

# Fire Management Plan

Reserves of the Lower Yorke Peninsula

2010-2020



*Incorporating Innes National Park, Caribie, Leven Beach, Point Davenport, Minlacowie, Ramsay and Warrenben Conservation Parks, included Crown Lands and participating Heritage Agreements*

Department  
for Environment  
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## EXECUTIVE SUMMARY

This Fire Management Plan for the Department for Environment and Heritage (DEH) managed lands on the Lower Yorke Peninsula includes eight DEH reserves: Innes National Park, Carribie, Leven Beach, Point Davenport, Minlacowie, Ramsay, Thidna (proposed) and Warrenben Conservation Parks, selected Crown land and participating heritage agreements. This plan has been developed to provide direction for fire management activities on identified land. The plan emphasises the protection of life and property and provides direction for land managers in the protection and enhancement of natural and cultural heritage. It is important to note that there will be a transitional stage where the management strategies and works proposed in the plan are undertaken and implementation will depend upon fire management priorities and the allocation of regional resources.

The lands included within this fire management plan were identified as a priority for fire management planning within the DEH Northern and Yorke Region because of the following issues:

- The positioning of the township of Marion Bay adjacent to Innes National Park.
- The protection of significant built and natural assets within and adjacent to the reserves and Crown land.
- The general protection of life, property and environmental values.
- Extreme overall fuel hazard levels in some areas included in the plan, due to the long-term absence of fire and modification of the natural vegetation.
- Protection of fauna and flora species of conservation significance, especially the nationally rated Malleefowl (*Leipoa ocellata*), Western Whipbird (eastern) (*Psophodes nigrogularis leucogaster*), Mainland Tammar Wallaby (*Macropus eugenii eugenii*), Osborn's Eyebright (*Euphrasia collina* ssp. *osbornii*) and threatened Spider-orchids.
- Protection of threatened ecological communities, specifically Thatching Grass (*Gahnia filum*) Sedgeland in drainage lines and depressions and Drooping Sheoak (*Allocasuarina verticillata*) Grassy Low Woodland on clay loams of low hills.
- The significance of the large area of remnant vegetation on the south-western Yorke Peninsula.
- High visitor numbers to Innes National Park, particularly during the fire season.
- The likelihood of accidental and intentional fire ignitions.
- Landscape protection of Innes National Park and Warrenben Conservation Park, to reduce the likelihood of the reserves, or large portion of either reserve, burning in a single fire event.

The issues identified above were addressed during the planning process 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 (GAFLC, 2008).

As a result of applying the above processes the following recommendations have been identified.

- Fuel reduction:
  - in Asset and Buffer Zones using a variety of methods, including (but not limited to) prescribed burning and mechanical removal
  - in strategic areas within the Conservation Zone to provide some landscape protection within the reserves and increase patchiness of the vegetation across larger areas
  - to complement strategies to manage species or habitats.
- Operational works to improve fire preparedness, including changes to fire access and mitigation and suppression infrastructure.
- Coordinated fire management between DEH and neighbours (including other government agencies and private landholders).

This draft plan was released for public comment over four weeks in September 2009. Comments were then evaluated and incorporated where considered appropriate. A major review of this plan will occur after ten years of implementation, or earlier if required.

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### 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](http://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 a strategic framework for fire management activities on DEH Northern and Yorke Region managed lands that fall within the planning area. This plan incorporates Innes National Park (NP), Carribie Conservation Park (CP), Leven Beach CP, Minlacowie CP, Point Davenport CP, Ramsay CP, Thidna (proposed) CP, Warrenben CP, selected Crown land and participating heritage agreements. 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 maximise the potential for the objectives to be met. Risk mitigation works and activities will increase the level of bushfire preparedness and guide management and suppression strategies during bushfire incidents.

These reserves were identified for fire management planning due to a number of factors:

- The existence of significant built and natural assets within and adjacent to the reserves.
- The occurrence of species populations, fauna and flora communities and ecosystems of conservation significance within the planning area.
- High visitor numbers, particularly during the fire season.
- The likelihood of accidental fire ignitions, particularly in high visitor use areas such as campgrounds and the likelihood of intentional fire ignitions.
- The impact of a significant bushfire within the planning area on the economy of the Yorke Peninsula.
- The potential for a bushfire within Innes NP to impact on the township of Marion Bay

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 included reserves, 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. These works will be facilitated through the DEH Northern and Yorke Region and prioritised by the Yorke District in liaison with the Regional Fire Management Officer. Adjoining lands are considered in the plan, but only in the context of works required to minimise the risk to assets from fires originating on DEH managed lands. However, DEH will support and complement landscape scale fire planning for adjoining lands. Fire management planning for land other than that managed by DEH is the responsibility of the Yorke Peninsula Bushfire Management Committee (BMC), in accordance with the requirements of the *Fire and Emergency Services Act 2005*. DEH is represented on this committee, 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 plans to evolve and improve. Consultation with the community and stakeholders is seen as critical to successful planning and has been built into the planning process.

### 1.1 Objectives

The fire management objectives that apply to all DEH managed land are as follows.

#### General Objectives for Fire Management

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- To manage fire to offer protection to human life and property, whilst maximising environmental outcomes.
- To ensure that sound conservation and land management principles are applied to fire management activities and where fire is used as a management tool (e.g. for risk mitigation, fire suppression or ecological purposes).
- To apply an adaptive management approach to fire management on DEH managed land supported by contemporary research.
- To complement Bushfire Risk Management Plans (formerly Bushfire Prevention Plans).
- To undertake bushfire suppression activities in a safe and professional manner.
- To provide for the strategic containment of bushfires (e.g. 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 ecological fire management guidelines in conservation zones.

The fire management objectives that apply specifically to the lower Yorke Peninsula planning area are as follows.

#### General Objectives for Fire Management in the Lower Yorke Planning Area

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- To reduce the impact of bushfire in the reserves by:
  - minimising the likelihood of a significant portion of remnant vegetation on the south-western Yorke Peninsula burning in a single fire event
  - minimising the likelihood of a landscape scale fire in the planning area.
- To reduce the likelihood of a bushfire impacting significant recreational values and assets.
- To improve knowledge of how species populations, flora and fauna communities and ecosystems respond to fire, by filling gaps in knowledge (e.g. managing fire in a fragmented landscape, appropriate patch size, etc.) and contributing new information and concepts to the adaptive management process.
- To maintain or improve the viability of species populations, flora and fauna communities and ecosystems in reserves by:

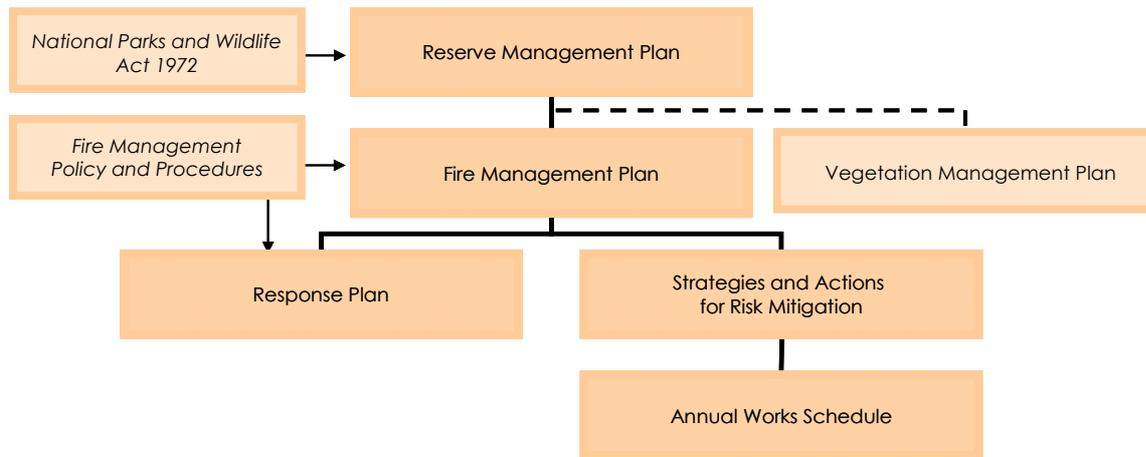
## General Objectives for Fire Management in the Lower Yorke Planning Area

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- reducing the likelihood of fire suppression operations impacting upon 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
  - reducing the likelihood of bushfire burning large remnants of preferred habitat of significant species
  - creating variability within the fire regime to benefit a range of species populations, flora and fauna communities and ecosystems
  - undertaking appropriate biodiversity management post-fire
  - using fire as part of an integrated weed management strategy
  - using fire to meet specific species habitat requirements.
- To work with universities to develop a research program that informs the DEH prescribed burning program where appropriate.
  - 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:
    - maintaining daily bushfire preparedness in accordance with bushfire risk, including 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 DEH Policy
    - using the functions, roles and responsibilities of the Australasian Interagency Incident Management System (AIIMS).

## 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 reserves and are prepared as a requirement under the *National Parks and Wildlife Act 1972* (or *Wilderness Protection Act 1992* where relevant). Fire Management Plans are produced for reserves 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 and are used in the early stages of an incident. Response Plans are reviewed annually to ensure currency.



**FIGURE 1 – THE PLANNING FRAMEWORK**

### 2.1 Legislation

#### 2.1.1 Federal Legislation

The *Federal Environment Protection and Biodiversity Conservation (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), DEH has responsibilities for fire management activities within reserves constituted under this Act. The preparation of Fire Management Plans is not a statutory requirement under this Act, but a Departmental Policy.

DEH has responsibilities for fire management on unalienated Crown land and any Crown land dedicated to, owned by, or under the 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 *Crown Lands Management Act 2009* defines Crown land as the following:

- 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 these lands will be described as Crown Lands Act reserves.

- 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).

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 (CFS) must take steps to have any relevant provisions of a management plan for a government reserve brought to the attention of members of the CFS who might exercise powers under this section with respect to the reserve.

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 also defined as 'clearance' under the Act). All prescribed burns must be approved through the process delegated to DEH by the Native Vegetation Council (NVC).

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**

DEH has a Fire Management Policy (DEH, 2009b) which outlines the agencies fire management responsibilities and provides a framework for bushfire suppression, prescribed burning and fuel management.

Under this Policy, DEH has fire management responsibilities for:

- reserves dedicated under the *National Parks and Wildlife Act 1972* or *Wilderness Protection Act 1992*
- 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).

The Policy states that DEH will undertake fire management activities to protect life, property and environmental assets and to enhance the conservation of natural and cultural heritage. 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 hazard 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 Policies and Procedures 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, 2006b), 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 Policy and Procedure Manual* (DEH, 2009f).
- CFS Chief Officer Standing Orders and Standard Operating Procedures (CFS, 2009b).
- CFS Operations Management Guidelines (OMGs) (CFS, 2009d).

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* (where relevant). 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.

A Reserve Management Plan was developed for Innes NP in 2003 (DEH, 2003c). The Plan was amended in 2004 to incorporate new management programs (such as the Mainland Tammar Wallaby reintroduction program) and to allow for the use of prescribed burning for fuel reduction and ecological management (DEH, 2004c). The Plan identifies the risks associated with high fuel loads within the reserve due to an absence of fire and advocates for the development of a Fire Management Plan in association with the CFS and other stakeholders.

Point Davenport CP, Carribie CP, Ramsay CP, Warrenben CP, Leven Beach CP and Minlacowie CP have been included in a management plan for the *Mainland Conservation Parks of the Yorke Peninsula* (DEH, 2009g). The Plan identifies the importance of maintaining perimeter access around these reserves and provides for the use of prescribed fire for asset protection, fuel reduction and biodiversity management.

The management plan for Troubridge Island CP and Althorpe Islands CP (DEH, 2007) recognises that it is not likely that fire played a role in shaping the ecosystems of these Islands and suggests that prescribed fire should not be implemented for ecological management or for fuel reduction within these reserves. However, fire may be used to assist weed control programs or other ecological purposes. The Plan states that a Fire Management Plan is not necessary for these reserves. As such, these Islands have not been included in this Fire Management Plan.

Thidna CP is yet to be proclaimed into the protected area system and therefore does not have a current Reserve Management Plan.

### **2.3.2 Fire Management Plans**

A Community Bushfire Protection Plan was prepared by DEH for shack sites at Shell Beach, Dolphin Bay, Fishermans Village (Pondalowie Bay) and Inneston within Innes NP (DEH, 2003a). The plan outlines a number of recommended actions and works that may aid in reducing the risk posed by fire to life and property within these areas. Recommendations include:

- the development of a public awareness and education campaign
- the provision of location maps for shacks
- the inspection of shacks to ensure they meet safety standards
- fuel reduction around shacks
- the preparation of an evacuation plan by SA Police and CFS in liaison with DEH.

A risk assessment has been completed as part of the planning process for this Fire Management Plan and has considered the risk to the shack sites. Risk mitigation works are detailed in Appendix 1.

### **2.3.3 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 NPW Act or *Wilderness Protection Act 1992* 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.

Strategies for Boneseed management were developed during the prescribed burn planning process for a recent prescribed burn in Innes NP. These strategies are incorporated into Appendix 2.

Vegetation Management Plans prepared for any of the land included in this plan in the future should take fire management zoning and strategies into consideration when planning sites for revegetation. Any revegetation undertaken on DEH managed land should be planned in consultation with the District Ranger and Regional Fire Management Officer.

### **2.4 Local and Regional Environmental Planning**

The following documents provide management direction for the biodiversity of the lower Yorke Peninsula planning area and adjoining lands.

- *Biodiversity Plan for the Northern Agricultural Districts of South Australia* (Graham, et al., 2001).
- *Northern and Yorke Regional Natural Resources Management Plan* (N&Y NRM Board, 2009).

The objectives, strategies and works outlined in this Fire Management Plan were developed to allow for the maintenance of ecological integrity and are consistent with objectives outlined in 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 Northern Agricultural Districts of South Australia* (Graham, et al., 2001) is one of several regional biodiversity plans developed by DEH. The planning area covers approximately three million hectares spanning from Gawler in the south to Port Augusta in the north, including the entire Yorke Peninsula. The Biodiversity Plan was written to guide the conservation, management and rehabilitation of habitats at a regional level. The plan identifies the south-western Yorke Peninsula as a 'large remnant area', hence a priority for management and biodiversity conservation. The plan lists 'inappropriate fire regimes' as a threat to biodiversity on the south-western Yorke Peninsula and describes the following management actions for DEH.

- Continue to update fire history mapping for all DEH reserves.
- Experiment with prescribed burning and encourage patchiness to promote habitat diversity, biodiversity and age variation within native vegetation, especially in the larger reserved areas.
- Suppress fires rapidly in smaller reserved areas.

#### **2.4.2 Natural Resources Management Plan**

Under the SA *Natural Resources Management Act 2004*, regional Natural Resources Management (NRM) Boards must develop a NRM Plan for their region. The *Natural Resources Management Plan for the Northern and Yorke Region* (N&Y NRM Board, 2009) discusses the condition of environmental values in the region, identifies threatening processes, discusses options for more effective management and establishes a framework of broad actions and targets to guide management. In relation to fire, the plan considers

the influence that climate change is likely to have on biodiversity and identifies inappropriate fire regimes as a threat to the ecological integrity of remnant native vegetation.

## 2.5 Adjoining Lands

Adjoining lands are considered in this Fire Management Plan, but only in the context of works required to minimise the risk to DEH managed land from external fires and the risk to private assets from fires originating on DEH managed land. However, DEH will support and complement landscape scale fire planning for adjoining lands. A number of documents exist that contribute to the effective management of bushfire risk for adjoining lands.

- *Roadside Vegetation Management Plan for Yorke Peninsula* (Wigan and Malcolm, 1989).
- *Native Vegetation Management Plan for Roadsides Under the Care and Control of the District Council of Yorke Peninsula* (DC Yorke Peninsula, 2000).
- *Native Vegetation Management – a needs analysis of regional service delivery in the Northern Agricultural District* (Smith, et al., 2003).
- *Yorke Peninsula Development Plan* (Planning SA, 2003).
- *Yorke Peninsula District Bushfire Prevention Plan* (Yorke Peninsula DBPC, 2009).

All fire management planning and works undertaken on DEH managed land are subject to consultation with local government to ensure that they are consistent with the objectives of Bushfire Prevention Plans.

## 2.6 Recovery Planning

Recovery Plans are prepared for nationally threatened species that are listed under the EPBC Act. On the lower Yorke Peninsula a number of species of national conservation significance have been recorded and the following species either have Recovery Plans that are under development or in place.

- Malleefowl (Benshemesh, 2007).
- Western Whipbird (Baker-Gabb, 2007).
- Osborn's Eyebright (Moritz and Bickerton, 2007b; Potts, 1999).
- Ghost Spider-orchid (*Caladenia intuta*) (Quarmby, 2006).
- Large-club Spider-orchid (*Caladenia macroclavia*) (Bickerton, 2003b; Quarmby, 2006).
- Jumping-jack Wattle (*Acacia enterocarpa*) (Moritz and Bickerton, 2007a).
- Hooded Plover (*Thinornis rubricollis*) (Baker-Gabb and Weston, 2006).

## 2.7 Partnership Agencies

The South Australian CFS is the lead combatant agency for bushfire suppression in rural South Australia. Responding to a fire on DEH managed land is undertaken jointly by DEH and other CFS Brigades (note DEH is a CFS Brigade under the *Fire and Emergency Services Act 2005*). Local CFS Brigades from the Southern Yorke Group will form the initial response to fire incidents on DEH managed land, along with DEH appliances located at Stenhouse Bay. As a fire escalates, DEH responds according to a staged District, Region and Statewide response with available resources.

Local brigades are heavily relied upon for fire suppression activities, particularly for first and second response to an incident. The cooperation, support and understanding between CFS, DEH brigades and the local community have been critical to successful fire suppression on DEH managed land and across the broader landscape in the past, and will be critical to the success of this plan.

### **2.8 Consultation**

DEH is committed to close cooperation and involvement with State and Commonwealth organisations, special interest groups and the broader community to achieve the goals of biodiversity conservation and protection of life and property. To achieve this, the CFS, Local Government, Friends of Parks and the Northern and Yorke NRM Board have been consulted during the development of this Fire Management Plan.

DEH fire management plans are prepared and adopted in accordance with the *Policy and Procedure for Fire Management Planning: Project Management and Consultation* (DEH, 2009a). Consultation is not a statutory requirement for Fire Management Plans, but is a Departmental Policy. The plan was subject to DEH internal consultation for a period of four weeks prior to being released for public consultation. 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.

### **2.9 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 derived from the recommendations listed in this Fire Management Plan and this will be reviewed on an annual basis.

### 3 BUSHFIRE ENVIRONMENT

The components of any landscape contributing to its bushfire potential 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 planning area is situated on the southern section of the Yorke Peninsula and, for the purpose of this plan it is defined as all land south of the northern Minlacowie and Ramsay Hundred line ([Map 1](#)). The planning area falls within the jurisdiction of the District Council of Yorke Peninsula and incorporates eight DEH reserves (totalling 15 339 ha): Innes NP (9 463 ha), Carribe CP (19 ha), Leven Beach CP (417 ha), Minlacowie CP (29 ha), Point Davenport CP (184 ha), Ramsay CP (145 ha), Thidna (proposed reserve) CP (934 ha) and Warrenben CP (4 147 ha).

A total of 25 parcels of other lands, totalling 1 767 ha, have been incorporated into this plan (Table 1). This includes Crown land, participating Heritage Agreements and roadside vegetation adjoining DEH managed land.

Proposed reserves have been included into this plan to ensure issues are identified and strategies for risk minimisation are prepared when these areas are included in the reserve system in the future.

Crown land dedicated to, owned by, or under the control of the Minister for Environment and Conservation was identified for inclusion into this plan by assessing proximity to built assets, presence of native vegetation and size.

**TABLE 1 – OTHER LANDS INCLUDED IN THIS FIRE MANAGEMENT PLAN**

Type	Dedication	Parcel Type and Number	Hundred	Size (ha)
Proposed Addition to Innes NP	Gym Beach Road Reserve	N/A	Warrenben	3.3
Heritage Agreement	Private	Section 20	Warrenben	273.4
Unalienated Crown land	Minister for Environment and Conservation	Allotment 2	Warrenben	146.4
Unalienated Crown land	Minister for Environment and Conservation	Section 129, 130, 177, 10, 268	Warrenben	1247.8
Unalienated Crown land and adjoining road reserve	Minister for Environment and Conservation	Section 176, 163, 1, 109	Warrenben	17.3
Unalienated Crown land	Minister for Environment and Conservation	Section 235, 247, 248, 250	Moorowie	29.5
Unalienated Crown land and adjoining road reserve	Minister for Environment and Conservation	Allotment 720, 761, 93, 726, 725, 724, 723, 722, 721	Melville	49.2

### 3.1.2 Surrounding Lands

Yorke Peninsula is best known for its highly productive farmlands, focused on cereal, pulse, lamb and wool production (N&Y INRM Committee, 2003). The area is also a valuable source of minerals and constructive materials, including dolomite, gypsum, limestone and salt (N&Y INRM Committee, 2003).

The main function of other lands adjoining the DEH reserves is agricultural and rural residential. To a lesser extent adjacent lands support livestock, public institutions, general residential, recreation, native vegetation for conservation and quarrying/mining activities.

Land tenure adjoining the DEH reserves is predominantly private land with some areas of Crown land. [Map 1](#) provides an overview of surrounding land tenure.

### 3.1.3 Terrain

The Yorke Peninsula is characterised by mainly sandy undulating plains with central rises and low hills in addition to dunes and salt lakes or low cliffs along the coast (Graham, *et al.*, 2001; N&Y NRM Board, 2009). Soils are largely loam over clay, shallow calcrete or calcareous loams with areas of dune fields and saline land (N&Y NRM Board, 2009). The extensive coastal dune system of the lower Yorke Peninsula incorporates a range of habitats, from open areas of drifting sand to stabilised dunes covered with dense vegetation.

Yorke Peninsula has little drainage definition with many surface water catchments flowing into landlocked lagoons (saline wetlands) (N&Y INRM Committee, 2003). The extensive saline wetland between Yorketown and Warooka divides the cereal growing lands of the north from the mainly pastoral and sparsely populated "foot" of the Peninsula.

The native vegetation of the lower Yorke Peninsula is predominantly heath and shrublands on the coast and cliff tops merging inland with extensive mallee woodlands, salinas and grasslands. Vegetation communities are shown on [Map 2](#).

Innes NP comprises part of the largest area of remnant native vegetation on the Yorke Peninsula and features varied landscapes including coastal cliffs, rocky headlands, wave cut platforms and sandy beaches.

The terrain of the lower Yorke Peninsula does not generally restrict bushfire suppression operations. Vegetation associations and aspect are more likely to influence suppression strategies. However, the coastal reserves are characterised by large dune systems restricting access for firefighting. Terrain is presented on [Map 1](#).

### 3.1.4 Climate and Fire Weather

The lower Yorke Peninsula experiences a Mediterranean climate of mild, wet winters and hot, dry summers. The area is exposed to the climate modifying effects of the Southern Ocean and experiences the full force of winter storms, but benefits from cool breezes in summer. At Stenhouse Bay, climate data shows that in the summer winds are predominantly south-easterly in the morning tending to south-westerly in the afternoon with infrequent strong, hot, north/northwest winds. At Warooka, south-easterly winds dominate (BOM, 2009). The lower Yorke Peninsula may also experience thunderstorms during summer. The average maximum temperature in summer varies due to coastal influences from 24°C at Stenhouse Bay to 27°C at Warooka (BOM, 2009).

The planning area receives an average rainfall of around 450 mm per year (BOM, 2009). This mostly falls in winter, with the highest monthly average occurring in July at Warooka (65 mm) and June at Stenhouse Bay (69 mm) (BOM, 2009).

### 3.2 Extreme Fire Conditions

Strong winds, combined with high temperatures and low humidity increases the likelihood of extreme fire intensity and behaviour. Under these conditions, suppression activities are unlikely to be effective in areas supporting Very High and above overall fuel hazard levels (DEH, 2006b) and suppression activities will be confined to the protection of life and property. There is a dramatic increase in the likelihood of major bushfire events when the following conditions are experienced:

- Lightning strikes as a result of thunderstorm activity, which generally occurs in November and February through to March.
- Very High to Extreme overall fuel hazard levels in native vegetation.
- Low humidity, decreased soil and fuel moisture, particularly during drought years.
- Strong winds shifting direction during the course of a fire, typically northerly to south-westerly.

### 3.3 Fire History

#### 3.3.1 Mapping Fire Occurrences

[Map 3](#) (Fire History) has been compiled from the latest DEH fire incident reports. The quality of the fire history mapping varies, depending on the method of capture. It is important to note that only visible burn areas over 0.5 ha in size have been mapped and that mapping is limited to fires that have occurred on DEH managed land or fires where DEH was in attendance. Consequently, the mapped fires should be regarded as a minimum estimate of fire occurrences.

The Fire History Map ([Map 3](#)) shows a large proportion of the landscape was subject to a number of fires in the 1950s. Within reserves there is limited recorded fire history. The most recent mapped fires occurred in 2007 near Warooka and Foul Bay.

#### 3.3.2 Bushfires

Detailed records of recent fire incidents that have occurred within DEH reserves are stored within the Department's fire reporting database. This database, along with spatial records and other historical data was reviewed during the development of this fire management plan.

Since 1956 a total of 40 recorded bushfire incidents have occurred within or in close proximity to reserves in the planning area. Some of the larger incidents include the following bushfires.

- A 595 ha fire southwest of Foul Bay in 2007.
- A fire that threatened Point Davenport CP in 2007.
- A 50 ha fire that threatened Innes NP in 2002.
- A 30 ha fire that burnt Innes NP in 1989.
- A 40 ha fire near Innes NP in 1985.
- A 561 ha fire southwest of Warrenben CP in 1977.

- A 942 ha fire south of Warrenben CP in 1967.
- A series of fires in 1958 near Carribie CP, Point Davenport CP and Warrenben CP that burnt a total of 6 065 ha.
- A series of fires in 1956 near Carribie CP and Warrenben CP that burnt 7 529 ha.

The cause of fire incidents has been recorded by DEH since 1976 and is summarised in Table 2. The data indicates that in the planning area there has been a significant bias toward human-caused ignitions rather than ignition by lightning, with campfire escapes attributed to 23% of ignitions.

**TABLE 2 – FIRE CAUSE OF INCIDENTS SINCE 1976**

Fire Cause	No.	%
Lightning	2	7
Burn-off escape	5	17
Machinery	3	10
Campfire escape	7	23
Suspected arson	5	17
Other	6	20
Not recorded	2	7

### 3.4 Prescribed Burning

On the lower Yorke Peninsula, DEH has implemented prescribed burning within Innes NP. Three burns have been undertaken within the reserve since 2006, the most recent being completed for asset protection along Stenhouse Bay Road in an attempt to reduce the likelihood of fire exiting the reserve and threatening the township of Marion Bay.

As part of the planning process, areas have been identified for prescribed burning across the planning area ([Map 4](#)). 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 or other factors that may have occurred since time of writing. Each burn area identified on [Map 4](#) may not be burnt in its entirety at one point in time, as the area may be divided and burnt over a number of seasons or the burn itself may be patchy. Proposed burns are subject to the planning process described in Section 5.3.4.

### 3.5 Vegetation Communities

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 Major Vegetation Sub-group (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 in vegetation (Section 4.3.2).

There are eight MVS within the planning area that have been mapped by DEH. [Map 2](#) shows the distribution of MVS in the planning area. Table 3 (below) lists the dominant species layers for each MVS.

**TABLE 3 – DOMINANT SPECIES LAYERS FOR MAJOR VEGETATION SUB-GROUPS**

MVS No.	MVS Name	Dominant Species Layers
15	Melaleuca open forests and woodlands	<i>Melaleuca halmaturorum</i> , <i>M. lanceolata</i> , <i>Sarcocornia quinqueflora</i> , <i>Lycium ferocissimum</i> , <i>Austrostipa</i> spp., <i>Moraea setifolia</i> , <i>Templetonia retusa</i> , <i>Acacia nematophylla</i> , <i>Carpobrotus rossii</i> , <i>Allocasuarina verticillata</i> , <i>Lasiopetalum discolor</i> , <i>Rhagodia candolleana</i> ssp. <i>candolleana</i>
22	Arid and semi-arid Acacia low open woodlands and shrublands with chenopods	<i>Acacia pycnantha</i> , <i>Austrostipa eremophila</i>
26	Casuarina and Allocasuarina forests and woodlands	<i>Allocasuarina verticillata</i> , <i>Exocarpos aphyllus</i> , <i>Bursaria spinosa</i> , <i>Beyeria lechenaultii</i> , <i>Acrotriche patula</i> , <i>Lepidosperma congestum</i>
29	Mallee heath and shrublands	<i>Eucalyptus diversifolia</i> ssp. <i>diversifolia</i> , <i>E. incrassata</i> , <i>E. porosa</i> , <i>E. rugosa</i> , <i>Melaleuca lanceolata</i> , <i>M. uncinata</i> , <i>Acrotriche patula</i> , <i>Correa pulchella</i> , <i>Gahnia lanigera</i> , <i>Beyeria lechenaultii</i> , <i>Pimelea serpyllifolia</i> ssp. <i>serpyllifolia</i> , <i>Lasiopetalum discolor</i> , <i>Baeckea crassifolia</i> , <i>Templetonia retusa</i> ,
32	Other shrublands	<i>Olearia axillaris</i> , <i>Threlkeldia diffusa</i> , <i>Muehlenbeckia adpressa</i> , <i>Isolepis nodosa</i> , <i>Senecio pinnatifolius</i> , <i>Beyeria lechenaultii</i> , <i>Eucalyptus porosa</i> , <i>Alyxia buxifolia</i> , <i>Rhagodia candolleana</i> ssp. <i>candolleana</i> , <i>Helichrysum leucopsidium</i> , <i>Callitris canescens</i> , <i>Gahnia lanigera</i> , <i>Templetonia retusa</i> , <i>Leucophyta brownii</i> , <i>Samolus repens</i>
38	Wet tussock grassland, herbland, sedgeland or rushland	<i>Gahnia lanigera</i> , <i>Linum strictum</i> ssp. <i>strictum</i>
39	Mixed chenopod, samphire or forblands	<i>Parapholis incurva</i> , <i>Tecticornia halocnemoides</i> , <i>Samolus repens</i>
49	Melaleuca shrublands and open shrublands	<i>Melaleuca lanceolata</i> , <i>M. uncinata</i> , <i>Exocarpos aphyllus</i> , <i>Acrotriche patula</i> , <i>Nitraria billardiarei</i> , <i>Atriplex paludosa</i> ssp. <i>cordata</i> , <i>Tetragonia implexicoma</i>

### 3.6 Values and Assets

#### 3.6.1 Visitors, Lessees and Park Residents

Innes NP receives up to 140 000 visitors annually and due to its popularity during the fire danger season, it can be expected that if a bushfire occurs a large number of people will be present in the reserve. Recreational activities within Innes NP include camping, fishing, surfing, bushwalking, picnicking, nature observation, sailing and diving. Vehicle access is permitted and all public tracks are maintained to be traversable by conventional vehicles. In order to reduce the likelihood of accidental ignitions within the reserve, campfires are prohibited during the fire danger season.

Compared to Innes NP, only a low number of people visit the other reserves included in this plan. Within these other reserves, campfires are prohibited at all times of the year.

Facilities and built assets across the planning area are listed in Section 3.6.2. Management of visitors, residents and lessees during a bushfire is discussed in Section 6.3.

Both Leven Beach CP and Thidna CP have District Council of Yorke Peninsula owned 'bush' campgrounds immediately adjacent. These are:

- Burners Beach Campground on the eastern boundary of Leven Beach CP
- Gleesons Landing Campground on the southern boundary of Thidna CP
- Swincers Rocks Campground on the northern boundary of Thidna CP.

These campgrounds are accessible by conventional vehicles and campers are required to obtain a camping permit from the council. It should be noted campfires are permitted at these locations throughout the year, except on days declared a Total Fire Ban by the CFS.

## Management Strategies

### Visitors, Lessees and Park Residents

1. Implement appropriate fuel management strategies as shown on [Map 4](#) and detailed in Appendix 1 to increase the safety of visitors, lessees and park residents.
2. Strategies for the management of visitors, lessees and park residents during a bushfire should be considered and incorporated into emergency management procedures.
3. Educate residents and lessees about preparedness and encourage them to prepare their own Bushfire Survival Plan as per CFS guidelines.
4. Annually review information provided to visitors regarding their safety and response to emergency situations via brochures, signs and the DEH website.
5. Consider reserve closures on days of significant fire weather to ensure visitor safety (at the discretion of the Director, National Parks and Wildlife).
6. Continue annual inspections to ensure lessees comply with fire safety standards and meet contractual obligations.
7. Review campgrounds within Innes NP that allow campfires and the location of designated campfire sites to minimise the likelihood of accidental ignitions.
8. Liaise with the District Council of Yorke Peninsula regarding fire management and the use of campfires within council managed campgrounds adjoining DEH managed land.

### 3.6.2 Built Assets

There are a number of built assets at risk from bushfires within the planning area:

- One shack at Point Davenport CP.
- Various assets at Innes NP, including:
  - 22 shacks
  - Visitor Information Centre and DEH Office

- five buildings for DEH staff and volunteers
- Rhinos Tavern, General Store and DEH workshop compound at Stenhouse Bay
- seven short-term holiday rental properties, plus two properties pending potential restoration
- two long-term rental properties at Inneston
- infrastructure associated with seven campgrounds at Innes NP (Cable Bay, Shell Beach, Gym Beach, Pondalowie, Casuarina, Stenhouse Bay and Browns Beach)
- infrastructure at day visitor areas such as Ethel's Wreck, Stenhouse Bay and West Cape
- lighthouses
- telecommunications tower.

There are also a number of adjacent assets that could potentially be threatened by a bushfire burning out of DEH managed land:

- Marion Bay township including residential dwellings, commercial properties and community and recreational facilities to the east of Innes NP
- Couch's Beach and The Pines townships to the west of Leven Beach CP
- Sultana Point township to the north of unalienated Crown land (Sultana Block)
- District Council of Yorke Peninsula owned campgrounds and associated infrastructure to the north and south of Thidna CP and to the east of Leven Beach CP
- rural residential dwellings and associated assets surrounding most of the reserves
- cropping and grazing land and associated infrastructure surrounding all of the reserves.

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 the reserves and the corresponding fire management strategies. Map 1 shows the location of assets within the planning area.

<b>Management Strategies</b>	
<b>Built Assets</b>	9. Implement fuel management strategies appropriate to asset protection as shown on <a href="#">Map 4</a> and detailed in Appendix 1.
<b>Built Assets</b>	10. Encourage adjacent property owners to work with CFS to implement appropriate and coordinated fire management works on their own land to minimise the threat of fire.
<b>Built Assets</b>	11. Undertake fire management works and activities on DEH managed land to minimise the impact that fire may pose to adjacent assets.

### 3.6.3 Cultural Heritage

Information on Aboriginal and European heritage is collected during prescribed burn planning as part of the Environmental Assessment Table (EAT) (refer to Section 5.3.4) (DEH, 2004e). Any fire operations must be in accordance with the *Fire Policy and Procedure for the Protection of Cultural Heritage* (DEH, 2009w).

#### Aboriginal Heritage

The land comprising the lower Yorke Peninsula forms part of the 'Country' of the Narungga people as described by Tindale (1974). The Narungga people occupied approximately 650 000 ha of the peninsula, extending north to Port Broughton, east to the Hummock Range and as far south as Stenhouse Bay and inclusive (Tindale, 1974). The Narungga nation was made up of four clans, the Kurnara in the north of the peninsula, Windera in the east, Wari in the west and Dilpa in the south. The Narungga were known to use fire to burn grassland and promote regeneration (SATC, 2009). The Narungga continue to have a strong cultural and physical connection the region.

Aboriginal heritage sites have been recorded throughout the lower Yorke Peninsula. Innes NP contains significant sites and other sites related to Narungga and Ngarna creation dreaming (DEH, 2004c). Twenty-one sites have been listed on the Central Archive for Innes NP, which includes the Register of Aboriginal Sites and Objects (the Register). These sites are described as archaeological and burial sites. No other sites are listed for any of the other reserves, however it should be noted that the Register is not a comprehensive record of all Aboriginal sites and objects in South Australia, therefore sites or objects may exist in the planning area, even though the Register does not identify them. When implementing this plan, DEH will comply with the *Aboriginal Heritage Handbook and Strategy* (DEH, 2006f), to facilitate the protection of sites during bushfire suppression and prescribed burns.

#### European Heritage

The salt lakes in the Edithburgh/Yorketown district became South Australia's primary salt production area in the late 1800s, before evaporation pans were established at Port Price, near the head of Gulf St Vincent. At the southern end of the peninsula, areas around Lake Fowler and Stenhouse Bay were once important sources of gypsum. Mining of gypsum commenced at Marion Bay in 1889 and by the early 1900s a community of approximately 150 people were settled at Inneston, which continued to grow and was proclaimed a town in 1927. The township of Inneston and a number of historic sites at Stenhouse Bay are listed on the State Heritage Register.

None of the other reserves are known to preserve any items associated with European settlement, however Ramsay CP has a small house ruin and memorial plaque. The *Mainland Conservation Parks of the Yorke Peninsula Management Plan* (DEH, 2009g) suggests that a heritage survey may uncover items of interest. If any items are revealed during this process DEH will consider the risks and determine if fuel management activities are required.

## Management Strategies

### Cultural Heritage

12. Implement fuel management strategies appropriate for the protection of cultural assets as shown on [Map 4](#) and detailed in Appendix 1.
13. 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.
14. Ensure suppression strategies take into account significant cultural assets in order to minimise impacts from these activities and undertake post-fire rehabilitation.

#### 3.6.4 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 the Mid North and Yorke Peninsula, 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 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 or Vulnerable) under the federal EPBC Act
- South Australian rated, that is, listed as Threatened (with a rating of Endangered, Vulnerable or Rare) under the NPW Act, Revised Schedules 7, 8 and 9
- regionally rated, that is, listed as Threatened (with a rating of Critically Endangered, Endangered, Vulnerable, Rare, Near Threatened or Least Concern) by Gillam and Urban (2008) within the *Northern and Yorke Regional Species Conservation Assessments* report
- 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 of national conservation significance within the planning area. This includes one Extinct, one Critically Endangered, five Endangered and 12 Vulnerable species (see Appendix 2 and 3 for detail). In addition to the information provided within the appendices, species response and ecological information for selected significant flora, fauna and ecological communities have been detailed in the following section. This includes the **Malleefowl**, **Western Whipbird** (eastern), **Mainland Tammar Wallaby**, **Western Pygmy Possum**, **Osborn's Eyebright**, five nationally **threatened orchid species** and two provisionally listed **threatened ecological communities**.

Appendix 2, 3 and 4 list flora, fauna and ecological communities of conservation significance, as well as species and communities that are considered important in terms of fire management. Note that this is not intended to be an exhaustive list as it does not consider species and communities that are regionally significant, but attempts to summarise

the current level of fire response knowledge for many state and nationally rated species and communities.

DEH is committed to increasing its capacity to incorporate species' requirements into improved ecological fire management. The actions in this plan relate specifically to fire management actions on DEH managed land; nevertheless DEH will work with the community on landscape scale biodiversity conservation.

**Malleefowl**

Malleefowl are listed as Vulnerable under both the federal EPBC Act and the state NPW Act and Critically Endangered in the Northern and Yorke region. The species has undergone significant decline across its range, which extends through the southern semi-arid region of NSW, Victoria, South Australia and Western Australia. On the lower Yorke Peninsula, Malleefowl are currently found within and around Innes NP and Warrenben CP, predominantly in areas of mallee heath and shrubland vegetation (MVS No. 15, 21, 29, 32, 39).

Key habitat requirements for Malleefowl include sufficient leaf litter for nest construction and maintenance and the presence of shrub species for food. The species construct distinctive mound nests using sand and leaf litter and spend up to 11 months of the year in the vicinity of the nest, creating and maintaining the structure. The effect of fire on Malleefowl is severe and breeding in burnt areas is usually reduced for at least 30 years (Benshemesh, 2000). Fire influences key habitat requirements and thus effectively restricts the species distribution and abundance. Burnt areas also increase opportunities for predators, such as Foxes (*Vulpes vulpes*), to seek out Malleefowl and their nests and therefore predator control should be considered following fire within Malleefowl habitat.

A national Recovery Plan has been developed for Malleefowl (Benshemesh, 2000), which identifies large fires and increasing fire frequency as factors contributing to the decline of the species. The effect of fire on Malleefowl populations is mitigated by promoting patchy burns within the landscape.

Management Strategies	
Malleefowl	15. Utilise prescribed burning to create patchiness in Malleefowl habitat if required and monitor the response of Malleefowl populations.
	16. Consult the Malleefowl Recovery Team when planning burns in known habitat of the Malleefowl.
	17. Consider requirements for predator control to be carried out immediately following bushfires and prescribed burns
	18. Develop an Ecological Fire Management Strategy for the Malleefowl.

**Western Whipbird (eastern)**

The Western Whipbird (eastern) is listed as Vulnerable under both the federal EPBC Act and the state NPW Act and Endangered in the Northern and Yorke region. The species occurs in three isolated regional populations in South Australia and one in north western Victoria although, in South Australia, the species has not been recorded in Ngarkat CP since 2004.

Based on recent records, the Yorke Peninsula (Innes NP) population probably consists of 250 or more birds (DEH, 2006a; Garnett and Crowley, 2000). A national recovery plan has been developed for threatened mallee birds, including the eastern subspecies of the Western Whipbird (Baker-Gabb, 2007).

The Western Whipbird (eastern) usually occurs in habitats that have an open layer of mallee (about 3 to 5 m tall) and an understorey of dense shrubs (about 1.5 to 2 m tall) (Woinarski, *et al.*, 1988). On the lower Yorke Peninsula, the species is predominantly found within Innes NP and Warrenben CP (MVS No. 29, 32, 49, 21). The decline of the Western Whipbird (eastern) has primarily been attributed to the broad-scale clearance of suitable habitat, causing populations to become isolated and at risk of predation from Cats (*Felis catus*) and Foxes.

Habitat fragmentation has reduced the potential for Western Whipbird (eastern) populations to disperse through the landscape. The species recolonisation potential is limited by fires due to the reduced availability of unburnt refuges adjacent to burnt areas in a fragmented landscape.

Small remaining populations are therefore highly vulnerable to bushfire. The species do however rely on periodic fires to regenerate their habitat, keeping the shrub layer suitably dense (DEH, 2006a). The Western Whipbird (eastern) has been recorded in habitats that were last burnt less than two years earlier, and in habitats that were last burnt forty or more years ago, but most habitats that are occupied have a post-fire age of 10 to 25 years (DEH, 2005a; Higgins and Peter, 2002; Woinarski, *et al.*, 1988).

## Management Strategies

<b>Western Whipbird (eastern)</b>	19. Utilise prescribed burning to create patchiness in Western Whipbird (eastern) habitat if required and monitor the response of Western Whipbird (eastern) populations.
	20. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of the Western Whipbird (eastern).
	21. Consider requirements for predator control to be carried out immediately following bushfires and prescribed burns.
	22. Develop an Ecological Fire Management Strategy for the Western Whipbird (eastern).

### Mainland Tammar Wallaby

The South Australian sub-species of the Mainland Tammar Wallaby is listed as Extinct in the Wild under the federal EPBC Act, Endangered under the state NPW Act and regionally Critically Endangered. Although limited historical data exist on the decline of the Mainland Tammar Wallaby sub-species, extensive habitat clearance for agricultural production and predation by Foxes are considered to be the prime causes of extinction over its former range (DEH, 2004b). It has also been identified that fire may have been a contributing factor to the decline of the species (DEH, 2004b). The discovery of an introduced population of the mainland subspecies on an island off New Zealand led to the development of a re-introduction program within Innes NP.

Mainland Tammar Wallabies typically inhabit coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland (Smith and Hinds, 1995) (current range with MVS No. 15, 21, 29, 32). They require dense low vegetation for daytime shelter and more open grassy areas for feeding. Recent studies at Innes NP have shown that wallabies prefer to rest under the cover of *Melaleuca* spp. during the daytime. The loss of suitable habitat due to inappropriate fire regimes may expose them to predators, such as Foxes and therefore requirements for predator control may need to be considered following a bushfire or prescribed burn within Innes NP.

Studies in Western Australia have shown that fire may play an important role in Tammar Wallaby ecology by producing optimal habitat conditions. With an absence of natural fires, Tammar Wallabies in Perup Forest (Western Australia) are dependent on prescribed burns to regenerate tea-tree (*Melaleuca*) thickets that they inhabit (CALM, 2004). It has been identified within the *Mainland Tammar Wallaby Translocation Proposal* (DEH, 2004b) that the requirement for prescribed burns in Innes NP may need to be considered in the future to regenerate mallee and grassland habitat. In addition, the proposal also supports the use of prescribed fire for the construction of fire breaks and fuel modification to reduce the risk of large fire events impacting on the Mainland Tammar Wallaby in Innes NP.

## Management Strategies

### Mainland Tammar Wallaby

23. Monitor the effect of various fire regimes to promote suitable grassland habitat for Mainland Tammar Wallaby populations.
24. Consult the Mainland Tammar Wallaby Recovery Team when planning burns in known habitat of the Mainland Tammar Wallaby.
25. Develop an Ecological Fire Management Strategy for grasslands on the lower Yorke Peninsula and include habitat for Mainland Tammar Wallaby populations.
26. Consider the requirements for predator control immediately following bushfires and prescribed burns.
27. Avoid burning areas of *Melaleuca* spp. used as daytime resting sites by Mainland Tammar Wallabies

### Western Pygmy Possum

The Western Pygmy Possum is considered to be Endangered in the Northern and Yorke Region and is listed as Common but Limited in South Australia. The species has been recorded at Innes NP, Warrenben CP and Thidna CP. The Innes NP population is considered ecologically significant because it is the only small native terrestrial mammal remaining in the area (Pestell, 2005).

The Western Pygmy Possum inhabits mallee and *Melaleuca* forest (MVS No. 15, 29, 32, 49) in areas of high temperature and low rainfall. It is a nocturnal feeder eating mostly nectar and pollen and to a lesser extent small invertebrates (Dr. S Petit, 2009a pers. comm.). Within Innes NP possums are known prefer nectar from Coastal White Mallee (*Eucalyptus rugosa*) when it is available and for this reason, areas of Coastal White Mallee forest in the reserve are considered to be significant for the survival of this species (Dr. S Petit, 2009a pers. comm.).

Scat and fur swab analyses showed that possums within the reserve consume mostly *Eucalyptus* pollen followed by *Melaleuca* pollen and to a lesser extent moths (Pestell and Petit, 2007).

By day Western Pygmy Possums shelter in leaf-lined tree hollows and old birds' nests. On the lower Yorke Peninsula a large proportion of Western Pygmy Possums nest in leaf litter on the ground and therefore are at risk of mortality if a fire occurs within nesting areas (Dr. S Petit, 2009b pers. comm.). The species is dependent on thick ground cover which provides protection and possible escape routes from predators such as Foxes.

Within Innes NP, *Melaleuca* forests (MVS No. 15) have been identified as significant habitat for the Western Pygmy Possum. Prescribed burns in C-zones should avoid *Melaleuca* forests and where this is not possible, must be consistent with ecological fire management guidelines, ensuring that at least 50% of Western Pygmy Possum habitat at any occupied site is greater than 60 years post-fire (Table 6). Burning in areas of Coastal White Mallee should aim to meet ecological fire management guidelines and should be avoided when this species is in flower (summer).

There is no recovery plan for this species in South Australia, however in New South Wales, where it is listed as Endangered, a plan has been developed. The plan recognises that the effects of various fire regimes on Western Pygmy Possums are unknown, however suggests that frequent burning can remove mallee, or limit the extent of old mallee, and is likely to eliminate some shrub species that provide food (NSW NPWS, 2001). The plan suggests the alteration of prescribed burning regimes to ensure succession, maturation, maintenance and identification of known or potential habitat.

## Management Strategies

Western Pygmy Possum	28. Avoid burning <i>Melaleuca</i> forest (MVS No. 15) in C-zones and where this is not possible, manage within ecological fire management guidelines for MVS No. 15, ensuring that at least 50% of occupied Western Pygmy Possum habitat is greater than 60 years post-fire (Table 6).
	29. Avoid burning areas of Coastal White Mallee forest when in flower and manage these areas to ecological fire management guidelines for MVS No. 15
	30. Monitor the response of Western Pygmy Possum populations and preferred habitat, particularly <i>Melaleuca</i> and Coastal White Mallee forests, to various fire regimes.
	31. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of the Western Pygmy Possum.
	32. Use prescribed burning to reduce the likelihood of bushfire burning large remnants of preferred Western Pygmy Possum habitat in their entirety.

### Osborn's Eyebright

Osborn's Eyebright is listed as Endangered under the federal EPBC Act and Endangered in South Australia under the NPW Act. A draft Recovery Plan has been developed for the subspecies (Moritz and Bickerton, 2007b).

Osborn's Eyebright occurs within Innes NP and Ramsay CP on the lower Yorke Peninsula. Other *Euphrasia* species are known to prefer open habitats, characterised by patches of open ground, spaced low vegetation and moist soils (Potts, 1997a)

Research focused on the influence of fire on Osborn's Eyebright has not been undertaken to date. As described by Moritz and Bickerton (2007b), the subspecies may rely on fire (or other disturbance) to reduce competition and increase light exposure, promoting regeneration and recruitment. From observations of other *Euphrasia* species in Tasmania, fire is known to stimulate germination and expose seeds to sunlight (Potts, 1997b) and is considered the main disturbance involved in increasing population size (Potts, 1997a). Recent observations suggest that germination after fire only occurs close to parent plants and that smoke does not appear to break seed dormancy (Moritz and Bickerton, 2007b).

The seasonal timing of burning is thought to be important for the response of this subspecies however has not been investigated. The subspecies is also thought to be semi-parasitic, so the response to fire of its host is also important.

As the management of fire regimes is thought to be required to promote recovery, it is recommended that research programs investigating the fire ecology of the subspecies be established (Potts, 1999).

## Management Strategies

Osborn's Eyebright	33. Monitor Osborn's Eyebright populations to improve knowledge on the subspecies response to fire.
	34. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of Osborn's Eyebright.
	35. Consider weed management strategies and herbivore management following prescribed burns and bushfires.
	36. Consider potential impacts to the subspecies when undertaking track management activities in known habitat.

### Threatened Orchids

The Ghost Spider-orchid (*Caladenia intuta*) is listed as Critically Endangered under the federal EPBC Act and Endangered in SA. The Coast Spider-orchid (*C. conferta*), Large-club Spider-orchid (*C. macroclavia*) and Goldsack's Leek-orchid (*Prasophyllum goldsackii*) are listed as Endangered under both the EPBC Act and state NPW Act. The Winter Spider-orchid (*C. brumalis*) is listed as Vulnerable under both the federal EPBC Act and state NPW Act. Regional species conservation assessments recently carried out by DEH (Gillam and Urban, 2008) have determined the Coast Spider-orchid, Large-club Spider-orchid and Goldsack's Leek-orchid as Critically Endangered and the Ghost and Winter Spider-orchids as Endangered in the Northern and Yorke Region. All of these species occur within the planning area, however not all have been recorded within DEH reserves (see Appendix 2 for specific information).

Orchid seed is short-lived and the soil seed bank is generally only viable for about 12 months, which means that if a fire occurs during the fruiting period, the seed bank will be depleted and no recruitment will occur until plants produce seed again the next year

(Brown, 2006; Flaherty, *et al.*, 2007). There is reliable data showing somewhat frequent summer fire does not negatively influence the abundance of many geophytic species (Brown, 2006; Flaherty, *et al.*, 2007). Many *Caladenia* species have been observed to flower profusely following summer fires and a number of *Prasophyllum* species tend to exhibit a similar response (Jones, 2006). Information on the fire response of threatened orchids in the planning area is included in Appendix 2.

As described by Brown (2006) and Flaherty *et al.* (2007) fire may be detrimental to geophytes during late autumn and winter (active growth) and during spring (flowering). Some orchid populations may require 10 or more years to recover if the entire population is subject to fire at these times. Specific flowering times for threatened orchids occurring in the planning area have been included in Appendix 2. If it is necessary to apply fire during winter to early spring, the burn should be suitably patchy so mycorrhizal fungi, essential for orchid seed germination and survival, are not impacted during their active growing phase (Brown, 2006; Flaherty, *et al.*, 2007). In summary, it is accepted that prescribed burns in significant orchid habitat should be planned to occur in early autumn, before the shoot cohort emerges (Brown, 2006; Flaherty, *et al.*, 2007), as prescribed burning during summer is not usually feasible due to a number of factors.

A Recovery Plan has been developed for twelve threatened orchid species in the 'Lofty Block' of South Australia (Quarmby, 2006), which incorporates the lower Yorke Peninsula. The Ghost and Large-club Spider-orchid are included in the plan which recognises that the implementation of the recovery strategies and actions for included species has potential benefits for other threatened species. No recovery plans exist for the other species described above.

## Management Strategies

### Threatened Orchids

37. Monitor the response of the threatened orchid populations to fire.
38. Consult the Northern Lofty Block Threatened Orchid Recovery Team when planning burns in known habitat of threatened orchids.
39. Avoid prescribed burning or slashing threatened orchid habitat during their active growth period or when flowering.
40. Consider weed management strategies and herbivore management following prescribed burns and bushfires.
41. Develop an Ecological Fire Management Strategy for threatened orchids.

### Threatened Ecological Communities

#### Thatching Grass (*Gahnia filum*) sedgelands in drainage lines and depressions

Thatching Grass sedgelands in drainage lines and depressions are considered regionally significant and are provisionally listed as Vulnerable in South Australia (DEH, 2005c). The community occurs throughout coastal fresh and brackish swamps, often in association with Swamp Paperbark (*Melaleuca halmaturorum*) and in sandier areas it occurs in association with Coastal White Mallee (*Eucalyptus diversifolia*) (DEH, 2008b). The community has not been mapped, however on the lower Yorke Peninsula it is known to occur within parts of MVS No. 38 in Carribe CP and it is also known from Leven Beach CP. Thatching Grass is an

essential host species for the pupae of the nationally threatened Yellow Sedge-Skipper Butterfly (*Hesperilla flavescens*) (see Appendix 3)

This ecological community has historically suffered severe degradation due to drainage, increased salinity and grazing, with little evidence of regeneration. Repeated burning over time would most likely adversely impact Thatching Grass sedgeland communities (DEH, 2008b).

Drooping Sheoak (*Allocasuarina verticillata*) grassy low woodland on clay loams of low hills

Drooping Sheoak grassy low woodlands on clay loams of low hills are provisionally listed as Vulnerable in South Australia (DEH, 2005c). The community prefers well-drained soils, such as rocky coastal areas, basalt plains and hills on dry rocky highlands and ridges on calcrete rises. Formally extensive throughout the southern part of the State, much has been lost to land clearance for agriculture, grazing, invasion by pest species and altered fire regimes. The community has not been mapped. On the lower Yorke Peninsula it occurs within parts of MVS No. 26 which is found in Innes NP, Leven Beach CP, Ramsay CP and Warrenben CP.

A Recovery Plan has not been developed for the community on Yorke Peninsula, although a report has been prepared to guide the restoration of Drooping Sheoak grassy woodland communities on the Eyre Peninsula (Peeters, *et al.*, 2006). On Eyre Peninsula it has been observed that Drooping Sheoaks have regenerated after fire via basal resprouting, although subsequent grazing by herbivores may repeatedly remove new shoots and eventually kill the tree. Severely burnt Drooping Sheoak trees do not resprout, although regeneration via seed can occur if seeds survive the fire (Peeters, *et al.*, 2006).

## Management Strategies

### Threatened Ecological Communities

42. Monitor the response of Thatching Grass to fire, particularly to determine suitable fire regimes for preferred habitat of the Yellow Sedge-Skipper Butterfly.
43. Monitor the response of Drooping Sheoaks occurring within the Drooping Sheoak grassy low woodland on clay loams of low hills community to fire.
44. Consult the Northern and Yorke Conservation Programs Unit when planning burns within threatened ecological communities.
45. Avoid burning large contiguous remnants of ecological communities in their entirety during a single fire event. Use prescribed burning to promote patchiness within remnants.
46. Consider herbivore management following fire within Drooping Sheoak grassy low woodland on clay loams of low hills communities.

## 3.7 Pest Species

### 3.7.1 Fauna

The conditions that result following a fire can be favourable to some fauna, but for other species these conditions may result in population decline. There is evidence that pest fauna and native species can flourish in the conditions existing after a fire. The degree of impact by pest fauna and also native species post-fire depends on a number of factors, including the pre-fire abundance of the species and characteristics of the fire (e.g. fire size, shape, season, intensity and location). Herbivores, such as Kangaroos (*Macropus* spp.) can

benefit from the post-fire regeneration, finding suitable food within the recently burnt area (Gill and Catling, 2002; Murphy and Bowman, 2007). In Innes NP it is thought that the Emu (*Dromaius novaehollandiae*) may also benefit from regeneration in burnt areas and have a role in seed dispersal post-fire.

Within the planning area, a number of pest fauna have been recorded. These include the Fox, Cat, Brown Hare (*Lepus capensis*), House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*), Common Starling (*Sturnus vulgaris*), European Rabbit (*Oryctolagus cuniculus*), European Goldfinch (*Carduelis carduelis*), Feral Pigeon (*Columba livia*), Ticks (*Amblyomma triguttatum triguttatum*) and Honey Bees (*Apis mellifera*).

It is important to note that the information collected on pest fauna pre-fire is used to determine appropriate management post-fire. There is the opportunity to increase the rate of eradication programs for pest fauna after fire, to take advantage of the reduced vegetation cover and/or possible concentration of fauna in a smaller area. Prescribed burning provides opportunities to examine 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, 2004e). Section 5.3.4 provides more information on burn preparation.

### 3.7.2 Flora

Weeds can have significant impacts on native vegetation and ecological communities within remnant vegetation (Saunders, et al., 1991). Disturbance (e.g. 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). Weeds may alter fuel distributions and lead to more frequent or more intense fires (Hobbs, 2002). Some of the most significant weed species within the planning area include Bridal Creeper (*Asparagus asparagoides*), Bridal Veil (*Asparagus declinatus*), African Boxthorn (*Lycium ferocissimum*), Boneseed (*Chrysanthemoides monilifera*), False Caper (*Euphorbia terracina*), Horehound (*Marrubium vulgare*), One-leaf Cape Tulip (*Moraea flaccida*), Myrtle-leaf Milkwort (*Polygala myrtifolia*), Perennial Veldt Grass (*Ehrharta calycina*) and Salvation Jane (*Echium plantagineum*). Fire management guidelines for these species and other weeds of concern are included in Appendix 2.

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, 2004e). 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.

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

### 3.7.3 Plant Pathogens

The EPBC Act identifies 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 and the fungus can spread through mud carried on vehicle tyres, walking boots and equipment. Phytophthora has not been identified on the lower Yorke Peninsula and its potential to become established is low (DEH, 2004d).

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

47. Refer to Ecological Fire Management Guidelines (Table 3) and fire management guidelines for introduced flora species (Appendix 2) during prescribed burn planning.
48. Consider the use of fire as part of an integrated biodiversity management strategy.
49. Conduct post-fire weed control subject to Regional priorities and resource availability.
50. Identify the potential impact of weed species prior to any prescribed burn as part of the EAT. This will identify any priority weed species and recommend post-fire actions to mitigate the impact of weeds.
51. Collect relevant information in prescribed burn planning as part of the EAT on introduced fauna, to determine appropriate management post-fire.
52. Develop Ecological Fire Management Strategies for Horehound and Bridal Creeper.
53. Ensure hygiene practices are implemented to reduce the likelihood of infestation. Refer to the DEH Operating Procedure - Phytophthora Vehicle Disinfection Unit (DEH, 2003b).
54. If necessary, consider appropriate management programs post-fire to address issues with increased grazing pressure in consultation with Nature Conservation Programs staff.

## 4 RISK

### 4.1 Risk Assessment

A risk assessment was conducted in line with the *Policy and Procedure 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 DEH managed land in the planning area. The risk assessment considered visitor use, assets (built, cultural and natural values) and neighbouring properties for all DEH managed land in the planning area. Risk assessment is a function of likelihood and consequence.

- 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).

The *Policy and Procedure for Risk Assessment in DEH Fire Planning* provides more information on this process. 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

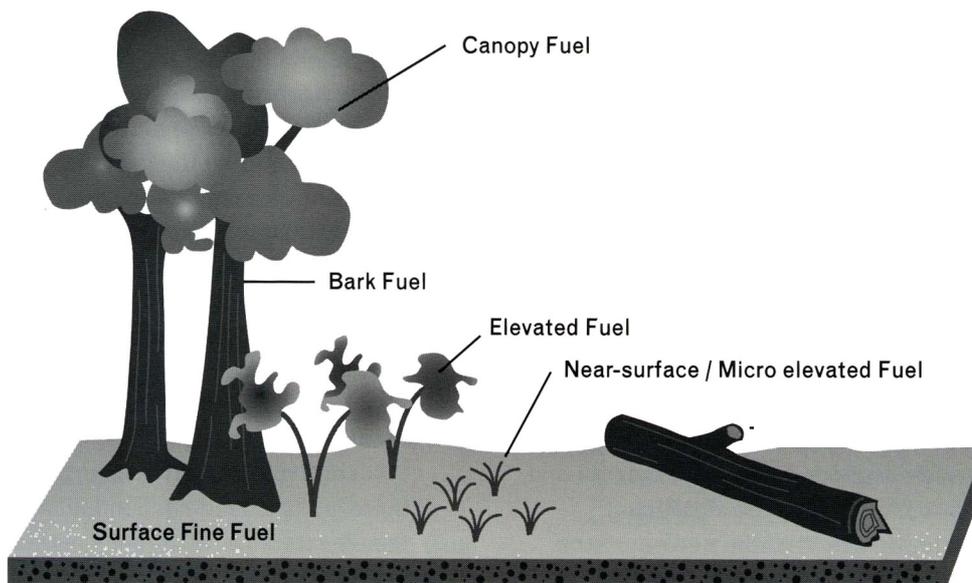
The likelihood of lightning strike ignition was assessed as *Possible* within the reserves as lightning has been attributed as fire cause in the past and has been seen to strike adjacent land.

The likelihood of human-caused ignitions was assessed as *Likely* due to the high visitor numbers during fire season and the adjoining land use. The likelihood of fire ignition is *Likely* in areas where campgrounds and shacks are located because fire history records show a high percentage of ignitions have resulted from campfire escapes occurring within Innes NP. However, campfires are not permitted on DEH reserves during the fire danger season. The likelihood of fires originating from the District Council of Yorke Peninsula operated campgrounds is increased as there is considerable opportunity for campfire escapes to occur because fires are permitted throughout the fire danger season except on days declared a Total Fire Ban by the CFS. Ignitions from agricultural activities such as harvesting and some burn-offs (from mid February through to April) on adjoining land is *Likely*.

### 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 – COMPONENTS OF FUEL IN VEGETATION**

(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, 2006b). Each layer, as well as the overall fuel hazard can be assessed as: Low, Moderate, High, Very High or Extreme (DEH, 2006b).

Within the planning area long unburnt mature mallee woodland is characterised by Extreme Elevated and Near Surface fuel hazard. Where the fuel loads are continuous a ground fire will most likely carry to the Elevated fuels under extreme conditions. *Melaleuca* very low open forest, particularly around lakes in Innes NP are characterised by Extreme Elevated fuel hazard. Both of these vegetation types exhibit long spotting distances under a wide range of conditions. Coastal vegetation communities are not traditionally considered fire prone although recent fires demonstrate that the vegetation will carry fire. Occurrences of mallee (MVS No. 29), *Melaleuca* (MVS No. 15, 49) and coastal vegetation (MVS No. 32) throughout the planning area are shown on Map2.

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, 2006b). DEH maintains a database containing fuel hazard assessment records. The process for recording and submitting fuel hazard data is explained in the *DEH 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 planning area in order to provide a guide for fire management (Table 4).

The process used to derive MVS is described in Section 3, dominant species layers for each MVS in Table 3 and the extent of each MVS within the planning area is shown on [Map 2](#).

The likely maximum overall fuel hazard is based on on-ground sampling and vegetation mapping within the planning area, adjusted to account for the time since last fire. It can be used for planning and incident management, however this estimate should be supported by on-ground inspection 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 4 – LIKELY MAXIMUM OVERALL FUEL HAZARD FOR MVS IN THE PLANNING AREA**

<b>MVS No.</b>	<b>MVS Name</b>	<b>Likely Maximum Overall Fuel Hazard</b>	<b>Significant Fuel Layers</b>
<b>15</b>	Melaleuca open forests and woodlands	Extreme	Elevated
<b>21</b>	Other <i>Acacia</i> tall open shrublands and shrublands	Very High	Elevated
<b>26</b>	<i>Casuarina</i> and <i>Allocasuarina</i> forests and woodlands	Very High	Near Surface, Elevated
<b>29</b>	Mallee heath and shrublands	Extreme	Near Surface, Elevated
<b>32</b>	Other shrublands	High	
<b>38</b>	Wet tussock grassland, herbland, sedgeland or rushland	Moderate	
<b>39</b>	Mixed chenopod, samphire or forblands	Low	
<b>49</b>	<i>Melaleuca</i> shrublands and open shrublands	Very High	

\* denotes introduced species

<sup>1</sup> 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, designed to improve their safety and welfare and fire suppression effectiveness. 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, 2009x). PPE shall also be consistent with the *DEH Occupational Health, Safety and Welfare Policy* (DEH, 2006d).

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, 2008c; 2009h) and the *Policy and Procedure for Earthmoving Equipment* (DEH, 2009j)).

All firefighting equipment is inspected prior to the commencement of the fire season and after use at fires to ensure that minimum requirements are met as prescribed in DEH policies and standards.

### 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 complete the Basic Firefighting Level 1 CFS course at a minimum.

All DEH personnel engaged in fire management operations are trained in accordance with the DEH *Policy and Procedure for Fire Training* (DEH, 2009n) 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, 2009s) for details).

DEH is committed to maintaining a safe working environment during fire operations in compliance with the *Occupational Safety, Health and Welfare Act 1986*, consistent with the *DEH Occupational Health, Safety and Welfare Policy* (DEH, 2006d) and the *Fire Policy and Procedure for Safety, Health and Welfare* (DEH, 2009t).

### 5.3 Risk Mitigation Strategies

#### 5.3.1 Fire Access Tracks

DEH is committed to managing a strategic network of fire access tracks in the reserve system, in accordance with the GAFLC standard (GAFLC, 2008) and the *Fire Policy and Procedure for Fire Access Tracks* (DEH, 2009u). Tracks occurring within the reserves, 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.

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. Pondalow Bay Road in Innes NP). On the lower Yorke Peninsula several reserves do not have an internal track network.

The likelihood of loss of life or injury to visitors in Innes NP was assessed as *Possible* due to the high number of visitors during the fire danger season and limited vehicle access in and out of the reserve. Access to Innes NP is restricted to Pondalow Bay Road; however it is possible for 4WD emergency service vehicles to access the reserve from Gym Beach Road through a private property to Browns Beach. Permission is required to access the private track.

Fire access points and tracks have been reviewed as part of this plan and proposed changes are summarised within Appendix 1. If track works are not recommended, they will be maintained to the GAFLC standards shown on [Map 4](#) (Fire Management and Access). In order to maintain tracks to GAFLC standards works will be implemented on an annual basis, subject to resources, fuel hazard and other factors. Design and location of new fire access tracks will take into consideration gentle slopes and low fuel hazard areas to provide for the safety of firefighters during fire management operations.

## Management Strategies

### Fire Access Tracks

55. Implement changes to fire access as described in Appendix 1.

56. Maintain tracks to the GAFLC standards as shown on [Map 4](#).

57. Implement signs on fire access tracks according to GAFLC standards (GAFLC, 2008).

58. Improve access and egress to minimise the likelihood of entrapment in Innes NP during a bushfire.

### 5.3.2 Fire Infrastructure

The following fire infrastructure is maintained for fire suppression activities within the lower Yorke Peninsula planning area:

- CFS approved airstrips at Yorketown and Minlaton.
- Stenhouse Bay helipad.
- Fire water in concrete tanks at Innes NP and Warrenben CP.
- Numerous standpipes, hydrants and static water supplies (tanks, dams, etc) across the planning area.

[Map 4](#), the Response Plan for the Northern and Yorke Region (DEH, 2009v) as well as the regional annual works schedule will provide more information on fire infrastructure.

### 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 all DEH managed land
- clarify the areas where different fire management activities will be undertaken on all DEH managed land
- ensure a standard approach to the application of fire management zones on DEH managed land across South Australia.

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 were determined, giving consideration to overall 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 DEH managed land within the planning area are described in Appendix 1 and shown on [Map 4](#).

The following general objectives apply for fire management zoning across DEH managed land in the planning area.

#### A-zone Objectives

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- 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

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- 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 rural areas or assets on DEH managed land.
- To provide a suppression advantage to assist in containing bushfires within defined areas, that is to minimise the likelihood of fires entering DEH managed land from the wider landscape or exiting DEH managed land.
- To enhance safe access for firefighters.

#### C-zone Objectives

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- To manage fire to meet the reserve management objectives as specified within the Reserve Management Plans listed in Section 2.3 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 promote habitat patchiness through variability in the fire regime.
- To manage fire regimes to ensure consistency with ecological fire management guidelines.
- To manage fire to retain existing tree hollows and promote the creation of new hollows
- To reduce the likelihood of fragmentation of native vegetation through fire management strategies.
- To reduce the likelihood of contiguous vegetation burning in a single fire event.

### **Prescriptions 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 within 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, 2004e) and the *Policy and Procedure for Prescribed Burning* (DEH, 2009y) for more information.

#### **5.3.4 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 Procedure for Prescribed Burning*. Ecological burns are also subject to the planning process as detailed in the *Fire Policy and Procedure for Ecological Burning* (DEH, 2009i).

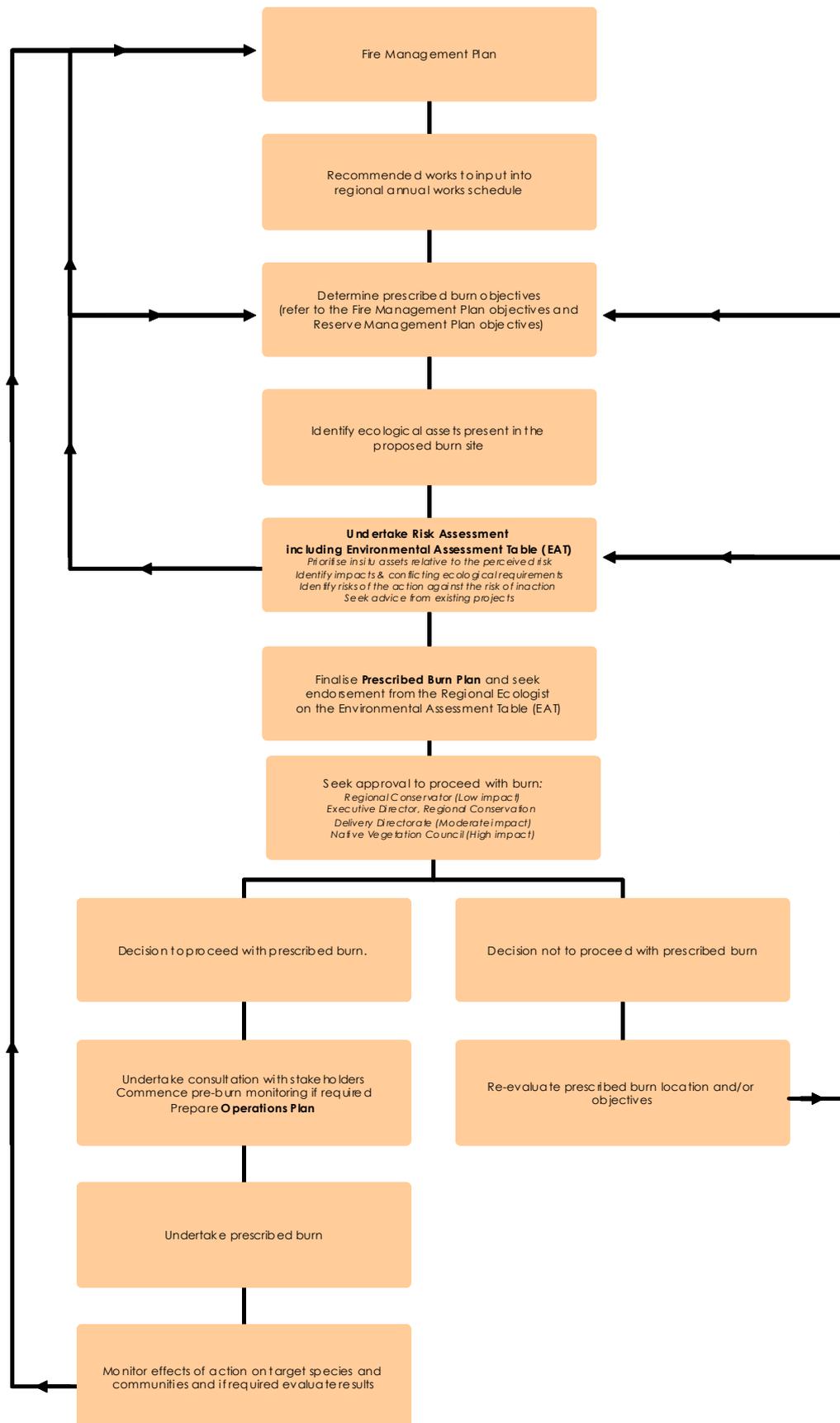


FIGURE 3 – FLOW CHART DETAILING THE BURN PLANNING PROCESS

### 5.3.5 Fire Management Blocks

The planning area has been divided into eleven fire management blocks to ensure that information and issues unique to a particular area have been addressed (Table 5). Block boundaries are based on access and the practicalities of implementing fire management objectives and do not coincide with reserve management boundaries. Refer to the Reserve Management Plans for gazetted reserve boundaries.

**TABLE 5 – FIRE MANAGEMENT BLOCK INFORMATION**

Reserve	Block	Size (ha)
Thidna Conservation Park	Thidna Block	934.2
Point Davenport Conservation Park	Point Davenport Block	184.2
Ramsay Conservation Park	Ramsay Block	145.3
Leven Beach Conservation Park	Leven Beach Block	416.6
Carribie Conservation Park	Carribie Block	19.4
Innes National Park	Innes Block	11 098.9
Warrenben Conservation Park	Warrenben Block	4 147.4
Minlacowie Conservation Park	Minlacowie Block	28.5
Unalienated Crown Land	Marion Bay Block	17.1
Unalienated Crown Land	Sturt Bay Block	29.4
Unalienated Crown Land	Sultana Block	49.2

### 5.3.6 Ecological Fire Management

The management of fire to maintain biodiversity is discussed in more detail in the *Draft DEH Guidelines for Ecological Fire Management* (DEH, 2006c). 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.

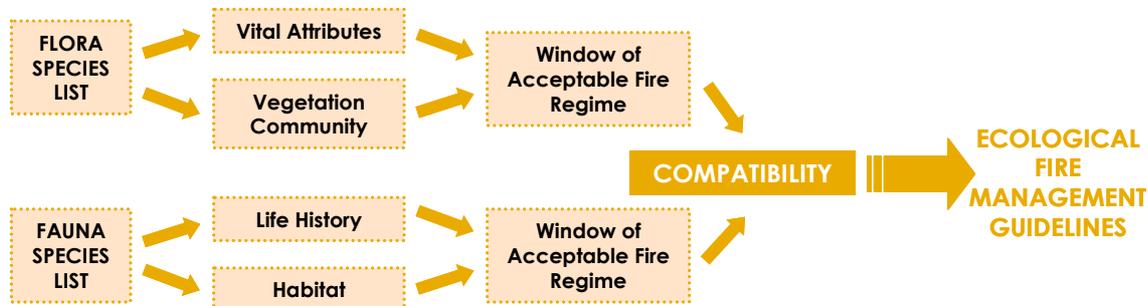
#### Methodology

Ecological Fire Management Guidelines have been developed from the research and analysis of available data relating to the Key Fire Response Species (the species most likely to decline due to inappropriate fire regime) within the planning 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 attributes data of flora and fauna, 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 (below) illustrates this process.



**FIGURE 4 – APPROACH FOR DETERMINING ECOLOGICAL FIRE MANAGEMENT GUIDELINES**

### Interpreting Ecological Fire Management Guidelines

Ecological Fire Management Guidelines have been defined for MVS, enabling fire management to strategically plan and manage fire on DEH managed land in a way that will ensure the maintenance and enhancement of biodiversity (Table 3). Guidelines for five aspects of fire regime (interval, frequency, spatial, intensity and season) have been determined for all MVS within the planning area (where data are available). The upper and lower thresholds of potential concern 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.*, 2004).

- 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 3) 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.*, 2004).

TABLE 6 – ECOLOGICAL FIRE MANAGEMENT GUIDELINES FOR MVS IN THE PLANNING AREA

		FIRE REGIME						
		Thresholds of Potential Concern		Spatial Criteria	Frequency	Intensity		Season
		TPC 1 – Lower threshold in years	TPC 2 – Upper threshold in years	Inter-fire intervals within TPC1 and TPC2 across more than X% of the extent of this MVS within the planning area	Avoid more than 2 fires within a period of 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 <sup>1</sup>
<b>15</b>	<i>Melaleuca</i> open forests and woodlands	30	60	40 <sup>2</sup>	40	N	N	Spring
<b>21</b>	Other <i>Acacia</i> tall open shrublands and shrublands	15	50	50	30	Y	Y	During & following drought
<b>26</b>	<i>Casuarina</i> and <i>Allocasuarina</i> forests and woodlands	20	50	50	40	N	N	Spring or during & following drought
<b>29</b>	Mallee heath and shrublands	20	50	50	40	Y	N	During & following drought
<b>32</b>	Other shrublands	20	50	50	40	Y	N	Spring or during & following drought
<b>38</b>	Wet tussock grassland, herbland, sedgeland or rushland	5	50	50	10	N	N	Spring or during & following drought
<b>49</b>	<i>Melaleuca</i> shrublands and open shrublands	20	60	50	40	N	N	Spring

<sup>1</sup> 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.

<sup>2</sup> This shall be managed so that no more than 50% of Western Pygmy Possum habitat at any occupied site is less than TPC2.

## 6 RESPONSE

### 6.1 Response Plans

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

Note that the Response Plan is for initial response only. If the incident escalates this Fire Management Plan should be referred to for more detailed fire management information, in conjunction with DEH staff.

### 6.2 Suppression Considerations

Initial efforts to contain bushfires should be made using existing access tracks, previously burnt areas and natural low fuel areas. If unsuccessful, alternative strategies may be considered providing the impact can be justified, and ecological consequences considered. The best available fire prediction should be used before decisions on strategies are taken to ensure all agencies are working to a common goal. 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 provide Policy advice as well as resources and other logistical and planning support.

#### 6.2.1 Ground Crews

Considerations.

- Coastal cliffs are a hazard for ground crews and vehicles.
- Avoid driving on lake beds and beaches as the surface is often unpredictable.
- Reduce vehicle speed along rough unsealed access tracks to avoid causing injury and vehicle damage.
- Sand dunes are often steep and difficult to negotiate.
- Likelihood of increased fire behavior as a result of south-westerly wind changes.
- Extreme fuels in vegetation dominated by *Melaleuca* on lake boundaries in Innes NP.
- Likelihood of spotting and ember attack on assets, particularly within Marion Bay and Stenhouse Bay.
- Malleefowl mounds are threatened by fire management activities. Avoid mounds where possible.
- Consider safety overhead, as aerial suppression may be operational.
- Use anchor points to maintain safe access for firefighters.
- Advantage should be taken of the naturally occurring low fuel areas such as mobile dunes and dry lakes during suppression.
- Reliance on ground crews and aerial suppression due to difficulty of machinery deployment.

- Water for fire suppression can be sourced from DEH standpipes and static water supplies as shown on [Map 4](#). Alternatively Bulk Water Carriers may be deployed to an incident.
- In regards to fire access within the planning area:
  - public roads and access tracks within reserves have been classified to GAFLC standards and 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 should not be used during fire suppression operations unless verified by on ground inspection and approved by the IMT
  - there is a high likelihood that public roads in Innes NP may be blocked due to traffic during an incident, as a result there is a risk of entrapment
  - access to Innes NP is restricted to Pondalowie Bay Road, however access via Gym Beach Road through private property is possible. Note: permission is required to access the private track.
  - through access may not be possible in some reserves (e.g. Carribie, Minlacowie), maps should be checked carefully to reduce the risk of entrapment.
- Implement precautionary hygiene measures to reduce the risk of *Phytophthora* infestation and spread of weeds. This is to be in accordance with the *Standard Operating Procedure - Phytophthora Threat Management* (DEH, 2002) and the *DEH Operating Procedure - Phytophthora Vehicle Disinfection Units* (DEH, 2003b), which states that:
  - all vehicles and equipment are to arrive at the fire ground in a clean state
  - when stood down, all vehicles are to leave the staging area in a clean state.

### 6.2.2 Machinery Use

Considerations.

- All machinery operations should make use of the existing low fuel areas in the reserves (e.g. lakes, previous prescribed burns, etc.).
- Avoid damaging Malleefowl mounds where possible.
- Coastal cliffs within these reserves will pose risks to machinery operators.
- The construction of new tracks should not be necessary during an incident.
- Machinery is to be excluded from significant areas where possible (e.g. foredunes and lakes to protect the stromatolites).
- Machinery use during fire suppression is to be in accordance with the *Fire Policy and Procedure for Earthmoving Equipment* (DEH, 2009j), which states that CFS must liaise with a delegated DEH officer before engaging earthmoving equipment on DEH managed lands.
- Machinery deployment is to be managed in accordance with the *CFS Supervision of Machinery Guidelines* (CFS, 2007).
- 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.

- Minimum Impact Suppression Techniques (MIST) and specialised equipment that reduces impacts to the landscape shall be used wherever possible and control methods will not be greater than the potential or actual impact of the fire.
- Standards for control lines are to be in accordance with the *Fire Policy and Procedure for Control Lines* (DEH, 2009r).
- The use of control lines should be determined by the IMT, based on fire behaviour and weather conditions, giving due consideration to safety and strategic advantage.
- Implement precautionary hygiene measures to reduce the risk of *Phytophthora* infestation and spread of weeds. This is to be in accordance with the *Standard Operating Procedure for Phytophthora Threat Management* (DEH, 2002) and the *DEH Operating Procedure - Phytophthora Vehicle Disinfection Units* (DEH, 2003b):
  - all machinery and equipment are to arrive at the fire ground in a clean state
  - when stood down, machinery is to leave the staging area in a clean state.

### 6.2.3 Aerial Suppression

Considerations.

- Implementation of aerial suppression is to be in accordance with the *Fire Policy and Procedure for Aerial Operations* (DEH, 2009q).
- Only chemicals qualified and approved by the United States Department of Agriculture (USDA) Forest Service and endorsed by Australasian Fire and Emergency Authorities Council (AFAC) will be used on DEH managed land and on DEH fire appliances (see USDA Forest Service (2008) document).
- The use of retardant should be in accordance with the *Fire Policy and Procedure for Fire Suppression Chemicals* (DEH, 2009p).
- 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).
- Aerial ignition should be considered for the implementation of large scale prescription burns and during bushfires 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, Lessee and Park Resident Management During Bushfire

The safety of residents, lessees and park residents 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, 2009c).

Visitors within reserves are managed according to the *Fire Policy and Procedure for Visitor Safety* (DEH, 2009o), 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, 2009a), which explains that as far as is possible, members of the community should decide for themselves whether to stay or go 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.

## 7 RECOVERY, RESEARCH AND MONITORING

### 7.1 Post-fire Rehabilitation and Recovery

DEH has a *Policy and Procedure for Post-fire Rehabilitation* (DEH, 2009m) 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 Research

Any fire-related research that is proposed within the reserves in the planning area should be discussed with the Senior Fire Research Scientist and be in accordance with *Policy and Procedures for Fire Research* (DEH, 2009l) and in consultation with the Northern and Yorke Region Conservation Programs Manager.

It is recommended that research should be undertaken to:

#### Research

59. Investigate the suitability of the Ecological Fire Management Guidelines (Table 3) for MVS by quantifying the existing status of MVS within the planning area, to assist fire managers with burn planning and suppression activities
60. Investigate the suitability of the Ecological Fire Management Guidelines (Table 3) for MVS through the on-ground assessment of historical fire regimes in similar communities across the state.
61. Investigate the suitability of MVS key fire response species to determine fire regimes within the planning area.
62. Assess the suitability of adapting the results from the FuSE project to assist in predicting fire behaviour within the planning area, specifically within Innes NP.
63. Investigate the effect of fire and grazing pressure post fire on the following species and ecological communities; Malleefowl, Western Whipbird (eastern), Mainland Tammar Wallaby, Western Pygmy Possums, Osborn's Eyebright, Coast Spider-orchid, Goldsack's Leek-orchid, Winter Spider-orchid, Thatching Grass sedgeland in drainage lines and depressions, Drooping Sheoak Grassy low Woodland on clay loams of low hills.
64. Investigate the use of fire for the management of weeds (e.g. Boneseed).

### 7.3 Monitoring

Monitoring will be established in conjunction with any prescribed burns conducted within the reserves in the planning area, in accordance with DEH policy and procedures. This includes the *DEH Interim Prescribed Burning Monitoring Procedure* (DEH, 2004a), *Policy and Procedure for Prescribed Burning* (DEH, 2009y), incorporating the Environmental Assessment Table and monitoring procedures. As described within the *DEH Interim Prescribed Burning Monitoring Procedure*, monitoring will be carried out before, during and after burning. Refer to Section 5.3.3 and 5.3.4 of this plan for general information on zoning, burning and the planning requirements.

It is recommended that monitoring is undertaken to:

**Monitoring**

65. Investigate the fuel accumulation rates of the various MVS that occur within the planning area (Table 1). These data will help DEH staff determine if and when fuel reduction works are required, ultimately assisting in the scheduling of operational works and activities in B-zones.
66. Assess the suitability of the proposed weed management guidelines for the control of introduced species following fire (Appendix 2)
67. Establish monitoring of flora and fauna species of interest pre fire or in long unburnt areas and continue to monitor species post fire to determine impacts.

## 8 SUMMARY OF MANAGEMENT STRATEGIES

### Visitors, Lessees and Park Residents

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1. Implement appropriate fuel management strategies as shown on [Map 4](#) and detailed in Appendix 1 to increase the safety of visitors, lessees and park residents.
2. Strategies for the management of visitors, lessees and park residents during a bushfire should be considered and incorporated into emergency management procedures.
3. Educate residents and lessees about preparedness and encourage them to prepare their own Bushfire Survival Plan as per CFS guidelines.
4. Annually review information provided to visitors regarding their safety and response to emergency situations via brochures, signs and the DEH website.
5. Consider reserve closures on days of significant fire weather to ensure visitor safety (at the discretion of the Director, National Parks and Wildlife).
6. Continue annual inspections to ensure lessees comply with fire safety standards and meet contractual obligations.
7. Review campgrounds within Innes NP that allow campfires and the location of designated campfire sites to minimise the likelihood of accidental ignitions.
8. Liaise with the District Council of Yorke Peninsula regarding fire management and the use of campfires within council managed campgrounds adjoining DEH managed land.

### Built Assets

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9. Implement fuel management strategies appropriate to asset protection as shown on [Map 4](#) and detailed in Appendix 1.
10. Encourage adjacent property owners to work with CFS to implement appropriate and coordinated fire management works on their own land to minimise the threat of fire.
11. Undertake fire management works and activities on DEH managed land to minimise the impact that fire may pose to adjacent assets.

### Cultural Heritage

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12. Implement fuel management strategies appropriate for the protection of cultural assets as shown on [Map 4](#) and detailed in Appendix 1.
13. 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.
14. Ensure suppression strategies take into account significant cultural assets in order to minimise impacts from these activities and undertake post-fire rehabilitation.

### Malleefowl

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15. Utilise prescribed burning to create patchiness in Malleefowl habitat if required and monitor the response of Malleefowl populations.
16. Consult the Malleefowl Recovery Team when planning burns in known habitat of the Malleefowl.
17. Consider requirements for predator control to be carried out immediately following bushfires and prescribed burns
18. Develop an Ecological Fire Management Strategy for the Malleefowl.

## Western Whipbird (eastern)

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19. Utilise prescribed burning to create patchiness in Western Whipbird (eastern) habitat if required and monitor the response of Western Whipbird (eastern) populations.
20. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of the Western Whipbird (eastern).
21. Consider requirements for predator control to be carried out immediately following bushfires and prescribed burns.
22. Develop an Ecological Fire Management Strategy for the Western Whipbird (eastern).

## Mainland Tammar Wallaby

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23. Monitor the effect of various fire regimes to promote suitable grassland habitat for Mainland Tammar Wallaby populations.
24. Consult the Mainland Tammar Wallaby Recovery Team when planning burns in known habitat of the Mainland Tammar Wallaby.
25. Develop an Ecological Fire Management Strategy for grasslands on the lower Yorke Peninsula and include habitat for Mainland Tammar Wallaby populations.
26. Consider the requirements for predator control immediately following bushfires and prescribed burns.
27. Avoid burning areas of *Melaleuca* spp. used as daytime resting sites by Mainland Tammar Wallabies

## Western Pygmy Possum

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28. Avoid burning *Melaleuca* forest (MVS No. 15) in C-zones and where this is not possible, manage within ecological fire management guidelines for MVS No. 15, ensuring that at least 50% of occupied Western Pygmy Possum habitat is greater than 60 years post-fire (Table 6).
29. Avoid burning areas of Coastal White Mallee forest when in flower and manage these areas to ecological fire management guidelines for MVS No. 15
30. Monitor the response of Western Pygmy Possum populations and preferred habitat, particularly *Melaleuca* and Coastal White Mallee forests, to various fire regimes.
31. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of the Western Pygmy Possum.
32. Use prescribed burning to reduce the likelihood of bushfire burning large remnants of preferred Western Pygmy Possum habitat in their entirety.

## Osborn's Eyebright

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33. Monitor Osborn's Eyebright populations to improve knowledge on the subspecies response to fire.
34. Consult the Northern and Yorke Conservation Programs Unit when planning burns in known habitat of Osborn's Eyebright.
35. Consider weed management strategies and herbivore management following prescribed burns and bushfires.
36. Consider potential impacts to the subspecies when undertaking track management activities in known habitat.

## Threatened Orchids

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37. Monitor the response of the threatened orchid populations to fire.

38. Consult the Northern Lofty Block Threatened Orchid Recovery Team when planning burns in known habitat of threatened orchids.
39. Avoid prescribed burning or slashing threatened orchid habitat during their active growth period or when flowering.
40. Consider weed management strategies and herbivore management following prescribed burns and bushfires.
41. Develop an Ecological Fire Management Strategy for threatened orchids.

## Threatened Ecological Communities

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42. Monitor the response of Thatching Grass to fire, particularly to determine suitable fire regimes for preferred habitat of the Yellow Sedge-Skipper Butterfly.
43. Monitor the response of Drooping Sheoaks occurring within the Drooping Sheoak grassy low woodland on clay loams of low hills community to fire.
44. Consult the Northern and Yorke Conservation Programs Unit when planning burns within threatened ecological communities.
45. Avoid burning large contiguous remnants of ecological communities in their entirety during a single fire event. Use prescribed burning to promote patchiness within remnants.
46. Consider herbivore management following fire within Drooping Sheoak grassy low woodland on clay loams of low hills communities.

## Pest Species

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47. Refer to Ecological Fire Management Guidelines (Table 3) and fire management guidelines for introduced flora species (Appendix 2) during prescribed burn planning.
48. Consider the use of fire as part of an integrated biodiversity management strategy.
49. Conduct post-fire weed control subject to Regional priorities and resource availability.
50. Identify the potential impact of weed species prior to any prescribed burn as part of the EAT. This will identify any priority weed species and recommend post-fire actions to mitigate the impact of weeds.
51. Collect relevant information in prescribed burn planning as part of the EAT on introduced fauna, to determine appropriate management post-fire.
52. Develop Ecological Fire Management Strategies for Horehound and Bridal Creeper.
53. Ensure hygiene practices are implemented to reduce the likelihood of infestation. Refer to the DEH Operating Procedure - Phytophthora Vehicle Disinfection Unit (DEH, 2003b).
54. If necessary, consider appropriate management programs post-fire to address issues with increased grazing pressure in consultation with Nature Conservation Programs staff.

## Fire Access Tracks

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55. Implement changes to fire access as described in Appendix 1.
56. Maintain tracks to the GAFLC standards as shown on [Map 4](#).
57. Implement signs on fire access tracks according to GAFLC standards (GAFLC, 2008).
58. Improve access and egress to minimise the likelihood of entrapment in Innes NP during a bushfire.

## Research

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59. Investigate the suitability of the Ecological Fire Management Guidelines (Table 3) for MVS by quantifying the existing status of MVS within the planning area, to assist fire managers with burn planning and suppression activities
60. Investigate the suitability of the Ecological Fire Management Guidelines (Table 3) for MVS through the on-ground assessment of historical fire regimes in similar communities across the state.
61. Investigate the suitability of MVS key fire response species to determine fire regimes within the planning area.
62. Assess the suitability of adapting the results from the FuSE project to assist in predicting fire behaviour within the planning area, specifically within Innes NP.
63. Investigate the effect of fire and grazing pressure post fire on the following species and ecological communities; Malleefowl, Western Whipbird (eastern), Mainland Tamar Wallaby, Western Pygmy Possums, Osborn's Eyebright, Coast Spider-orchid, Goldsack's Leek-orchid, Winter Spider-orchid, Thatching Grass sedgelands in drainage lines and depressions, Drooping Sheoak Grassy low Woodland on clay loams of low hills.
64. Investigate the use of fire for the management of weeds (e.g. Boneseed).

## Monitoring

---

65. Investigate the fuel accumulation rates of the various MVS that occur within the planning area (Table 1). These data will help DEH staff determine if and when fuel reduction works are required, ultimately assisting in the scheduling of operational works and activities in B-zones.
66. Assess the suitability of the proposed weed management guidelines for the control of introduced species following fire (Appendix 2)
67. Establish monitoring of flora and fauna species of interest pre fire or in long unburnt areas and continue to monitor species post fire to determine impacts.

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## 10 APPENDICES

## Appendix 1 – Assets and Strategies for Risk Mitigation

	Values and Assets	Location	Recommended Works
<b>Carribie Block</b>	Carribie CP – whole of reserve	-	<ul style="list-style-type: none"> <li>• Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
<b>Innes Block</b>	<b>Marion Bay:</b> Marion Bay Township Marion Bay Hall Marion Bay CFS Shed Retail shops, food outlets Sporting Facilities Infrastructure (Jetty)	Adjacent to the south-east corner of the reserve	<ul style="list-style-type: none"> <li>• B-zone (370 m) between Jolly Beach and Snow Lake.</li> <li>• B-zone (40 m) within Innes NP at the south-western edge of Marion Bay township.</li> </ul>
	<b>Stenhouse Bay Precinct:</b> Stenhouse Bay Campground Stenhouse Bay Hall Rhinos Tavern Five DEH staff / volunteer houses Innes NP Visitor Centre DEH office and workshop	On reserve	<ul style="list-style-type: none"> <li>• A-zone (40 m) surrounding dwellings and campground toilets.</li> <li>• A-zone (50 m) surrounding the Innes NP Visitor Centre.</li> <li>• A-zone (250 m x 100 m) encompassing the DEH workshop, Stenhouse Bay Hall and Rhinos Tavern.</li> <li>• B-zone (100 m) along ETSA Track and from the south-western end of the ETSA Track to Pondalowie Bay Road.</li> <li>• C-zone burning north-west of Stenhouse Bay to provide landscape protection to Innes NP and the Stenhouse Bay Precinct.</li> <li>• Emergency Management Procedures for the management of visitors, residents and lessees during a bushfire to be reviewed on a regular basis.</li> </ul>
	<b>Inneston Precinct:</b> Old Inneston Township holiday rentals Two private leases in Inneston	On reserve	<ul style="list-style-type: none"> <li>• A-zone (40 m) surrounding dwellings.</li> <li>• B-zone (200 m) along the Inneston Track and encompassing the Inneston Precinct.</li> <li>• Emergency Management Procedures for the management of visitors, residents and lessees during a bushfire to be reviewed on a regular basis.</li> </ul>

	Values and Assets	Location	Recommended Works
Innes Block	<b>Pondalowie Bay Precinct:</b> 19 shacks at Fisherman's Village Pondalowie Campground Casuarina Campground	On reserve	<ul style="list-style-type: none"> <li>A-zone (40 m) surrounding toilets at campgrounds and day visitor sites.</li> <li>A-zone (190 m x 200 m) encompassing Fisherman's Village.</li> <li>A-zone (40 m) surrounding the shack to the west of the Fisherman's village.</li> <li>B-zone surrounding the Pondalowie Bay precinct (200 m along Pondalowie Bay Road, 100 m south of the precinct from Pondalowie Bay Road to the coast, 800 m north of the boardwalk between Pondalowie Bay Road and the coast).</li> <li>Emergency Management Procedures for the management of visitors, residents and lessees during a bushfire to be reviewed on a regular basis.</li> </ul>
	<b>Other Shacks:</b> Two shacks at Dolphin Bay and one at Shell Beach Shepherds Hut at Shell Beach	On reserve	<ul style="list-style-type: none"> <li>A-zone (40 m) surrounding shacks.</li> </ul>
	<b>Other Campgrounds:</b> Gym Beach Campground Browns Beach Campground Shell Beach Campground Cable Bay Campground	On reserve	<ul style="list-style-type: none"> <li>A-zone (40 m) surrounding toilets at campgrounds.</li> <li>B-zone (200 m) south of Pondalowie Bay Road to the coast encompassing the Cable Bay campground.</li> </ul>
	Innes NP – whole of reserve	-	<ul style="list-style-type: none"> <li>B-zone (200 m) from Spider Lake, through Inneston to Cable Bay.</li> <li>B-zone (200 m) along Gym Beach Fire Track.</li> <li>C-zone burning in the area south of Pondalowie Bay Road to Marion Lake.</li> <li>Upgrade the Gym Beach Fire Track to Standard.</li> <li>Work with owners of Section 20 (Hundred of Warrenben) to upgrade the centre track to Standard and develop a Memorandum of Understanding for its use.</li> </ul>
Leven Beach Block	Private housing at Couch's Beach	50 m from western boundary of reserve	<ul style="list-style-type: none"> <li>B-zone (100 m) along the western boundary of the reserve.</li> </ul>
	Burners Beach Campground (council managed)	Adjacent to the eastern boundary of the reserve	<ul style="list-style-type: none"> <li>B-zone (100m) along the eastern boundary of the reserve.</li> <li>Liaise with the District Council of Yorke Peninsula to discuss fire management and campfires within Burners Beach campground.</li> </ul>
	Leven Beach CP – whole of reserve	-	<ul style="list-style-type: none"> <li>Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>

	Values and Assets	Location	Recommended Works
<b>Minlacowie Block</b>	Minlacowie CP – whole of reserve	-	<ul style="list-style-type: none"> <li>• Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
<b>Point Davenport Block</b>	Shack	On reserve	<ul style="list-style-type: none"> <li>• A-zone (40 m) surrounding the shack.</li> </ul>
	Point Davenport – whole of reserve	-	<ul style="list-style-type: none"> <li>• Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
<b>Ramsay Block</b>	Powerlines	Along Power Line Road	<ul style="list-style-type: none"> <li>• Liaise with ETSA Utilities and the council to discuss the management of fuel under the powerlines.</li> </ul>
	Whole of reserve – Ramsay CP	-	<ul style="list-style-type: none"> <li>• Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
<b>Warrenben Block</b>	Powerlines	Along Stenhouse Bay Road	<ul style="list-style-type: none"> <li>• Liaise with ETSA Utilities and the council to discuss the management of fuel under the powerlines.</li> <li>• B-zone (200 m) along the reserve boundary adjoining Stenhouse Bay Road.</li> </ul>
	Whole of reserve – Warrenben CP	-	<ul style="list-style-type: none"> <li>• B-zone (100 m) along the southern boundary.</li> <li>• B-zone (100 m) along the Elephant Track.</li> <li>• C-zone burning between the north-eastern boundary to the south-western boundary of the reserve.</li> <li>• Upgrade all internal tracks to Standard.</li> </ul>

	Values and Assets	Location	Recommended Works
Thidna Block	Gleasons Landing and Swincers Rocks campgrounds (council managed)	To the south and north of the reserve	<ul style="list-style-type: none"> <li>Liaise with the District Council of Yorke Peninsula to discuss fire management and the use of campfires in these campgrounds.</li> </ul>
	Whole of reserve – Thidna CP	-	<ul style="list-style-type: none"> <li>Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
Marion Bay Block	Marion Bay township	Marion Bay	<ul style="list-style-type: none"> <li>A-zone (40 m) within Section 1 and 163.</li> <li>B-zone, all of Section 176 and adjoining road reserve.</li> <li>B-zone, all of Section 109. To be achieved through mechanical vegetation removal.</li> <li>Recommend to the Yorke Peninsula Bushfire Management Committee that an A-zone be maintained on neighbouring properties by their owners.</li> </ul>
	Whole of Marion Bay Block	-	<ul style="list-style-type: none"> <li>Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
Sturt Bay Block	Two small sheds	On Crown land	<ul style="list-style-type: none"> <li>Investigate ownership of buildings on the Crown land. If the buildings are not authorised then they should be removed. Liaise with the Land Administration Branch. If the buildings are authorised then an A-zone (40 m) will be created around the buildings.</li> </ul>
	Whole of Sturt Bay Block	-	<ul style="list-style-type: none"> <li>Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>
Sultana Block	Shacks	Adjacent to the northern boundary of the Sturt Bay Block	<ul style="list-style-type: none"> <li>A-zone (40 m from assets) along the northern boundary.</li> </ul>
	Whole of Sultana Block		<ul style="list-style-type: none"> <li>Fire will be managed within C-zones to meet reserve management objectives.</li> </ul>

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

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Acacia enterocarpa</i>	Jumping-jack Wattle	EN	E	EN	49	RA	Shrub	<ul style="list-style-type: none"> <li>Seedling recruitment mostly following disturbance, but occasionally on undisturbed sites</li> <li>Flowering: May – Oct</li> </ul>	#	Aus^
<i>Acacia rheticocarpa</i>	Resin Wattle	VU	V	EN			Perennial Shrub	<ul style="list-style-type: none"> <li>Flowering: Aug – Oct</li> </ul>	#	Aus^
<i>Asparagus asparagoides</i> *	Bridal Creeper				15 21 262 9 32	IN LB MI RA	Annual	<ul style="list-style-type: none"> <li>Adults resprout from tubers post-fire</li> <li>Extremely intense fire may impact tuber mass</li> <li>Seedlings take 3 to 5 years to set seed</li> <li>Seeds are short lived with few remaining viable for &gt; 2 years</li> <li>Flowering: Aug – Sept</li> </ul>	<ul style="list-style-type: none"> <li>Burn in autumn after annual shoot cohort emerges</li> <li>Spot spray post-fire regrowth</li> <li>Introduce biological control agents post-fire</li> </ul>	SA^
<i>Asparagus declinatus</i> *	Bridal Veil				32	CA TH	Annual	<ul style="list-style-type: none"> <li>Adults resprout following fire</li> <li>Extremely intense fire may impact tuber mass</li> <li>Spread by bird-dispersed seed and movement of rhizomes</li> <li>Flowering: Aug – Sep</li> </ul>	<ul style="list-style-type: none"> <li>Weed control required post-fire</li> </ul>	SA^
<i>Austrostipa nullanulla</i>	Club Spear-grass	VU	V	EN			Perennial	<ul style="list-style-type: none"> <li>Occurs on salt lake edges, crests, slopes and spurs.</li> <li>Altered fire regimes such as the exclusion of fire and a high frequency of fires are potential threats to this species</li> <li>Flowering: Dec – Jan and Sep – Oct</li> </ul>	<ul style="list-style-type: none"> <li>Fire interval &gt; 10 years</li> </ul>	SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Austrostipa pilata</i>	Prickly Spear-grass		V	RA			Perennial	<ul style="list-style-type: none"> <li>Observed growing in loamy sand in Coastal White Mallee (<i>Eucalyptus diversifolia</i>)/Red Mallee (<i>E. socialis</i>) open mallee</li> <li>Flowering: Nov</li> </ul>	#	SA^
<i>Billardiera</i> sp. Yorke Peninsula (P.C.Heyligers 80164)	Lehmann's Apple-berry		E	EN		IN	Creepers	<ul style="list-style-type: none"> <li>Occurs in Yorrell (<i>Eucalyptus gracilis</i>) open mallee</li> <li>Flowering: based on other <i>Billardiera</i> spp. between Aug – Feb</li> </ul>	#	SA^
<i>Caladenia bicalliata</i> subsp. <i>bicalliata</i>	Western Daddy-long-legs		R	CR	2949	IN WA TH	Perennial Herb	<ul style="list-style-type: none"> <li>Found growing in Coastal White Mallee open mallee.</li> <li>Populations have been known to survive fire</li> <li>Flowering plants decrease with time since fire</li> <li>Lifespan for genus possibly 5 to 15 years</li> <li>Subpopulations are small and highly fragmented.</li> <li>Considered to be declining.</li> <li>Flowering: Sep – Oct</li> </ul>	<ul style="list-style-type: none"> <li>Recommended fire intervals &gt; 3 years</li> </ul>	SA^
<i>Caladenia brumalis</i>	Winter Spider-orchid	VU	V	EN	2629	IN MI RA LB	Herb	<ul style="list-style-type: none"> <li>Highly specialised relationship between orchid and pollinator – likely to be wasps</li> <li>May benefit from summer fire stimulation as part of life cycle. Frequency unknown</li> <li>Observed to increase in abundance following intense summer fire on the Eyre Peninsula</li> <li>Populations are fragmented and habitat is degraded.</li> <li>Flowering: Sep – Nov</li> </ul>	<ul style="list-style-type: none"> <li>Post-fire grazing management is critical</li> </ul>	(Ecological Associates Pty Ltd, 2007), SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Caladenia conferta</i>	Coast Spider-orchid	EN	E	CR	26	RA	Herb	<ul style="list-style-type: none"> <li>Highly specialised relationship between orchid and pollinator - likely to be a Thynnine wasp</li> <li>Fire is a potential threat.</li> <li>Known from two locations in SA – Yorke Peninsula and the upper South East.</li> <li>Flowers: Aug – Sep</li> </ul>	#	(TSSC, 2006a), SA <sup>^</sup>
<i>Caladenia fuliginosa</i> (formally <i>fragrantissima</i> ssp. <i>fragrantissima</i> )	Scented Spider-orchid		V	EN		IN		<ul style="list-style-type: none"> <li>Occurs in small to extensive populations in a wide range of soil types and habitats however it there has recently been a significant reduction in individual plants.</li> <li>Flowering: Sep – Nov</li> </ul>	#	SA <sup>^</sup>
<i>Caladenia intuta</i>	Ghost Spider-orchid	CE	E	EN			Annual Herb	<ul style="list-style-type: none"> <li>Known from four populations on the mid-Yorke Peninsula, none of these occur on DEH land</li> <li>Grows in Mallee Box (<i>Eucalyptus porosa</i>) and Drooping Sheoak woodland, with an understorey of sparse shrubs. It grows in sandy loam soils, preferably white sandy loam, on calcrete rises</li> <li>Similar species are known to flower at 3 to 5 years old and have a lifespan of 15 years</li> <li>Does not require fire or other disturbance to set seed, it is unknown if disturbance would enhance recruitment</li> <li>Flowering and seed set: Aug – Sep</li> </ul>	#	(Quarmby, 2006) SA <sup>^</sup>
<i>Caladenia macroclavia</i>	Large-club Spider-orchid	EN	E	CR			Perennial Herb	<ul style="list-style-type: none"> <li>Thought to be endemic to the Yorke Peninsula</li> <li>Found in mallee woodland and grassy mallee woodland with sandy loam soils over limestone</li> <li>It survives mostly in small remnant blocks of vegetation and along roadsides</li> <li>Flowering: Aug – Sep</li> </ul>	<ul style="list-style-type: none"> <li>The use of earthmoving equipment, at any time of year has the potential to damage plants</li> </ul>	(Bickerton, 2003a) SA <sup>^</sup>

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Caladenia sanguinea</i>	Crimson Daddy-long-legs		R	CR				<ul style="list-style-type: none"> <li>Observed growing on private property near Warooka</li> </ul>	#	SA^
<i>Chrysanthemoides monolifera*</i>	Boneseed				29	IN	Shrub	<ul style="list-style-type: none"> <li>A mild to hot prescribed burn will kill adult plants and stimulate the germination of the seeds</li> <li>Flowering: late winter – spring</li> </ul>	<ul style="list-style-type: none"> <li>Weed control required post fire</li> </ul>	Aus^ SA^
<i>Choretrum glomeratum</i> var. <i>glomeratum</i>	White Sour-bush			RA		IN WA	Shrub	<ul style="list-style-type: none"> <li>The Lycaenid butterflies <i>Hypochrysops ignitus</i> and <i>Ogyris otanes</i> that utilise this plant as a host are now considered critically endangered in the region</li> <li>Fire may stimulate germination</li> </ul>	#	SA^
<i>Choretrum glomeratum</i> var. <i>chrysanthum</i>	Yellow Sour-bush		R	VU			Shrub	<ul style="list-style-type: none"> <li>The Lycaenid butterflies <i>Hypochrysops ignitus</i> and <i>Ogyris otanes</i> that utilise this plant as a host are now considered critically endangered in the region</li> <li>Fire may stimulate germination</li> </ul>	#	SA^
<i>Corybas expansus</i>	Dune Helmit-orchid		V	RA	29	IN WA	Herb	<ul style="list-style-type: none"> <li>At Innes NP was observed growing near a salt lake under mallee vegetation</li> <li>Current population size unknown.</li> </ul>	#	SA^
<i>Daviesia sejugata</i>	Disjunct Bitter-pea		E	EN		IN	Shrub	<ul style="list-style-type: none"> <li>Discovered in Innes NP in sandy soil</li> <li>Observed along roadsides</li> <li>Flowering: Aug – Sep</li> <li>This species has the capacity to sucker; as a result there is very low genetic diversity within populations.</li> <li>There are only 2 or 3 extant populations in SA.</li> <li>This species is likely critically endangered and endemic to lower YP.</li> </ul>	<ul style="list-style-type: none"> <li>Plans to burn or conduct verge works at known sites should only be done in consultation with the N&amp;Y Conservation Programs Unit</li> </ul>	SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Echium Plantagineum</i> *	Salvation Jane				29	IN	Herb	<ul style="list-style-type: none"> <li>Adults killed by fire</li> <li>Seedlings readily germinate post-fire, especially following summer rain events</li> <li>Some seeds are killed by fire</li> </ul>	<ul style="list-style-type: none"> <li>Weed control may be required post-fire</li> </ul>	Aus^
<i>Ehrharta calycina</i> *	Perennial Veldt Grass						Perennial Grass	<ul style="list-style-type: none"> <li>A significant weed in sandy soils on lower Yorke Peninsula</li> <li>May well spread into burnt areas post-fire.</li> <li>Can dramatically change the fuel load</li> <li>Profuse seed regenerator</li> <li>Seeds remain viable for about 12 months</li> <li>Fire does not usually kill plants</li> </ul>	<ul style="list-style-type: none"> <li>Weed control may be required post-fire</li> </ul>	E Aus^
<i>Euphorbia terracina</i> *	False Caper				15 26 29 32	IN LB PD WA RA	Herb	<ul style="list-style-type: none"> <li>Able to invade relatively undisturbed vegetation although greatly enhanced by disturbance such as fire</li> <li>Plants are generally killed by fire, however some resprouting following wildfire has been observed.</li> <li>Fire can cause mass germination of soil-stored seed</li> <li>Flowering: Aug – Nov</li> </ul>	#	Aus^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Euphrasia collina</i> <i>ssp. osbornii</i>	Osborn's Eyebright	EN	E	CR	26 29 49	IN RA	Short-lived Perennial Herb	<ul style="list-style-type: none"> <li>Patches of open ground are required for germination, and adequate moisture levels are required for seedling survival</li> <li>Seed production is copious and the soil seed bank probably survives for decades. Fire is thought to be required for the recovery of populations from the seed bank</li> <li>There is risk of extinction if conditions do not favour germinants post-fire</li> <li>May rely upon disturbance events to promote regeneration and recruitment</li> <li>Flowering: June and Aug – Dec</li> <li>The seasonal timing of fires may also be important for the response of this species, although nothing is known about this factor.</li> <li>The species is also thought to be semi-parasitic, so the response to fire of its host is also important.</li> </ul>	<ul style="list-style-type: none"> <li>Prescribed burning only after seed release (Autumn)</li> <li>Avoid prescribed burning during active growth period or when flowering</li> </ul>	(Potts, 1997a) SA^
<i>Halosarcia flabelliformis</i>	Bead Samphire	VU	V	RA	39	IN TH	Annual Shrub	<ul style="list-style-type: none"> <li>Observed growing on samphire flats and salt lakes in swampy areas on the Yorke Peninsula</li> <li>Flowering: Jan – May</li> </ul>	#	SA^
<i>Lycium ferocissimum</i> *	African Boxthorn				21 262 9 31 32	IN CA TH LB PD RA WA	Shrub	<ul style="list-style-type: none"> <li>Juvenile period &lt; 2 years.</li> <li>Adults generally resprout following fire</li> <li>Fruits (berries) dispersed by birds and foxes</li> <li>Flowering: mostly summer but throughout the year</li> </ul>	<ul style="list-style-type: none"> <li>Weed control required post-fire</li> </ul>	SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Marrubium vulgare</i> *	Horehound				29	IN WA	Bushy perennial to 1 m	<ul style="list-style-type: none"> <li>Adults killed by fire &amp; seedlings readily recruit post-fire</li> <li>Fire may reduce up to 80% of the seed bank</li> <li>Flowering: Sep – Mar</li> </ul>	<ul style="list-style-type: none"> <li>Weed control required post-fire</li> <li>Burn at short intervals</li> </ul>	SA^
<i>Mentha diemenica</i>	Slender Mint		R	CR			Perennial, Shrub	<ul style="list-style-type: none"> <li>Usually found beside creeks, dams, swamps and reservoirs or in damp gullies</li> <li>Flowering: Nov – Feb</li> </ul>	#	SA^
<i>Moraea flaccida</i> *	One-leaf Cape Tulip				32 29	IN CA	Perennial herb with annual leaves & flowers	<ul style="list-style-type: none"> <li>Reproduce through root corms that stay dormant in the soil until conditions are favourable</li> <li>Requires 2 to 3 years to set seed, seeds viable for 1 year</li> <li>Fire can bring corms out of dormancy and stimulate flowering – after fire rain can stimulate corms</li> <li>Flowering: Aug – Sep</li> </ul>	<ul style="list-style-type: none"> <li>Weed control required post-fire</li> </ul>	SA^ Aus^
<i>Olearia pannosa</i> ssp. <i>pannosa</i>	Silver Daisy-bush	VU	V	EN	15		Shrub	<ul style="list-style-type: none"> <li>Other species in genus have variable seed production, low seed viability and limited seed dispersal.</li> <li>Resprouts from lignotuber</li> <li>Increased light availability following fire appears to encourage germination</li> <li>Small fragmented populations found on roadsides and in cemeteries on the southern Yorke Peninsula</li> <li>Flowering: Aug – Oct</li> </ul>	#	R^ SA^ Aus^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Pleuropappus phyllocalymmeus</i>	Silver Candles	VU	V	VU		IN	Annual	<ul style="list-style-type: none"> <li>Unlikely to be naturally burnt</li> <li>Seed production occurs in mid-summer with seeds likely to fall within cracks of mud pans, away from direct heat</li> <li>Unlikely to be stimulated by fire due to preferred habitat</li> <li>Restricted to the bottom of the southern Yorke Peninsula</li> <li>Flowering: Sep – Dec</li> </ul>	#	SA^
<i>Polygala myrtifolia</i> *	Polygala / Myrtle-leaf Milkwort				32	IN SB	Shrub	<ul style="list-style-type: none"> <li>Killed by fire, however germinates prolifically after fire</li> <li>Flowering: throughout year, mostly spring</li> </ul>	<ul style="list-style-type: none"> <li>Consider post-fire management for known sites of infestation.</li> </ul>	SA^
<i>Polypogon tenellus</i>			V	VU	15	IN	Annual Grass	<ul style="list-style-type: none"> <li>Observed growing in Swamp Paperbark (<i>Melaleuca halmaturorum</i>) Very Low Open Forest in gypsum sand</li> <li>Only SA specimen seen was collected in 'damp gypseous sand' in 1991 and was described as common.</li> </ul>	#	SA^
<i>Prasophyllum calcicola</i>	Limestone Leek-orchid		V	EN	29	IN WA	Perennial Herb	<ul style="list-style-type: none"> <li>Found in coastal areas on calcareous sand.</li> <li>Known from less than five subpopulations on the southern Yorke Peninsula</li> <li>Prolific flowering post summer fire on the Eyre Peninsula, but it is not known if this was a result of existing population stimulation or new individuals.</li> <li>Flowering: Sep – Oct</li> </ul>	#	SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Prasophyllum fecundum</i>	Self-pollinating Leek-orchid		R	CR	49		Herb	<ul style="list-style-type: none"> <li>Has been found in Broombush (<i>Melaleuca uncinata</i>) mallee shrubland in roadside vegetation on the Yorke Peninsula</li> <li>Very small population size, considered to be declining on the southern Yorke Peninsula</li> <li>Genus likely to be stimulated by summer fire but it is unknown whether this is due to existing population stimulation or new individuals</li> <li>Flowering: Sep – Nov</li> </ul>	#	SA^
<i>Prasophyllum goldsackii</i>	Goldsack's Leek-orchid	EN	E	CR	29	WA	Herb	<ul style="list-style-type: none"> <li>Reaches maturity at 5 years</li> <li>Only flowers occasionally and the flowers rarely open</li> <li>Known from three locations on the southern Yorke Peninsula</li> <li>Flowering: Sep – Oct</li> </ul>	#	(TSSC, 2006b) RA, SA^
<i>Prasophyllum occultans</i>	Hidden Leek-orchid		R	CR		WA	Herb	<ul style="list-style-type: none"> <li>Growing on limestone with Annual Candles in Warrenben CP</li> <li>Known from two locations, considered to be declining on the southern Yorke Peninsula</li> <li>Likely to be stimulated by summer fire but it is unknown whether this is due to existing population stimulation or new individuals.</li> <li>Flowering: Sep – Nov</li> </ul>	#	SA^
<i>Pultenaea villifera</i> var. <i>glabrescens</i>	Splendid Bush-pea	VU	V				Low spreading or tall shrub	<ul style="list-style-type: none"> <li>Blue Mountains population (<i>Pultenaea villifera</i>) is fire sensitive (although can resprout following low intensity fire), recruitment occurring from a persistent soil stored seed bank following fire.</li> <li>Vulnerable to bushfire due to limited overall distribution.</li> <li>Flowering: Sep – Oct</li> </ul>	#	(DECC, 2009) SA^

Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Life Form	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines/ Post-fire Mgt	Source
<i>Ranunculus sessiliflorus</i> var. <i>pilulifer</i>	Annual Buttercup		V	EN		WA IN	Annual	<ul style="list-style-type: none"> <li>Observed growing profusely after fire near Marion Bay</li> <li>Found along roadsides and in gypsum hollows on the southern Yorke Peninsula</li> </ul>	#	SA <sup>^</sup>
<i>Sarcozona bicarinata</i>	Ridged Noon-flower		V	VU			Herb	<ul style="list-style-type: none"> <li>Flowering: Aug – Dec</li> <li>Fire stimulates growth</li> <li>Lives for 2 years</li> </ul>	#	SA <sup>^</sup> (Gillam and Urban, 2008)
<i>Senecio macrocarpus</i>	Large-fruit Groundsel	VU	V	CR	38	CA	Herb	<ul style="list-style-type: none"> <li>Found on clay loam in Thatching Grass sedgeland on Yorke Peninsula</li> <li>Threats include inappropriate fire regimes.</li> <li>Disturbance events, such as fire, are thought to assist in the recruitment of new individuals</li> <li>Flowering: Sep – Oct</li> </ul>	#	SA <sup>^</sup>
<i>Stackhousia annua</i>	Annual Candles	VU	V	RA	26 293 2	IN WA CA	Annual Herb	<ul style="list-style-type: none"> <li>Endemic to near-coastal areas of south-western Yorke Peninsula and south-eastern Eyre Peninsula</li> <li>Occurs in sandy soil, in open 'glades' or disturbed areas (e.g. campsites, firebreaks, etc.) within dense mallee or shrubland, dominated by Coastal White Mallee and Drooping Sheoak shrubland</li> <li>Observed growing in rolled firebreaks at Warrenben CP.</li> <li>Perennial <i>Stackhousia</i> species do well after fire, but it is not certain if Annual <i>Stackhousia</i> would respond similarly.</li> <li>Flowering: Sep – Oct</li> </ul>	#	(Pobke, 2007) Aus <sup>^</sup>

**Appendix 3 – Fire Response of Rated and Significant Fauna Species**

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	<i>Acanthiza iredalei rosinae</i>	Slender-billed Thornbill	VU	V	EN		LB	I H	<ul style="list-style-type: none"> <li>Sites: nest in upper branches of shrubs</li> <li>Material: Bark, grass, cobwebs &amp; lined with soft plant material</li> <li>Season: Jul-Nov</li> </ul>	<ul style="list-style-type: none"> <li>Sedentary</li> <li>In Ngarkat CP the eastern subspecies increased in abundance post fire, peaking at sites 7 years post fire and can persist in mature heath</li> <li>Requires long unburnt areas for recolonisation</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the likelihood of extensive bushfires</li> </ul>	(Ward and Paton, 2004) Aus^
Bird	<i>Aquila audax</i>	Wedge-tailed Eagle			RA	29 32	IN WA	C	<ul style="list-style-type: none"> <li>Sites: High in a tree</li> <li>Material: sticks, bark &amp; leaves</li> <li>Season: usually Jun-Jul but can vary</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits timbered country and plains, singly or in pairs</li> <li>Requires old growth forests</li> <li>Fire will impact the feeding or breeding habitat</li> </ul>	<ul style="list-style-type: none"> <li>Minimise the likelihood of extensive or high intensity fires.</li> <li>Protect breeding locations.</li> </ul>	SA^
Bird	<i>Burhinus grallarius</i>	Bush Stone Curlew		V	CR		IN WA LB	I G C	<ul style="list-style-type: none"> <li>Sites: On the ground, beside a log in a scrape or small bare patch</li> <li>Material: Earth</li> <li>Season: Jul-Jan</li> </ul>	<ul style="list-style-type: none"> <li>High site fidelity</li> <li>Nocturnal</li> <li>Requires litter and fallen timber on the ground</li> <li>Fire during the breeding season may disrupt nesting and kill individual birds</li> <li>High risk of significant impact on populations from extensive fires</li> </ul>	<ul style="list-style-type: none"> <li>Avoid frequent fires</li> <li>Avoid burning more than 50% of individual habitat patches in a single fire event</li> <li>Avoid 2 or more successive fires in spring/summer</li> </ul>	SA^
Bird	<i>Calamanthus cautus cautus</i>	Shy Heathwren (Shy Hylacola)		R	EN		IN TH LB	G I	<ul style="list-style-type: none"> <li>Sites: on or near ground</li> <li>Material: Bark, grass</li> <li>Season: Jul-Nov</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits mallee and coastal thickets with dense, low cover, grass tussocks and sand plain.</li> <li>Sedentary</li> </ul>	<ul style="list-style-type: none"> <li>Avoid burning large extents of habitat at one time.</li> <li>Retain fallen logs and ground debris.</li> </ul>	Aus^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	<i>Egretta sacra</i>	Eastern Reef Egret		R	VU	15 32	IN	C	<ul style="list-style-type: none"> <li>Sites: On a rock or in the branches of a low bushy tree</li> <li>Material: Sticks</li> <li>Season: Sep-Feb</li> </ul>	<ul style="list-style-type: none"> <li>Found on islands, rocky shores, beaches, tidal rivers, inlets, mangroves, singly or in pairs</li> <li>Habitat unlikely to be directly affected by fire</li> </ul>	#	SA^
Bird	<i>Falco peregrinus</i>	Peregrine Falcon		R	VU	15 21 29 32	IN	C	<ul style="list-style-type: none"> <li>Sites: Rock crevices, cliffs</li> <li>Material: Rock</li> <li>Season: Aug-Nov</li> </ul>	<ul style="list-style-type: none"> <li>The same nesting sites may be used for many years and be susceptible to fire</li> <li>Pairs will maintain a home range approx. 20-30 km<sup>2</sup></li> <li>May follow fires hunting disturbed prey</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the likelihood of extensive bushfires</li> </ul>	SA^
Bird	<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle		E	EN	15 29 32 49	IN PD	C	<ul style="list-style-type: none"> <li>Sites: large tree, on ledges of cliffs or on the ground on off-shore islands</li> <li>Material: Sticks &amp; leaves</li> <li>Season: May – Oct</li> </ul>	<ul style="list-style-type: none"> <li>The same nest is often used for years in succession and may be susceptible to fire</li> <li>Fire may destroy a nest tree completely or render the tree and surrounding vegetation unsuitable</li> <li>Following fire, eggs or nestlings may be at greater risk of predation</li> </ul>	<ul style="list-style-type: none"> <li>Manage fire to minimise the threat to nest sites and breeding birds</li> <li>Reduce fuel loads around active nest trees prior to planned burns, to minimise the chance of a nest tree being impacted by fire.</li> </ul>	Aus^ SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	<i>Leipoa ocellata</i>	Malleefowl	VU	V	CR	15 21 29 32 39	IN WA	G I	<ul style="list-style-type: none"> <li>Sites: Mound builder</li> <li>Material: Sand, gravel &amp; vegetative matter</li> <li>Season: Nest construction in Autumn, laying between Sept-Apr</li> </ul>	<ul style="list-style-type: none"> <li>Ideal habitat age thresholds estimated between 20-60 years</li> <li>Breeding in burnt areas is reduced until 30 years post fire</li> <li>Mortality as a result of fire may be substantial.</li> </ul>	<ul style="list-style-type: none"> <li>Ensure a bias to long vegetation of 20-60 years of age</li> <li>Reduce the likelihood of landscape scale fires.</li> <li>Avoid disturbance of active nests with fire, including suppression and track construction.</li> </ul>	(Benshemesh, 2000) SA^
Bird	<i>Lichenostomus cratitius occidentalis</i>	Purple-gaped Honeyeater		R	VU	15 21 26 29 32 39 49	IN WA CA TH MI	I N	<ul style="list-style-type: none"> <li>Sites: &lt; 1 m high</li> <li>Material: bark, grass</li> <li>Season: Jul-Jan</li> </ul>	<ul style="list-style-type: none"> <li>Prefers mallee heathland, mallee woodland and shrubland</li> <li>Locally nomadic</li> </ul>	#	Aus^
Bird	<i>Melanodryas cucullata cucullata</i>	Hooded Robin		R	VU	26	WA RA	I	<ul style="list-style-type: none"> <li>Sites: 1-7 m high in a tree</li> <li>Material: rootlets, grass and bark,</li> <li>Season: Jul-Nov</li> </ul>	<ul style="list-style-type: none"> <li>Ground feeder</li> <li>Sedentary</li> <li>Inhabits <i>Eucalypt</i> woodland, mallee and <i>Acacia</i> shrub land.</li> <li>Avoids dense forest.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce fuel loads around nest trees prior to planned burns</li> <li>Reduce the likelihood of extensive bushfires</li> </ul>	Aus^
Bird	<i>Microeca fascians assimilis</i>	Jacky Winter		R	VU	26	RA	I	<ul style="list-style-type: none"> <li>Sites: 1 - 20 m high</li> <li>Material: grass, hair, bark, lichen</li> <li>Season: Aug-Dec</li> </ul>	<ul style="list-style-type: none"> <li>Prefers open woodland with an open shrub layer and bare ground</li> </ul>	#	Aus^
Bird	<i>Myiagra inquieta</i>	Restless Flycatcher		R	VU	26	IN RA	I	<ul style="list-style-type: none"> <li>Sites: 1 - 20 m high</li> <li>Material: Lichen, hair, feathers</li> <li>Season: Jul-Jan</li> </ul>	<ul style="list-style-type: none"> <li>Prefers riparian vegetation or otherwise near water, open woodlands with a sparse shrubby understorey.</li> </ul>	#	Aus^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	<i>Numenius madagascariensis</i>	Eastern Curlew		V	VU	32	PD	C	<ul style="list-style-type: none"> <li>Sites: Breeds in the northern hemisphere</li> <li>Season: May-Jun</li> </ul>	<ul style="list-style-type: none"> <li>Found in estuaries, tidal mudflats, sandspits, saltmarshes, mangoves, open grasslands near water and fresh or brackish lakes</li> <li>Migratory</li> </ul>	#	Aus^
Bird	<i>Pandion haliaetus</i>	Osprey		E	EN		IN	C	<ul style="list-style-type: none"> <li>Sites: On a rock or cliff-face, in a tree, on the ground on islands.</li> <li>Material: Sticks, driftwood, seaweed</li> <li>Season: Jul-Sept</li> </ul>	<ul style="list-style-type: none"> <li>Found on borders of rivers, lakes, inlets of coasts and small islands lying off-shore, singly or in pairs.</li> <li>Following fire, eggs or nestlings may be at greater risk of predation.</li> </ul>	<ul style="list-style-type: none"> <li>Manage fire to minimise the risk to nest sites and breeding birds where possible</li> <li>Reduce fuel loads around active nest trees prior to planned burns</li> </ul>	Aus^ SA^
Bird	<i>Plectorhyncha lanceolata</i>	Striped Honeyeater		R	EN	26	RA	I N	<ul style="list-style-type: none"> <li>Sites: In a Sheoak or other tree</li> <li>Material: Grasses, rootlets, plant-down, wool, feathers, hair</li> <li>Season: Jul-Jan</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits dry forests, woodlands, mallee and coastal <i>Melaleuca</i>, <i>Banksia</i> and <i>Casuarina</i> thickets</li> <li>Feeds in dense foliage at the lower levels of the canopy</li> </ul>	#	Aus^
Bird	<i>Psophodes nigrogularis leucogaster</i>	Western Whipbird (eastern subspecies)	VU	E	EN	29 32 49 21 29	IN WA	I G C	<ul style="list-style-type: none"> <li>Sites: &lt; 2 m high</li> <li>Material: Bark, twigs and grass</li> <li>Season: Jul-Oct</li> </ul>	<ul style="list-style-type: none"> <li>The most suitable habitat has a post fire age of 10-25 years</li> <li>High potential for significant mortality and loss of habitat as a result of extensive, high intensity fires</li> </ul>	<ul style="list-style-type: none"> <li>Avoid burning more than &gt;50% of habitat</li> <li>Avoid 2 or more successive fires in late winter/spring</li> </ul>	SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Bird	<i>Stagonopleura guttata</i>	Diamond Firetail		V	EN		WA	G I	<ul style="list-style-type: none"> <li>Sites: Shrub and tree canopy</li> <li>Material: Grass</li> <li>Season: Oct-Jan</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits grassy woodlands, feeds on native grasses &amp; forbs</li> <li>Requires ground cover</li> <li>Habitat likely to be temporarily adversely impacted by fire</li> <li>May benefit from exposed sites to forage for seeds and insects</li> </ul>	<ul style="list-style-type: none"> <li>&gt;50% of habitat patch should not burn in a single fire event</li> </ul>	SA^
Bird	<i>Thinornis rubricollis</i>	Hooded Plover		V	VU	15 29 32 39	IN PD	I	<ul style="list-style-type: none"> <li>Sites: Depression in sand among pebbles, shells or seaweed. Above high tide mark</li> <li>Season: Sep-Jan</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits seashores, dunes, margins of coastal lagoons and inland salt lakes</li> <li>Local movements to inland salt lakes in the winter</li> <li>Thought to be stable on the Yorke Peninsula and breeding</li> </ul>	#	Aus^
Bird	<i>Turnix varia</i>	Painted Button-quail		V	EN	15 26 29 32	IN WA LB	G I	<ul style="list-style-type: none"> <li>Sites: Under vegetation within a depression</li> <li>Material: Grass</li> <li>Season: Aug-Mar</li> </ul>	<ul style="list-style-type: none"> <li>Risk of population loss during bushfire due to low mobility</li> <li>Ground feeding, generally increase in abundance post-fire</li> </ul>	<ul style="list-style-type: none"> <li>&gt;50% of a habitat patch should not burn in a single fire event</li> </ul>	SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Invertebrate	<i>Hesperilla flavescens</i>	Yellow Sedge-skipper Butterfly					LB	H	<ul style="list-style-type: none"> <li>Sites: Eggs laid on the underside of a Thatching Grass leaf, close to the ground.</li> <li>Material: Thatching Grass</li> <li>Season: Spring &amp; Autumn</li> </ul>	<ul style="list-style-type: none"> <li>Leven Beach CP contains stands of the only food source for the larva of this species (Thatching Grass)</li> <li>Local extinction of a population could occur if a fire impacts on preferred food species</li> <li>Younger Thatching Grass growth is preferred by the butterflies.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid burning habitat where populations are known to occur</li> <li>Avoid backburning, machinery use and the use of retardants in potential habitat</li> <li>Small fires promote regeneration of Thatching Grass.</li> <li>Prescribed burning to occur between Apr-Aug.</li> <li>&gt;50% of a potential habitat patch should not be burnt in one year and ensure a &gt;5 year interval before burning remaining area.</li> </ul>	(Coleman and Coleman, 2000) SA^
Mammal	<i>Cercartetus concinnus</i>	Western Pygmy Possum			EN	15 29 32 49	IN WA TH	I N	<ul style="list-style-type: none"> <li>Sites: Hollows, stumps, lignotubers, disused birds nests, under shrubs, leaf litter</li> <li>Material: Leaves</li> <li>Season: All</li> </ul>	<ul style="list-style-type: none"> <li>Inhabits mallee and dry forest</li> <li>Threatened by frequent fires that remove the shrub layer and mallee providing food and shelter</li> <li>On the lower Yorke Peninsula many individuals have been observed nesting in leaf litter</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the likelihood of extensive bushfires</li> <li>50% of occupied habitat should be &gt;60 years post-fire in MVS No. 15</li> <li>Burning during daylight hours likely to disrupt possums in torpor</li> </ul>	SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Mammal	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			LC	32 29	MI IN	I	<ul style="list-style-type: none"> <li>Sites: trees, birds nests, buildings</li> <li>Season: Sep-Oct</li> </ul>	<ul style="list-style-type: none"> <li>Common</li> <li>Forages below the tree canopy in woodland areas</li> <li>Requires old growth habitat with fibrous bark but known to roost in houses</li> <li>Torpor from May to late August</li> <li>Foraging distances are generally between 4 and 11 km</li> </ul>	<ul style="list-style-type: none"> <li>Burning during daylight hours likely to disrupt bats in torpor</li> </ul>	Aus^
Mammal	<i>Chalinolobus morio</i>	Chocolate Wattled Bat			LC	15 29 32	IN WA	I	<ul style="list-style-type: none"> <li>Season: Late spring to early summer</li> </ul>	<ul style="list-style-type: none"> <li>Forms colonies in tree hollows, ranging from 20 to &gt; 100</li> <li>Requires old growth habitat with fibrous bark</li> <li>Hibernation starts later and finishes earlier than other bats.</li> </ul>	<ul style="list-style-type: none"> <li>Burning during daylight hours likely to disrupt bats in torpor</li> </ul>	Aus^
Mammal	<i>Macropus eugenii eugenii</i>	Mainland Tammar Wallaby	EX	E	CR	15 21 29 32	IN	H	<ul style="list-style-type: none"> <li>Sites: Pouch</li> <li>Season: Jan-Mar</li> </ul>	<ul style="list-style-type: none"> <li>Introduced and probably increasing</li> <li>Require dense low vegetation for daytime shelter (<i>Melaleuca</i> shrubs) and more open grassy areas for feeding</li> <li>Has been observed grazing in recently burnt areas in Western Australia</li> </ul>	<ul style="list-style-type: none"> <li>Avoid burning daytime shelter sites (<i>Melaleuca</i>)</li> </ul>	(CALM, 2004) SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Mammal	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat			LC	29	WA MI	I	<ul style="list-style-type: none"> <li>Season: late spring or early summer</li> </ul>	<ul style="list-style-type: none"> <li>Often found beneath the exfoliating bark of Acacias and Sheoaks as well as in tree hollows and under other debris</li> <li>Prefers roost sites with warm, humid conditions.</li> <li>Prefers the hollows of large old Eucalypts for nursery colonies</li> </ul>	<ul style="list-style-type: none"> <li>Burning during daylight hours likely to disrupt bats in torpor</li> </ul>	Aus^
Mammal	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna			RA		IN	I	<ul style="list-style-type: none"> <li>Sites: Rudimentary pouch</li> <li>Season: Jun-Sep</li> </ul>	<ul style="list-style-type: none"> <li>Shelters under logs, in stumps or burrows or under bushes</li> <li>Home ranges of approx. 50 ha</li> <li>Fire likely to impact food source and shelter availability</li> </ul>	#	SA^
Mammal	<i>Tadarida australis</i>	White-striped Freetail Bat			LC			I	<ul style="list-style-type: none"> <li>Sites: Tree hollows</li> <li>Season: toward the end of the year</li> </ul>	<ul style="list-style-type: none"> <li>Individuals have been found under loose tree bark, in dead stumps and in buildings</li> <li>Depends on large trees for hollows</li> </ul>	<ul style="list-style-type: none"> <li>Burning during daylight hours likely to disrupt bats in torpor</li> </ul>	Aus^
Mammal	<i>Vespadelus regulus</i>	Southern Forest Bat			LC			I	<ul style="list-style-type: none"> <li>Season: early summer</li> </ul>	<ul style="list-style-type: none"> <li>Forms colonies of up to 100 individuals in tree hollows and sometimes in buildings</li> </ul>	<ul style="list-style-type: none"> <li>Burning during daylight hours likely to disrupt bats in torpor</li> </ul>	Aus^
Reptile	<i>Varanus gouldii</i>	Sand Goanna			LC	29	MI	C	<ul style="list-style-type: none"> <li>Sites: Excavation, tunnel or hollow</li> <li>Season: Spring</li> </ul>	<ul style="list-style-type: none"> <li>Ground dwelling species inhabiting sandy coastal sclerophyll forest</li> <li>Shelters in burrows, in dense litter or hollow logs</li> </ul>	#	SA^

Type	Species	Common Name	EPBC Act Status	NPW Act Status	Regional Status	MVS No	FM Block	Diet	Breeding	Species Ecology & Fire Response	Ecological Fire Mgt Guidelines	Source
Reptile	<i>Varanus rosenbergi</i>	Heath Goanna		V	EN		WA IN	I C	<ul style="list-style-type: none"> <li>Sites: Termite mounds</li> <li>Season: Summer - Spring</li> </ul>	<ul style="list-style-type: none"> <li>Found in heath, open forest and woodland</li> <li>Termite mounds are a critical habitat components</li> <li>Threats include inappropriate fires regimes</li> </ul>	#	(DEH, 2008a) SA^

## Appendix 4 – Ecological Communities of Conservation Significance

Ecological Community	SA Status (DEH, 2005c)	EPBC Act Status	FM Block	Occurrence	Components	Fire Response	Ecological Fire Mgt Guidelines	Source
Thatching Grass ( <i>Gahnia filum</i> ) sedgeland in drainage lines and depressions	V		CA	Occurs throughout coastal fresh and brackish swamps.	<ul style="list-style-type: none"> <li>Smooth cutting-grass.</li> <li>Thatching Grass is an essential host species for the pupae of the nationally threatened Yellow Sedge-Skipper Butterfly and the Chrysotricha Sedge-skipper (<i>Hesperilla chrysotricha</i>)</li> </ul>	#	#	(DEH, 2008b; Grund, 2000)
Drooping Sheoak ( <i>Allocasuarina verticillata</i> ) Grassy Low woodland on clay loams of low hills	V		IN LB RA WA	Occurs on well-drained soils such as rocky coastal areas, basalt plains and hills on dry rocky highlands and ridges on calcrete rises.	<ul style="list-style-type: none"> <li>Open savannah woodland with Drooping Sheoak as the principal dominant tree species.</li> <li>Dryland Tea-tree (<i>Melaleuca lanceolata</i>) is a frequently associated and sometimes dominant tree species.</li> <li><i>Danthonia</i> and <i>Stipa</i> species are prominent perennial grasses in the understorey.</li> </ul>	<ul style="list-style-type: none"> <li>High frequency, intense fires result in a decline in mature Drooping Sheoak.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid burning contiguous remnants in their entirety during a single fire event.</li> <li>Drooping Sheoak will regenerate after fire via basal Resprouting.</li> </ul>	(Peeters, <i>et al.</i> , 2006), SA^

## 10.1 Summary of Codes Used in Appendices

### Block Codes

CODE	BLOCK	CODE	BLOCK
TH	Thidna Block	IN	Innes Block
PD	Point Davenport Block	WA	Warrenben Block
RA	Ramsay Block	MI	Minlacowie Block
LB	Leven Beach Block	MB	Marion Bay Block
CA	Carribie Block	SB	Sturt Bay Block
		SU	Sultana Block

### Other Codes Used

DIET OF RATED FAUNA SPECIES	
C	Carnivore or scavenger. Mainly vertebrates
H	Herbivore. Includes folivores, grazers & browsers
N	Nectar feeder
I	Insectivore/"arthropodivore"/omnivore
G	Granivore. Typically peak in abundance after a fire event in fire adapted vegetation, due to the stimulation of flowering and subsequent seed set.

NPW ACT STATUS		EPBC ACT STATUS		REGIONAL STATUS (Gillam and Urban, 2008)	
E	Endangered	EX	Extinct	CR	Critically Endangered
V	Vulnerable	CE	Critically Endangered	EN	Endangered
R	Rare	EN	Endangered	VU	Vulnerable
		VU	Vulnerable	RA	Rare
				LC	Least Concern

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
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
<b>Backburn(ing)</b>	A fire started intentionally along the inner edge of a control line to consume the fuel in the path of a bushfire.
<b>Bark Fuel</b>	The flammable bark on tree trunks and upper branches (DEH, 2006b).
<b>Bulk Water Carrier</b>	A large tanker used for replenishing firefighting appliances with water.
<b>Bushfire</b>	An unplanned fire. A generic term that includes grass fires, forest fires and scrub fires.
<b>Bushfire Management Committee (BMC)</b>	A total of 16 Bushfire Management Committees exist across the state, reporting to a central State Bushfire Coordination Committee. 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.
<b>Bushfire Risk Management Plan</b>	Replaces a Bushfire Prevention Plan. Developed by Bushfire Management Committees as a requirement under the <i>Fire and Emergency Services Act 2005</i> .
<b>Bushfire Survival Plan</b>	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, 2009c).
<b>Canopy Fuel</b>	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, 2006b).
<b>CFS</b>	The South Australian Country Fire Service.
<b>Control line</b>	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
<b>CP</b>	Conservation Park
<b>DEH</b>	The South Australian Department for Environment and Heritage.
<b>Discontinuous fuels</b>	Significant gaps between clumps or patches of fuel (DEH, 2006b).
<b>DBPC</b>	District Bushfire Prevention Committee. These Committees have been replaced by Bushfire Management Committees due to recent changes to the <i>Fire and Emergency Services Act 2005</i> .
<b>EAT</b>	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, 2004e).
<b>Ecological Fire Management</b>	The active use of fire in nominated areas to achieve specified ecological objectives.

TERM	DEFINITION
<b>Elevated Fuel</b>	Shrubs and juvenile understorey plants up to 3 m in height (DEH, 2006b).
<b>EPBC Act</b>	The Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
<b>ETSA Utilities</b>	South Australia's primary electricity distributor.
<b>FDI</b>	Fire Danger Index. Calculated using a combination of temperature, relative humidity, wind speed, vegetation and drought factors (CFS, 2009e)
<b>Fire behaviour</b>	The manner in which a fire reacts to the variables of fuel, weather and topography.
<b>Firebreak</b>	An area or strip of land where vegetation has been removed or modified to reduce the risk of fires starting and reduce the intensity and rate of spread of fires that may occur (GAFLC, 2008)
<b>Fire danger</b>	The combination of all factors, which determine whether fires start, spread and do damage, and whether and to what extent they can be controlled.
<b>Fire danger rating</b>	An evaluation of fire rate of spread, or suppression difficulty for specific combinations of fuel, fuel moisture, temperature, humidity and wind speed. The rating is determined using the Fire Danger Index (FDI) (CFS, 2009e)
<b>Fire frequency</b>	The number of fires that have occurred on the same area over a time period.
<b>Fire intensity</b>	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, <i>et al.</i> , 2003)
<b>Fire interval</b>	The interval between successive fires.
<b>Fire management</b>	All activities associated with the management of fire-prone land, including the use of fire to meet land management goals and objectives.
<b>Fire regime</b>	The history of fire in a particular vegetation type or area including the fire frequency, interval, intensity, extent and seasonality of burning (Brooks, <i>et al.</i> , 2004).
<b>Fire season</b>	The period(s) of the year during which fires are likely to occur, spread and do sufficient damage to warrant organised fire control.
<b>Fire severity</b>	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, <i>et al.</i> , 2003)
<b>Fire suppression</b>	The activities connected with restricting the spread of bushfire following its detection and making it safe.
<b>Fuel</b>	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.
<b>Fuel hazard</b>	The overall fuel hazard is defined as the sum of the influences of bark fuel, elevated fuel and surface fine fuel (DEH, 2006b).
<b>Fuel management</b>	Modification of fuels by prescribed burning, or other means.

TERM	DEFINITION
<b>GAFLC</b>	South Australian Government Agencies Fire Liaison Committee.
<b>Heritage Agreement</b>	Private conservation areas established through an agreement between the SA Minister for Environment and Conservation and the landholder under the <i>Native Vegetation Act 1991</i>
<b>IBRA</b>	Interim Biogeographical Regionalisation for Australia.
<b>Incident Controller (IC)</b>	The individual responsible for the management of all incident operations and IMT.
<b>Incident Management Team (IMT)</b>	Incident Management Team. The group of incident management personnel comprising the IC and the people he/she appoints to be responsible for the functions of Operations, Planning and Logistics.
<b>Key Fire Response Species (KFRS)</b>	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.
<b>Life history</b>	The combination of attributes with respect to growth, shelter, food/nutrients and reproduction which determine species' requirements for existence (FEWG, 2004).
<b>MIST</b>	Minimum Impact Suppression Techniques. Achieving fire management objectives using methods that are consistent with land and resource management objectives. When determining an appropriate suppression response, consideration will be given to undertaking suppression with greater sensitivity and the long-term effects (WFLLC, 2003).
<b>Near-surface fuel</b>	Grasses, low shrubs and heath, sometimes containing suspended components (leaves, bark and/or twigs).
<b>NP</b>	National Park
<b>NPW Act</b>	The South Australian <i>National Parks and Wildlife Act 1972</i> .
<b>NVC</b>	Native Vegetation Council. Established under the provisions of the <i>Native Vegetation Act 1991</i> , responsible for making decisions on a wide range of matters concerning native vegetation in SA (DWLBC, 2006).
<b>Of conservation significance</b>	<p>In this plan, used to describe important or rated populations or species of flora and fauna as well as vegetation communities. These may be:</p> <p>Nationally rated, that is, listed as Threatened (with a rating of Extinct, Critically Endangered, Endangered, Vulnerable or Conservation Dependent) under the federal EPBC Act.</p> <p>South Australian rated, listed as Threatened (with a rating of Endangered, Vulnerable or Rare) under the NPW Act, Revised Schedules 7, 8 and 9.</p> <p>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).</p>

TERM	DEFINITION
<b>Patchiness</b>	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.
<b>Prescribed Burn Plan</b>	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.
<b>Prescribed burning</b>	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.
<b>Response plan</b>	A plan detailing the response for a risk or an area including the type and number of resources.
<b>Retardant</b>	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.
<b>Risk assessment</b>	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 works for risk mitigation. Considers Likelihood and Consequence to determine an overall risk rating through a matrix (DEH, 2006e).
<b>sp.</b>	Species
<b>Spotting</b>	The ignition of spot fires from sparks or embers.
<b>spp.</b>	Species (plural)
<b>ssp.</b>	Subspecies (botanical nomenclature)
<b>Surface Fuel</b>	Otherwise known as 'litter'. Comprised of leaves, twigs and bark on the ground (DEH, 2006b)
<b>Total Fire Ban</b>	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).
<b>TPC</b>	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.
<b>var.</b>	Variety (botanical nomenclature)
<b>Vital Attributes</b>	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* (2005b) or the *AFAC Knowledge Web Wildfire Glossary* (2010)

