH Fire Management Policy* (DEH, 2009b)
- Those contained within the *DEH Fire Management Policy and Procedure Manual* (DEH, 2009f)

- CFS Chief Officer Standing Orders and Standard Operating Procedures (CFS, 2009a).
- CFS Operations Management Guidelines (OMGs) (CFS, 2009b).

Strategies implemented during an incident will be determined by the Incident Management Team (IMT), taking this plan into consideration in accordance with Section 97 of the *Fire and Emergency Services Act 2005*.

2.3 Planning for DEH Managed Lands

2.3.1 Reserve Management Plans

Reserve management plans are a statutory requirement under the *National Parks and Wildlife Act 1972* and the *Wilderness Protection Act 1992*. Reserve management plans provide the overarching strategy for all management activities in reserves.

In relation to fire, a reserve management plan will:

- provide an overview of any fire-related issues in the reserve in question
- state DEH responsibilities for managing fire in the reserve system in accordance with DEH Fire Management Policy
- identify the requirement for a fire management plan based on the nature of any fire-related issues.

Reserve management plans have been developed for 52 reserves in the planning area. Two plans are in preparation:

- *Conservation Parks of the Coorong District* including Bunbury CP, Martin Washpool CP, Messent CP, Mount Boothby CP and Tilley Swamp CP
- *Coorong NP* including Salt Lagoon Islands CP and Lake St Clair CP.

Seven reserves do not have reserve management plans (Bernouilli CP, Naracoorte Caves CR, Currency Creek GR, Tolderol GR, Custon CP, Mud Islands GR and Vivigani Ardune CP). The objectives and strategies within this fire management plan are consistent with all of these reserve management plans.

2.3.2 Vegetation Management Plans

Vegetation Management Plans are compiled as a means to identify a prioritised, strategic and sustainable approach to mitigating the impact of pest plants on natural ecosystems (Paul and Incoll, 2001). Unlike Reserve Management Plans, they are not a legislative requirement under the *National Parks and Wildlife Act 1972* and are completed on an *ad hoc* basis for selected DEH reserves depending on resource availability. Vegetation Management Plans have not been prepared for any of the reserves included in this Fire Management Plan.

Vegetation Management Plans prepared for any of the reserves in the planning area in the future should take the zoning arrangements and strategies within this Fire Management Plan into consideration when designating sites for revegetation. Any revegetation should be planned in conjunction with the relevant District Ranger and in consultation with the Regional Fire Management Officer.

2.4 Local and Regional Environmental Planning

The following documents provide management direction for the biodiversity of the South East planning area and adjoining lands:

- *The Biodiversity Plan for the South East of South Australia* (Willoughby*, et al.*, 2001).
- *Draft South East Natural Resources Management Plan* (SE NRM Board, In Prep).

The fire management planning objectives, strategies and works outlined in this plan were developed with careful consideration given to providing for the maintenance of ecological integrity. This fire management plan is consistent with the objectives outlined in these local and regional environmental plans. The recommendations of these plans are described in more detail below.

2.4.1 Biodiversity Plan

The *Biodiversity Plan for the South East of South Australia* (Croft*, et al.*, 1999) is one of several regional biodiversity plans developed by DEH. The Biodiversity Plan was written to guide the conservation, management and rehabilitation of habitats at a regional level. The *South East Biological Survey* (Foulkes and Heard, 2003), completed in 1997, was conducted as part of the greater Biological Survey of SA, with the objectives of:

- improving knowledge of South Australian biodiversity
- determining biological variation across the state
- managing nature conservation in the long-term.

2.4.2 Natural Resources Management Plan

The *South East Natural Resources Management Plan* is being developed in consultation with the community, other agencies and stakeholders as a requirement under the *Natural Resources Management Act 2004* (NRM Act). The plan, which will be linked to the *State NRM Plan* (DWLBC, 2006a) describes the condition of, and the natural resources within, the region and will identify goals to improve environmental outcomes in the South East. It will provide a strategic framework for achieving the vision for natural resource management in the South East.

2.4.3 Recovery Planning

Recovery plans are prepared for nationally threatened species (or subspecies) listed under the EPBC Act. In the South East reserves a number of terrestrial species and one community of 'national conservation significance' have been recorded. The following species either have recovery plans that are in development or in place:

- Orange-bellied Parrot (*Neophema chrysogaster*) (DEH (Cwlth), 2004)
- Malleefowl (*Leipoa ocellata*) (Benshemesh, 2000)
- Striped Legless-lizard (*Delma impar*) (Smith and Robertson, 1999)
- Red-tailed Black-cockatoo (*Calyptorhynchus banksii graptogyne*) (DEWR, 2007)
- Swift Parrot (*Lathamus discolour*) (Swift Parrot Recovery Team, 2001)
- Little Dip Spider-orchid (*Caladenia richardsiorum*) (Murphy*, et al.*, 2008)

- Swamp Greenhood (*Pterostylis tenuissima*) (Murphy*, et al.*, 2008)
- Maroon Leek-orchid (*Prasophyllum frenchii*) (Duncan and Coates, 2007)
- Metallic Sun-orchid (*Thelymitra epipactoides*) (Duncan and Coates, 2007)
- Elegant Spider-orchid (*Caladenia formosa*) (Todd, 2000)
- Jumping-jack Wattle (*Acacia enterocarpa*) (Moritz and Bickerton, 2007)
- Clover Glycine (*Glycine latrobeana*) (Carter and Sutter, 2005)
- Sand Ixodia (*Ixodia achillaeoides* ssp. *arenicola*) (Carter, 2005)
- Monarto Mintbush (*Prostanthera eurybioides*) (Pound*, et al.*, 2004)
- Large-fruit Groundsel (*Senecio macrocarpus*) (Sinclair, 2004)
- Buloke Woodland (*Allocasuarina leuhmannii*) (Cheal and Lucas, 2005).

The fire management planning objectives, strategies and works outlined in this plan were developed by giving careful consideration to providing for the maintenance of ecological integrity. This fire management plan is consistent with the objectives outlined in these local and regional environmental plans.

2.5 Partnership Agencies

The South Australian CFS is the lead combatant agency for bushfire suppression in rural South Australia. Responding to a fire in DEH reserves is undertaken jointly by CFS and DEH (note DEH is a CFS Brigade under the *Fire and Emergency Services Act 2005*). This partnership is essential in maintaining co-ordinated fire management operations and implementing fire preparation, mitigation and suppression activities.

SA Water and DEH have developed an MoU for fire suppression operations on SA Water managed land. This arrangement is critical in complementing fire management works undertaken on DEH reserves, particularly where they are adjacent SA Water lands.

ForestrySA and DEH have developed a MoU for fire protection, prevention and suppression operations in the South East. This MoU applies to all DEH and ForestrySA reserves in the South East where co-operation could be of benefit to either party, with specific attention given to reserves which share a common or near boundary.

All fire management planning and works undertaken on DEH land are subject to consultation with the relevant Bushfire Management Committee to ensure consistency with the objectives of Bushfire Risk Management Plans.

2.6 Consultation

DEH is committed to close co-operation and involvement with State and Commonwealth organisations, special interest groups and the broader community to achieve the dual goals of biodiversity conservation and protection of life and property. To achieve this, CFS, Bushfire Management Committees, lessees, conservation groups and ecologists have been consulted during the development of this plan.

DEH fire management plans are prepared and adopted in accordance with the *Policy and Procedures for Fire Management Planning: Project Management and Consultation* (DEH, 2009u). Consultation is not a statutory requirement for fire management plans and is a Departmental policy. However, the plan was subject to DEH internal consultation for a period of four weeks prior to being released externally for public consultation (also for a period of four weeks). The finalised plan is reviewed and endorsed by the National Parks and Wildlife Council and Native Vegetation Council's Fire Sub-committee before it is adopted by DEH Executive.

2.7 Plan Review and Currency

This fire management plan will undergo a major review after ten years of implementation, or earlier if required. A works program will be developed and reviewed on an annual basis, derived from the recommendations listed in this fire management plan.

3 BUSHFIRE ENVIRONMENT

The components of any landscape contributing to the potential for bushfire include terrain, slope and aspect, climate and weather, vegetation and land use.

3.1 Description of the Planning Area

3.1.1 Location and Included Lands

The South East Region of South Australia lies between the capital cities of Adelaide and Melbourne, and covers the south-eastern corner of South Australia. For the purposes of this Fire Management Plan, the reserves within the region administered by DEH is bounded by the Dukes Highway to the east, the Southern Ocean to the south and west, and extends north to the town of Strathalbyn (refer to Map 1). Mount Gambier is the main regional centre.

Sixty-eight DEH reserves comprising 112 362 hectares are managed within this region and are included in this fire management plan (refer to Map 1).

An additional five parcels of other lands, totalling 1 383 hectares, have been incorporated into this plan (refer to Table 1 below). This includes land adjoining the reserves that may be added into the reserve system. Potential land acquisitions have been included to ensure issues are identified and strategies for risk minimisation are prepared should these areas be included in the reserve system in the future.

The planning area contains eight local government areas. These are: the District Councils of Grant, Robe and Tatiara; the Kingston District Council; Naracoorte Lucindale Council; Wattle Range Council; Alexandrina Council; and the City of Mount Gambier. Refer to Map 1 for an overview.

TABLE 1 – OTHER LANDS INCLUDED IN THIS FIRE MANAGEMENT PLAN

Type	Dedication	Parcel Name	Hundred	Size (ha)
Dedicated reserve	Minister for Environment and Conservation	Wyomi Reserve	Lacepede	53
Dedicated reserve	Kingston District Council	Wyomi Reserve	Lacepede	2
Dedicated reserve	Minister for Environment and Conservation	Picks Swamp	Caroline	214
Dedicated reserve	Minister for Environment and Conservation	Piccaninnie Grassland	Caroline	26
Dedicated reserve	Minister for Environment and Conservation	Wyndgate	Nangkita	1 088

3.1.2 Surrounding Land Tenure

Areas adjoining the reserves in the South East Region have a variety of land uses (refer to Map 1). With a favourable climate, suitable soils and underground water, the South East has a strong history as a highly productive agricultural area that supports a diverse industry base. The agricultural industries adjoining the reserves predominantly comprise sheep or beef properties, or horticultural production (wine grapes). There are also areas of native vegetation conserved under Heritage Agreement (HA) or managed by other government agencies. Commercial forestry is a significant industry in the region, with Radiata Pine and Tasmanian Blue-gum plantations also adjacent, or near reserves. These industries comprise major exposure risks, as do the built assets and privately-owned native vegetation, which can also occur in close proximity to reserves.

3.1.3 Terrain

The South East Region lacks major relief, but has unique landforms originating from a long, complex geological history. The region is distinguished by a series of stranded dunes, 2-10 kms apart that rise between 20-50 m above inter-dunal plains parallel to the current coast south-west of Naracoorte. These plains are prone to winter inundation and host a variety of wetland systems (Croft*, et al.*, 1999; SENRCC, 2003).

The general gradient of the land towards the coast is 1:1600, and to the north less than 1:5000. Thus, surface water moves slowly towards the coast, eventually resulting in extensive swamps and lakes, prevalent at the time of European settlement. Generally, there is a lack of surface streams and rivers, but where they do exist, their catchments originate in western Victoria. The establishment of a system of private drains begun in the 1860s enhanced natural flows. Later, a system of drains were excavated, which effectively drained inter-dunal swamps.

The landscape makes access to many areas uncomplicated. The lack of steep slopes lessens the rate of spread of fires and decreases risks to firefighters when undertaking suppression operations.

3.1.4 Climate

The South East Region of South Australia has a cool moist climate with long mild dry summers, followed by cool wet winters. The general trend is for rainfall to decrease northwards and away from the coast, from a maximum of 850mm annual rainfall in the southern areas of the region to 450 mm in the north near Keith and Bordertown.

Temperatures are generally cool throughout the region. The close proximity of the ocean affects temperature, restricting the seasonal and diurnal temperature ranges of the coastal zone. Average mean maximum temperature increases northward and inland. Mount Gambier has an average mean maximum temperature of 19°C, Naracoorte 20.8°C and Keith 22.1°C (Foulkes and Heard, 2003).

Average wind strength is greater on the coast than inland. Strong winds are generally associated with the passing of cold fronts and intense low pressure systems from the north, north-west, south-west and south. At the coast, winds are generally south-westerly to south-easterly during the summer, and in winter the winds are more variable in direction with

highest frequencies of the south-westerly and north-westerly components. Southerly winds are also most frequent at Mount Gambier in summer, but during winter these are replaced by winds from the north and west (Laut*, et al.*, 1977).

From October to December, the South East can experience severe weather conditions with thunderstorms and associated lightning activity. The hottest months in the region are generally January and February, which coincide with grass curing and soil dryness. Frontal activitity can change, relatively quickly, the prevailing southerly summer wind direction to strong north to north-west winds with associated high temperatures (close to 40 degrees Celsius). This, combined with generally low humidity (< 50%), can create extreme fire weather conditions. Subsequent frontal changes can then produce strong south-west winds. In addition, unpredicted localised wind effects can occur with coastal wind influences over the varying topography.

Extreme Fire Conditions

It is broadly understood that strong winds, combined with high temperatures and low humidity encourages moderate to severe fire intensity and behaviour. Under such conditions, suppression is unlikely to be effective in areas supporting *Very High* and above overall fuel hazard levels (DEH, 2006e). There is a dramatic increase in the likelihood of a major bushfire event in the South East when the following conditions are experienced.

- *Very High* to *Extreme* overall fuel hazard levels in native vegetation.
- Low humidity, decreased soil and fuel moisture, particularly during drought years.
- High winds shifting direction during the course of a fire.
- Lightning strikes as a result of increased thunderstorm activity between late November and December, then again around mid March to early April.
- Continuous fuels on agricultural land allowing for rapid fire spread.

3.1.5 Fire History

Mapping Fire Occurrences

Map 3 has been compiled from the latest DEH fire incident reports. The quality of the firescar mapping varies, depending on the methods of capture, which ranges from the digitising of enlarged aerial photographs to the interpretation of hand drawn maps. Fire scar boundaries produced from these sources have been added to the DEH spatial database. It is important to note that only visible firescars have been mapped. Consequently, the mapped fires may be regarded as a minimum estimate of fire occurrences.

Natural and Human-caused Fires

Detailed records of recent fire incidents that have either occurred on DEH managed land or were attended by DEH staff are stored within the Department's fire reporting database. This database, along with spatial records and any other historical records, was reviewed during the development of this Fire Management Plan.

Since 2002, a total of 41 records pertaining to bushfire incidents have occurred within or in close proximity to the reserves in the plan area. Some of the larger incidents include:

- Gum Lagoon CP – started by lightning, more than 5 000 hectares were burnt (including adjacent private property) in November 2006
- Bucks Lake GR – a 100 hectare fire, started by a neighbouring burn-off, that burnt 90 hectares of the reserve in October 2004
- Canunda NP – a 200 hectare fire started by lightning at Mia Mia Point in December 2003
- Messent CP – 3 148 hectares were burnt in May 2002 when a prescribed burn crossed control lines.

Historically, a number of landscape scale fires have been recorded throughout the South East of South Australia (refer to Map 3):

- Ash Wednesday fires on 16th February 1983. These consisted of some of the most devastating bushfires South Australia has experienced. Around 170 000 ha of land in the Adelaide Hills and in the South East were burnt in the fires, believed to have been started through the clashing of power lines, tree branches connecting with power lines and fires being deliberately lit. The Ash Wednesday bushfires caused significant plantation losses in the South East. Altogether 18 500 ha of forest, belonging to the Woods and Forests Department of SA (now ForestrySA), were destroyed. This represented 29% of the total area planted with conifers in the South East.
- The Caroline fire on 2nd February 1979. Three fires started near Mount Gambier. Two spot fires were controlled while still in grassland. However, the third fire, which originated in an old windrow of pine-slash near Caroline (south of Mount Gambier), spread quickly into softwood plantations east of the origin, and before it was controlled early the following day, burnt over a distance of 27 kms and an area of nearly 8 000 ha.
- Kongorong fire in 1959. This fire burnt 28 000 ha with the loss of one life.

Prescribed Burning

Prescribed burning has been undertaken within eleven reserves included in this fire management plan; these are Telford Scrub CP, Messent CP, Bool Lagoon GR, Mount Scott CP, Penambol CP, Padthaway CP, Canunda NP, Nene Valley CP, Gum Lagoon CP, Desert Camp CR and Mary Seymour CP. Prescribed burning has also been undertaken within Piccaninnie Grassland (other land, dedicated under the Minister for Environment and Conservation).

As part of the planning process, and in consultation with the South East Region Conservation Programs Unit, areas were identified for prescribed burning across the planning area. The implementation of these burns is subject to resource availability and regional priorities. Potential burn areas may be altered, or may be withdrawn at the discretion of DEH as a result of unplanned fires that may have occurred since time of writing. Each burn area identified on Map 4 (Fire Management and Access) may not be burnt in its entirety as the area may be divided and burnt over a number of seasons, or the burn itself may be patchy. These proposed burns are subject to the planning process as described in Section 5.3.3.

3.1.6 *Vegetation Communities*

***Major Vegetation Sub-groups* (*MVS*)**

Floristic mapping for this plan uses a compilation of regional vegetation mapping data that has been reclassified to comply with the National Vegetation Information System (NVIS) classification for Australia. The MVS level of the NVIS classification emphasises the structural and floristic composition of the dominant stratum but with additional types identified according to typical shrub or ground layers occurring with a dominant tree or shrub stratum. Within this Fire Management Plan MVS have been used as these groupings are accepted by fire managers for predicting maximum Overall Fuel Hazard levels (Section 4.3).

There are 13 MVS within the plan area that have been mapped by DEH. Map 2 shows the distribution of MVS in the planning area. Table 2 (below) lists the dominant species composition for each MVS and the Ecological Fire Management Guidelines are outlined in Table 5 (page 49).

TABLE 2 – DOMINANT SPECIES LAYERS FOR MAJOR VEGETATION SUB-GROUPS (MVS)

MVS No.	MVS Name	Dominant Species Layers
4	*Eucalyptus* forests with a shrubby understorey	*Eucalyptus obliqua, E. ovata* var. *ovata, E. baxteri, E. cosmophylla, E. fasciculosa, E. camaldulensis* var. *camaldulensis, Xanthorrhoea semiplana* ssp. *tateana, Hakea rostrata, Acacia retinoides, Leptospermum myrsinoides, Banksia marginata, Olearia ramulosa, Hibbertia riparia, Platylobium obtusangulum, Pteridium esculentum*
5	*Eucalyptus* forests with a grassy understorey	*Eucalyptus camaldulensis* var. *camaldulensis, E. leucoxylon, Acacia stenophylla, Cyperus gymnocaulos, Setaria jubiflora, Bromus rubens Avena barbata, Lolium* spp.
8	*Eucalyptus* woodlands with a shrubby understorey	*Eucalyptus obliqua, E. baxteri/arenacea, E. camaldulensis* var. *camaldulensis, E. ovata, E. viminalis* ssp. *cygnetensis, E. odorata, E. leucoxylon, Acacia melanoxylon, Leptospermum myrsinoides, L. continentale, Banksia marginata, Xanthorrhoea caespitosa, Pteridium esculentum, Astroloma conostephioides*
9	*Eucalyptus* woodlands with a grassy understorey	*Eucalyptus largiflorens, Danthonia* spp., *Eryngium vesiculosum, Pratia concolor, Marsilea dummondii*
12	*Callitris* forests and woodlands	*Callitris gracilis, Austrostipa* spp., *Enchylaena tomentosa* var. *tomentosa, Senecio pinnatifolius, Einadia nutans*
15	*Melaleuca* open forests and woodlands	*Melaleuca lanceolata, M. halmaturorum, Juncus kraussii, Enchylaena tomentosa* var. *tomentosa, Sarcocornia quinqueflora*
19	*Eucalyptus* low open woodlands with tussock grass	*Eucalyptus leucoxylon, E. camaldulensis* var. *camaldulensis, Danthonia* spp., *Austrostipa* spp., *Vittadinia dissecta* var. *hirta, Lepidosperma concavum, Linum trigynum, Briza maxima, Anagallis arvensis, Avena barbata*
21	Other *Acacia* tall open shrublands	*Acacia leiophylla, A. paradoxa, Olearia ramulosa, Leptospermum continentale, L. lanigerum, Poa poiformis, Lagurus ovatus, Goodenia amplexans, Muehlenbeckia gunnii, Dianella brevicaulis, Phragmites australis, Baumea tetragona*
26	*Casuarina* and *Allocasuarina* forests and woodlands	*Allocasuarina verticillata, A. luehmannii, Bursaria spinosa, Austrodanthonia setacea*
27	Mallee *eucalyptus* low open woodlands	*Eucalyptus leptophylla, E. socialis, Melaleuca lanceolata, Triodia irritans, Austrostipa* spp., *Helichrysum leucopsideum*
29	Mallee heath and shrublands	*Eucalyptus diversifolia* ssp. *diversifolia , E. incrassata,, Allocasuarina muelleriana* ssp. *muelleriana, Melaleuca uncinata, Leptospermum coriaceum, Xanthorrhoea*

MVS No.	MVS Name	Dominant Species Layers
		caespitosa
30	Heath	*Banksia ornata, Leptospermum myrsinoides, L. continentale, Leucopogon virgatus, Astroloma conostephioides*
31	Chenopod shrublands	*Sclerostegia arbuscula, Sarcocornia quinqueflora, Suaeda australis*
32	Other shrublands	*Leptospermum continentale, L. lanigerum, Leucopogon parviflorus, Acacia longifolia* ssp. *sophorae, Ozothamnus ferrugineus, Olearia axillaris,*
36	Temperate tussock grasslands	*Themeda triandra, Pimelea glauca, Acrotriche affinis*
37	Other tussock grasslands	*Spinifex sericeus, Ozothamnus turbinatus, Isolepis nodosa*
38	Wet tussock grassland, herbland, sedgeland or rushland	*Typha domingensis, Cyperaceae* spp., *Juncus* spp., *Gahnia trifida, Isolepis* spp., *Poa* spp.
39	Mixed chenopod, samphire or forblands	*Sarcocornia* spp., *Halosarcia* spp., *Wilsonia rotundifolia, Distichlis distichophylla*
47	*Eucalyptus* open woodlands with shrubby understorey	*Eucalyptus fasciculosa, E. leucoxylon, E. arenacea, Banksia marginata, Acacia pycnantha, Xanthorrhoea caespitosa, Leptospermum mysinoides, Kunzea pomifera*
48	*Eucalyptus* open woodlands with a grassy understorey	*Eucalyptus fasciculosa, E. leucoxylon, Lomandra effusa, Austrostipa* spp., *Danthonia* spp.
49	*Melaleuca* shrublands and open shrublands	*Melaleuca brevifolia, M. halmaturorum, M. uncinata, Gahnia filum*

3.2 Values and Assets

3.2.1 Visitor Use

The South East (also known as the Limestone Coast) supports a very successful tourism industry with a range of natural attractions, including coastal reserves such as Canunda NP, Little Dip CP, Beachport CP and Coorong NP. There is also the internationally renowned Naracoorte Caves NP, southern Australia's only World Heritage site that attracts more than 50 000 people each year. The Coorong is a Wetland of International Importance under the Ramsar Convention, providing a significant breeding and refuge area for many species of waterbirds. It is also an Aboriginal archaeological site of national importance. Coorong NP receives more than 100 000 visitors each year.

A range of recreational activities can be undertaken within the reserves of the South East, such as diving and snorkelling, bird-watching, adventure-caving, walking, camping, fishing and four-wheel driving. Visits are generally short-term and are undertaken during daylight hours for the majority of the reserves.

The following is a summary of areas within the planning area that are popular with visitors:

- Camping and four-wheel driving at Coorong NP, Canunda NP and Little Dip CP.
- Diving and snorkelling at Piccaninnie Ponds CP and Ewens Ponds CP.
- The Naracoorte Caves NP visitor precinct, including the Wonambi Centre.
- Tantanoola Caves NP visitor precinct.
- Bird-watching at Bool Lagoon GR, Hacks Lagoon CP and Telford Scrub CP.

- Historic Adam Lindsay Gordon cottage and museum at Dingley Dell CP.

Additionally, surfers and fishermen frequent many locations along the coastline and there are numerous walking trails throughout the reserves.

Management Strategies	
Visitor Use	1. Implement appropriate fuel management strategies as shown on Map 4 to increase visitor safety.
	2. Review the need for visitor management plans within the reserves in the planning area, prepare plans as required and review these annually.
	3. Regularly rehearse the visitor management emergency procedure to be implemented during a bushfire.
	4. Consider reserve closures when significant fire weather is forecast to ensure visitor safety (at the discretion of the Director National Parks and Wildlife).

3.2.2 Built Assets

There are a number of significant built assets at risk from bushfires including:

- hardwood and softwood forestry plantations adjacent to reserves, representing a significant capital outlay
- many homes, sheds and outbuildings, and community facilities scattered throughout the area, including towns such as Beachport, Robe, Southend and Salt Creek in the vicinity of reserves
- tourist facilities adjacent to reserves such as the Coorong Wilderness Lodge and Wirreanda Campground (Naracoorte Caves NP)
- numerous DEH built assets including housing (Canunda NP, Tantanoola Caves CP, Naracoorte Caves NP, Dingley Dell CP, Noonameena (Coorong NP) and Wyndgate), offices at Noonameena and Wyndgate, tourist infrastructure such as visitor centres (Wonambi and Tantanoola Caves); ablution blocks, campground facilities, interpretative information, boardwalks, lookouts, barriers and signs etc.

DEH will undertake fire management works and activities to minimise the likelihood of fire impacting built assets (both public and private buildings).

Appendix 1 details significant assets within, and adjacent to, reserves and the corresponding fire management strategies. Map 1 shows the location of assets within reserves, in the planning area.

Management Strategies

Built Assets

5. Implement fuel management strategies appropriate to asset protection as shown on Map 4 and other risk mitigation works as detailed in Appendix 1.
6. Encourage adjacent property owners to work with the CFS to implement appropriate and coordinated fire management works on their own land to minimise the threat of fire.
7. Undertake fire management works and activities on DEH reserves to minimise the impact that fire may pose to adjacent public assets.

3.2.3 Cultural Heritage

Indigenous Heritage

The South East Region has been home to a number of indigenous groups and their descendants, including Tanganekald, Meintangk, Bunganditj, Ngarkat/Tatiara and Portaruwutj peoples. Descendents of these clans are still represented by various Aboriginal Heritage committees and organisations including the Kungari Association Inc., the Ngarrindjeri Heritage Committee Inc., and the Tattyara Aboriginal Heritage Consultancy. Evidence of Aboriginal occupation dating back around 8 600 years can be found in the South East from archaeological excavations in a rock shelter at Mount Burr (Campbell*, et al.*, 1963). There are numerous archaeological sites in the South East Region registered on the Department for Aboriginal Affairs and Reconciliation Heritage Sites Database. These sites have cultural significance for Indigenous people today, with many also being of scientific significance. Sites include stone artefacts, shell middens, rock art, stone arrangements and campsites.

Native Title - Native Title is used to describe the interests that Indigenous people have in land and waters according to their traditional laws and customs. Twelve reserves covered by this Fire Management Plan have two registered Native Title claims: the 'Ngarrindjeri and Others Native Title Claim', which includes Tilley Swamp CP, Gum Lagoon CP, Martin Washpool CP, Messent P, Mount Boothby and Salt Lagoon Islands Conservation Parks, Bunbury CR, Coorong NP and Mud Islands GR, Currency Creek and Tolderol Game Reserves. For the other Native Title Claim, 'Gunditjmara', the only area in South Australia that is included, is the area of the Lower Glenelg River that passes through South Australia.

In carrying out this plan DEH will comply with the *Aboriginal Heritage Act 1988* and the *Aboriginal Heritage Handbook and Strategy* (DEH, 2006b). Information on Indigenous heritage is collected during prescribed burn planning as part of the Environmental Assessment Table (EAT) (DEH, 2004c). Any fire operations must be in accordance with the Fire Policy and Procedure for the Protection of Cultural Heritage (DEH, 2009s).

European Heritage

European settlement in the South East began in the 1830s (Fort, 2005). Abundant surface water, a boon to the Indigenous people, was a curse to settlers and they immediately began to drain the land. Large pastoral runs were taken up by pioneers from the mid-1840s, closer settlement around Mount Gambier progressed and the population began to grow. Drainage was the impetus for closer settlement schemes and one of the solutions to the unemployment problems of the 1860s. Progressively over the last 135 years drainage

has been instrumental in transforming the landscape of the South East of South Australia (Fort, 2005). In 2003, the population of the South East Region was estimated to be around 63,000 people. This represents 4.2% of the State's total population. The majority of South East residents live in the lower South East, with 38% in the City of Mount Gambier (SENRCC, 2003).

Throughout the reserves there are several structures and remains that are of special cultural and heritage value, providing examples of European history in the South East. The majority of these assets are built of stone, and therefore are not generally at risk from bushfires. Many are sited in cleared areas offering some protection from bushfire. Where this is not considered adequate, further strategies for protection are outlined in the plan. Any fire management activities must be in accordance with the *Fire Policy and Procedure for the Protection of Cultural Heritage* (DEH, 2009s).

The following is a summary of European sites and objects that relate to the region's history:

- The historic Adam Lindsay Gordon cottage at Dingley Dell CP (currently listed on the Register of State Heritage Places, the Register of the National Estate and is classified by the National Trust of Australia (SA)
- Stone wall ruins (Little Dip CP and Woakwine CP)
- Lighthouse cottage ruins (Bernouilli CP)
- Coola Outstation ruins (Canunda NP)
- Cantara homestead, Chinaman's Well, Salt Creek Inn (Coorong NP)
- Blanche Cave (Naracoorte Caves NP).

Management Strategies

Cultural Assets

8. Implement fuel management strategies appropriate for the protection of cultural assets as shown on Map 4.
9. Ensure liaison at bushfires occurs to identify cultural assets, where time allows. Once the fire has passed evaluate sites to establish if any damage has occurred.
10. Ensure suppression strategies take into account significant cultural assets in order to minimise impacts from these activities and undertake post-fire rehabilitation.

3.2.4 Natural Values

Karst Systems

Karst features in the South East Region include the numerous sinkholes of the Lower South East, limestone pavements, coastal limestone cliffs, as well as cave features such as those preserved at the Naracoorte Caves NP and Tantanoola Caves CP. Naracoorte Caves NP is one of 17 World Heritage sites in Australia and comprises 26 caves, many of them with speleotherm development such as stalactites and stalagmites. They are also considered important habitats for flora and fauna, due to the specific conditions they provide. The Naracoorte Caves have acted as pitfall traps and predator dens for over 500,000 years, preserving a rich fossil record of Naracoorte's ancient fauna. This fossil record covers several ice ages and the arrival of humans to the continent. The Tantanoola Cave is filled with a

spectacular array of limestone formations in one large dolomite cavern. A former marine cliff, known as 'Up-and-Down Rocks' runs the length of the reserve.

The effect of fire on karst landscapes is largely unpredictable; however is somewhat related to geology, soil type, surface vegetation, and fire interval and intensity. Eberhard (2004) linked altered fire regimes to changes in hydrology in Jewel Cave, Western Australia. Over 1978 to 2002 a reduction in fire frequency within the Jewel Cave catchment contributed to an increase in understorey vegetation density and groundcover. The dense vegetation and groundcover influenced surface flows through rainfall interception resulting in decreased groundwater recharge, which lead to a lowered water table in the cave.

In order to maintain the natural values of the karst system, DEH shall aim to minimise degradation of water quality within the catchment area by reducing the incidence of erosion and subsequent runoff that may occur as a result of fire management operations. DEH will also consider the hydrological implications of fire management actions within the karst catchment. Smoke management should be considered during prescribed burn planning and steps should be taken in order to minimise potential impacts on the karst system.

Management Strategies

Karst Systems

11. Consider weather conditions during prescribed burn planning to minimise the likelihood of smoke impact to the karst system.
12. Minimise the likelihood of fire management operations impacting groundwater quality by restricting the use of fire suppression chemicals and reducing the erosion potential in significant karst areas.
13. Ensure appropriate liaison at bushfires occurs to identify karst values. Once the fire has passed evaluate sites to establish if any damage has occurred.
14. Ensure suppression strategies take into account significant karst values in order to minimise impacts from fire management activities and undertake post-fire rehabilitation.

Flora, Fauna and Ecological Communities

The Environmental Database of South Australia contains records from several data sources, including the Threatened Plant Population Database, the Biological Survey of South Australia and opportunistic sightings of significant flora and fauna.

Fire response information, where known, is included for species and communities 'of conservation significance' in Appendix 2, 3 and 4.

In this *plan* 'of conservation significance' is used to describe important or rated populations or species of flora and fauna as well as vegetation communities. These may be:

- Nationally rated, that is, listed as Threatened (with a rating of Extinct, Critically Endangered, Endangered, Vulnerable or Conservation Dependent) under the federal *Environment Protection and Biodiversity Conservation Act 1999*)
- South Australian rated, listed as Threatened (with a rating of Endangered or Vulnerable) under the *National Parks and Wildlife Act 1972, Revised Schedules 7, 8 and 9*

- Provisionally listed as Threatened (with a rating of Endangered or Vulnerable) in South Australia, that is, included on the unpublished DEH *Provisional List of Threatened Ecosystems of South Australia* (DEH, 2005c).

There are a number of flora and fauna species, as well as ecological communities, considered to be of conservation significance within the reserves of the South East. This includes Nationally *Endangered* and *Vulnerable* species and communities, as listed below.

Birds

- Orange-bellied Parrot (*Neophema chrysogaster*)
- Red-tailed Black-cockatoo (*Calyptorhynchus banksii graptogyne*)
- Malleefowl (*Leipoa ocellata*)
- Swift Parrot (*Lathamus discolour*)

Mammals

- Southern Brown Bandicoot (*Isoodon obesulus obesulus*)
- Long-nosed Potoroo (*Potorous tridactylus*)
- Heath Mouse/Rat (*Pseudomys shortridgei*)
- Southern Bent-wing Bat (*Miniopterus schreibersii bassanii*)

Reptiles/Amphibians

- Striped Legless Lizard (*Delma impar*)
- Southern Bell Frog (*Litoria raniformis*)

Flora

- Jumping-jack Wattle (*Acacia enterocarpa*)
- Coloured Spider-orchid (*Caladenia colorata*)
- Little Dip Spider-orchid (*Caladenia richardsiorum*)
- Elegant Spider-orchid (*Caladenia formosa*)
- Metallic Sun-orchid (*Thelymitra epipactoides*)
- Maroon Leek-orchid (*Prasophyllum frenchii*)
- Swamp Greenhood (*Pterostylis tenuissima*)
- Monarto Mintbush (Prostanthera eurybioides)
- Silver Daisy-bush (*Olearia pannosa spp. pannosa*)
- Sand Ixodia (*Ixodia achillaeoides* ssp. *arenicola*)
- Clover Glycine (*Glycine latrobeana*)
- Large-fruited Groundsel (*Senecio macrocarpus*)

Ecological Communities

- Buloke (*Allocasuarina luehmannii*) woodland

- Grey Box (*Eucalyptus microcarpa*) grassy woodland (nominated under EPBC Act)

Appendices 2 and 3 contain a detailed list of rated and significant flora and fauna as well as ecological information and fire management guidelines (where known). Appendix 4 summarises information on threatened ecological communities.

There is a commitment to increase our capacity to incorporate species' requirements into improved ecological fire management. The influence of fire on significant species will be monitored to increase the knowledge-base of how species respond to fire. This information will be used to update the DEH vital attributes database for use in future Ecological Fire Management Guidelines (Appendix 2, 3 and 4).

The management strategies in this plan relate specifically to fire management actions within the included lands; nonetheless, DEH will work with the community on landscape scale biodiversity conservation.

Orange-bellied Parrot

The Orange-bellied Parrot (OBP) is listed as *Endangered* Nationally and in South Australia. The OBP is endemic to south-eastern Australia. The species breeds (during the summer months) mostly within 20 kms of Melaleuca, Tasmania – considered the entire known breeding population (Brown and Wilson, 1984). They migrate to the mainland during autumn and winter where they forage at scattered localities along the coastline between eastern Victoria and the Coorong in South Australia.

Winter foraging habitat for OBP includes saltmarshes, coastal dunes, pastures, shrublands, estuaries, islands, beaches and moorlands, usually within 10 kms of the coast. In Victoria, the species mainly uses natural saltmarshes dominated by Beaded Glasswort (*Sarcorcornia quinqueflora*) and Shrubby Glasswort (*Sclerostegia arbuscula*), as well as associated grassy or weedy pastures. In South Australia, the parrots also use beaches, dune systems, and sheltered areas along rocky foreshores (Green and Harley, 2005). The encroachment of woody shrubs into the grassland areas of coastal habitat in South Australia is perceived as a threat, reducing the area of available feeding habitat. An absence of fire may have contributed to this change of habitat.

The OBP has been recorded in Canunda NP, Beachport CP, Tolderol GR, Coorong NP, Messent CP and Piccaninnie Ponds CP. Most recent sightings come from Canunda NP (1999), Piccaninnie Ponds CP (2002) and Coorong NP (2006).

The Recovery Plan states that the only region where the OBP frequents in significant numbers is at Melaleuca in Tasmania where fire is regularly used to protect human assets and where a concerted effort has been made to apply fire management prescriptions for the species (DEH (Cwlth), 2004).

The *Regional Action Plan for the South East of South Australia*, which reviews habitat information from known OBP sites in the South East, recommends the protection and enhancement of habitat and food resources at key sites through the implementation of appropriate burning and habitat management regimes (Green and Harley, 2005).

Management Strategies

Orange-bellied Parrot

15. Conduct prescribed burning to protect and enhance known foraging habitat.
16. Prescribed burns planned on known foraging habitat will be conducted during times when birds are absent from the mainland, otherwise pre-burn surveys to ensure area to be burnt is not being utilised as feeding habitat will be undertaken.
17. Prepare an Ecological Fire Management Strategy for the OBP to guide planning and the implementation of prescribed burns in known or potential OBP habitat.
18. Consult the OBP Recovery Team during the planning of any prescribed burn to be conducted within known habitat of the OBP.

Red-tailed Black Cockatoo

The South-eastern Red-tailed Black-cockatoo (RTBC) is one of five subspecies known to exist. Nationally, and in South Australia, it is listed as Endangered. The sub-species occurs as a single population in a small area of south-eastern Australia delimited by Keith to Lucindale to Mount Gambier in South Australia and Portland to Casterton, Toolondo, Natimuk, Dimboola, Nhill and Kaniva in Victoria (Hill and Burnard, 2001 in: DEWR, 2007). The cockatoo is widespread but rare within this range, and breed across much of the range. About half of all suitable habitat has been cleared within the bird's current range (Koch, 2003). The habitat critical to survival of the RTBC is defined as all potential habitat (feeding, nesting and roosting) within its 'current normal range', as described in Section 1.5 of the *National Recovery Plan for the South-Eastern Red-tailed Black-cockatoo* (DEWR, 2007).

In the South East, the cockatoo has been recorded in Bangham CP, Glen Roy CP and most recently, at Telford Scrub CP.

The RTBC is highly specialised, feeding primarily on the seeds of Desert and Brown Stringybark (*Eucalyptus arenacea* and *E. baxteri*), and seasonally on the seeds of Buloke (*Allocasuarina leuhmannii*). Feeding habitat is much more fragmented in South Australia than in Victoria (DEWR, 2007). South Australian reserves managed by DEH amount to 1% of total habitat available (i.e. across SA and Vic), and reserves managed by ForestrySA amount to 2% of total habitat available (DEWR, 2007).

High intensity prescribed burns and bushfires substantially reduce seed availability in Stringybarks for at least nine years, with some effects persisting for more than 11 years (Koch, 2003). The *National Recovery Plan for the South-Eastern Red-tailed Black-cockatoo* emphasises that it is important, when prescribed burning, to reduce fire intensity, which results in reduced canopy scorch and thus much quicker recovery of trees to full seed production. Additionally, prescribed burns should be timed to avoid years in which a given block of woodland has a newly matured seed crop. The aim is to retain up to 85% of Stringybark habitat as >10 years post-fire across all land tenures (as per the *National Recovery Plan* (DEWR, 2007). Prescribed burns with reduced canopy scorch can achieve both fire protection outcomes and improve food availability (DEWR, 2007).

Management Strategies	
Red-tailed Black Cockatoo	19. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
	20. Ensure that up to 85% of Stringybark habitat across the SA reserved area is retained as >10 years post-fire.
	21. Ensure prescribed burns carried out in potential or known RTBC habitat are planned so as to reduce canopy scorch of Stringybark.
	22. Conduct pre-burn surveys to ensure area to be burnt is not currently being utilised as feeding habitat.
	23. Consult with the RTBC Recovery Team and ForestrySA during the planning of any burn to be conducted within potential habitat, and to assist with fire management strategies to meet the conservation requirements of the RTBC.

Malleefowl

The Malleefowl is found in semi-arid to arid shrublands and low woodlands, especially those dominated by Mallee and/or Acacias. A sandy substrate and abundance of leaf litter are required for breeding (Benshemesh, 2000). Mallee habitats are the stronghold for the species and are considered amongst the most flammable of habitat types. Nationally and in South Australia, it is listed as Vulnerable.

In the South East, the Malleefowl has been recorded from Bunbury CR, Big Heath CP, Bangham CP, Coorong NP, Gum Lagoon CP, Martin Washpool CP, Mount Boothby CP, Desert Camp CR/CP, Mount Scott CP and Messent CP.

Large fires may be catastrophic for Malleefowl as the birds are poor fliers and do not appear to disperse widely as fires approach (Benshemesh, 2000). Fires that burn entire habitat areas may cause the local extinction of the species, where surrounding areas no longer provide safe haven or a source of recolonisation. Fire in Mallee typically kills and removes all parts of the vegetation above the surface and thus fire has a major influence on the structure and floristic composition of habitats occupied by Malleefowl.

The effects of fire on Malleefowl populations appear to be severe and long-lasting. After extensive fires, Malleefowl may not breed for up to 17 years (Tarr, 1965 and Cowley et al, 1969 in Benshemesh, 2000), possibly due to a shortage of litter material for nesting, or greater exposure to predators. Nonetheless, in the Upper South East Malleefowl habitat has been observed to support successful mound building and recruitment much earlier post-fire than in more arid habitats of the species range (M. Bachmann pers. comm.).

A national Recovery Plan has been developed for Malleefowl (Benshemesh, 2000) which identifies increasing fire frequency as a factor contributing to the decline of this species. The plan advocates for the development of fire management plans for all reserves greater than 5 000 hectares (such as Gum Lagoon CP) and these plans should focus on minimising the risk of spread of large fires across the landscape and encouraging patchy burns where bushfire does occur. It is recognised that fire exclusion is not realistic, however significant areas of habitat should be identified and strategies developed for the protection of this habitat. The use of prescribed fire may be advantageous in the construction of firebreaks

and for fuel modification within these larger reserves. The development of fire management plans for reserves less than 5 000 hectares (such as Mount Scott CP) should also be considered. It should be recognised that these smaller remnants are more likely to burn in their entirety in a single fire event, therefore there is a higher risk to the extinction of local populations of Malleefowl should a fire occur.

Management Strategies

Malleefowl

24. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
25. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.
26. Consult with the Malleefowl Recovery Team during the planning of any burn to be conducted within known habitat, and to assist with fire management strategies to meet the conservation requirements of the Malleefowl.
27. Prepare an Ecological Fire Management Strategy for the Malleefowl to guide planning and the implementation of prescribed burns in known Malleefowl habitat.

Swift Parrot

The Swift Parrot breeds in Tasmania and migrates to mainland Australia in autumn. Nationally it is listed as Endangered, and in South Australia, Vulnerable.

Records in South Australia indicate observations in Big Heath and Bangham Conservation Parks in 1983, and Padthaway CP in 1982. Swift Parrots are now rarely seen in South Australia (Swift Parrot Recovery Team, 2001) as their principal over-wintering habitat occurs in Queensland, New South Wales and Victoria. However, three records have been made in 2005 and 2006 in the South East of South Australia (B. Green pers. comm.).

Management Strategies

Swift Parrot

28. Avoid burning known Swift Parrot habitat and exclude those areas proposed for burning in which new observations have been recorded.

Southern Brown Bandicoot

The Southern Brown Bandicoot (SBB) is listed as Nationally Endangered, and Vulnerable in South Australia. Most of the habitat currently occupied by bandicoots is conserved by ForestySA as Native Forest Reserves under the *Forestry Act 1950* (Paull, 1995). On DEH managed land, the Southern Brown Bandicoot occurs within Telford Scrub CP (Paull, 1995), Lower Glenelg River CP (D. Harley pers. comm.) and possibly Gower CP (M. Bachmann pers. comm.). There are also historic records from Penambol CP (M. Bachmann pers. comm.).

No recovery plan for the SBB exists specific to the South East, however a *Recovery Plan for the Southern Brown Bandicoot in the Mount Lofty Ranges* (Haby and Long, 2005) has been developed. The plan advocates the development and implementation of fire management plans that minimise the likelihood of bushfires burning entire habitat patches, as well as the implementation of monitoring programs to determine the effect of fire

management regimes on bandicoot populations (Haby and Long, 2005). Knowledge of the short and long-term impacts of fire on this species is incomplete, therefore providing a mosaic of post-fire stages is desirable. In fragmented habitats like the South East, there is also an increased risk of localised extinction if fire burns an entire habitat patch (Haby and Long, 2005).

The Southern Brown Bandicoot Mount Lofty Ranges Regional Recovery Team supports the use of prescribed burns where they assist in achieving recovery actions. Fuel-reduced areas (ie Overall Fuel Hazard less than *High*) should burn with a lower intensity and burn less thoroughly (especially under milder conditions), which provides some refuge areas in the event of a large bushfire. Areas of *High* to *Extreme* Overall Fuel Hazard will burn with higher intensity and are therefore likely to increase the risk of local bandicoot extinction as unburnt remnants are unlikely to remain for refuge.

Management Strategies	
Southern Brown Bandicoot	29. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
	30. Attempt to provide unburnt patches within, and adjacent to burn area as refuge during prescribed burning or bushfire suppression activities.
	31. Prepare an Ecological Fire Management Strategy for the SBB to guide planning and the implementation of prescribed burns in known SBB habitat.
	32. Consult with the relevant recovery team and ForestrySA during the planning of any prescribed burn to be conducted within known habitat of the species, and to assist with fire management strategies to meet the conservation requirements of the SBB.

Striped Legless Lizard

Striped Legless Lizards (SLL) are restricted in distribution to tussock grasslands of temperate south-eastern Australia. The South East of South Australia forms the western limit of the species geographical range. The species was first discovered in South Australia in 1966 during the excavation of a trench at Bool Lagoon GR (or Hacks Lagoon CP). Since that time, its presence has been confirmed at just four other sites (Harley, *et al.*, 2005). Smyth (1972) as cited in Harley, *et al.* (2005) lists it amongst the known reptile fauna of Big Heath CP, although this report requires further clarification. Nationally the species is listed as Vulnerable, and Endangered in South Australia.

Sites occupied by the species are characterised by flat or gently undulating topography with few or no shrubs and trees. The majority of sites where the species occurs have fertile soils with a moderate to high clay content. Such soils are prone to cracking during summer, and in doing so expose underground cavities in which lizards may shelter from fire, predators, extreme weather and lay their eggs (Harley, *et al.*, 2005). Optimal sites for Striped Legless Lizards are dominated by stands of Kangaroo Grass (*Themeda triandra*), Wallaby Grass (*Austrodanthonia* spp.), Tussock Grass (*Poa* spp.) and Spear Grass (*Austrostipa* spp.). In South Australia the species has mainly been detected at sites dominated by exotic weeds such as *Phalaris aquatica*.

The National Recovery Plan (1999) suggests that fires can result in lizard mortality, yet may not always eliminate the species from a site. Fire has been recorded as causing mortality in the species (Coulson, 1990; Walton, 1995), but the extent to which populations are affected is unknown. Extensive fires over large areas are thought to cause direct mortality, as well as reducing cover for the species and its prey and exposing animals to increased predation. The behavioural reaction of the Striped Legless Lizard to fire is unknown, although it seems likely that survivors would either move into unburnt areas or remain relatively inactive in the soil or under rocks until the vegetation recovers enough to provide shelter.

Management Strategies

Striped Legless Lizard

33. Minimise major disturbance (i.e. heavy grazing, cultivation, rock removal) and fire management activities in known or potential habitat between August and March when the lizards are most active.
34. Avoid burning large areas (>50%) of known or potential meta-population habitat.
35. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.

Southern Bell Frog

The Southern Bell Frog (also known as Growling Grass Frog, Warty Bell Frog, Green and Golden Frog or Golden Bell Frog) is a large ground-dwelling frog. Currently, the distribution of the species within the South East is largely limited to isolated populations between Naracoorte and Penola, near Bordertown and Mundulla, Beachport, Glencoe and one site near Kingston (Walker and Goonan, 2002 and Walker, 2003 in Harley, *et al.*, 2005). Bool Lagoon GR and Hacks Lagoon CP are considered to be the most important sites in the region for this species, supporting high numbers (D. Harley pers. comm.). Nationally, and in South Australia, the Southern Bell Frog is listed as Vulnerable.

Management Strategies

Southern Bell Frog

36. Avoid burning large areas (>50%) of potential meta-population habitat and/or wetland verges.
37. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.

Long-nosed Potoroo

The Long-nosed Potoroo was thought to be extinct in south-eastern South Australia during the 1990s, with no confirmed records for more than two decades. However, in 2002, several individuals were captured in the Lower Glenelg River CP (M. Bachmann unpubl. data). This reserve is immediately adjacent to the Victorian border and the population is continuous with those present in Victoria's Lower Glenelg National Park. The nearest Victorian record of a Potoroo is from approximately 30 kms to the east of the CP, although suitable habitat occurs for several kilometres east of the reserve (Harley, *et al.*, 2005). The Lower Glenelg River CP marks the western limit of the species' current range, with populations that once occurred west of the Glenelg River presumed to be extinct (Harley, *et al.*, 2005). Nationally, the species is listed as Vulnerable, and Endangered in South Australia.

In the Lower Glenelg River CP, the Potoroo occurs along a sandy ridge dominated by Brown Stringybark (*Eucalyptus baxteri*) Woodland. In places, the understorey is dense, comprising Yacca (*Xanthorrhoea australis*) and various heathland species.

Fire may have a significant impact on the diversity of fungi species and sporocarp production, which form a major component of the diet of the Long-nosed Potoroo (Claridge *et al.*, 1993 in Harley, *et al.*, 2005). Thus fire management may be critical to ensuring Potoroos persist in South Australia. Claridge and Barry (2000) (as cited in Harley, *et al.*, 2005) concluded that the probability of Potoroo diggings being present increased with time since fire, and that forest patches that were unburnt for at least 20 years supported the greatest abundance of Potoroos. Despite this, the species has some resilience to fire, with a population in western Victoria recovering to pre-fire levels after five years, following a fire that eliminated more than 90% of the population (Bennett, 1993 and Menkhorst, 1995 in Harley, *et al.*, 2005). Lower Glenelg River CP has not been burnt for over 20 years and currently appears to provide suitable habitat for the Long-nosed Potoroo.

Management Strategies	
Long-nosed Potoroo	38. Investigate the use of prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
	39. Investigate the use of prescribed burning to enhance habitat and food resources.
	40. If deemed appropriate, conduct prescribed burning to meet Management Strategies 36 and 37.
	41. Liaise with the Victorian Department of Sustainability and Environment (DSE) regarding scheduled prescribed burns and fire management activities adjacent the Lower Glenelg River CP.

Heath Mouse

The Heath Mouse is a small, ground-dwelling rodent native to heathlands of south-eastern and south-western Australia. The distribution of the species is restricted to two discrete, widely separated regions, one being in the south-west of Western Australia and the other in south-western Victoria/south-east South Australia (Harley, *et al.*, 2005). Nationally, it is listed as Vulnerable, and Endangered in South Australia.

In June 2001, the species was discovered in the lower South East of South Australia in the Lower Glenelg River CP (M. Bachmann, unpubl. data). This site is separated from all other South Australian locations by the Glenelg River, and is contiguous with the Lower Glenelg National Park in Victoria. The species has also recently been recorded (2004) in two ForestrySA reserves of the South East – Dry Creek Native Forest Reserve (NFR) and Honeysuckle NFR.

Fire management may be critical to ensuring Heath Mouse populations persist in South Australia. The species is able to persist in high densities at sites subjected to regular fires (eg 10-14 years frequency) in the Grampians. Cockburn (1979) and Meulman (1997) (as cited in Harley, *et al.*, 2005) suggest that the highest mouse densities occur in heathland 7-8 years post-fire. However, populations also occur in long unburnt heathlands in south-western Victoria and Western Australia (eg >20 years). The species life history strategy may differ

according to the vegetation type and fire frequency (Cockburn, 1979 as cited in Harley, *et al.*, 2005). Fire regimes thus become a critical consideration in managing the species within small remnants.

Management Strategies	
Heath Mouse	42. Investigate the use of prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
	43. Investigate the use of prescribed burning to enhance habitat and food resources.
	44. If deemed appropriate, conduct prescribed burning to meet Management Strategies 40 and 41.
	45. Liaise with DSE regarding scheduled prescribed burns and fire management activities adjacent the Lower Glenelg River CP.
	46. Consult with ForestrySA to assist with fire management planning to meet the conservation requirements of the Heath Mouse.

Southern Bent-wing Bat

The Southern Bent-wing Bat is an insectivorous cave-dwelling bat found in south-eastern South Australia and western Victoria. The species is currently listed as Nationally *Critically Endangered*.

During April to August, the bat is dispersed over a wide region of south-eastern South Australia and western Victoria. Over 50 caves are known to be used as wintering sites. Around late August, the bats commence their annual migration to one of two maternity caves in Naracoorte, South Australia, and in Warnambool, Victoria. The population of bats has been declining since estimates were taken in 1963/64. Likely factors contributing to the decline include clearance of native vegetation and open woodlands, drainage of natural wetlands and river basins in the South East, pollutants, extended low rainfall events and changes in agriculture and land-use (Reardon, 2001). The species preferentially forages for small insects over native vegetation and wetlands (Grant, 2004).

Management Strategies	
Southern Bent-wing Bat	47. Consider the effects of prescribed burning if conducting burns in the vicinity of wintering sites.

Jumping-jack Wattle

The Jumping-jack Wattle is restricted to the Eyre Peninsula, Yorke Peninsula and South East regions of South Australia. The species is considered Nationally *Endangered* owing to poor recruitment, small population size, isolation of populations and lack of conserved populations (Moritz and Bickerton, 2007). The South East supports South Australia's only reserved population of the species at Aberdour CP (Johnson, 2005).

Lack of recruitment poses a serious threat to populations of Jumping-jack Wattle in the South East. It is not known whether fire or other forms of disturbance initiate recruitment events and this may warrant further investigation (Johnson, 2005). Overman and Venn 1999) (as cited in Johnson, 2005) consider it likely that the species requires occasional fire for recruitment from soil-stored seed.

Management Strategies

Jumping-jack Wattle

48. Trial the use of prescribed burning to gain a better understanding of the species response to ecological disturbance.

49. If deemed appropriate, conduct prescribed burning to diversify the age structure of Jumping-Jack Wattle to mitigate the risks associated with maintaining all of the population in the one successional stage.

Threatened Orchids

Threatened Spider-orchids

Three species of threatened Spider-orchid occur across the South East. These are the Coloured Spider-orchid and the Little-Dip Spider-orchid (both listed as Endangered Nationally and in SA) and the Elegant Spider-orchid (listed as Vulnerable Nationally and in SA).

The Coloured Spider-orchid has been recorded in Mount Monster CP, Bangham CP, and more recently the Coorong NP. The Little-Dip Spider-orchid is endemic to South Australia and is found in coastal vegetation between Southend and Meningie no more than six kilometres from the coast (Murphy, *et al.*, 2008). The Little-Dip Spider-orchid has been recorded in Little Dip CP, Beachport CP Canunda NP and Coorong NP. The Elegant Spider-orchid is known from Mount Scott CP and Mount Monster CP.

The role of fire in the ecology of the various Spider-orchid species is not known, but is likely to be an important factor, as many Caladenia species exhibit strong flowering responses in the years following fire (Duncan and Coates, 2007). Fire removes surrounding vegetation, increasing light levels and temperature at ground level, and possibly increasing moisture levels with reduced plant competition for moisture (Purdie, 1977 as cited in Duncan and Coates, 2007). Seedling establishment may be critically dependent on fires (Duncan and Coates, 2007).

The timing for fire is also critical, with the best time being late summer or early autumn, after seed dispersal, but prior to new shoot growth. Fuel reduction burning in spring and autumn is considered to be a threatening process for many orchid species (Duncan and Coates, 2007).

Metallic Sun-orchid

The Metallic Sun-orchid has been recorded in Padthaway CP, Tilley Swamp CP, Messent CP, Mount Boothby CP, Big Heath CP, Coorong NP and Desert Camp CR. Nationally, and in South Australia, it is listed as Endangered.

The Metallic Sun-orchid is a post-disturbance coloniser that utilises early successional stages of its habitat after various forms of disturbance. Where insufficient disturbance occurs and the vegetation becomes more dense, the orchid will not flower. Seed capsules are often observed in the field, particularly following fire (Cropper, 1993). Flowering is enhanced by fires during the previous summer, but a high percentage of plants generally flower regardless (Backhouse and Jeanes, 1995) as long as the vegetation remains open.

Maroon Leek-orchid

The Maroon Leek-orchid occurs in South Australia and Victoria. South Australia possesses the most significant population, with over 2000 individuals occurring in the same wetland complex at Piccaninnie Ponds CP (DEH, 2006f). Nationally, and in South Australia, it is listed as Endangered.

In South Australia the Maroon Leek-orchid habitat is described as wet grass/sedgeland over calcrete pavement. However, the change in hydrology, where wetlands have been partially drained, has resulted in shrubs encroaching into orchid habitat. Shrubs eliminate available habitat by out-competing the orchid for resources, such as light, and subsequently changes the micro-climate. A reduction in flowering has been recorded in *Prasophyllum* where there has been increased levels of biomass accumulation (Coates and Lunt, 2001).

The response of populations to fire is poorly known for most orchid taxa, but there is evidence that the population biology of some species may be heavily influenced by fire frequencies, season of burning, time since fire and fire intensity (Backhouse and Jeanes, 1995).

Swamp Greenhood

The Swamp Greenhood orchid is mainly restricted to the coastal plains of south-east South Australia and south-west Victoria. The species occurs exclusively in *Leptospermum lanigerum* (Silky or Woolly Tea-tree) shrubland. This association occurs on black, alkaline soils on swamps or along watercourses seasonally inundated with freshwater (Murphy*, et al.*, 2008). In South Australia, the orchid has been recorded at Piccaninnie Ponds CP and the adjacent reserve known as Picks Swamp. Nationally, and in South Australia, it is listed as Vulnerable.

Whilst fire is not listed as a current threat to the species (Murphy*, et al.*, 2008), major disturbance (ie grazing, weed invasion, drainage and erosion) to its specialised habitat poses a serious threat to its survival.

Management Strategies	
Threatened Orchids	50. Machinery used during any fire suppression or fire management activities is to be excluded from location of known population sites of Swamp Greenhood.
	51. Minimise the likelihood of vehicles or earthmoving equipment impacting on threatened orchid populations during fire suppression operations.
	52. Avoid prescribed burning or slashing within threatened Spider-orchid populations more frequently than every 5 years.
	53. Minimise the likelihood of large areas of threatened Spider-orchid habitat burning in a single fire event.
	54. Trial the response of orchid species to different disturbance regimes, including fire.
	55. If deemed appropriate, use fire as a strategy to manage the recovery of orchid species.
	56. Any prescribed burning to be implemented late Summer to early Autumn (before leaf emergence).
	57. Ensure follow-up herbivore control if orchid sites are burnt.
	58. Consult with the appropriate Recovery Team during the planning of any prescribed burning in known threatened orchid habitat.

Monarto Mintbush

Monarto Mintbush is endemic to South Australia where it is restricted to two disjunct populations, one near Monarto and the other around Mt Monster near Keith. The Mt Monster area is considered to be a 'stronghold' of the species, supporting approximately 83% of the naturally occurring plants known at this time (Johnson, 2005). Nationally, and in South Australia, it is listed as Endangered.

Evidence of recruitment in the absence of fire has been exhibited at sites with no apparent disturbance history. The species is believed to be dependent to some degree on fire or other disturbance to initiate recruitment events. However, it is possible that inappropriate disturbance regimes may be an impediment to its recovery (Johnson, 2005).

Management Strategies	
Monarto Mintbush	59. Trial the response of Monarto Mintbush to different disturbance regimes, including fire, to gain a better understanding of the species.
	60. If deemed appropriate, use fire as a strategy to manage the recovery of Monarto Mintbush.

Silver Daisy-bush

The Silver Daisy-bush is endemic to South Australia where scattered populations occur across the agricultural regions of the state. Nationally, and in South Australia, it is listed as Vulnerable. In the South East, small populations are recorded in Aberdour CP, Mount Scott CP and Desert Camp CR. The largest known reserved population is found in Big Heath CP (Johnson, 2005).

A number of populations known from reserves comprise plants which are ageing and/or senescing with no sign of recruitment. These populations are therefore at risk of local extinction. Old and/or senescing plants may be producing less viable seed. It is not known whether fire or other forms of disturbance may initiate recruitment events. However, the persistence of the plant in a ForestrySA administered Native Forest Reserve in the South East, burnt in 1999, indicates that the species is able to survive low intensity fires. Historically, prescribed burns have been undertaken within reserves at regular intervals and it is likely that the Silver Daisy-bush has recovered from several of these fire events (Johnson, 2005).

Management Strategies	
Silver Daisy-bush	61. Ensure minimal mechanical disturbance within, or within proximity to, known population sites within DEH reserves.
	62. Trial the use of prescribed burning to gain a better understanding of the response of Silver Daisy-bush to disturbance.

Sand Ixodia

The Sand Ixodia is of limited distribution in South Australia where it is restricted to near-coastal areas of the Lower South East between Cape Northumberland and Carpenters Rocks. Only two populations are known to exist in South Australia, the largest of which is conserved in Douglas Point CP. The species is associated with windswept low shrublands over limestone, often on steep slopes. The two known South Australian populations are within close proximity to the coast, ie within 500 m of high water mark (Johnson, 2005). Nationally, it is listed as Vulnerable, and in South Australia, Endangered.

Fire is important for germination of other Ixodia taxa (notably the Hills Daisy (*Ixodia achillaeoides* ssp. *alata*), whose germination is cued to smoke). However, it is considered unlikely that smoke plays a major role in the natural germination of Sand Ixodia. The natural cues that germinate seeds of the species are unknown, but based on the exposed coastal habitat of the taxon, could depend on factors such as specific soil moisture, fluctuations in soil temperature, soil storage or seed scarification by wind (Carter, 2005 in Johnson, 2005).

Management Strategies	
Sand Ixodia	63. Trial the use of prescribed burning to gain a better understanding of the response of Sand Ixodia to disturbance.
	64. If deemed appropriate, use fire as a strategy to manage the recovery of Sand Ixodia.

Clover Glycine

The Clover Glycine is widespread but sporadic across the grasslands and grassy woodlands of Victoria, Tasmania and South Australia (Carter and Sutter, 2005). Plant numbers are not accurately known and may fluctuate annually due to environmental conditions. The species has been recorded in the Lower Glenelg River CP, Mary Seymour CP, Big Heath CP and Piccaninnie Ponds CP. Nationally, and in South Australia, it is listed as Vulnerable.

The most appropriate fire management regime for the species has not been determined and is likely to vary across the plants distribution. The total exclusion of fire may be

detrimental to Clover Glycine as it may be dominated by grasses and/or weeds and also lack recruitment opportunities (Carter and Sutter, 2005). Conversely, frequent burning (ie annual spring-summer burning) is likely to deplete the seed bank and the plants capacity to persist (Carter and Sutter, 2005; Lynch, 1994).

Management Strategies	
Clover Glycine	65. Aim to manage within the Ecological Management Guidelines proposed for Clover Glycine as described within Appendix 2.
	66. Ensure minimal mechanical disturbance within, or within proximity to, known population sites.

Large-fruited Groundsel

Large-fruited Groundsel has a limited distribution in South Australia and Victoria with the vast majority of plants restricted to one location in Messent CP. Nationally, and in South Australia, it is listed as Vulnerable.

The species is a long-lived perennial and occurs in a variety of habitats ranging from grasslands to woodlands where competition from other understorey species is relatively low. The lack of competition may play an important part of the species critical habitat (Sinclair, 2004 in Hinchliffe, 2005) and may be associated with regular burning, or as a result of the physical and floristic characteristics of the site.

Although adult populations of the species can persist for relatively long periods in grassland habitat that hasn't been burnt, recruitment and long-term survival is unlikely (Sinclair, 2004 in Hinchliffe, 2005). The optimal frequency and intensity of fires required for this species is likely to vary depending on the conditions at individual sites. A study on the impact of fire in Messent CP by Davies (2005) (as cited in Hinchliffe, 2005) concluded that sedges in unburnt sedgeland are unlikely to out-compete the species, as do Kangaroo Grass (*Themeda triandra*) and Mallee Honey-myrtle (*Melaleuca brevifolia*) in grasslands in Victoria and shrubland in Gum Lagoon CP, respectively. Therefore the use of fire to manage this species in non-grassland sites is likely to be less important (Sinclair, 2004 in Hinchliffe, 2005).

Burning is highly detrimental during September-October as it inhibits flowering, especially if subsequent rainfall is low and a secondary flowering period is prevented (Hills and Boekel, 2003 Hinchliffe, 2005).

Management Strategies	
Large-fruited Groundsel	67. Aim to manage within the Ecological Management Guidelines proposed for Large-fruited Groundsel as described within Appendix 2.
	68. Avoid burning known population sites between September-October.

Buloke Woodland

Buloke Woodland is of limited occurrence in South Australia, where it is predominantly restricted to the Bordertown/Mundulla/Custon/Frances area of the South East. Buloke

Woodlands are listed as Endangered Nationally and listed provisionally in South Australia. Buloke Woodlands in the South East are now largely restricted to roadsides, highly isolated and degraded remnants on private property and small council-managed reserves/parklands (Johnson, 2005). Wolseley Common CP is the only reserve in the South East which conserves Buloke Woodland.

Buloke is not fire tolerant and trees subjected to frequent fire will die (Cheale and Lucas, 2005 in Johnson, 2005). Seedlings/saplings of Buloke may also be destroyed by fire, severely impacting upon the integrity of the community.

Management Strategies

Buloke Woodland

69. Aim to manage within the Ecological Fire Management Guidelines proposed for Major Vegetation Sub-group No. 26 as described within Table 5.

3.3 Pest Species

3.3.1 Fauna

Feral animals can flourish in the conditions existing after a fire, but for other species these conditions may result in population decline. Pest animals such as rabbits and deer can benefit from the post-fire regeneration, or 'green pick', and the increased access a fire provides. Native species, such as kangaroos and wallabies, may also thrive and concentrate in the regenerating areas, finding suitable food. Predation on small mammals and birds by foxes may increase post-fire due to the reduction in shelter sites or cover, and the increased access a fire provides (Gill and Catling, 2002). The degree of impact that these species have post-fire depends on a number of factors, including pre-fire numbers and characteristics of the fire (e.g. size, shape, season, intensity and location).

Within the reserves of the South East, a number of introduced species have been recorded. These include the European Rabbit (*Oryctolagus cuniculus*), European Hare (*Lepus capensis*), European Fox (*Vulpes vulpes*), Feral Goat (*Capra hircus*), Fallow Deer (*Cervus dama*), Feral Cat (*Felis catus*), House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*), Cattle (*Bos taurus*) and Sheep (*Ovis aries*).

It is important that the information collected on pest animals and plants pre-fire is used to determine appropriate management post-fire. There is the opportunity to increase the rate of eradication programs for pest animals and plants after fire, to take advantage of the reduced vegetation cover and/or possible concentration of animals in a smaller area. Prescribed burning provides opportunities for research and monitoring into how pest fauna respond to fire. Management of pest fauna post-fire is more likely to be implemented if it is expected that pest fauna will impact species of conservation significance.

Information on pest fauna may be collected during prescribed burn planning as part of the Environmental Assessment Table (EAT), to determine appropriate management post-fire (DEH, 2004c; 2008). Refer to Section 5.3.3 for more information on burn preparation.

3.3.2 Flora

Weeds can have significant impacts on native vegetation and ecological communities within reserves (Saunders*, et al.*, 1991). Disturbance (eg grazing, nutrient inputs, erosion, fragmentation) is likely to promote weed invasion, and fire in areas already affected by one or more of these disturbance mechanisms is likely to lead to weed proliferation (Hobbs, 1991; Hobbs, 2002; Hobbs and Huenneke, 1992). It is well known that disturbance, especially fire, is an important mechanism in natural systems (Hobbs and Huenneke, 1992). Fires can also provide the opportunity for weed species to better establish and proliferate, with many weed species out-competing native species in regenerating post-fire. Weeds can significantly alter the fuel within ecosystems, and hence the fire regime (Saunders*, et al.*, 1991).

In the South East, the DEH Environmental Weed Management Action Tool (Herpich and Lindsay, 2008) has recently collected weed infestation data from patches of remnant vegetation across all tenure in the region. The project targeted 20 weed species (identified from the joint NRM Board and Department for Water, Land and Biodiversity Conservation (DWLBC) South East Weed Risk Assessment Project, 2005), which pose the highest threat to biodiversity. They are:

- Sallow Wattle (*Acacia longifolia* var. *longifolia*)
- Coast Wattle (*Acacia longifolia* var. *sophorae*)
- Golden-wreath Wattle (*Acacia saligna*)
- Bridal Creeper – Western Cape form (*Asparagus asparagoides*)
- Bridal Creeper (*Asparagus asparagoides*)
- Native Bluebell Creeper (*Billardiera heterophylla*)
- Boneseed (*Chrysanthemoides monilifera*)
- Shiny-leaved Coprosma (*Coprosma repens*)
- Dolichos Pea (*Dipogon lignosus*)
- Perennial Veldt-grass (*Ehrharta calycina*)
- Spiny Rush (*Juncus acutus*)
- Coastal Tea-tree (*Leptospermum laevigatum*)
- European Olive (*Olea europaea*)
- Phalaris (*Phalaris aquatica*)
- Radiata Pine (*Pinus radiata*)
- Myrtle-leaved Milkwort (*Polygala myrtifolia*)
- Buckthorn (*Rhamnus alaternus*)
- Blackberry (*Rubus* sp.)
- Tall Wheat-grass (*Thinopyron elongatum*)
- Gorse (*Ulex europeaus**)

All but * are found in reserves within this fire management plan.

All prescribed burns conducted by DEH will assess weed control measures in the EAT, completed as a requirement of the prescribed burn planning process (DEH, 2004c; 2008). The EAT will describe the weed control to be implemented post-burn. However, investment will be based on the reserves overall habitat quality and also management priorities within the region.

Fire has been accepted as a tool for weed management, prescribed as part of an integrated approach. An integrated approach to weed management involves the planned use of fire coupled with other weed control techniques (including herbicide, biological, mechanical and physical control eg hand-pulling) noting that the combination, timing and application of methods is likely to differ depending on the target species. It is not the intention of DEH to augment weed infestation following a prescribed burn.

Volunteers, community groups and DEH pest plant programs have completed significant weed management work within reserves in the South East.

Monitoring programs should ensure that vulnerable areas are evaluated pre and post-fire to determine what post-fire weed control is required.

3.3.3 Plant Pathogens

The *Environment Protection and Biodiversity Conservation Act 1999* has identified Phytophthora (*Phytophthora cinnamomi*) as a key threatening process, which means that it is a major threat to native vegetation and associated fauna, particularly threatened species. Phytophthora is a soil and waterborne fungus that causes disease and death to a variety of native plant species (as well as introduced species). It occurs in areas of high rainfall. The fungus can spread with mud carried on vehicle tyres, walking boots and equipment.

The South East has been identified as being at *Moderate* risk (DEH, 2006d). However, at the time of writing this plan, Phytophthora has not been identified within any of the reserves in the South East. To ensure that Phytophthora is not spread across the South East, DEH has a Standard Operating Procedure which addresses Phytophthora threat management (DEH, 2002). This outlines hygiene procedures and guidelines to protect the integrity of natural areas by minimising the risk of Phytophthora infestation and spread in DEH reserves.

Management Strategies

Pest Species

70. Implement Interim Ecological Fire Management Guidelines (Table 5) and fire management guidelines for introduced flora species (Appendix 2) during prescribed burn planning.
71. Consider the use of fire as part of an integrated weed management strategy to minimise weed spread and restore native ecosystems.
72. Conduct post-fire weed control consistent with Regional priorities.
73. Identify the potential impact of weed species prior to any prescribed burn in prescribed burn planning, as part of the EAT, and recommend post-fire actions to mitigate the impact of weeds.
74. Identify the potential impact of introduced fauna on biodiversity values, as part of the EAT, and recommend appropriate post-fire actions to mitigate the impact of introduced fauna.
75. Consider the increased access within vegetation post-fire as part of an integrated weed management strategy to minimise weed spread.

4 RISK

4.1 Risk Assessment

A risk assessment for all DEH reserves in the planning area was conducted in line with the *Policy and Procedures for Risk Assessment in DEH Fire Planning* (DEH, 2009d) as a requirement of the compilation of this fire management plan. The risk assessment is a tool used to gauge the risks arising from bushfire to life, property and environmental values, within and adjacent to the reserves in the South East. The risk assessment considered visitor use, assets (built, cultural and environmental) and neighbouring properties for all reserves in the plan area. Risk assessment is a function of likelihood and consequence, as follows:

- Likelihood considers the possibility that a fire related risk will occur and is assessed on a basis of *Rare* to *Almost Certain* (*Rare, Unlikely, Possible, Likely, Almost Certain*).
- Consequence considers bushfire risk based on impacts to life, property and environmental values and is ranked from *Insignificant* to *Critical* (*Insignificant, Minor, Moderate, Major, Critical*).
- Based on the derived likelihood and consequence ratings, the overall risk for each scenario is determined using a risk matrix and ranked from *Low* to *Extreme* (*Low, Moderate, High, Extreme*).

Refer to the *Policy and Procedures for Risk Assessment in DEH Fire Planning* for further information (DEH, 2009d). Risk assessment is ongoing and continually reviewed to reflect the changing landscape. The application of fire management zones, as well as recommended actions and works in this plan are derived from the risk assessment process.

4.2 Potential for Fire Ignitions

It was assessed that there is a *Moderate* risk of lightning strike ignition, as the majority of reserves are small and widely scattered, and there is generally rain associated with lightning throughout the year within the region.

The risk of anthropogenic ignitions was assessed as *Moderate* due to high fuel levels, degree of accessibility, variable levels of visitation to reserves within the planning area and relatively few incidents being recorded in the past. Ignitions may include those occurring as a result of unattended campfires, private burn-offs, agricultural plant and equipment, or the result of arson.

4.3 Fuel Hazard

4.3.1 Overall Fuel Hazard

The Overall Fuel Hazard is used in fire management planning to determine the level of risk posed by bushfire to life, property and environmental assets in the risk assessment. The Overall Fuel Hazard is derived from the assessment of four fuel layers in vegetation: *Surface, Near-surface, Elevated and Bark Fuel* (Figure 2). Canopy fuel is not measured as part of Overall Fuel Hazard.

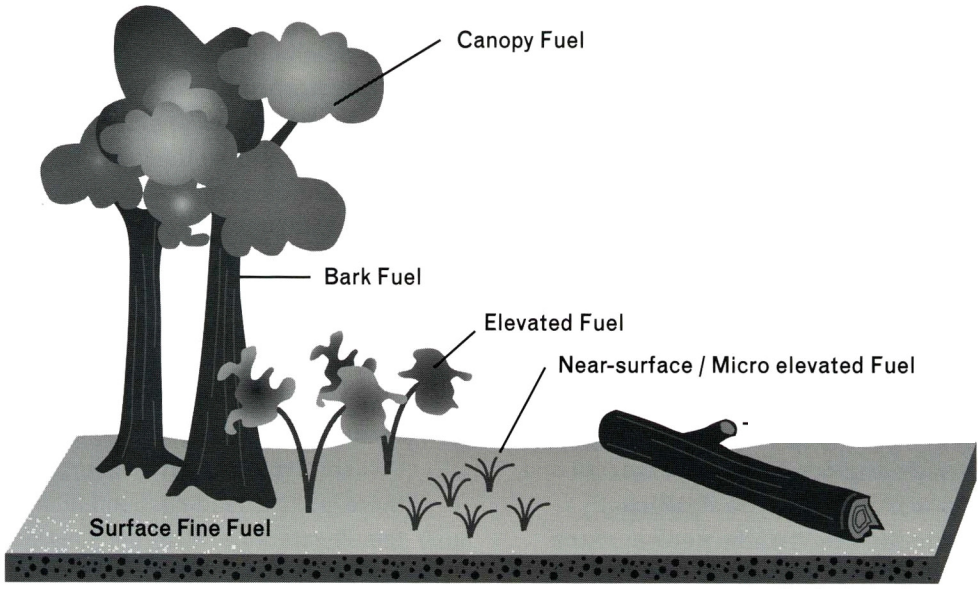

FIGURE 2 – FUEL LAYERS IN VEGETATION

Source (Tolhurst and Cheney, 1999)

Each fuel layer contributes to different aspects of fire behaviour: flame depth and height, surface fire combustion and rate of spread, spotting and crown fire (DEH, 2006e). Each layer, as well as the Overall Fuel Hazard can be assessed as: *Low, Moderate, High, Very High or Extreme* (DEH, 2006e).

Extreme bark hazard is likely in areas supporting Brown Stringybark (*Eucalyptus baxteri*) and/or Messmate Stringybark (*E. obliqua*) where fire has not occurred for some time, or if fire has occurred it was of low intensity and did not reduce the bark fuel hazard. In these areas, spot fires are likely to start ahead of the fire front, due to embers and firebrands blown in the wind. The occurrence of Stringybark communities throughout the planning area is shown on Map 2.

Research completed by McCarthy and Tolhurst (2004) investigated the effectiveness of fuel reduction burning in Victoria. It was concluded that maintaining Overall Fuel Hazard levels at *High* or less aids in slowing the rate of spread of a subsequent bushfire. It was determined that to achieve long-term fuel reduction effects the focus should be on the reduction of bark and elevated fuels as these fuel layers are likely to contribute to the overall fuel hazard.

For more information on fuel hazard assessment methodology and evaluation refer to the *Overall Fuel Hazard Guide for South Australia* (DEH, 2006e). DEH maintains a database containing fuel hazard assessment records. The process for recording and submitting fuel hazard data is explained in the *Fire Policy and Procedure for Fuel Hazard Assessment* (DEH, 2009e).

4.3.2 Likely Maximum Overall fuel Hazard

Maximum Overall Fuel Hazard levels have been estimated for Major Vegetation Sub-groups (MVS) within the plan area in order to provide a guide for fire management (refer to Table

3). The process used to derive MVS is described in Section 3.1.6 and the extent of each MVS within the reserves of plan area is shown on Map 2.

The likely maximum Overall Fuel Hazard for MVS can be used for planning and incident management. However, this should be supported by on-ground sampling as areas of vegetation remain unmapped and it is likely that other factors (such as high weed density) will influence the overall fuel hazard.

TABLE 3 – LIKELY MAXIMUM OVERALL FUEL HAZARD FOR MVS IN THE PLAN AREA

MVS No.	MVS Name	Likely Maximum Overall Fuel Hazard	Significant Fuel Layers
4	*Eucalyptus* forests with a shrubby understorey	Extreme	Surface Elevated Bark[1]
5	*Eucalyptus* forests with a grassy understorey	Very High	Surface Elevated
8	*Eucalyptus* woodlands with a shrubby understorey	Extreme	Surface Elevated Bark[1]
9	*Eucalyptus* woodlands with a grassy understorey	High	Surface Elevated
12	*Callitris* forests and woodlands	High	Surface Elevated
15	*Melaleuca* open forests and woodlands	High	Elevated
19	*Eucalyptus* low open woodlands with tussock grass	High	Surface
21	Other *Acacia* tall open shrublands	High	Surface Elevated
26	*Casuarina* and *Allocasuarina* forests and woodlands	High	Elevated
27	Mallee *eucalyptus* low open woodlands	Very High	Near-surface Elevated
29	Mallee heath and shrublands	Very High	Near-surface Elevated
30	Heath	Extreme	Elevated
31	Chenopod shrublands	Low	
32	Other shrublands	High	
36	Temperate tussock grasslands	High	Near-surface Elevated
37	Other tussock grasslands	Very High	
38	Wet tussock grassland, herbland, sedgeland or rushland	Very High	Near-surface Elevated
39	Mixed chenopod, samphire or forblands	Moderate	
47	*Eucalyptus* open woodlands with shrubby understorey	Extreme	Surface Elevated Bark[1]
48	*Eucalyptus* open woodlands with a grassy understorey	High	Surface
49	*Melaleuca* shrublands and open shrublands	Extreme	Elevated

[1] if Stringybark present

5 READINESS

5.1 Equipment

DEH is committed to purchasing and maintaining specialised fire equipment and communications systems to optimise fire management and response capabilities.

DEH issues personal protective equipment (PPE) to all firefighting staff that is designed to protect the safety and welfare of personnel. DEH ensures that PPE issued to firefighters meets recognised Australian Standards (where they exist), CFS requirements and Schedules as set out in the *Policy and Procedure for Personal Firefighting Equipment* (DEH, 2009v). PPE shall also be consistent with the DEH *Occupational Health Safety and Welfare Policy* (DEH, 2006a).

DEH firefighting resources include a variety of firefighting vehicles and equipment, which may be deployed to fires anywhere in South Australia or interstate. DEH ensures that all firefighting equipment meets Australian Standards (where they exist) and complies with CFS standards, unless specified otherwise in DEH environmental policies and standards (including the *Policy and Procedure for Fire Appliance Equipment Standards* (DEH, 2009w) and the *Policy and Procedure for Earthmoving Equipment* (DEH, 2009x).

All firefighting plant and equipment is inspected (and tested) prior to the commencement of the fire season and after use at fire incidents to ensure that minimum standards and equipment lists are met as prescribed in DEH Schedules.

Management Strategies

Equipment

76. Explore opportunities through prescribed burning to trial new fire equipment or fire technology products as they become available.

5.2 Training

Firefighting is a specialised activity with a range of associated hazards. All firefighters shall be trained to carry out their duties safely and recognise hazardous situations. DEH staff involved, directly or indirectly, in the management of fire incidents are required to satisfactorily complete the *Basic Fire Fighting Level 1* CFS course.

All DEH personnel engaged in fire management operations are trained in accordance with the DEH *Policy and Procedure for Fire Training* (DEH, 2009a) and CFS standards. All staff involved in fire suppression are required to undertake annual pre-season training and health checks and meet fitness requirements to ensure that they are able to carry out assigned duties safely and competently (see the *Policy and Procedure for Fire Personnel Health and Fitness* (*Fighting Fit*) (DEH, 2009g) for details).

DEH is committed to maintaining a safe working environment during fire operations in compliance with the *Occupational Health, Safety and Welfare Act 1986* and consistent with the DEH *Occupational Health, Safety and Welfare Policy* (DEH, 2006a).

5.3 Risk Mitigation Strategies

5.3.1 Fire Access

DEH is committed to managing a strategic network of fire access tracks in the reserve system, in accordance with the Government Agencies Fire Liaison Committee (GAFLC) standard (GAFLC, 2008) and the *Fire Policy and Procedure for Fire Access Tracks* (DEH, 2009t). Tracks occurring within the reserves in the plan area, as well as external tracks/public roads considered important for fire suppression have been classified as a 'Major', 'Standard' or a 'Minor' track according to the standard. Tracks that are considered unsuitable for fire suppression have been classified as 'Service' tracks and should not be used during fire suppression operations unless verified by on-ground inspection. Map 4 shows fire access tracks according to their GAFLC classification.

Slashed areas (unmapped) may be used for access during an incident subject to consultation with relevant DEH District staff.

Tracks that are identified as important for fire suppression are usually located in low fuel areas, supported by zoning or may be positioned between significant assets (e.g. Lagoon Track, Beeama-Parsons Road, Wolesley-Teatrick Road).

Design and location of new fire access tracks will take into consideration topography and low fuel hazard areas to provide for the safety of firefighters during suppression activities. New fire access tracks are proposed for Lake Hawdon South CP. Track upgrades to improve accessibility are proposed in Gum Lagoon CP, Mt Scott CP, Piccaninnie Ponds CP and Woakwine CP.

Fire access points and tracks have been reviewed as part of this plan and proposed changes are summarised within Appendix 1. If track closures or upgrades are not recommended in the plan, tracks will be maintained to the GAFLC standards shown on Map 4, through verge works and slashing. In order to maintain tracks to GAFLC standards, works will be implemented on an annual basis, subject to resources, fuel hazard and other factors.

Management Strategies	
Fire Access	77. Implement changes to fire access as described in Appendix 1.
	78. Maintain tracks to the GAFLC standards as shown on Map 4.
	79. Implement signs on fire access tracks according to GAFLC standards.

5.3.2 Fire Infrastructure

Utilites and facilities in the planning area that are important during a firefighting effort include water sources and airstrips (Map 4). The following fire infrastructure is maintained for fire suppression activities within the reserves in the planning area.

- Overhead quick-fill structures (Penambol CP; Hacks Lagoon CP; Naracoorte NPWS depot; Wonambi Centre).
- Numerous tanks and bores.

Access to off-reserve watersources should be negotiated directly with neighbours through the CFS. The *Response Plan for the South East Region* (DEH, 2009h) as well as the South East Region annual works schedule will provide up to date information on fire infrastructure as these documents are updated annually.

5.3.3 Fire Management Zones

Fire management zones as detailed in the *Policy and Procedure for Fire Management Zoning in DEH Fire Planning* (DEH, 2009c) have been introduced into DEH fire management planning to:

- ensure that appropriate management actions are implemented to meet the requirements for asset protection and ecological management on DEH reserves and DEH managed land
- clarify the areas where different fire management activities will be undertaken on DEH reserves and DEH managed land
- ensure a standard approach to the application of fire management zones on DEH reserves and DEH managed land across South Australia
- assist in the development of fire management plans and programs for DEH reserves and DEH managed land.

Fire management zones are categorised according to the primary objective for fire management – Asset Zone (A-zone), Buffer Zone (B-zone) or Conservation Zone (C-zone). These zones are determined, giving consideration to fuel hazard levels in different habitat types and the level of risk to assets including life, property and cultural heritage, and biodiversity assets. The zones allocated to the planning area are described in Appendix 1 and also displayed on Map 4.

The following general objectives apply for fire management zoning across the planning area:

A-zone Objectives

- To provide a low fuel area of at least 40 m to help protect life (owners/firefighters) and property/built assets from radiant heat damage, flame contact and short distance ember attack.
- To modify the rate of spread and fire intensity providing the highest degree of safety for fire crews during suppression.

B-zone Objectives

- To minimise the likelihood of bushfire impacting on property and ecological assets.
- To assist in reducing bushfire intensity, ember attack and spotting potential, likely to impact on the assets within the surrounding urban areas or assets within the reserves.
- To provide a suppression advantage to assist in containing bushfires within defined areas, that is to minimise the likelihood of fires entering the reserve from the wider landscape or exiting the reserve.
- To enhance safe access for firefighters.

C-zone Objectives

- To manage fire to meet the reserve management objectives as specified within the Reserve Management Plans listed in Section 2.3.1 of this document.
- To assist in the conservation of species and populations such as the rated species listed in Appendix 2 and 3, as well as threatened ecological communities listed in Appendix 4, through the application of appropriate fire regimes.
- To reduce the likelihood of contiguous vegetation burning in a single fire event.

Major Strategies within DEH Reserves in the South East

The following provides an overview of the major strategies that have been developed based on the risk assessment.

- Maintenance of existing track network across all blocks in the planning area, and the introduction of new access, or upgrade of existing tracks, to improve accessibility.
- Wide B-zones have been placed within significant blocks (Desert Camp CR, Gum Lagoon CP) in order to form an effective fuel break to reduce the likelihood of fire moving across the landscape or exiting DEH land.
- The native vegetation remaining in the South East is unevenly distributed, concentrated in areas less suited to agriculture. Due to the fragmented landscape and relatively small size of reserves across the plan area (78% <1000 hectares), strategic prescribed burning within C-zones will be undertaken to reduce the impact of bushfire.

These and other zones applied to the reserves in the planning area are shown on Map 4 and detailed in Appendix 1. Note that the extent of these B-zones, as displayed spatially, is indicative and the widths will be more clearly defined during prescribed burn planning depending on the method of implementation.

Prescription for Fuels in A- and B-zones

The Overall Fuel Hazard:

- should not exceed *Moderate* for the areas designated as A-zones

- should not exceed *High* for the areas designated as B-zones.

In A- and B-zones, fuel management will be undertaken to achieve the desired level of overall fuel hazard, once it exceeds the prescribed limit. Note that within C-zones management is not dictated by overall fuel hazard levels, rather zoning allows for fire management to meet ecological and conservation management objectives.

Fuel Reduction in A- and B-zones

Details on fuel reduction methods with A- and B-zones are provided within the EAT (as part of prescribed burn planning), which is prepared before the implementation of each prescribed burn (see below) and also before fire management works are undertaken within DEH managed land where native vegetation is being cleared and is not exempt under the *Native Vegetation Act 1991*. Refer to the *Interim Environmental Assessment Table Guidelines* (DEH, 2004c) and the *Policy and Procedure for Prescribed Burning* (DEH, 2009i) for more information.

Burn Preparation

All prescribed burning in A-, B- and C-zones (regardless of the objective or tenure) will adhere to the planning process utilising the EAT, as detailed in Figure 3 and in the *Fire Policy and Procedures for Prescribed Burning* (DEH, 2009i). Ecological Burns are also subject to the planning process detailed in *Fire Policy and Procedure for Ecological Burning* (DEH, 2009j).

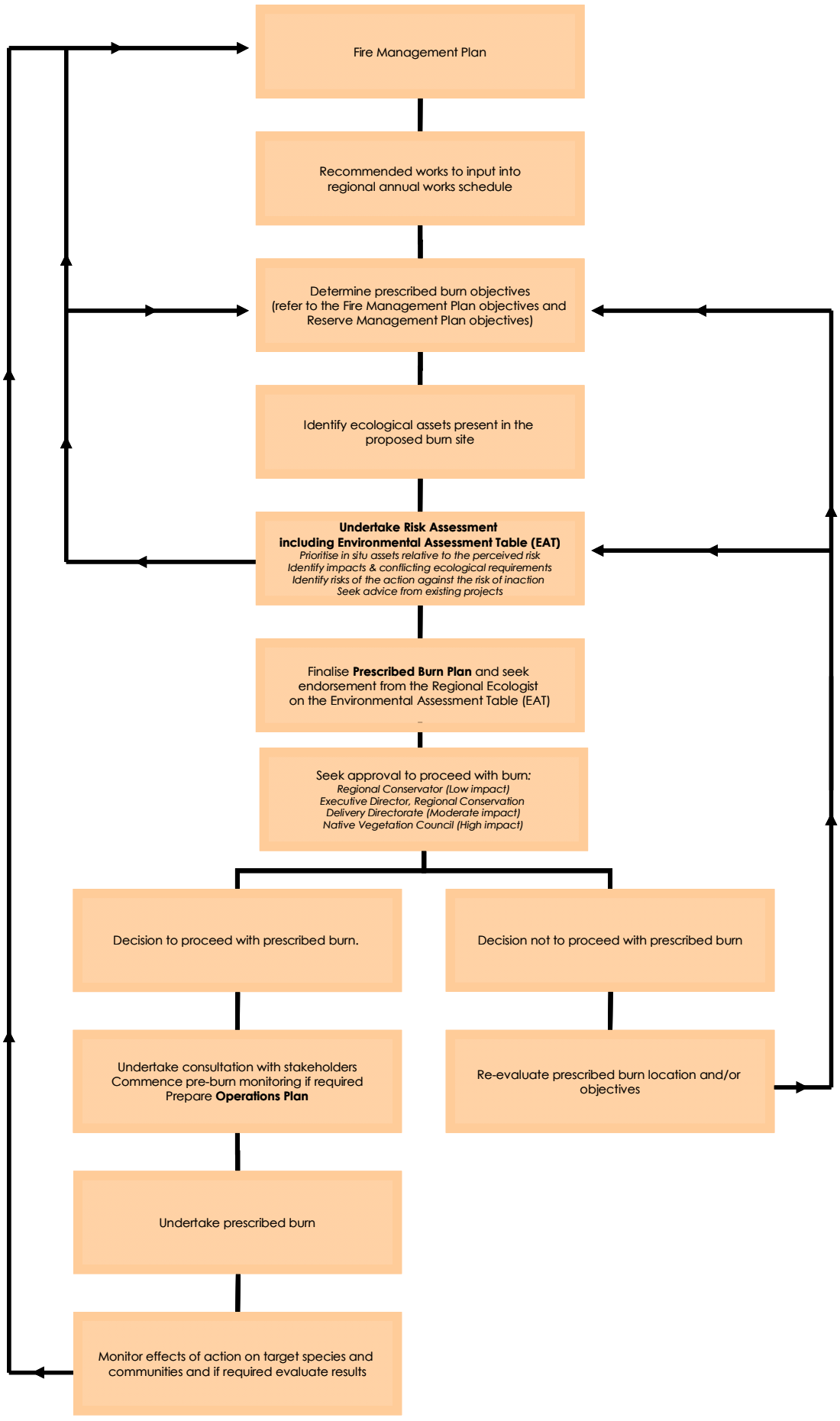

FIGURE 3 – FLOWCHART DETAILING THE BURN PLANNING PROCESS

Fire Management Blocks

The reserves in the plan area have been divided into fire management blocks, ensuring that information and issues unique to a particular area have been addressed (Table 4). Block boundaries are based on access and the practicalities of implementing fire management objectives.

TABLE 4 – FIRE MANAGEMENT BLOCK INFORMATION

Block	Reserve	Size (ha)
Aberdour	Aberdour Conservation Park	133
Bangham	Bangham Conservation Park	738
Beachport	Beachport Conservation Park	710
Belt Hill	Belt Hill Conservation Park	9
Bernouilli	Bernouilli Conservation Reserve	200
Big Heath Park	Big Heath Conservation Park	2 351
Big Heath Reserve	Big Heath Conservation Reserve	103
Blacketts Scrub	Gum Lagoon Conservation Park	1 310
Bool Lagoon	Bool Lagoon Game Reserve	3 103
Bucks Lake	Bucks Lake Game Reserve	136
Bunbury	Bunbury Conservation Reserve	1 951
Butcher Gap	Butcher Gap Conservation Park	178
Calectasia	Calectasia Conservation Park	14
Canunda	Canunda National Park	9 325
Carpenter Rocks	Carpenter Rocks Conservation Park	32
Coorong	Coorong National Park	46 745
Custon	Custon Conservation Park	28
Desert Camp Park	Desert Camp Conservation Park	49
Desert Camp Reserve	Desert Camp Conservation Reserve	893
Dingley Dell	Dingley Dell Conservation Park	6
Douglas Point	Douglas Point Conservation Park	31
Ewens Ponds	Ewens Ponds Conservation Park	34
Fairview	Fairview Conservation Park	1 398
Furner	Furner Conservation Park	285
Geegeela	Geegeela Conservation Park	858
Glen Roy	Glen Roy Conservation Park	540
Gower	Gower Conservation Park	39
Grass Tree	Grass Tree Conservation Park	15
Guichen Bay	Guichen Bay Conservation Park	121
Gum Lagoon	Gum Lagoon Conservation Park	7 244
Hacks Lagoon	Hacks Lagoon Conservation Park	195
Hanson Scrub	Hanson Scrub Conservation Park	393

Block	Reserve	Size (ha)
Islands	Baudin Rocks Conservation Park	17
	Currency Creek Game Reserve	129
	Mud Islands Game Reserve	120
	Penguin Island Conservation Park	5
	Salt Lagoon Islands Conservation Park	75
Jip Jip	Jip Jip Conservation Park	141
Lake Frome	Lake Frome Conservation Park	1 091
Lake Hawdon South	Lake Hawdon South Conservation Park	3 190
Lake Robe	Lake Robe Game Reserve	406
Lake St Clair	Lake St Clair Conservation Park	189
Little Dip	Little Dip Conservation Park	2 138
Lower Glenelg River	Lower Glenelg River Conservation Park	127
Martin Washpool	Martin Washpool Conservation Park	1 882
Mary Seymour	Mary Seymour Conservation Park	345
Messent	Messent Conservation Park	11 606
Mount Boothby	Mount Boothby Conservation Park	4 087
Mount Monster	Mount Monster Conservation Park	92
Mount Scott	Mount Scott Conservation Park	1 267
Mullinger Swamp	Mullinger Swamp Conservation Park	12
Naracoorte Caves Reserve	Naracoorte Caves Conservation Reserve	70
Naracoorte Caves Park	Naracoorte Caves National Park	467
Nene Valley	Nene Valley Conservation Park	386
Padthaway	Padthaway Conservation Park	987
Penambol	Penambol Conservation Park	178
Penola	Penola Conservation Park	226
Piccaninnie Ponds	Piccaninnie Ponds Conservation Park	547
Piccaninnie Grassland	Piccaninnie Ponds (adj. Piccaninnie Ponds CP)	26
Picks Swamp	Piccaninnie Ponds (adj. Piccaninnie Ponds CP)	214
Pine Hill Soak	Pine Hill Soak Conservation Park	51
Poocher Swamp	Poocher Swamp Game Reserve	77
Reedy Creek	Reedy Creek Conservation Park	148
Talapar	Talapar Conservation Park	490
Tantanoola Caves	Tantanoola Caves Conservation Park	14
Telford Scrub	Telford Scrub Conservation Park	176
Tilley Swamp	Tilley Swamp Conservation Park	1 538
Tolderol	Tolderol Game Reserve	428
Vivigani Ardune	Vivigani Ardune Conservation Park	41
Woakwine	Woakwine Conservation Reserve	424

Block	Reserve	Size (ha)
Wolseley Common	Wolseley Common Conservation Park	28
Wyndgate	Wyndgate	1 088
Wyomi	Wyomi Council Reserve (adj. Butcher Gap CP)	55
	Total	**113 745**

5.3.4 Ecological Fire Management

The management of fire to maintain biodiversity is discussed in more detail in the Draft DEH *Ecological Fire Management Guidelines for South Australian Parks and Native Vegetation* (DEH, 2009k). This approach is being used as a sound basis for the management of fire for biodiversity across Australia (Andersen, *et al.*, 2003; FEWG, 2004; Hopkins and Saunders, 1987; Whelan, *et al.*, 2002). It is based on accumulating knowledge of species, populations and communities and their response to fire regimes, and then applying this knowledge to fire management practices to maximise biodiversity outcomes. Ecological fire management guidelines are used to assist in achieving management objectives in C-zones within all DEH fire management plans.

Methodology

Ecological Fire Management Guidelines have been developed from the research and analysis of available data relating to the *Key Fire Response Species* within the reserves of the plan area. The approach used by DEH to define the Ecological Fire Management Guidelines involves the identification of fire regime thresholds using flora and the assessment of the potential impacts of these thresholds against known faunal requirements, particularly the requirements of species of conservation significance. The steps taken in the development of the Ecological Fire Management Guidelines are as follows:

- Vital attribute data of plant and animal species, and ecological communities are gathered and assessed.
- This knowledge is used to identify the Thresholds of Potential Concern (TPC) of fire regime (fire interval, intensity, season and type) where species significantly decrease.
- Ecological Fire Management Guidelines are formed from these thresholds and are then used to guide the fire management practices to ensure that adequate habitat is available to maintain biodiversity (i.e. species, populations and communities).

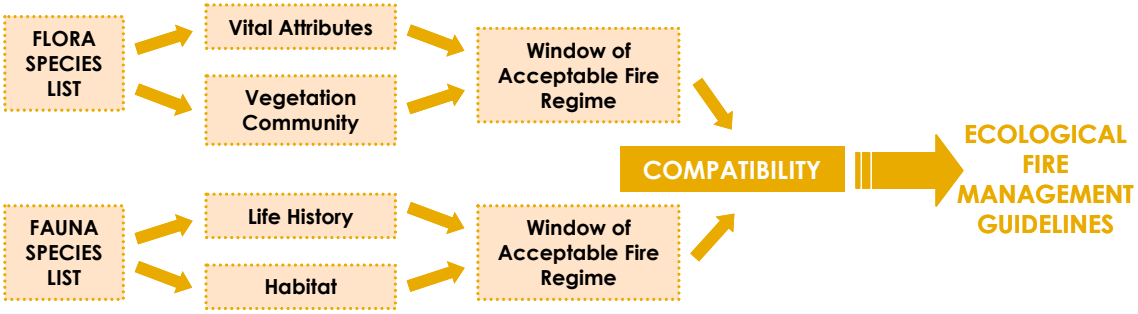

FIGURE 4 – APPROACH FOR DETERMINING ECOLOGICAL FIRE MANAGEMENT GUIDELINES

(Adapted from DEH, 2009k)

Interpreting Ecological Fire Management Guidelines

Ecological Fire Management Guidelines have been defined for Major Vegetation Sub-groups (MVS), enabling fire management to strategically plan and manage fire across the reserves of the South East in a way that will ensure the maintenance and enhancement of biodiversity (Table 5). Guidelines for five aspects of fire regime (interval, frequency, spatial, intensity and season) have been determined for all MVS within the plan area (where data is available). The upper and lower limits of fire interval for a particular MVS have been proposed, as well as recommendations on the management of fire frequency. Fire intensity requirements for species regeneration and undesired seasonal burning patterns have also been identified. Ecological Fire Management Guidelines should not be used as prescriptions; instead they define a window of "acceptable" fire regime that ensures the conservation of existing species.

Thresholds of Potential Concern

Thresholds of Potential Concern (TPC) are defined as 'the limits of tolerance to a particular fire regime' (Kenny*, et al.*, 2003).

- TPC1 demonstrates the lower threshold for fire interval (in years) for a particular MVS. 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 a community.
- TPC2 demonstrates 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 MVS if fire is absent for more than the time specified.

If either of the thresholds are breached, species of sensitive functional types are likely to significantly decline. Fire intervals between the upper and the lower threshold (Table 5) are predicted to maintain the species complement, whereas intervals shorter than the lower threshold or longer than the upper threshold are predicted to lead to the decline of the *Key Fire Response Species* (Kenny*, et al.*, 2003).

TABLE 5 – ECOLOGICAL FIRE MANAGEMENT GUIDELINES FOR MVS IN THE PLAN AREA

		FIRE REGIME						
		Interval		Spatial Criteria	Frequency	Intensity		Season
MVS No	MVS Name	**TPC 1** –inter-fire interval greater than X years	**TPC 2** – Inter-fire interval less than X years[1]	Inter-fire intervals within **TPC1** and **TPC2** across more than X% of the extent of this vegetation type within the planning area	Avoid more than 2 fires within X years	Avoid more than 2 successive fires of low intensity	Some medium to high intensity fire needed to regenerate some species	Avoid 2 or more successive fires in season[2]
4	*Eucalyptus* forests with a shrubby understorey	20	50	50%	40	Y	Y	Spring or during & following drought
5	*Eucalyptus* forests with a grassy understorey	5	25	50%	30	N	N	Spring or during & following drought
8	*Eucalyptus* woodlands with a shrubby understorey	15	35	50%	40	Y	Y	Spring
9	*Eucalyptus* woodlands with a grassy understorey	20	25	50%	30	Y	Y	Spring or during & following drought
12	*Callitris* forests and woodlands	10	20	50%	70	Y	Y	During & following drought
15	*Melaleuca* open forests and woodlands	10	60	50%	20	Y	N	During & following drought
19	*Eucalyptus* low open woodlands with tussock grass	10	20	50%	60	Y	Y	Spring or during & following drought
26	*Casuarina* and *Allocasuarina* forests and woodlands	20	50	50%	50	N	N	Spring or during & following drought
27	Mallee *eucalyptus* low open woodlands	20	50	50%	60	Y	Y	During & following drought
29	Mallee heath and shrublands	20	50	50%	40	Y	Y	Spring or during & following drought
30	Heath	10	30	50%	25	Y	Y	Spring or during & following drought

MVS No	MVS Name	FIRE REGIME						
		Interval		Spatial Criteria	Frequency	Intensity		Season
		TPC 1 –inter-fire interval greater than X years	**TPC 2** – Inter-fire interval less than X years[1]	Inter-fire intervals within **TPC1** and **TPC2** across more than X% of the extent of this vegetation type within the planning area	Avoid more than 2 fires within X years	Avoid more than 2 successive fires of low intensity	Some medium to high intensity fire needed to regenerate some species	Avoid 2 or more successive fires in season[2]
32	Other shrublands	20	40	50%	40	Y	Y	Spring
36	Temperate Tussock grasslands	10	20	50%	20	N	N	Autumn
37	Other tussock grasslands	10	25	50%	20	Y	Y	Autumn
38	Wet tussock grassland, herbland, sedgeland or rushland	10	35	50%	20	Y	Y	During & following drought
47	*Eucalyptus* open woodlands with shrubby understorey	10	35	50%	20	Y	Y	Spring
48	*Eucalyptus* open woodlands with a grassy understorey	20	50	50%	40	Y	Y	During & following drought
49	*Melaleuca* shrublands and open shrublands	10	60	50%	20	Y	N	Spring

[1] denotes that there was insufficient data to calculate TPC2; all values are 'expert' estimates, based on literature and generic plant life histories.

[2] note that this is not restricted to the same year, but may relate to fires occurring in the same season over a number of years.

6 RESPONSE

6.1 Response Plans

A Response Plan exists for the South East Region (DEH, 2009h), which is reviewed on an annual basis in accordance with the *fire Policy and Procedure for Response Planning* (DEH, 2009l). The response plan provides maps and reserve-specific information in relation to fire management, including water points, equipment and access, as well as levels of preparedness.

Note that these plans are for initial response only and this Fire Management Plan should be referred to for more detailed fire management information, in conjunction with DEH staff.

DEH South East Region acknowledges that due to the distance of many reserves to DEH District offices, CFS appliances are generally first on the scene of fire incidents.

6.2 Suppression Considerations

Efforts to contain bushfires will be made by using existing control lines, previously burnt areas and natural low fuel areas. Predicted fire intensity should be considered before adopting a suppression strategy or combination of strategies. Firefighter safety and the protection of life are paramount.

Within reserves it is likely that DEH staff will be the best source of this information, as such they should be consulted during the development of any incident prediction. Consideration for firefighter safety and the protection of life are paramount during all suppression operations. A DEH Liaison Officer will be assigned to most incidents attended by DEH crews. The role of the DEH Liaison Officer is to coordinate and work with Incident Control, to give advice on DEH policy and procedures, organise the supply of DEH resources and provide logistical and planning support.

Ground Crews

Considerations:

- Extreme fuels in vegetation dominated by Stringybarks.
- All maps should be checked carefully to determine escape routes and reduce the likelihood of entrapment.
- Reliance on ground crews and aerial suppression due to difficulty in machinery deployment.
- DEH role in fire suppression and the role of other fire suppression agencies during an incident (i.e. CFS and the MFS may focus on asset protection and FSA, DEH and CFS are likely to implement hose lays and carry out remote area firefighting).
- Water for fire suppression can be sourced from DEH tanks, standpipes and dams as shown on Map 4. Alternatively tankers may be deployed to the incident and there may be mains water points in the surrounding area.
- The use of foams, retardants and gels should be minimised in creek lines.
- Coastal/sea breezes can influence fire behaviour.

- In regards to fire access within the plan area:
    - Public roads and access tracks classified to GAFLC standards are shown on Map 4.
    - Gates providing access to DEH managed lands are illustrated on Map 4.
    - Public roads and access tracks classified as 'Service Tracks' on Map 4 should not be used for fire suppression unless verified by inspection and approved by the IMT.
    - Public roads may be used by sightseers.
    - Travelling time to and from an incident, as well as at an incident, is likely to increase due to the above-mentioned factors.
- Implement precautionary hygiene measures (as per DEH SOP-002 *Phytophthora Threat Management*, Section 7.2.2 (DEH, 2002)) to reduce the risk of the spread of weeds and pathogens.
    - All equipment is to arrive at the fireground in a clean state.
    - When stood down, all equipment is to leave the staging area in a clean state.

Machinery Use

Considerations:

- Machinery use and deployment during fire suppression is to be in accordance with:
    - DEH Fire Policy and Procedure for Earthmoving Equipment (DEH, 2009x)
    - CFS Supervision of Machinery Guidelines (CFS, 2007)
    - Phytophthora hygiene procedures as described in Section 3.3.3.
- Machinery is to be excluded from significant areas such as threatened flora and fauna sites. Liaison with the relevant DEH staff is required to provide advice on minimising the impact on natural values.
- Machinery use in the vicinity of any karst system is to be referred to the relevant District Ranger.
- All practical options, effectiveness, the likelihood of success and likely positive and negative impacts on environmental and cultural values must be considered when planning the use of earthmoving equipment.
- Minimal disturbance suppression techniques and specialised equipment, or technology that reduces impacts to the landscape shall be used wherever possible.
- Standards for control lines are to be in accordance with the *Standard Operating Procedure for Fire Control Lines* (DEH, 2009m).
- The use of control lines should be determined by the IMT, based on fire severity and weather conditions, giving due consideration to safety and strategic advantage.
- Steep terrain will often considerably reduce the efficiency and effectiveness, and increases risk for machinery operators.
- The need to undertake high impact suppression measures, such as chaining or mineral earth breaks during a running fire should be reduced by utilising existing control lines and through the strategic use of previous fire scars and fuel patterns.

- Implement precautionary hygiene measures (as per DEH SOP-002 *Phytophthora Threat Management* (DEH, 2002)) to reduce the risk of the spread of weeds and pathogens.
    - All vehicles and equipment are to arrive at the fireground in a clean state; and
    - When stood down, all vehicles are to leave the staging area in a clean state.

Aerial Suppression

Considerations:

- Implementation of aerial suppression is to be in accordance with the *Fire Policy and Procedure for Aerial Operations* (DEH, 2009n)
- DEH supports the use of retardant and foam products that meet Australian Standards. The use of retardant should be in accordance with the *Fire Policy and Procedure for Fire Suppression Chemicals* (DEH, 2009o)
- The use of retardant in catchment areas should be in accordance with the *Memorandum of Understanding on Aerial Application of Chemical Fire Retardants between SA Water and CFS* (CFS, 2006)
- The use of retardant should be restricted to critical situations, such as the protection of built assets. Retardant should not be dropped in creeklines or in close proximity to standing water, due to the increase in nutrients and resultant potential weed proliferation and/or impacts to nutrient sensitive native species
- The use of foams should be minimised in catchment areas and creek lines
- Sea water should only be used where no other water source is available
- Aerial suppression should only be undertaken where the operation is supported by ground crew
- Aerial ignition should be considered for the implementation of large scale prescription burns. During bushfires aerial ignition should be considered to reduce the impact of head fires on control lines and increase the probability of success in limiting the propagation of bushfire within the landscape.

6.3 Visitor Management During Bushfire

The safety of residents and lessees within reserves is managed in accordance with the 'Prepare Act Survive' principle, which advocates for the preparation of Bushfire Survival Plans ahead of time and explains the responsibility of individuals to stay well informed to assist in decision making to improve safety (CFS, 2009d).

Visitors within reserves are managed according to the *Fire Policy and Procedure for Visitor Safety* (DEH, 2009p), which allows for the temporary closure of reserves or cancellation of activities due to an actual emergency, imminent threat or extreme threat of a bushfire.

CFS has an *Evacuation Policy* (CFS, 2009c), which explains that as far as is possible, members of the community should decide for themselves whether to 'Plan to Stay and Defend' or 'Go Early' when threatened by an emergency. Directed evacuation will only be undertaken by the South Australia Police and Emergency Services when it is safe to do so and adequate resources are available. These nominated authorities will only direct

evacuation when it is evident that loss of life or injury is imminent and almost certain. DEH will comply with all requests from these authorities in evacuating visitors, lessees and residents from reserves during an emergency.

6.4 Fire Management on Islands

Five islands or groups of islands (346 ha) are incorporated into the following DEH reserves:

- Baudin Rocks CP (17 ha)
- Currency Creek GR (129 ha)
- Mud Islands GR (120 ha)
- Penguin Islands CP (5 ha)
- Salt Lagoon Islands CP (75 ha)

Given the relative remoteness and logistical problems associated with fighting fires in these locations, it is likely that most fires will be left to burn out naturally. The risk of fire on off-shore islands is considered to be *Low*. Any response to limit the impact of fire on off-shore islands will be determined after consideration of the potential impact, prevailing weather conditions, access and resources.

Management Strategies	
Islands	80. Review the need for prescribed burning for ecological or protection purposes.
	81. Where possible, manage fire to ensure the maintenance of biodiversity and the protection of natural and cultural assets.

7 RECOVERY, MONITORING AND RESEARCH

7.1 Post-Fire Rehabilitation and Recovery

DEH has a *Policy and Procedure for Post-fire Rehabilitation* (DEH, 2009q) to ensure that the post-fire rehabilitation and recovery of a reserve is identified during an incident. A post-fire rehabilitation plan should be prepared and should describe the areas affected by fire and impacts on the natural and built environment. Specific objectives of post-fire rehabilitation plans are outlined in the Policy and Procedure.

7.2 Monitoring

Monitoring will be established in conjunction with any prescribed burns conducted within reserves in the plan area in accordance with DEH policy and procedures. This includes the *Policy and Procedure for Prescribed Burning* (DEH, 2009i), incorporating the Environmental Assessment Table and monitoring procedures. Refer to Section 5.3.3 of this plan for general information on C-zone burning and the planning requirements.

Opportunities for monitoring will also be considered in areas impacted by bushfire to improve knowledge about the response of species, communities and habitats to fire within the planning area, as per DEH guidelines (DEH, 2004b). The results from post-fire monitoring will be used to further refine fire management consistent with an adaptive management approach.

It is recommended that monitoring be undertaken to:

Monitoring

82. Monitor and develop models for the fuel accumulation rates of the various MVS that occur within the plan area. These data will help DEH staff determine if and when fuel reduction works are required, ultimately assisting in the scheduling of operation works and activities in B-zones.
83. Assess the suitability of the Interim Ecological Fire Management Guidelines for MVS through the assessment of historical fire regimes in similar communities across the state (Table 5).
84. Assess the suitability of the proposed Interim Ecological Fire Management Guidelines for the control of introduced species following fire (Appendix 2).

7.3 Research

Further investigation via research and monitoring is critical to refine future fire management. Some research is already happening and DEH needs to ensure that research is tailored to address specific and pertinent management issues, is relevant to land managers and can be readily incorporated into improved ecological fire management through the refinement of the proposed ecological fire management guidelines (see Section 5.3.4). To ensure that this occurs, any fire-related research that is proposed within the reserves in the plan area should be consistent with the DEH Fire Research Strategy, and discussed with the Senior Fire Research Scientist, (Bioknowledge SA, DEH) and be in accordance with fire research policy (DEH, 2009r).

The research questions that could be asked in the South East planning area are numerous. Testing the underlying assumptions of the fire management model used for this landscape is

critical to informing future iterations of this plan. Some simple ecological and operational research questions that require further exploration include:

- the fire requirements of flora and flora;
- the role of unburnt patches;
- the role of fire severity and inter-fire interval mosaics; and
- the influence of prescribed burning effectiveness on bushfire behaviour and suppression success.

The following table summarises recommended research that may be undertaken in the planning area.

Research	85. Investigate the suitability of the Interim Ecological Fire Management Guidelines (Table 7) for MVS by quantifying the existing status of MVS within the planning area, to assist fire managers with burn planning and suppression activities
	86. Investigate the suitability of the Interim Ecological Fire Management Guidelines (Table 7) for MVS by the on-ground assessment of historical fire regimes in similar communities across the state.
	87. Investigate the role of prescribed burning on a range of species, including threatened orchids, Jumping-Jack Wattle, Silver Daisy-bush, Sand Ixodia, Southern Brown Bandicoot, Long-nosed Potoroo and Heath Mouse to gain a better understanding of recruitment events, and critical life-cycle processes. Use this information to update the Ecological Fire Management Guidelines (Appendix 4).
	88. Explore the effects of fire regime on threatened flora and fauna, species populations and ecosystems and use this information to propose Ecological Fire Management Guidelines (Appendix 3, 4 and 5) where they do not exist.
	89. Determine the post-fire response of rare and threatened flora and fauna.

8 SUMMARY OF RECOMMENDATIONS

Visitor Use

1. Implement appropriate fuel management strategies as shown on Map 4 to increase visitor safety.
2. Review the need for visitor management plans within the reserves in the planning area, prepare plans as required and review these annually.
3. Regularly rehearse the visitor management emergency procedure to be implemented during a bushfire.
4. Consider reserve closures when significant fire weather is forecast to ensure visitor safety (at the discretion of the Director National Parks and Wildlife).

Built Assets

5. Implement fuel management strategies appropriate to asset protection as shown on Map 4 and other risk mitigation works as detailed in Appendix 1.
6. Encourage adjacent property owners to work with the CFS to implement appropriate and coordinated fire management works on their own land to minimise the threat of fire.
7. Undertake fire management works and activities on DEH reserves to minimise the impact that fire may pose to adjacent public assets.

Cultural Assets

8. Implement fuel management strategies appropriate for the protection of cultural assets as shown on Map 4.
9. Ensure liaison at bushfires occurs to identify cultural assets, where time allows. Once the fire has passed evaluate sites to establish if any damage has occurred.
10. Ensure suppression strategies take into account significant cultural assets in order to minimise impacts from these activities and undertake post-fire rehabilitation.

Karst Systems

11. Consider weather conditions during prescribed burn planning to minimise the likelihood of smoke impact to the karst system.
12. Minimise the likelihood of fire management operations impacting groundwater quality by restricting the use of fire suppression chemicals and reducing the erosion potential in significant karst areas.
13. Ensure appropriate liaison at bushfires occurs to identify karst values. Once the fire has passed evaluate sites to establish if any damage has occurred.
14. Ensure suppression strategies take into account significant karst values in order to minimise impacts from fire management activities and undertake post-fire rehabilitation.

Orange-bellied Parrot

15. Conduct prescribed burning to protect and enhance known foraging habitat.
16. Prescribed burns planned on known foraging habitat will be conducted during times when birds are absent from the mainland, otherwise pre-burn surveys to ensure area to be burnt is not being utilised as feeding habitat will be undertaken.
17. Prepare an Ecological Fire Management Strategy for the OBP to guide planning and the implementation of prescribed burns in known or potential OBP habitat.
18. Consult the OBP Recovery Team during the planning of any prescribed burn to be conducted within known habitat of the OBP.

Red-tailed Black Cockatoo

19. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
20. Ensure that up to 85% of Stringybark habitat across the SA reserved area is retained as >10 years post-fire.
21. Ensure prescribed burns carried out in potential or known RTBC habitat are planned so as to reduce canopy scorch of Stringybark.
22. Conduct pre-burn surveys to ensure area to be burnt is not currently being utilised as feeding habitat.
23. Consult with the RTBC Recovery Team and ForestrySA during the planning of any burn to be conducted within potential habitat, and to assist with fire management strategies to meet the conservation requirements of the RTBC.

Malleefowl

24. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
25. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.
26. Consult with the Malleefowl Recovery Team during the planning of any burn to be conducted within known habitat, and to assist with fire management strategies to meet the conservation requirements of the Malleefowl.
27. Prepare an Ecological Fire Management Strategy for the Malleefowl to guide planning and the implementation of prescribed burns in known Malleefowl habitat.

Swift Parrot

28. Avoid burning known Swift Parrot habitat and exclude those areas proposed for burning in which new observations have been recorded.

Southern Brown Bandicoot

29. Conduct prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
30. Attempt to provide unburnt patches within, and adjacent to burn area as refuge during prescribed burning or bushfire suppression activities.
31. Prepare an Ecological Fire Management Strategy for the SBB to guide planning and the implementation of prescribed burns in known SBB habitat.
32. Consult with the relevant recovery team and ForestrySA during the planning of any prescribed burn to be conducted within known habitat of the species, and to assist with fire management strategies to meet the conservation requirements of the SBB.

Striped Legless Lizard

33. Minimise major disturbance (i.e. heavy grazing, cultivation, rock removal) and fire management activities in known or potential habitat between August and March when the lizards are most active.
34. Avoid burning large areas (>50%) of known or potential meta-population habitat.
35. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.

Southern Bell Frog

36. Avoid burning large areas (>50%) of potential meta-population habitat and/or wetland verges.

37. Attempt to provide unburnt patches within, and adjacent to burnt areas as refuge during prescribed burning or bushfire suppression activities.

Long-nosed Potoroo

38. Investigate the use of prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
39. Investigate the use of prescribed burning to enhance habitat and food resources.
40. If deemed appropriate, conduct prescribed burning to meet Management Strategies 36 and 37.
41. Liaise with the Victorian Department of Sustainability and Environment (DSE) regarding scheduled prescribed burns and fire management activities adjacent the Lower Glenelg River CP.

Heath Mouse

42. Investigate the use of prescribed burning to increase habitat patchiness and minimise the risk of large areas (>50%) of meta-population habitat burning in one fire event.
43. Investigate the use of prescribed burning to enhance habitat and food resources.
44. If deemed appropriate, conduct prescribed burning to meet Management Strategies 40 and 41.
45. Liaise with DSE regarding scheduled prescribed burns and fire management activities adjacent the Lower Glenelg River CP.
46. Consult with ForestrySA to assist with fire management planning to meet the conservation requirements of the Heath Mouse.

Southern Bent-wing Bat

47. Consider the effects of prescribed burning if conducting burns in the vicinity of wintering sites.

Jumping-jack Wattle

48. Trial the use of prescribed burning to gain a better understanding of the species response to ecological disturbance.
49. If deemed appropriate, conduct prescribed burning to diversify the age structure of Jumping-Jack Wattle to mitigate the risks associated with maintaining all of the population in the one successional stage.

Threatened Orchids

50. Machinery used during any fire suppression or fire management activities is to be excluded from location of known population sites of Swamp Greenhood.
51. Minimise the likelihood of vehicles or earthmoving equipment impacting on threatened orchid populations during fire suppression operations.
52. Avoid prescribed burning or slashing within threatened Spider-orchid populations more frequently than every 5 years.
53. Minimise the likelihood of large areas of threatened Spider-orchid habitat burning in a single fire event.
54. Trial the response of orchid species to different disturbance regimes, including fire.
55. If deemed appropriate, use fire as a strategy to manage the recovery of orchid species.
56. Any prescribed burning to be implemented late Summer to early Autumn (before leaf emergence).
57. Ensure follow-up herbivore control if orchid sites are burnt.

58. Consult with the appropriate Recovery Team during the planning of any prescribed burning in known threatened orchid habitat.

Monarto Mintbush

59. Trial the response of Monarto Mintbush to different disturbance regimes, including fire, to gain a better understanding of the species.
60. If deemed appropriate, use fire as a strategy to manage the recovery of Monarto Mintbush.

Silver Daisy-bush

61. Ensure minimal mechanical disturbance within, or within proximity to, known population sites within DEH reserves.
62. Trial the use of prescribed burning to gain a better understanding of the response of Silver Daisy-bush to disturbance.

Sand Ixodia

63. Trial the use of prescribed burning to gain a better understanding of the response of Sand Ixodia to disturbance.
64. If deemed appropriate, use fire as a strategy to manage the recovery of Sand Ixodia.

Clover Glycine

65. Aim to manage within the Ecological Management Guidelines proposed for Clover Glycine as described within Appendix 2.
66. Ensure minimal mechanical disturbance within, or within proximity to, known population sites.

Large-fruited Groundsel

67. Aim to manage within the Ecological Management Guidelines proposed for Large-fruited Groundsel as described within Appendix 2.
68. Avoid burning known population sites between September-October.

Buloke Woodland

69. Aim to manage within the Ecological Fire Management Guidelines proposed for Major Vegetation Sub-group No. 26 as described within Table 5.

Pest Species

70. Implement Interim Ecological Fire Management Guidelines (Table 5) and fire management guidelines for introduced flora species (Appendix 2) during prescribed burn planning.
71. Consider the use of fire as part of an integrated weed management strategy to minimise weed spread and restore native ecosystems.
72. Conduct post-fire weed control consistent with Regional priorities.
73. Identify the potential impact of weed species prior to any prescribed burn in prescribed burn planning, as part of the EAT, and recommend post-fire actions to mitigate the impact of weeds.
74. Identify the potential impact of introduced fauna on biodiversity values, as part of the EAT, and recommend appropriate post-fire actions to mitigate the impact of introduced fauna.
75. Consider the increased access within vegetation post-fire as part of an integrated weed management strategy to minimise weed spread.

Equipment

76. Explore opportunities through prescribed burning to trial new fire equipment or fire technology products as they become available.

Fire Access

77. Implement changes to fire access as described in Appendix 1.
78. Maintain tracks to the GAFLC standards as shown on Map 4.
79. Implement signs on fire access tracks according to GAFLC standards.

Islands

80. Review the need for prescribed burning for ecological or protection purposes.
81. Where possible, manage fire to ensure the maintenance of biodiversity and the protection of natural and cultural assets.

Monitoring

82. Monitor and develop models for the fuel accumulation rates of the various MVS that occur within the plan area. These data will help DEH staff determine if and when fuel reduction works are required, ultimately assisting in the scheduling of operation works and activities in B-zones.
83. Assess the suitability of the Interim Ecological Fire Management Guidelines for MVS through the assessment of historical fire regimes in similar communities across the state (Table 5).
84. Assess the suitability of the proposed Interim Ecological Fire Management Guidelines for the control of introduced species following fire (Appendix 2).

Research

85. Investigate the suitability of the Interim Ecological Fire Management Guidelines (Table 7) for MVS by quantifying the existing status of MVS within the planning area, to assist fire managers with burn planning and suppression activities
86. Investigate the suitability of the Interim Ecological Fire Management Guidelines (Table 7) for MVS by the on-ground assessment of historical fire regimes in similar communities across the state.
87. Investigate the role of prescribed burning on a range of species, including threatened orchids, Jumping-Jack Wattle, Silver Daisy-bush, Sand Ixodia, Southern Brown Bandicoot, Long-nosed Potoroo and Heath Mouse to gain a better understanding of recruitment events, and critical life-cycle processes. Use this information to update the Ecological Fire Management Guidelines (Appendix 4).
88. Explore the effects of fire regime on threatened flora and fauna, species populations and ecosystems and use this information to propose Ecological Fire Management Guidelines (Appendix 3, 4 and 5) where they do not exist.
89. Determine the post-fire response of rare and threatened flora and fauna.

9 REFERENCES

AFAC Knowledge Web (2010) *Wildfire Glossary*. Australasian Fire and Emergency Services Authorities Council, East Melbourne. Online: <http://knowledgeweb.afac.com.au/national_data_and_glossary/wildfire_glossary> Accessed: 13 April 2010.

Andersen, A, Cook, G and Williams, R (2003) Synthesis: fire ecology and adaptive conservation management. In: *Fire in Tropical Savannas: the Kapalga Experiment* (eds A Andersen, G Cook and R Williams) pp. 153-164. Springer, New York.

Backhouse, G and Jeanes, J (1995) *Orchids of Victoria*. Melbourne University Press, Carlton.

Baker, J (2000) The Eastern Bristlebird: cover dependant and fire sensitive. *Emu* **100**, 286-298.

Benshemesh, J (1992) *The conservation ecology of malleefowl, with particular regard to fire*. PhD Thesis. Monash University, Clayton.

Benshemesh, J (2000) *National Recovery Plan for Malleefowl*. Department for Environment and Heritage, Government of South Australia, Adelaide.

Blakers, M, Davies, S and Reilly, P (1984) *The Atlas of Australian Birds*. Melbourne University Press, Melbourne.

Braby, M (2000) *Butterflies of Australia: Their Identification, Biology and Distribution. Volume 2*. ANIC/CSIRO Entomology, Canberra, CSIRO, Collingwood.

Brooks, M, D'Antonio, C, Richardson, D, Grace, J, Keeley, J, DiTomaso, J, Hobbs, R, Pellant, M and Pyke, D (2004) Effects of invasive alien plants on fire regimes. *BioScience* **54**, 677-688.

Brougham, K, Cherry, H and Downey, P (2006) *Boneseed Management Manual: Current Management and Control Options for Boneseed (Chrysanthemoides monilifera ssp. monilifera) in Australia*. Department of Environment and Conservation, NSW Government, Sydney South.

Brown, P and Wilson, R (1984) *Orange-bellied Parrot Recovery Plan*. Tasmanian National Parks and Wildlife Service, Hobart.

Campbell, T, Cleland, J and Hossfeld, P (1963) *Aboriginies of the Lower South-east of South Australia*. Hassell Press, Adelaide.

Carter, O (2005) *DRAFT Recovery Plan for Ixodia achillaeoides subsp. arenincola (Sand Ixodia) in Victoria and South Australia 2006-2010*. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Carter, O and Sutter, G (2005) *DRAFT Recovery Plan for Glycine latrobeana (Clover Glycine) in South Australia, Tasmania and Victoria 2006-2010*. Department for Sustainabilty and Environment, Heidelberg, Victoria.

CFS (2006) *Memorandum of Understanding on Aerial Application of Chemical Fire Retardants*. Country Fire Service and the South Australian Water Corporation, Adelaide.

CFS (2007) *Supervision of Machinery Guidelines*. South Australian Country Fire Service, Government of South Australia, Adelaide.

CFS (2009a) *Chief Officer's Standing Orders and Standard Operating Procedures (October 2009)*. SA Country Fire Service, Government of South Australia, Adelaide.

CFS (2009b) *Operations Management Guidelines (October 2009)*. SA Country Fire Service, Government of South Australia, Adelaide.

CFS (2009c) *Summary of CFS Evacuation Policy*. Operations Management Guidelines #23. Country Fire Service, Government of South Australia, Adelaide.

CFS (2009d) *CFS Fact Sheet - Prepare. Act. Survive. (October 2009)*. SA Country Fire Service, Government of South Australia, Adelaide. Online: <http://www.cfs.sa.gov.au/site/community_information/prepare_act_survive.jsp> Accessed: 13 April 2010.

Chapman, T (1995) *The Ecology and Management of the Black-chinned Honeyeater (Melithreptus gularis) in the Mount Lofty Ranges*. Unpublished Thesis. University of Adelaide, Adelaide.

Cheal, D and Lucas, A (2005) *DRAFT Recovery Plan for Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions: 2005-2009*. Arthur Rylah Institute for Environmental Research, Heidelberg, Victoria.

Coates, F and Lunt, I (2001) *Patterns of apperance and transition to flowering in Prasophyllum correctum D.L. Jones, a threatened orchid from south-eastern Australia*. International Orchid Conservation Congress, 24-28 September 2001, Perth, Western Australia, 24-28 September 2001

Coulson, G (1990) *Conservation Biology of the Striped Legless Lizard (Delma impar). An Initial Investigation.* Arthur Rylah Institute for Environmental Research, Technical Report Series No. 106, Department for Conservation and Environment, East Melbourne.

Croft, T, Carruthers, S, Possingham, H and Inns, B (1999) *Biodiversity Plan for the South East of South Australia*. Department for Environment, Heritage and Aboriginal Affairs, Government of South Australia, Adelaide.

Cropper, S (1993) *Management of Endangered Plants*. CSIRO, Melbourne.

DEH (2002) *DEH Standard Operating Procedure - Phytophthora Threat Management (SOP-002)*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2004a) *South Australian Code of Management for Wilderness Protection Areas and Zones*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2004b) *Interim Prescribed Burning Monitoring Procedure*. Department for Environment & Heritage, Government of South Australia, Adelaide.

DEH (2004c) *Interim Environmental Assessment Table Guidelines*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2005a) *Glossary of Fire Management Terms*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2005b) *Provisional List of Threatened Ecosysyems of South Australia. In progress*. Unpublished. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2005c) *Provisional list of Threatened Ecosystems of South Australia*. Unpublished. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006a) *Occupational Health, Safety and Welfare Policy*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006b) *Aboriginal Heritage Handbook and Strategy*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006c) *Policy and Procedures for Risk Assessment in DEH Fire Planning*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006d) *Phytophthora Management Guidelines. Phytophthora Technical Group*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006e) *Overall Fuel Hazard Guide for South Australia, 1st Edition*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2006f) *Threatened Species and Habitat Recovery in the South East - examples of project activities undertaken during 2006/07*. Department for Environment & Heritage, Government of South Australia, Mount Gambier.

DEH (2008) *Fire Policy and Procedure - Prescribed Burning*. Fire Policy and Procedure Manual (Draft 2008). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009a) *Fire Policy and Procedure - Training*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009b) *Fire Management Policy*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009c) *Fire Policy and Procedure - Fire Management Zoning* Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009d) *Fire Policy and Procedure - Risk Assessment in Fire Management Planning*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009e) *Fire Policy and Procedure - Fuel Hazard Assessment*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009f) *Fire Policy and Procedure Manual*. (Final). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009g) *Fire Policy and Procedure - Fighting Fit Program: Fire Personnel Health and Fitness*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009h) *Fire Response Plan - South East Region Response Zone*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009i) *Fire Policy and Procedure - Prescribed Burning*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009j) *Fire Policy and Procedure - Ecological Burning*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009k) *Ecological Fire Management Guidelines for South Australian Parks and Native Vegetation - DRAFT (Version 15)*. Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009l) *Fire Policy and Procedure - Response Planning*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009m) *Fire Policy and Procedure - Control Lines*. Fire Policy and Procedure Manual (Final 2009).

Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009n) *Fire Policy and Procedure - Aerial Operations*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009o) *Fire Policy and Procedure - Fire Suppression Chemicals*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009p) *Fire Policy and Procedure - Visitor Safety*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009q) *Fire Policy and Procedure - Post-fire Rehabilitation*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009r) *Fire Policy and Procedure - Research*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009s) *Fire Policy and Procedure - Protection of Cultural Heritage*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009t) *Fire Policy and Procedure - Fire Access Tracks*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009u) *Fire Policy and Procedure - Fire Management Planning: Project Management and Consultation*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009v) *Fire Policy and Procedure - Personal Firefighting Equipment*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009w) *Fire Policy and Procedure - Fire Appliance Equipment Standards*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (2009x) *Fire Policy and Procedure - Earthmoving Equipment*. Fire Policy and Procedure Manual (Final 2009). Department for Environment and Heritage, Government of South Australia, Adelaide.

DEH (Cwlth) (2004) *National Recovery Plan for the Orange-bellied Parrot (Neophema chrysogaster) 2006-2010*. Department of the Environment and Heritage, Commonwealth of Australia, Canberra.

DEWR (2007) *National Recovery Plan for the South-eastern Red-tailed Black-Cockatoo, Calyptorhynchus banksii graptogyne*. Department of the Environment and Water Resources, Commonwealth of Australia, Canberra.

Duncan, M and Coates, F (2007) *DRAFT Revised National Recovery Plan for Twenty-two Threatened Orchids in Victoria, South Australia and New South Wales*. Department of Sustainability and Environment, Victoria.

DWLBC (2006a) *State Natural Resources Management Plan*. Department of Water, Land and Biodiversity Conservation, Government of South Australia, Adelaide.

DWLBC (2006b) *Native Vegetation Council of South Australia*. Department of Water, Land and Biodiversity Conservation, Government of South Australia, Adelaide. Online: <http://www.dwlbc.sa.gov.au/native/nvc/index.html > Accessed: 29 January 2007.

Eberhard, S (2004) *Ecology and hydrology of a threatened groundwater-dependent ecosystem: The Jewel Cave karst system in Western Australia*. PhD thesis, Murdoch University, Western Australia.

FEWG (2004) *Guidelines and Procedures for Ecological Burning on Public Land in Victoria*. Fire Ecology Working Group, Department for Natural Resources and Environment & Parks Victoria, Government of Victoria, Melbourne.

Fort, C (2005) 'Doing' history and 'understanding' cultural landscapes: cutting through South Australia's Woakwine Range. *Journal of Biogeography* **32**, 1203.

Foulkes, J and Heard, L (2003) *A Biological Survey of the South East, South Australia*. Department for Environment and Heritage, Government of South Australia, Adelaide.

GAFLC (2008) *South Australian Firebreaks, Fire Access Tracks and Sign Standards Guidelines*. Government Agencies Fire Liaison Committee, Government of South Australia, Adelaide.

Garnett, S and Crowley, G (2000) *The Action Plan for Australian Birds 2000*. Department of the Environment, Water, Heritage and the Arts, Commonwealth of Australia, Canberra. Online: <http://www.environment.gov.au/biodiversity/threatened/publications/action/birds2000/index.html> Accessed: 24 June.

Gill, A and Catling, P (2002) Fire regimes and biodiversity of forested landscapes. In: *Flammable Australia: The Fire Regimes and Biodiversity of a Continent* (eds R Bradstock, J Williams and A Gill) pp. 351-369. Cambridge University Press, United Kingdom.

Grant, C (2004) *The conservation biology of the Southern Bent-wing Bat, Miniopterus schreibersii*. 13th

International Bat Research Conference, Warszawa, Mikolajki, Poland,

Green, B and Harley, D (2005) A review of habitat information from known Orange-bellied Parrot *(Neophema chrysogaster)* sites in the South East of South Australia, with accompanying reccommendations for future management directions. In: *Regional Action Plan for the South East of South Australia*. Conservation Programs Unit South East Region, Department for Environment and Heritage, Government of South Australia, Mt Gambier.

Grund, R (1998) *South Australian Butterflies - Data Sheets and Life Histories*. Online: <http://users.sa.chariot.net.au/~rbg/datasheet.htm> Accessed: 28 April 2010.

Haby, N and Long, K (2005) *Recovery Plan for the Southern Brown Bandicoot in the Mount Lofty Ranges, South Australia, 2004-2009*. Department for Environment and Heritage, Government of South Australia, Adelaide.

Harley, D, Bachmann, M, Green, R and Stratman, B (2005) *Regional Action Plans for the Recovery of Threatened Fauna in the South East of South Australia*. Conservation Programs Unit South East Region, Department for Environment and Heritage, Government of South Australia, Mt Gambier.

Haywood, B (2006) Distribution of the Black-chinned Honeyeater *(Melithreptus gularis)* and Chestnut-rumped Heathwren *(Hylacola pyrrhopygius)* in the South East of South Australia. *South Australian Ornithologist* **35**, 1-14.

Herpich, M and Lindsay, A (2008) *Environmental Weed Management Action Tool - a guide to implementing a landscape scale environmental weed planning tool*. Department for Environment and Heritage, Government of South Australia, Adelaide.

Hinchliffe, D (2005) *Regional Action Plans for the Senecio macrocarpus and Glycine latrobeana in the South East of South Australia*. Department for Environment and Heritage, Government of South Australia, Mt Gambier.

Hobbs, R (1991) Disturbance a precursor to weed invasion in native vegetation. *Plant Protection Quarterly* **6**, 99-104.

Hobbs, R (2002) Fire regimes and their effects in Australian temperate woodlands. In: *Flammable Australia: The Fire Regimes and Biodiversity of a Continent* (eds R Bradstock, J Williams and A Gill) pp. 305-326. Cambridge University Press, United Kingdom.

Hobbs, R and Huenneke, L (1992) Disturbance, diversity and invasion: implications for conservation. *Conservation Biology* **6**, 324-337.

Hopkins, A and Saunders, D (1987) Ecological studies as the basis for management. In: *Nature Conservation: the Role of Remnants in Native Vegetation* (eds D Saunders, G Arnold, A Burbidge and A Hopkins) pp. 15-28. Surrey Beatty, Sydney.

Johnson, R (2005) *Regional Action Plans for the Recovery of Threatened Flora and Ecological Communities in the South East of South Australia*. Department for Environment and Heritage, Government of South Australia, Mt Gambier.

Kenny, B, Sutherland, E, Tasker, E and Bradstock, R (2003) *Guidelines for Ecologically Sustainable Fire Management - NSW Biodiversity Strategy*. NSW National Parks and Wildlife Service, NSW Government, Hurstville.

Koch, P (2003) *Factors influencing food availability for the endangered south-eastern Red-tailed Black-Cockatoo Calyptorhynchus banksii graptogyne in remnant stringybark woodland and implications for management*. PhD Thesis. University of Adelaide, Adelaide.

Laut, P, Heyligers, P, Keig, G, Loffler, E, Margules, C, Scott, R and Sullivan, M (1977) *Environments of South Australia, Province 1 - South East*. Division of Land Use Research, Commonwealth Scientific and Industrial Research Organisation, Canberra.

Lynch, A (1994) *The identification and distribution of Glycine latrobeana (meissn.) Benth.* Papers and Proceedings of the Royal Society of Tasmania **128**: 17-20, University of Hobart, 1994.

Marchant, S and Higgins, P (1993) *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings*. Oxford University Press, Melbourne.

McCarthy, G and Tolhurst, K (2004) *Effectiveness of broad scale fuel reduction burning in Victorian parks and forests*. Forest Science Centre Orbost & Creswick, Department for Sustainability & Environment, Government of Victoria.

Merchant, S and Higgins, P (1993) *Handbook of Australian, New Zealand and Antarctic Birds. Volume 2 - Raptors to Lapwings*. Oxford University Press, Melbourne.

Monterola, V (2007) *Ministerial Review of Bushfire Management in South Australia*. South Australian Fire and Emergency Service Commission Board, Government of South Australia, Adelaide.

Moritz, K and Bickerton, D (2007) *Draft Recovery Plan for the Nationally Endangered Jumping-Jack Wattle Acacia enterocarpa (R.V. Smith)*. Report to the Species Listing Recovery and Policy Section, Australian Government Department of the Environment and Water Resources, Canberra.

Murphy, A, Dickson, C, Pritchard, A and Craig, A (2008) *Recovery Plan for Three Orchid Species in South-east South Australia and South-west Victoria: Caladenia richardsiorum (Little Dip Spider-orchid), Caladenia calcicola (Limestone Spider-orchid) and Pterostylis tenuissima (Swamp Greenhood) 2008 – 2012*. South Australian Department for Environment and Heritage, South East Region & Victorian Department for Sustainability and Environment, South West Victoria Region.

Parks and Wildlife Service Tasmania (2009) *Orange-bellied Parrot, Neophema chrysogaster*. National Parks and Wildlife Service, Department of Primary Industries, Parks, Water and Environment, Tasmania. Online: <http://www.parks.tas.gov.au/index.aspx?base=5136 > Accessed: 20 July 2009.

Paton, D, Rogers, D, Ward, M and Gates, J (2005) Birds and Fire in the Mallee Heathlands of Ngarkat. *Wingspan* **15**, 21-24.

Paul, S and Incoll, R (2001) *A Model for Vegetation Management Planning in the Mt Lofty Ranges. Vegetation Management Plan Methodology - DRAFT*. Department for Environment and Heritage, Government of South Australia, Adelaide.

Paull, D (1995) The distribution of the southern brown bandicoot (*Isoodon obesulus obesulus*) in South Australia. *Wildlife Research* **22**, 585-600.

Pausas, J, Ouadah, N, Ferran, A, Gimeno, T and Vallejo, R (2003) Fire severity and seedling establishment in Pinus halepensis woodlands, eastern Iberian Peninsula. *Plant Ecology* **169**, 205-213.

Potts, W (1999) *Recovery Plan for Threatened Tasmanian Lowland Euphrasia Species 1997-2001*. Department for Primary Industries, Water and Environment. Online: <http://www.deh.gov.au/biodiversity/threatened/publications/recovery/tas-euphrasia/index.html> Accessed: 10 July 2007.

Pound, L, Obst, C and How, T (2004) *Draft Recovery Plan for Prostanthera eurybioides (Monarto Mintbush)*. Report to the Threatened Species and Communities Section, Australian Government, Department of the Environment and Heritage, Canberra.

Reardon, T (2001) *Population size estimates and conservation of the Southern Bentwing Bat (Miniopterus bassanii) in South Australia.* Report to the Wildlife Conservation Fund Committee, South Australian Museum, Adelaide.

Robinson, M (1998) *A Field Guide to Frogs of Australia from Port Augusta to Fraser Island, including Tasmania*. New Holland Publishers, Australia.

Saunders, D, Hobbs, R and Margules, C (1991) Biological consequences of ecosystem fragmentation: a review. *Conservation Biology* **5**, 19-32.

SE NRM Board (In Prep) *Draft South East Natural Resources Management Plan*. South East Natural Resources Management Board, Government of South Australia, Mount Gambier.

SENRCC (2003) *South East Natural Resources Management Plan*. South East Natural Resources Consultative Committee, Mount Gambier.

Sinclair, S (2004) *Draft Recovery Plan for Senecio macrocarpus (Large-headed groundsel) 2004-2008*. Department of Sustainability and Environment, Heidelberg, Victoria.

Smith, W and Robertson, P (1999) *National Recovery Plan for the Striped Legless Lizard (Delma impar) 1999-2003*. Unpublished Report to Environment Australia, Canberra.

Swift Parrot Recovery Team (2001) *Swift Parrot Recovery Plan*. Tasmanian Department for Primary Industries, Water and Environment, Hobart.

Todd, J (2000) *National Recovery Plan for 12 Threatened Spider-orchids Caladenia R. Br. Taxa of Victoria and South Australia 2000 – 2004* Department of Natural Resources and Environment, Victoria.

Tolhurst, K and Cheney, P (1999) *Synopsis of the Knowledge Used in Prescribed Burning in Victoria*. Department of Natural Resources and Environment, Victorian Government East Melbourne, Victoria.

Walton, S (1995) *The effects of fire on grassland herpetofauna and habitat structure*. Honours Thesis, Deakin University, Geelong.

Ward, M and Paton, D (2004) Responses to fire of Slender-billed Thornbills, Acanthiza iredalei hedleyi, in Ngarkat Conservation Park, South Australia. I. Densities, group sizes, distribution and management issues. *Emu* **104**, 157-167.

Whelan, R, Rodgerson, R, Dickman, C and Sutherland, E (2002) Critical life cycles of plants and animals: developing a process-based understanding of population changes in fire-prone landscapes. In: *Flammable Australia: The Fire Regimes and Biodiversity of a Continent* (eds R Bradstock, J Williams and A Gill) pp. 94-124. Cambridge University Press, United Kingdom.

Willoughby, N, Oppermann, A and Inns, R (2001) *Biodiversity Plan for Kangaroo Island, South Australia*. Department for Environment and Heritage, Government of South Australia, Adelaide.

Woinarski, J (1989) The vertebrate fauna of Broombrush Melaleuca uncinata vegetation in north-western Victoria, with reference to effects of Broombrush harvesting. *Australian Wildlife Research* **16**, 217-238.

10 APPENDICES

Appendix 1: Summary of Recommended Works for Fire Management Blocks

	Recommended Works
ACROSS RESERVES IN THE PLAN AREA	Implement prescribed burning (within Interim Ecological Fire Management Guidelines) to reduce fuel loads and create patchiness within the C-zone of fire management blocks to limit the spread of bushfire into, or from reserves. Manage blocks so that a reduced fuel hazard area exists at any given time, but alternative sites are used so that TPC1 is not compromised at any one location.
	Investigate the suitability of the Interim Ecological Fire Management Guidelines for MVS (Table 5) through the assessment of historical fire regimes in similar communities across the state.
	Investigate the fuel accumulation rates of the various MVS that occur within the plan area to assist in determining if and when fuel reduction works are required.
	Neighbours of DEH reserves will need to implement fire management strategies around their own assets to complement the recommended works in this plan.
	Work with relevant stakeholders and land management agencies to implement fire management strategies across the plan area.
	Continue slashing and verge trimming programs associated with on-going track maintenance works.
	Maintain buffers around significant cultural assets where practicable (refer Section 3.2.3).
	Review the need to implement GAFLC track signage to improve identification and navigation in all reserves.
	Maintain tracks within reserves to the GAFLC standards as shown on Map 4.
	Consider the use of fire as part of an integrated weed management strategy to minimise weed spread within reserves. Assess the suitability of proposed weed management guidelines for the control of introduced species following fire (refer to Appendix 2)
	Conduct post-fire weed control subject to regional priorities.
	Review the need for visitor emergency plans within the planning area, and plans be prepared and implemented as required. Review plans annually. Regularly rehearse the visitor emergency procedure to be implemented during a fire.
ABERDOUR CP	Investigate options for C-zone burning in reserve to determine response of Jumping-Jack Wattle and Silver Daisy-bush to ecological disturbance.
	If appropriate, conduct prescribed burning to diversify the age structure of Jumping-Jack Wattle

	Recommended Works
BANGHAM CP	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl, or Red-tailed Black Cockatoo meta-population habitat burning in a single event.
	Ensure that up to 85% of Stringybark habitat for the Red-tailed Black Cockatoo (across the SA reserved area) is retained as >10 years post-fire.
	Follow guidelines for burning of Stringybark vegetation for any prescribed burning or fire suppression activities within C-zone.
	Investigate options for C-zone burning in reserve to determine response of the Coloured Spider-orchid to disturbance regimes.
	Investigate opportunities to implement fire management strategies over the whole native vegetation landscape.
	Install a 22 000 litre fire water tank.
BEACHPORT CP	Investigate options for C-zone burning in reserve to determine response of the Little Dip Spider-orchid to ecological disturbance.
	Work with Wattle Range Council and CFS to establish a fuel reduced zone adjacent Beachport township.
BELT HILL CP	Implement 40m A-zone along northern boundary, adjacent residence.
	Investigate options for C-zone burning to regenerate areas of Kangaroo-grass grassland.
BIG HEATH CP / CR	Implement C-zone burns to create habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
	Investigate options for C-zone burning to determine response of the Silver Daisy-bush and the Metallic Sun-orchid to ecological disturbance.
	Manage Clover Glycine within Interim Ecological Management Guidelines as described within Appendix 2.
	Install a 22 000 litre fire water tank on the south-eastern boundary.
	Install additional gates to limit the amount of vehicle traffic along the western boundary.
BOOL LAGOON GR / HACKS LAGOON CP	Investigate the use of prescribed burning within C-zone to control Horehound along the southern boundary.
	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Southern Bell Frog, or Striped Legless Lizard meta-population habitat burning in a single event.
	Improve vehicle access by upgrading the surface of Lilyponds Track along the northern boundary of the reserve.

	Recommended Works
BUCKS LAKE GR	Work co-operatively with Grant District Council to develop shared 40m A-zone along western boundary adjacent Carpenter Rocks residences.
	Investigate options to conduct prescribed burning in C-zone to maintain and enhance native grassland and sedgeland habitat.
BUNBURY CR	Work co-operatively with Coorong District Council to ensure maintenance of road reserve to north of HA (on northern boundary of reserve).
	Investigate options to implement fire management strategies over the whole native vegetation landscape.
	Investigate options to establish a central Minor Track.
	Investigate options to conduct a prescribed burn along the northern boundary to limit the spread of bushfire into, or from the neighbouring HA block.
	Implement C-zone burns to create habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
BUTCHER GAP CP/WYOMI RESERVE	Implement 20m A-zone along northern boundary of Butcher Gap CP adjacent residences on Nash Avenue, and along north-eastern section of Wyomi Reserve, residences on Bellevue Drive. Both zones utilise existing fuel-modified areas.
	Implement 40m A-zone in Wyomi Reserve adjacent residence on Pinks Beach Road.
	Install a 22 000 litre fire water tank.
	Implement shared 40m A-zone along Bannister Drive, adjacent Wyomi Reserve.
CALECTASIA CP	Investigate options for C-zone burning to maintain population of the Eastern Blue Tinsel-lily.
	Investigate options to implement fire management strategies over the whole native vegetation landscape.
CANUNDA NP	Improve Yates Track - liaise with landowner re hydroaxing (2.5 m either side) along length of track to improve access and maintain low fuel levels.
	Investigate options for C-zone burning in reserve to determine response of the Little Dip Spider-orchid to ecological disturbance.
	Investigate options to conduct prescribed burning in C-zone to protect and enhance foraging habitat for the Orange-bellied Parrot. Monitor the impact of any prescribed burning within coastal grasslands to assess the effect of fire regime on potential habitat.
CARPENTER ROCKS CP	Work co-operatively with adjacent landholders to implement fire management strategies over whole native vegetation landscape.
	Liaise with butterfly specialist(s) when planning prescribed burns within potential habitat of the Grassland Copper (*Lucia limbaria*) butterfly within the Carpenter Rocks block and/or adjacent native vegetation landscape.

	Recommended Works
COORONG NP	Investigate options for C-zone burning in reserve to determine response of the Little Dip Spider-orchid, Coloured Spider-orchid and Metallic Sun-orchid to ecological disturbance.
	Investigate options to conduct prescribed burning in C-zone to protect and enhance foraging habitat for the Orange-bellied Parrot.
	Implement 40m A-zone around NPW office and associated buildings, and Cantara Homestead (where practicable).
	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Investigate options to use fire as part of an integrated management strategy to control weed species and assist with native flora regeneration throughout the reserve.
CUSTON CP	Investigate options to use fire within C-zone as part of an integrated management strategy to maintain the Grey-box Grassy Woodland association.
DESERT CAMP CP	Work co-operatively with Kingston District Council to ensure maintenance of Rowney Rd and reserve to north-east.
DESERT CAMP CR	Implement 200m B-zone along interior track.
	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Investigate options for C-zone burning to determine response of the Metallic Sun-orchid and Silver Daisy-bush to ecological disturbance.
DINGLEY DELL CP	Implement a 40m A-zone around perimeter of cottage and caretaker's residence.
	Work co-operatively with Friends of Germein Reserve to implement fire management strategies over whole native vegetation landscape.
DOUGLAS POINT CP	Investigate options for C-zone burning to determine response of Sand Ixodia to ecological disturbance.
EWENS PONDS CP	Implement 40m A-zone around South East Drainage Board shed. Implement 40m B-zone around residence in north-east corner of reserve.

	Recommended Works
FAIRVIEW CP	Continue with control programs for Red Dodder.
	Ensure all vehicles and equipment leaving the reserve implement precautionary hygiene measures (refer to Section 6.2).
	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
FURNER CP	Work co-operatively with adjacent landholders to implement fire management strategies over whole native vegetation landscape.
	Investigate options to conduct prescribed burning along the northern boundary to limit the spread of bushfire into, or from the block.
GEEGEELA CP	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
GLEN ROY CP	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Red-tailed Black Cockatoo meta-population habitat burning in a single event.
	Ensure that up to 85% of Stringybark habitat for the Red-tailed Black Cockatoo (across the SA reserved area) is retained as >10 years post-fire.
	Follow guidelines for burning of Stringybark vegetation for any prescribed burning or fire suppression activities within C-zone.
	Look at options to extend Minor Track through centre of reserve to join Minor Track on western side of reserve.
GUICHEN BAY CP	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
GUM LAGOON CP	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Implement 100m B-zone along Mays Road and Naen-Naen East Track; and 200m B-zone along Lagoon Track and southern section of Coola Coola Track.
	Upgrade Lagoon Track from Minor to Standard.
	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
	Investigate options to conduct prescribed burning within Blacketts Scrub block to limit the spread of bushfire into, or from the block.

	Recommended Works
	Work co-operatively with Duck Island landholders to implement fire management strategies over the whole native vegetation landscape.
HANSON SCRUB CP	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
	Investigate options to conduct prescribed burning along the northern boundary to limit the spread of bushfire into, or from the neighbouring HA block.
ISLANDS	If a need is identified, prescribed burning in C-zone should be addressed via the DEH Prescribed Burn Plan and Environmental Assessment process.
JIP JIP CP	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
	Work co-operatively with Telstra to ensure low fuels maintained around telecommunications tower.
LAKE FROME CP	Investigate options to conduct prescribed burns within C-zone to control Narrow-leaf Bulrush and Common Reed in area of flowpath.
LAKE HAWDON SOUTH CP	Investigate options to conduct prescribed burning in C-zone to maintain and enhance native grassland and sedgeland habitat.
	Develop fire access tracks.
LAKE ST CLAIR CP	Investigate options to conduct prescribed burning in C-zone to maintain and enhance native grassland and sedgeland habitat.
LITTLE DIP CP / LAKE ROBE GR	Investigate options for C-zone burning in reserve to determine response of the Little Dip Spider-orchid to ecological disturbance.
LOWER GLENELG RIVER CP	Work co-operatively with adjacent land managers to implement fire management strategies over the whole native vegetation landscape.
	Investigate options to use fire within C-zone as part of an integrated management strategy to maintain threatened fauna species within reserve.
	Manage Clover Glycine within Interim Ecological Management Guidelines as described within Appendix 2.

	Recommended Works
MARTIN WASHPOOL CP	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
	Investigate options to implement a prescribed burn along the southern boundary to limit the spread of bushfire into, or from the neighbouring HA block.
MARY SEYMOUR CP	Investigate options to use fire within C-zone as part of an integrated weed management strategy to control Buckthorn.
	Manage Clover Glycine within Interim Ecological Management Guidelines as described within Appendix 2.
MESSENT CP	Implement 200m B-zone along Alf Flat Track.
	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Investigate options for C-zone burning to determine response of the Metallic Sun-orchid to ecological disturbance.
	Manage the Large-fruited Groundsel within Interim Ecological Management Guidelines as described within Appendix 2.
	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
	Install a 22 000 litre fire water tank along the Centre Track.
	Investigate options to establish a north-south Minor Track between the Centre Track and the northern boundary.
MOUNT BOOTHBY CP	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Investigate options for C-zone burning to determine response of the Metallic Sun-orchid to ecological disturbance.
	Investigate options to implement a prescribed burn along the northern boundary to limit the spread of bushfire into, of from the neighbouring HA block.
MOUNT MONSTER CP	Investigate options to use fire within C-zone to determine the response of the Monarto Mintbush to ecological disturbance.
	Investigate options for C-zone burning to determine response of the Coloured Spider-orchid and the Elegant Spider-orchid to ecological disturbance regimes.

	Recommended Works
MOUNT SCOTT CP	Investigate options for C-zone burning to determine response of the Silver Daisy-bush and Elegant Spider-orchid to ecological disturbance.
	Implement C-zone burns to increase habitat patchiness and minimise the likelihood of more than 50% of Malleefowl meta-population habitat burning in a single event.
	Upgrade Minor Tracks around perimeter of reserve to Standard.
	Work co-operatively with adjacent landholders to implement fire management strategies over the whole native vegetation landscape.
NARACOORTE CAVES NP / CR	Investigate options to conduct a prescribed burn north-west of the Wonambi Visitor Centre to reduce fuel loads, assist with native flora regeneration and as part of an integrated management strategy to control Bridal Creeper.
	Implement 40m A-zone around Wonambi Visitor Centre; NPW office and Café, bat centre, research lab, NPW depot and residence, Wirreanda Campground, Vic Fossil Centre (where practicable).
	Investigate options to conduct a prescribed burn south of Naracoorte Caves CR as part of an integrated management strategy to control Blackberry and Phalaris.
	Review the need to investigate the impacts of disturbance regimes, particularly fire, on the foraging habitat of the Southern Bent-wing Bat.
NENE VALLEY CP	Implement 40m A-zone along south-western boundary of reserve to offer protection to township residences adjacent the reserve.
PADTHAWAY CP	Investigate options to include HA in program of prescribed burning.
	Implement 75 m B-zone along southern boundary.
	Investigate options for C-zone burning to determine response of the Metallic Sun-orchid to ecological disturbance.
PENAMBOL CP	Work co-operatively with ForestrySA to implement fire management strategies over the whole native vegetation landscape.
PENOLA CP	Install a bore for fire suppression water.
	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.

	Recommended Works
	Liaise with butterfly specialist(s) when planning prescribed burns within potential habitat of the Blotched Dusky Blue (*Candalides acasta*) butterfly.
PICCANINNIE PONDS CP / PICCANINNIE GRASSLAND / PICKS SWAMP	Investigate options to conduct prescribed burning in C-zone to protect and enhance foraging habitat for the Orange-bellied Parrot. Monitor the impact of any prescribed burning within coastal grasslands to assess the effect of fire regime on potential habitat.
	Trial the use of fire within the C-zone as part of an integrated management strategy to control Coastal Wattle and assist in native grassland restoration.
	Investigate options to use fire within C-zone to determine response of the Maroon Leek-orchid to ecological disturbance.
	Manage Clover Glycine within Interim Ecological Management Guidelines as described within Appendix 2.
	Upgrade perimeter access tracks from Minor to Standard within complex.
	Liaise with butterfly specialist(s) when planning prescribed burns within potential habitat of the Silver Xenica (*Oreixenica lathoniella herceus*), Sword-grass Brown (*Tisiphone abeona*) and Bright-eyed Brown (*Heteronympha cordace*) butterflies within the Piccaninnie complex of reserves.
POOCHER SWAMP GR	Work co-operatively with adjacent landowners to implement fire management strategies over the whole native vegetation landscape.
	Continue to maintain grazing regime on reserve with adjacent landholder. Review as necessary.
REEDY CREEK CP	Work co-operatively with ForestrySA, and adjacent landowners to implement fire management strategies over the whole native vegetation landscape.
TANTANOOLA CAVES CP	Implement 40m A-zone around perimeter of visitor centre and residence.
TALAPAR CP	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
TELFORD SCRUB CP	Implement prescribed burns to create a series of different age-classes (and consequent fuel loadings) across the reserve to minimise the risk of the whole reserve burning in a single event.
	Work co-operatively with adjacent landholders to implement fire management strategies across whole native vegetation landscape.

	Recommended Works
	Investigate opportunities to conduct prescribed burning in C-zone to increase habitat patchiness and minimise the risk of more than 50% of Red-tailed Black Cockatoo, and Southern Brown Bandicoot meta-population habitat burning in a single event.
	Ensure that up to 85% of Stringybark habitat for the Red-tailed Black Cockatoo (across the SA reserved area) is retained as >10 years post-fire.
	Follow guidelines for burning of Stringybark vegetation for any prescribed burning or fire suppression activities within C-zone.
	Conduct pre-burn surveys for the presence of the White-bellied cuckoo-shrike, which is a regular visitor to the reserve in spring-summer. Evidence suggests annual nesting in the reserve (see Green and Haywood, 2003).
TILLEY SWAMP CP	Investigate options for C-zone burning to determine response of the Metallic Sun-orchid to ecological disturbance.
TOLDEROL GR	Investigate options to conduct prescribed burning in C-zone to protect and enhance foraging habitat for the Orange-bellied Parrot.
	Investigate options for C-zone burning to reduce area in reserve congested by Narrow-leaf Bulrush and Common Reed.
WOAKWINE CR	Upgrade Minor Tracks around perimeter of reserve to Standard.
WOLSELEY COMMON CP	Implement 40m B-zone adjacent the Wolesley-Teatrick Road.
	Investigate options for C-zone burning to regenerate native grassland.
	Manage the Buloke woodland within Interim Ecological Management Guidelines as described within Appendix 2.
WYNDGATE	Investigate options to conduct prescribed burning within C-zone as part of an integrated management strategy to control weed species.
	Install a 22 000 litre fire water tank.
WYOMI RESERVE	20 m A-zone adjacent Banister Drive in Pinks Beach 20 m A-zone behind properties on Bellevue Drive in Wyomi and continuing along First Avenue

Appendix 2: Fire Response of Rated, Significant and Introduced Flora Species

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Acacia enterocarpa	Jumping-Jack Wattle	EN	E	Shrub	• Unknown whether fire or other forms of disturbance initiate recruitment events • Lack of recruitment in South East population poses a serious threat • Likely that species requires occasional fire for recruitment from soil-stored seed • Flowers: August-September	• Likely to require fire stimulation as part of life-cycle • Frequency unknown	R Aus^
Acacia longifolia var. *sophorae**	Coast Wattle			Shrub	• Likely mass germination of soil-stored seed post-fire • High intensity fire will kill plants • Flowers: late winter-spring	• Will require follow-up weed control	R Aus^
Acacia longifolia var. *longifolia**	Sallow Wattle			Shrub	• Native to eastern states • Has ability to hybridise with *A.longifolia* var. *sophorae* • Hybridisation may provide extra vigour • Disturbance, including fire, usually stimulates mass germination • Flowers: spring	• Will require follow-up weed control	Aus^
*Acacia saligna**	Golden-wreath Wattle			Shrub	• Likely mass germination of soil-stored seed post-fire • Flowers: August-October	• #	Aus^
Agrostis rudis	Ruddy Bent		V	Grass	• Flowers: mainly December-March	• #	Aus^
Arthropodium milleflorum	Pale Vanilla-lily		V	Herb	• Flowers: November-February	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
*Asparagus asparagoides**	Bridal Creeper			Perennial climber	• Weed of National significance • Rhizomatous, cool season climber • Aggressive, highly invasive species capable of eliminating all indigenous ground-flora and small shrubs • Reproduces by seed and rhizomes • Seed dispersed mainly by birds	• Fire provides opportunity to implement chemical control (spot-spraying) or physical removal of rhizomes post-burn • Burning for weed control preferably in autumn	Aus^
*Asparagus asparagoides**	Bridal Creeper – Western Cape form			Perennial climber	• Reproduces by seed and rhizomes • Flowers: commences in August	• Fire provides opportunity to implement chemical control or physical removal of rhizomes post-burn	Aus^
*Billardiera heterophylla**	Native Bluebell Creeper			Shrub/ Climber	• Smothers ground-flora and smaller shrubs • Prolific seedling emergence following fire or soil disturbance among dense infestations is likely • Seed dispersed by birds and foxes • Flowers: spring-summer	• Avoid burning areas of infestation (unless follow-up control is available) • Small plants can be hand-pulled • Larger plants can be controlled by using herbicide	R Aus^
Caladenia colorata	Coloured Spider-orchid	EN	E	Orchid	• Many Caladenia species exhibit strong flowering responses to fire • Seedling establishment may be dependent on fire • Timing of fire critical • Flowers: September-October	• Avoid spring burning • Ensure follow-up herbivore control	R Aus^
Caladenia formosa	Elegant Spider-orchid	VU	V	Orchid	• As above • Flowers: September-October	• As above	Aus^
Caladenia parva	Small Green-comb Spider-orchid		E	Orchid	• As above • Flowers: August-October	• As above	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Caladenia richardsiorum	Little Dip Spider-orchid	EN	E	Orchid	• As above • Flowers: late September-early November	• As above	Aus^
Caladenia venusta	Large White Spider-orchid		V	Orchid	• As above • Flowers: September-November	• As above	Aus^
Caleana minor	Small Duck-orchid		V	Orchid	• Flowers: September-January	• Avoid spring burning	Aus^
Calectasia intermedia	Eastern Blue Tinsel-lily		V	Herb	• Flowers: winter-early spring	• #	Aus^
Callitriche umbonata	Water Starwort		V	Herb	• Flowers: August-December	• #	Aus^
Calocephalus lacteus	Milky Beauty-heads		E	Herb	• Flowers: November-March	• #	Aus^
Calochilus paludosus	Red Beard-orchid		V	Orchid	• Flowers: September-January	• #	Aus^
Cardamine gunnii	Spade-leaf Bitter-cress		V	Herb	• #	• #	
Chorizandra australis	Bristle-rush		E		• #	• #	

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
*Chrysanthemoides monilifera spp. monilifera**	Boneseed			Perennial Shrub	• Weed of National Significance • Lifespan: 10-20 years • Flowers: July-October • Fire kills adult plants • Seedlings readily recruit post-fire	• Follow up weed control required post fire • Refer to (Brougham, *et al.*, 2006)	Aus^
Clematis aristata	Mountain Clematis		V	Herb/ Climber	• Bears leathery fruits • Flowers: spring	• #	Aus^
*Coprosma repens**	Shiny-leaved Coprosma			Shrub	• Reproduces by seed, mainly spread by birds • Described as a plant that is 'hard to burn' • Flowers: summer	• #	Aus^
Craspedia paludicola	Swamp Buttons		V	Herb	• Flowers: September-November	• #	Aus^
*Cuscuta planiflora**	Red Dodder			Perennial	• Parasitises only broadleaf plants • Seeds mostly germinate in late spring • Seeds can remain viable for up to 60 years • Dispersal mostly by seed, but also water • Current infestation confined to ephemeral swamp (quarantine area)	• Ensure precautionary hygiene measures are implemented for all vehicles and equipment leaving Fairview CP	
Cyperus lhotskyanus			V	Herb	• Rhizomatous • Flowers: spring-summer	• #	Aus^
Cyperus lucidus	Leafy Flat-sedge		E	Herb	• Tussock forming • Flowers: spring-summer	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Derwentia derwentiana ssp. *derwntiana*	Derwent Speedwell		E	Herb	• Flowers: spring-summer	• #	SA^
Dipodium campanulatum	Bell-flower Hyacinth Orchid		V	Orchid	• Flowers: December-February	• #	Aus^
*Dipogon lignosus**	Dolichos Pea			Perennial Climber	• Highly invasive in woodlands, heathlands and dune systems • Lifespan: 10 years or longer • Seed can remain dormant in soil for several years • Flowers: mostly over spring • Fire can kill mature plants and stimulate seed germination	• Weed control will be required post-fire • Emergent seedlings post-fire provide opportunities for herbicide treatment	Aus^
*Ehrharta calycina**	Perennial Veldt-grass			Perennial Grass	• Often rhizomatous • Commonly invades highly disturbed ecosystems • Established plants re-sprout vigorously from the base of the tussock after drought and may provide some tolerance to fire • Reproduce both by seed and vegetatively • Regular burning may reduce invasiveness • Flowers: mainly October-November	• #	Aus^
Eryngium rostratum	Blue Devil		V	Perennial Herb	• Resprouting species • Flowers November-January • Primary juvenile period: 1 year • Killed by fire	• #	SA^
Euphrasia collina ssp. *collina*	Purple Eyebright		V	Perennial	• Seed regenerator • Patches of open ground are required for germination and adequate moisture levels are required for seedling survival • Seed production is copious and the seedbank probably survives for decades • Profuse germination occurs after a fire • Fire is thought to be required for the recovery of populations from the seedbank • There is risk of extinction if conditions do not favour germinants post fire	• #	(Potts, 1999) Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Glycine latrobeana	Clover Glycine	VU	V	Perennial Herb	• Flowers: September - December • Seed regenerator but also may spread from rhizomes • Known to germinate post-fire	• #	Aus^
Grevillea treueriana	Scarlet Grevillea	VU	V	Shrub	• Flowers: most of the year	• #	
Haeckeri pholidota	Scaly Haeckeria		V		• #	• #	
Hovea linearis	Common Hovea		V	Shrub	• Flowers: early spring	• #	Aus^
Ixodia achillaeoides ssp. *arenicola*	Sand Ixodia	VU	E	Shrub	• Low shrub • Often found in exposed, windswept areas close to the coast • Flowers: November-January	• #	Aus^
*Juncus acutus**	Spiny Rush			Herb	• Reproduces by seed and rhizomes • Can establish in minor disturbed areas, semi-aquatic	• #	Aus^
Juncus amabilis			V	Herb	• Regenerates vegetatively from rhizomes • Flowers November-December • Known to persist after fire	• #	Aus^
Juncus homalocaulis	Wiry Rush		V	Herb	• Flowers: spring-summer	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Juncus radula	Hoary Rush		V	Herb	• Flowers: spring-summer	• #	Aus^
*Leptospermum laevigatum**	Coastal Tea-tree			Shrub	• Flowers: spring-early summer	• #	
Levenhookia sonderi	Slender Stylewort		V		• #	• #	
Luzula flaccida	Pale Wood-rush		V	Perennial	• Spores persistent in soil • Flowers spring to summer	• #	Aus^
Mazus pumilio	Swamp Mazus		V	Herb	• Flowers: spring-summer	• #	Aus^
Mitrasacme pilosa var. *pilosa*	Hairy Mitrewort		V	Herb	• Flowers: spring-summer	• #	Aus^
*Olea europea**	European Olive			Tree	• Declared under the SA *Natural Resources Management Act 2004* • Adults resprout following fire. • Seedlings are killed by fire • Flowers late spring • Seeds germinate in autumn. • Fruit: Berry - dispersed by birds	• Weed control required post-fire. • Drill and fill to kill adults • Hand pull or grub seedlings.	SA^
Olearia glandulosa	Swamp Daisy-bush		V	Shrub	• Flowers: summer	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Olearia pannosa ssp. *pannosa*	Silver Daisy-bush	VU	V	Shrub	• Flowers August-October • Re-sprouts from lignotuber	• #	SA^
*Phalaris aquatica**	Phalaris			Grass	• Flowers: September-November • Burning will stimulate germination	• Weed control required following fire	Aus^
*Pinus radiata**	Radiata Pine			Tree	• Female cones produce large numbers of winged seed • Seeds spread by wind and are also carried by Yellow-tailed Black Cockatoos into native vegetation • Trees create dense shade and carpets the ground with pine needles, excluding native plants	• Fire will kill pine wildlings • High intensity prescribed burns will kill larger pine • Fire can be used in conjunction with manual methods of control	Aus^
Poa meionectes	Fine-leaf Tussock-grass		V	Grass	• Flowers: records in September and February	• #	Aus^
*Polygala myrtifolia**	Myrtle-leaved Milkwort			Shrub	• Highly invasive in coastal habitats, establishing in dune systems • Able to seed when less than 50cms high • Mass germination can follow soil or canopy disturbances • High intensity fire can kill mature plans • Flowers: mostly in spring	• Follow-up weed control will be required post-fire • Seedlings can be sprayed with herbicide • Seedlings will require control for at least 3 years	Aus^
Prasophyllum frenchii	Maroon Leek-orchid	EN	E	Orchid	• Reduction in flowering has been recorded where there has been increased levels of biomass accumulation	• Prescribed burning to be implemented late summer-early autumn (before leaf emergence) • Ensure follow-up herbivore control	Aus^
Pratia puberula	White-flower Matted Pratia		V	Herb	• Flowers: mainly October-November	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Prostanthera eurybioides	Monarto Mintbush	EN	E	Shrub	• Vectors of seed dispersal and seed bank dynamics are unknown • Associated with outcropping porphyritic granite at Mount Monster • Flowers: July/August-November	• #	R Aus^
Pterostylis "tasmanica"			V	Orchid	• #	• #	
Pterostylis arenicola	Sandhill Greenhood	VU	V	Orchid	• Endemic to SA • Particularly at risk from grazing animals and weeds • Occurs naturally in mallee and native pine woodlands • Flowers: September-December	• #	R
Pterostylis foliata	Slender Greenhood		R	Orchid	• Flowers: September-December	• #	Aus^
Pterostylis tenuissima	Swamp Greenhood	VU	V	Orchid	• Major disturbance is a serious threat to specialised habitat and to the orchids survival • Flowers: October-March	• Exclude machinery from location of known population sites	Aus^
Pycnosorus chrysanthes			E	Herb	• Flowers: early spring-early summer	• #	Aus^
Pycnosorus globosus	Drumsticks / Billy Buttons		V	Herb	• Flowers: spring-summer	• #	Aus^
Ranunculus glabrifolius	Shining Buttercup		V	Herb	• Flowers: December-February	• #	Aus^

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Ranunculus papulentus	Large River Buttercup		V	Herb	• Flowers: spring-autumn	• #	Aus^
*Rhamnus alaternus**	Buckthorn			Shrub	• Reproduces by seed • Re-shoot vigorously from the base whenever top-growth is damaged or removed • Flowers: late winter-early spring	• Weed control required post-fire • Drill and swab to kill adults • Hand pull or grub seedlings	Aus^
*Rubus fruticosus.**	Blackberry			Shrub	• Weed of National Significance • 1 year to seed set • Readily re-sprouts following fire • Seeds distributed by birds	• Weed control needed following fire	Aus^
Scaevola calendulacea	Dune Fanflower		V	Herb	• Flowers: throughout year	• #	Aus^
Schoenus latelaminatus	Medusa Bog-rush		V		• #	• #	
Senecio macrocarpus	Large-fruit Groundsel	VU	V	Herb	• Found in grasslands and woodlands where competition is relatively low • Lack of competition may play an important part of the species critical habitat and may be associated with regular burning • Recruitment and long-term survival unlikely without fire • Some fire management is needed to maintain gaps in vegetation for continued recruitment • Flowers: September-November	• Do not burn between September-October (prevents flowering)	R SA^
Senecio psilocarpus	Smooth-fruit Groundsel	VU	V	Herb	• Flowers: November-March	• #	Aus^
Stellaria caespitosa	Starwort		V		• #	• #	

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Swainsona procumbens	Broughton Pea		V	Herb	• Flowers: spring	• #	Aus^
Templetonia stenophylla	Leafy Templetonia		V	Shrub	• Flowers: spring	• #	Aus^
Tetrarrhena distichophylla	Hairy Rice-grass		V	Grass	• Associated with *Eucalyptus obliqua* and *E. baxteri* • Flowers: September-April	• #	Aus^
Thelymitra epipactoides	Metallic Sun-orchid	EN	E	Orchid	• A post-disturbance coloniser • If insufficient disturbance and the vegetation closes up, the orchid will not flower • Seed capsules are often observed following fire • Flowers: September-November	• Prescribed burning to be implemented late summer-early autumn (before leaf emergence) • Ensure follow-up herbivore control	Aus^ R
Thelymitra holmesii	Blue Star Sun-orchid		V	Orchid	• Flowers: October-January	• #	Aus^
Thelymitra matthewsii	Spiral Sun-orchid	VU	E	Orchid	• Flowers: August-October	• #	Aus^
*Thinopyron elongatum**	Tall Wheat-grass			Grass	• #	• #	
Tricostularia pauciflora	Needle Bog-rush		E		• #	• #	

See Page 105 for a description of codes used in appendices

Species	Common Name	EPBC Act Status	NPW Act Status	Life Form	Species Ecology & Fire Response	Ecological Fire Management Guidelines / Post-Fire Management	Source
Triglochin turriferum	Turret Arrowgrass		V		• Growing and flowering in response to rainfall	• #	AUSA
Veronica gracilis	Slender Speedwell		V	Herb	• Flowers spring through summer • Propagules always available (widely dispersed) • Establish in mature community or after disturbance	• #	SA^
Xanthorrhoea minor ssp. *lutea*	Little Yacca		E	Shrub	• #	• #	

Appendix 3: Fire Response of Rated and Significant Fauna Species

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	*Acanthiza iredalei hedleyi*	Slender-billed Thornbill		V	I	• Site: nests in upper branches of shrubs • Season: Jul-Oct	• The eastern subspecies occurs in low heathland dominated by casuarinas & banksias, interspersed with other heath plants such as melaleuca & hakea • Species is most abundant 7 years post-fire • Densities are likely to be lower & less variable in unburnt mature vegetation • Frequent, large-scale fire within remaining habitat could affect species abundance	• Create a mosaic of habitats at different stages post-fire • Reduce the likelihood of extensive fires	(Ward and Paton, 2004)
Bird	*Accipiter novaehollandiae*	Grey Goshawk		E	C	• Site: nests high in trees • Season: Aug-Nov	• Inhabits woodland & heavily forested areas • Swift flier	• Avoid high intensity fire resulting in crown fire or canopy scorch	
Invertebrate	*Anisynta cynone*	Cynone Grass-skipper Butterfly				• Season: on the wing Mar-mid Apr	• Known only to occur in the Kingston & Goolwa areas, preferring temperate grassland areas • Larval host plants include native & introduced grasses (e.g. *Austrostipa* spp., *Ehrharta calycina* & *Poa* spp.) • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)
Bird	*Anseranas semipalmata*	Magpie Goose		E	H I	• Site: floating nest • Season: Mar-Apr (may vary according to rainfall)	• Species has been re-established at Bool Lagoon GR • Once abundant in southern Australia, the species is primarily a bird of the sub-coastal plains of northern Australia • Inhabit swampy areas	• #	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Mammal	*Antechinus minimus maritimus*	Swamp Antechinus		E	I	• Season: winter • Site: grass-lined nest at the base of a grass tussock, beneath thick leaf litter, or shallow burrow in topsoil or litter	• Has a preference for dense heathland, tussock grassland & sedgeland habitats • Typically small, degraded & isolated from other remnant habitats • Poor ability to recolonise after fire • Fire could cause local extinctions • Loss of cover exposes species to predation	• Reduce the likelihood of extensive bushfires • Reduce the likelihood of frequent fires within known habitat	R Aus^
Bird	*Botaurus poiciloptilus*	Australasian Bittern		V	I	• Site: nests in reeds • Season: Oct-Jan	• Listed on the IUCN Red List as globally vulnerable • Inhabits dense reedbeds, fringing rivers & swamps • Specialised habitat requirements – so are more sensitive to overall habitat loss than many other wetland species • Inappropriate fire regimes can reduce habitat suitability	• Reduce the likelihood of frequent fires	(Merchant and Higgins, 1993)
Bird	*Calyptorhynchus banksii graptogyne*	Red-tailed Black Cockatoo	EN	E	G	• Site: nests in tree hollow of very old, large eucalypt • Season: Apr-Oct	• Species is highly specialised, feeding primarily on the seeds of Brown & Desert Stringybark, & seasonally on seeds of Buloke. • High intensity fire will substantially reduce seed availability in Stringybark for at least 9 years, with some effects persisting for more than 11 years • Reduced fire intensity will result in reduced canopy scorch & thus much quicker recovery of trees to full seed production	• Avoid prescribed burning in years in which an area of woodland has a newly matured seed crop • Assess the age/quantity of seed crops well in advance of any prescribed burn • Aim to maintain majority of Stringybark feeding habitat as long-unburnt (>10 years post-fire) • Minimise loss of hollows	(Koch, 2003) Aus^
Bird	*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo		V	G	• Site: hollows high in canopy • Season: Jul-Jan	• Nomadic or locally migratory • Higher intensity fire can increase hollow loss • Favours Eucalypt woodland & pine plantations • Fire is likely to impact on the availability of food sources	• Minimise loss of hollows (avoid high intensity fire) • Minimise the loss of important feeding sites & critical habitat	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Mammal	*Cercartetus nanus*	Eastern Pygmy-possum		V	N I	• Season: spring-autumn • Site: tree hollow	• Habitat highly fragmented in South East resulting in small, isolated populations • Inhabits eucalypt forest & heath • Can nest in very small tree hollows • Vulnerable to catastrophic events such as bushfire	• Use fire to strategically reduce fuel levels to reduce fire intensity in the event of un-planned fire	Aus^
Bird	*Coturnix psilophora*	Brown Quail		V	I G	• Site: depression on the ground under dense cover • Season: Aug-Mar	• Lives in grassland, marshes & scrub • Numbers may be temporarily reduced post-burn due to fire &/or exposure to predators	• Aim to provide unburnt areas for refuge • Fox baiting should be considered pre- & post-burn	Aus^
Bird	*Dasyornis broadbenti*	Rufous Bristlebird		V	I G	• Site: large nest in tussock or small dense shrub close to the ground • Season: September-December	• Frequents heavy scrub & coastal thickets • Ground feeder • It runs swiftly through undergrowth & seldom flies • Studies on the closely related Eastern Bristlebird have shown that they avoid areas of regenerating low vegetation • Have been found to occur at up to five times the density in older habitat (9-15 years) than younger habitat (3 years) • Fire has been blamed for the local extinction of numerous populations	• Bias towards old age-class vegetation (i.e. >20 yrs)	(Baker, 2000; Blakers, *et al.*, 1984; Garnett and Crowley, 2000)
Reptile	*Delma impar*	Striped Legless Lizard	VU	E	I	• Site: under rocks & in soil cavities • Season: summer-spring	• Uses grass tussocks & cracks in ground for foraging & shelter sites • Species in South East located at sites dominated by exotic grasses • Fire can cause mortality as well as reducing cover for the species & its prey. • Loss of cover exposes lizards to increased predation	• Avoid prescribed burning between August – March • Avoid burning >50% of habitat in a single event • Aim to increase patchiness within habitat	R Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Reptile	*Egernia coventryi*	Swamp Skink		E	I	• Season: Oct-Feb	• In South East restricted to pockets of dense sedge & Tea Tree associated with freshwater swamps • Dwells in dense low vegetation • Shelters in burrows	• Reduce the likelihood of extensive bushfires • Reduce the likelihood of frequent fires within known habitat	Aus^
Bird	*Falcunculus frontatus*	Crested Shrike-tit		V	I	• Site: vertical forks high in the canopy • Season: Sep-Jan	• Dependant on the canopy, should avoid burning the canopy • Sedentary with some local movements in autumn & winter • Frequency of fires prevent insects from establishing beneath the bark of gum barked trees • Peels bark from trees to extract prey from underneath • Has a large feeding territory >50 ha	• Avoid 2 or more successive fire intervals less than 10 years apart • Avoid high intensity fire resulting in crown fire or canopy scorch	Aus^
Bird	*Gallinago hardwickii*	Latham's Snipe		V	I	• Migratory: breeds in Japan from Jun-Jul & arrives in Australia by Aug	• Prefers wet areas (wetlands, irrigated areas, swamp edges etc), close to protective vegetative cover	• #	Aus^
Bird	*Glossopsitta pusilla*	Little Lorikeet		V	N	• Site: small hollow in eucalypt • Season: Jul-Jan	• Dependent upon flowering eucalypts for food • Now only occasionally encountered in the South East • Fire will permit eucalypts to flourish, resulting in increased food resources	• Minimise loss of hollows • Avoid high intensity fire resulting in crown fire or canopy scorch • Aim to create a spatial mosaic of habitats at different stages post-fire • Avoid prescribed burns if eucalypts in flower &/or species is present	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	*Grus rubicunda*	Brolga		V	H I	• Site: shallow water on a platform of dry grasses or sedge • Season: Sep-Dec	• Utilises swamps, shallow lakes, wet grasslands & pastures	• #	Aus^
Invertebrate	*Hesperilla chrysotricha*	Chrysotricha Sedge-skipper Butterfly				• Season – on the wing Oct- Jan	• Confined to *Gahnia* wetlands in coastal & near-coastal areas • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)
Invertebrate	*Hesperilla flavescens*	Yellow Sedge-skipper Butterfly				• Season – on the wing September to April	• Historically occurred along the Coorong • Uses host, *Gahnia deusta* in larval stage • Considered endangered in SA	• Reduce the likelihood of extensive bushfires	(Braby, 2000; Grund, 1998)
Invertebrate	*Heteronympha cordace*	Bright-eyed Brown Butterfly				• Season – on the wing mid December to early February	• Known only to occur from one location in the lower SE • Generally associated with wetlands • Considered endangered in SA	• Reduce the likelihood of extensive bushfires	(Grund, 1998)
Bird	*Hylacola pyrrhopygia*	Chestnut-rumped Heathwren		V	I	• Site: nests on ground or in a low bush or tussock • Season: Jun/Jul-Nov	• Requires large area of dense cover in heath, eucalypt woodland & forest • Fire & predation by feral animals considered detrimental to survival • May be an early successional coloniser of burnt woodland • The lack of suitable patchy fire regimes in remaining habitat may pose a threat to long-term survival	• Aim to provide a mosaic of areas • Avoid burning >50% dense cover • Fox baiting should be considered pre- & post-burn	(Haywood, 2006) Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Invertebrate	*Hypochrysops ignitus*	Fiery Jewel Butterfly				• Season: on the wing late Oct-early May	• May be found in mallee woodlands, heathlands & forests • Butterfly larvae develop within ant chambers underground • Host plants in the SE have not yet been documented, but may include *Brachyloma daphnoides* & *Choretrum spicatum* • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of frequent fires in known habitat	(Braby, 2000) (Grund, 1998)
Mammal	*Isoodon obesulus*	Southern Brown Bandicoot	EN	V		• Site: dense understorey vegetation • Material: soil & leaves • Season: late winter to summer	• Home range 1 ha - 6 ha • Inhabits heathland, shrubland, dry sclerophyll forest with heathy understorey, sedgeland or woodland • At least some individuals capable of surviving low intensity fire • Some indication that species prefers early seral stages, however this is not conclusive & habitat preference is more likely to be related to habitat structure rather than time since fire per se	• Mosaic of post-fire vegetation is desirable (diversity and structure) • Avoid inter-fire intervals <7 years • Some inter-fire intervals >15 years desirable	Aus^
Bird	*Lathamus discolour*	Swift Parrot	EN	V	N	• Does not breed on mainland • Migrates to mainland between March & May	• Small, fast flying parrot • Inhabits eucalypt forest & woodland • Feeds on winter flowering eucalypts (*Eucalyptus ovata, E. leucoxylon*) • Small numbers of parrots are occasionally recorded in the South East	• Minimise loss of hollows • Avoid high intensity fire resulting in crown fire or canopy scorch • Aim to create a spatial mosaic of habitats at different stages post-fire • Avoid prescribed burns if eucalypts in flower &/or species is present	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	*Leipoa ocellata*	Malleefowl	VU	V	G I	• Site: constructs a large nesting mound on the ground in autumn • Season: lays Sep-Mar/Apr	• Utilises mallee & woodland habitats • Also known to utilise melaleuca shrublands • Vegetation <10 years post-fire may have greater food density than older sites • Breeding rarely occurs in sites burnt within 15 years • Unburnt patches within burnt areas appear critical for recolonisation & post-fire persistence • Requires a dense & extensive leaf litter layer to provide nest material for incubation • Malleefowl habitat in the upper South East has been observed to support successful mound building & recruitment much earlier post-fire than in more arid habitats of the species range	• Ensure a bias towards old age-class vegetation (i.e. >20 years post-fire) • Promote localised patchiness in core habitat areas • Provide unburnt areas for refuge • Reduce the likelihood of landscape scale fires • Fox baiting programs should be considered pre- & post-burn	(Benshemesh, 1992; Woinarski, 1989) R, Aus^
Bird	*Lewinia pectoralis*	Lewin's Rail		V	I	• Site: nest within low vegetation, in or near water • Season: Aug-Dec	• Inhabits dense reedy sections of swamps & lakes. • Avoids exposure by feeding in vegetation • Species is likely to abandon wetlands where the fringing vegetation has been degraded by frequent burning • Highly vulnerable to habitat change	• #	(Marchant and Higgins, 1993)
Amphibian	*Litoria reniformis*	Southern Bell Frog	VU	V	I C	• Site: surface of shallow water within aquatic vegetation • Season: Sep-Jan	• Usually found in permanent lagoons, lakes, ponds & dams, especially those with bulrushes & emergent vegetation • Occurs both in woodland & areas of improved pasture	• Avoid burning >50% of habitat in a single event • Aim to provide unburnt areas for refuge • Reduce the likelihood of extensive bushfires	R, Aus^ (Robinson, 1998)

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	*Melithreptus gularis*	Black-chinned Honeyeater		V	I N	• Site: high in canopy • Season: mainly Jul-Dec	• Prefers drier woodlands dominated by box Eucalypts, often with little understorey • Local movements associated with the flowering of food plants • Forages in the upper canopy • High intensity fire likely to impact nesting sites & food availability • Fire may assist this species through the provision of feeding & breeding habitat by altering the structure of vegetation	• Avoid high intensity fire resulting in crown fire or canopy scorch	(Chapman, 1995) Aus^
Mammal	*Miniopterus schreibersii bassanii*	Southern Bent-wing Bat	CE	E	I	• Season: commences late Aug, births occur over summer • Site: maternity cave (Naracoorte NP)	• Found in south-eastern South Australia & western Victoria • Commences annual migration to maternity cave late August • Disperse to wintering sites at end of breeding season • Distribution is associated with large natural wetlands & river basins • Causes for observed population decline are not well understood • Species preferentially forages over native vegetation & wetlands	• #	Aus^
Bird	*Myiagra cyanoleuca*	Satin Flycatcher		V	I	• Site: nest on tree branch, 3-25 m above ground • Season: Oct/Nov-Jan/Feb	• South East represents the western limit of the species range • Utilise taller, wetter eucalypt forests	• Reduce likelihood of extensive bushfires	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	*Neophema chrysogaster*	Orange-bellied Parrot	EN	E	G	• Does not breed on mainland • Migrates to mainland in winter	• Utilises saltmarshes, coastal dunes, pastures, shrublands, estuaries, islands, beaches & moorlands, usually within 10 km of the coast • Feed along beaches & in nearby vegetation in SA • In Tasmania, main food preferences are found in sedgelands which have not been burnt for 3-15 years • Habitat management burns for the enhancement of feeding habitat in Tasmania has lead to a decline in fire frequency, & subsequently a decline in the number of parrots • Parrots frequent in significant number at Melaleuca, Victoria, where fire is regularly used to protect human assets & where a concerted effort has been made to apply fire management for the species	• Conduct prescribed burning when parrots are absent to maintain foraging habitat	(Parks and Wildlife Service Tasmania, 2009) Aus^
Bird	*Neophema chrysostoma*	Blue-winged Parrot		V	G	• Site: nest in tree hollows • Season: Oct-Jan	• South East is a major stronghold for this species • Feeds on the seeds of grasses, especially *Danthonia* spp., which regenerates after fire	• Minimise loss of hollows • Reduce likelihood of extensive fires	Aus^
Invertebrate	*Ogyris halmaturia*	Eastern Large Bronze Azure Butterfly				• Season: on the wing Oct-Dec	• Butterfly larvae develop within ant chambers underground • Presently only recorded from three locations in SA, incl. the upper SE • Considered endangered in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of frequent fires in known habitat	(Braby, 2000; Grund, 1998)
Invertebrate	*Oreixenica kershawi*	Striped Xenica Butterfly				• Season: on the wing mid Jan-mid Feb	• Known from only one location in the lower SE • Prefers Silky tea-tree, *Gahnia* habitat • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Invertebrate	*Oreixenica lathoniella*	Silver Xenica Butterfly				• Season: on the wing Mar-Apr	• Considered vulnerable in SA, being at the extreme western limits of its range • Recorded at two locations in the lower SE	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)
Bird	*Pachycephala olivacea*	Olive Whistler		V	I	• Site: nest in shrubs or dense grass clumps • Season: Sep-Jan	• Inhabits eucalypt forests, in dense vegetation • South East represents the western limit of its range • Under cover, they forage mainly on the ground	• Avoid burning >50% of known habitat in a single event • Provide unburnt areas for refuge	Aus^
Bird	*Pachycephala rufogularis*	Red-lored Whistler	VU	V	I	• Site: nests very near to the ground • Season: Sep-Dec	• Last recorded in 1987 • Frequents mainly mallee scrub with dense cover & spends much time on the ground feeding • Species prefers vegetation that has not been burnt for at least 5 years • Threatened by extensive fires	• Avoid fire intervals < 5 years • Reduce likelihood of extensive fires • Provide unburnt areas for refuge	(Paton, *et al.*, 2005) Aus^
Bird	*Petroica phoenicea*	Flame Robin		V	I	• Site: nests low in tree cavities & rock fissures • Season: Sep-Jan	• Migratory species, dispersing to lower latitudes during winter months • Likely to be seen in open country & pastures • Habitat likely to include recently burnt forest	• Avoid burning >50% of known habitat in a single event • Provide unburnt areas for refuge	Aus^
Mammal	*Potorous tridactylus*	Long-nosed Potoroo	V	E	H I	• Season: can be throughout the year, but more frequently end of winter/early spring or late summer	• Inhabits coastal heath & dry & wet sclerophyll forest • Major habitat requirement is relatively thick ground cover	• Reduce the likelihood of frequent fires within known habitat • Reduce the likelihood of extensive bushfires	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Reptile	*Pseudemoia rawlinsoni*	Glossy Grass Skink		E	I	• Season: young born late Feb	• Lower South East represents western edge of its range. • Species is a grassland/sedgeland specialist • Often found on edge of swamps & lakes • Degradation of grasslands may threaten survival	• Reduce the likelihood of frequent fires in known habitat • Reduce the likelihood of extensive bushfires	Aus^
Mammal	*Pseudomys shortridgei*	Heath Mouse/Rat	V	E	H	• Season: late spring/summer	• May be dependent on recently burnt areas when the initial flush of growth provides adequate food & cover • May disappear from an area when food species & productivity declines	• Can persist at sites subjected to high frequency burning (i.e. 7-14 yrs) • Reduce the likelihood of extensive bushfires • Aim to provide a mosaic of areas	Aus^
Bird	*Stagonopleura guttata*	Diamond Firetail		V	G	• Site: shrub & tree canopy • Season: Oct-Jan	• Inhabits grassy Eucalypt communities & feeds exclusively on the ground • Requires ground cover, including fallen timber • Local movements • Has suffered serious decline in the South East & is considered in danger of becoming extinct in the region • Strong fliers likely to evade fire • Habitat likely to be temporarily impacted by fire	• Avoid burning >50% of known habitat in a single fire event	(Foulkes and Heard, 2003) Aus^
Bird	*Stictonetta naevosa*	Freckled Duck		V	I	• Site: nests in bushes at water level • Season: Sep-Nov (can breed out of season when conditions are favourable)	• Regarded as one of the rarest waterfowl in the world • Is dependent on dense vegetation in large shallow swamps for breeding, & on permanent waters for refuge during drought	• #	Aus^

See Page 105 for a description of codes used in appendices

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Diet	Breeding	Species Ecology and Fire Response	Ecological Fire Mgt Guidelines	Source
Invertebrate	*Trapezites eliena*	Eliena Rush-skipper Butterfly				• Season: on the wing late Oct-late Jan	• Known only to use *Lomandra longifolia* as a host plant in SA • Confined to lower SE where host plant occurs • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)
Invertebrate	*Trapezites phigalia*	Phigalia Rush-skipper Butterfly				• Season: on the wing late September to early December	• Historically recorded in the upper SE region • Likely habitat Pink & Blue gum woodlands with a low heath understorey • Considered vulnerable in SA	• Avoid burning >50% of habitat in a single event • Reduce the likelihood of extensive bushfires	(Grund, 1998)
Invertebrate	*Trapezites symmomus*	Symmomus Rush-skipper Butterfly				• Season: on the wing early Jan-early Mar	• Occupies similar habitat to *T. eliena* • Recorded from only four areas in the lower SE • Considered vulnerable in SA	• Reduce the likelihood of extensive bushfires	(Grund, 1998)
Bird	*Turnix varius*	Painted Button-quail		V	G I	• Site: terrestrial under some vegetation within a depression • Season: Sep-May	• Numbers may be temporarily reduced due to fire &/or exposure to predators • Low mobility • Will enter farmlands for food • May invade or become abundant in recently burnt areas • Ground feeding species which generally increase in abundance post fire	• >50% of habitat patch should not burn in a single fire event • Fox baiting programs should be considered post-fire	Aus^
Mammal	*Wallabia bicolour*	Swamp Wallaby		V	H	• Season: throughout the year	• Prefers habitat with thick undergrowth	• Reduce the likelihood of extensive bushfires • Reduce the likelihood of frequent fires within known habitat • Aim to provide unburnt areas for refuge	Aus^

See Page 105 for a description of codes used in appendices

Appendix 4: Ecological Communities of Conservation Significance

Ecological Community	SA Status (DEH, 2005b)	EPBC Act Status	Occurrence	MVS No.	Block	Components	Fire Response	Fire Management Guidelines	Source
Grey Box (*Eucalyptus microcarpa*) **Grassy Woodland**	E	Nominated under EPBC Act to be listed as Vulnerable	• Predominantly restricted to the Bordertown/Mundulla/Custon /Frances areas of the South East. • Largely restricted to roadsides, disused rail corridors, highly isolated & degraded remnants on private property & small council-managed reserves/parklands.	8	Custon	• Grassy Woodland with Grey Box as the dominant tree species. • Co-dominant tree species include Buloke (*Allocasuarina luehmannii*), Black Box (*Eucalyptus largiflorens*) & Inland SA Blue Gum (*E. leucoxylon* ssp. *pruinosa*). • Typically, has an open grassy understorey. Including *Danthonia* & *Stipa* species.	• Grassy understorey species regenerate well following low-moderate intensity fire • Some shrub species regenerate following moderate-high intensity fire • Hollows & coarse woody debris are important fauna habitat elements & can be adversely affected by moderate to high intensity fire	• Avoid burning entire remnant during a single fire event • Aim to manage within the Ecological Fire Management Guidelines proposed for MVS 8	Aus^
Buloke (*Allocasuarina luehmannii*) **Woodland**	E	E	• Predominantly restricted to the Bordertown/Mundulla/Custon /Frances areas of the South East. • Fragmented community across much of its former range. • Largely restricted to roadsides, high isolated & degraded remnants on private property & small council-managed reserves/parklands.	26	Wolseley Common	• Woodland with Buloke as the dominant tree species. • *Danthonia* & *Stipa* species are prominent perennial grasses in the understorey.	• High frequency, intense fires results in a decline in mature Sheoak • Seedlings/saplings may also be destroyed by fire	• Aim to manage within the Ecological Fire Management Guidelines proposed for MVS 26	SA^

10.1 Summary of Codes Used in Appendices

NPW ACT STATUS		EPBC ACT STATUS		DIET OF RATED FAUNA SPECIES	
E	Endangered	EX	Extinct	C	Carnivore or scavenger. Mainly vertebrates.
V	Vulnerable	CE	Critically Endangered	H	Herbivore. Includes folivores, grazers & browsers.
R	Rare			N	Nectar feeder
		EN	Endangered	I	Insectivore/"arthropodivore"/omnivore
		VU	Vulnerable	G	Granivore. Typically peak in abundance after a fire event in fire-adapted vegetation, due to the stimulation of flowering & subsequent seed-set.
		CD	Conservation Dependant		

MISCELLANEOUS CODES	
#	Fire response is unknown or ambiguous, thus the required data is not available to propose Ecological Fire Management Guidelines. When data becomes available the table will be updated.
*	Introduced species

FIRE RESPONSE SOURCE	
R	Regional or local data
SA	South Australian data
Aus	Interstate data
^	Data/observations derived from published or unpublished literature.
E	Expert opinion (person knowledgeable in species genera)
I	Inferred from similar species (Senior Fire Ecologist - Fire Management Branch has inferred based on other species genera)

11 GLOSSARY OF ACRONYMS AND FIRE MANAGEMENT TERMINOLOGY

Term	Definition
Bark fuel	The flammable bark on tree trunks and upper branches (DEH, 2006e).
Bushfire	An unplanned fire. A generic term that includes grass fires, forest fires and scrub fires.
Bushfire Management Committee (BMC)	Bushfire Management Committees are responsible for the governance, planning and coordination of local fire prevention work. Responsible for the development of Bushfire Risk Management Plans. A total of 16 Bushfire Management Committees exist across the state, reporting to a central State Bushfire Coordination Committee.
Bushfire Risk Management Plan	Replaces a Bushfire Prevention Plan. Developed by Bushfire Management Committees as a requirement under the *Fire and Emergency Services Act 2005*.
Bushfire Survival Plan	Also known as a Bushfire Action Plan. A pre-prepared plan developed by people who live, visit or work in a bushfire prone area encompassing the decision to either "Leave Early" or to "Stay and Defend" to ensure that they are prepared and know what to do in the event of a bushfire (CFS, 2009d).
Canopy fuel	The crowns (leaves and fine twigs) of the tallest layer of trees in a forest or woodland. Not measured as part of the Overall Fuel Hazard assessment (DEH, 2006e).
CFS	The South Australian Country Fire Service.
Control line	(fireline) A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
DEH	The South Australian Department for Environment and Heritage.
EAT	DEH Environmental Assessment Table. Completed for all prescribed burns (as part of the Prescribed Burn Plan) and other fire management works where native vegetation is being cleared and is not exempt under the *Native Vegetation Act 1991* (DEH, 2004c).
Ecological fire management	The active use of fire in nominated areas to achieve specified ecological objectives.
Elevated fuel	Shrubs and juvenile understorey plants up to 3 m in height (DEH, 2006e).
EPBC Act	The commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Fire behaviour	The manner in which a fire reacts to the variables of fuel, weather and topography.
Fire danger rating	An evaluation of fire rate of spread, or suppression difficulty for specific combinations of fuel, fuel moisture, temperature, humidity and wind speed. The rating can be Low, Moderate, High, Very High or Extreme.
Fire frequency	The number of fires that have occurred on the same area over a time period.
Fire intensity	The rate of energy or heat release per unit time per unit length of fire front, usually expressed in kilowatts per metre (kw/m) (Pausas, *et al.*, 2003)
Fire interval	The interval between successive fires.
Fire management	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives.

Term	Definition
Fire regime	The history of fire in a particular vegetation type or area including the fire frequency, interval, intensity, extent and seasonality of burning (Brooks, *et al.*, 2004).
Fire scar	A destructive mark left on a landscape by fire.
Fire season	The period(s) of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control.
Fire severity	The effect of fire on an ecosystem, that is, on living plants, as well as on the amount and location of organic matter consumed during a fire (Pausas, *et al.*, 2003)
Fire suppression	The activities connected with restricting the spread of bushfire following its detection and making it safe.
ForestrySA	The South Australian government's forest management agency.
Fuel	Any material such as grass, leaf litter and live vegetation, which can be ignited and sustains a fire. Fuel is usually measured in tonnes per hectare.
Fuel hazard	The overall fuel hazard is defined as the sum of the influences of bark fuel, elevated fuel and surface fine fuel (DEH, 2006e).
Fuel management	Modification of fuels by prescribed burning, or other means.
Fuel reduction burning	The planned application of fire to reduce hazardous fuel quantities, undertaken in prescribed environmental conditions within defined boundaries.
GAFLC	South Australian Government Agencies Fire Liaison Committee.
Heritage Agreement (HA)	Private conservation areas established through an agreement between the SA Minister for Environment and Conservation and the landholder under the *Native Vegetation Act 1991*.
Incident Controller (IC)	The individual responsible for the management of all incident operations and IMT.
Incident Management Team (IMT)	The group of incident management personnel comprising the Incident Controller and the people he/she appoints to be responsible for the functions of Operations, Planning and Logistics.
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.
Life history	The combination of attributes with respect to growth, shelter, food/nutrients and reproduction which determine species' requirements for existence (FEWG, 2004).
MFS	South Australian Metropolitan Fire Service.
Near-surface fuel	Grasses, low shrubs and heath, sometimes containing suspended components (leaves, bark and/or twigs).
NPW Act	The South Australian *National Parks and Wildlife Act 1972*.
NVC	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 in South Australia (DWLBC, 2006b).

Term	Definition
Patchiness	The uneven distribution of fire regime across an area. Patchiness can be used to describe variability within a single burn area or variability between burns across a landscape.
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 incorporates the specifications and conditions under which the operation is to be conducted.
Prescribed burning	The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives. It is undertaken in specified environmental conditions.
Ramsar Convention	An intergovernmental treaty for the conservation and sustainable utilisation of wetlands
Response plan	A plan detailing the response for a risk or an area including the type and number of resources.
Retardant	A chemical generally mixed with water, designed to retard combustion by chemical or physical action. It is usually applied by aircraft but may be applied from tankers at the fire edge.
Risk assessment	Used in DEH fire planning to assist in evaluating the threat to life, property and environmental assets posed by bushfire and also to aid in developing strategies and implementing Recommendations for risk mitigation. Considers *Likelihood* and *Consequence* to determine an overall risk rating using a matrix as *Low, Moderate, High, Very High* or *Extreme* (DEH, 2006c).
SA Water	South Australian Water Corporation.
SE	South East
sp.	Species
Spotting	The ignition of spot fires from sparks or embers
spp.	Species (plural)
ssp.	Subspecies (botanical nomenclature)
Surface fuel	Otherwise known as 'litter'. Comprised of leaves, twigs and bark on the ground (DEH, 2006e)
Total Fire Ban	A ban on lighting and maintaining of a fire in the open, which can be invoked at any time during the year. When invoked, the Total fire Ban is imposed for a period of 24 hours, from midnight to midnight, but may also be imposed for part of a day or days. (Country Fire Service Regulations, 2003).
TPC	The *Threshold of Potential Concern* is defined as a point in time where *Key Fire Response Species* are likely to be affected by an aspect of fire regime.
var.	Variety (botanical nomenclature)
Vital attributes	Vital attributes are 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)

Unless otherwise indicated, definitions have been sourced from the *DEH Fire Glossary* (2005a) or the *AFAC Knowledge Web Wildfire Glossary* (2010)

January 2010. FIS: 90594 (Cover)