

Department for Environment and Heritage
Management Plan



Carpenter Rocks Conservation Park
and Bucks Lake Game Reserve

2007



Government
of South Australia

This plan of management was adopted on **18 May 2007** and was prepared pursuant to section 38 of the *National Parks and Wildlife Act 1972*.



Government of South Australia

Department for Environment
and Heritage

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FOREWORD

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve are located on the Lower South East coast, approximately 40 kilometres south-west of Mount Gambier. The reserves conserve unique coastal habitat in the Lower South East and protect important flora and fauna species, including some of national and international significance.

Carpenter Rocks Conservation Park protects 30.5 hectares of coastal habitat, which was purchased with the assistance of the Australian Government's Natural Heritage Trust. The park protects part of the only known population of Carpenter Rocks Manna Gum and provides significant roosting habitat for the Orange-bellied Parrot, which is critically endangered at a national level. Bucks Lake Game Reserve is 138 hectares of near pristine seasonally-inundated coastal wetland. The reserve protects habitat for important fauna species such as the state endangered Swamp Antechinus and the Southern Bush Rat. The land comprising the reserves is significant for the Boandik people, with one site of significance located in Carpenter Rocks Conservation Park and another two sites within close proximity of the reserves.

The draft plan for Carpenter Rocks Conservation Park and Bucks Lake Game Reserve was released for public exhibition in August 2006. At the close of the comment period, 13 submissions were received, raising issues including the possible addition of unallotted Crown land to the north-west of Bucks Lake Game Reserve, the Bucks Lake Rehabilitation Project and additional information regarding native vegetation and fauna in both reserves. All comments were considered by the South East Consultative Committee and forwarded to the South Australian National Parks and Wildlife Council for advice before the plan was adopted.

This management plan outlines objectives and strategies for the future management of these reserves, notably the protection of threatened species, support of the Bucks Lake Rehabilitation Project, and the intention to enter into cooperative environmental management agreements with environmentally-conscious landowners near the reserves.

Many people have contributed to the development of this plan of management. Their interest and helpful suggestions are gratefully acknowledged.

I now formally adopt the plan of management for Carpenter Rocks Conservation Park and Bucks Lake Game Reserve under the provisions of section 38 of the *National Parks and Wildlife Act 1972*. I encourage you to read the plan and appreciate the importance of the habitat protected by these reserves.



HON GAIL GAGO MLC

MINISTER FOR ENVIRONMENT AND CONSERVATION



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ACKNOWLEDGEMENTS

The advice and input received from the Kungari Heritage Association Inc, the Field Naturalists' Society of South Australia, the Friends of Mount Gambier Parks and the South Australian Field and Game Association is greatly appreciated.

1 PARK LOCATIONS AND FEATURES

Carpenter Rocks Conservation Park was proclaimed on 6 September 2001 under the *National Parks and Wildlife Act 1972* with a section 43 proclamation providing for existing and future rights for exploration and mining under the *Petroleum Act 2000*. The South Australian Government purchased the land with the assistance of the Australian Government through the National Reserve System Program of the Natural Heritage Trust and a contribution from the Nature Foundation SA Inc. Bucks Lake Game Reserve was constituted as a National Park in 1968 under the *National Parks Act 1966* and was later constituted as a Game Reserve by statute under the *National Parks and Wildlife Act 1972*.

Bucks Lake Game Reserve and Carpenter Rocks Conservation Park are located on the Lower South East coast of South Australia, approximately 40 km south-west of Mount Gambier by road, close to the township of Carpenter Rocks (Figure 1). Both reserves experience the cool wet winters and long mild dry summers that are characteristic of the South East region. Major land uses in the area include forestry, grazing, cropping, and rural living. Other National Parks and Wildlife Act reserves in the vicinity of the reserves include Nene Valley Conservation Park and Canunda National Park.

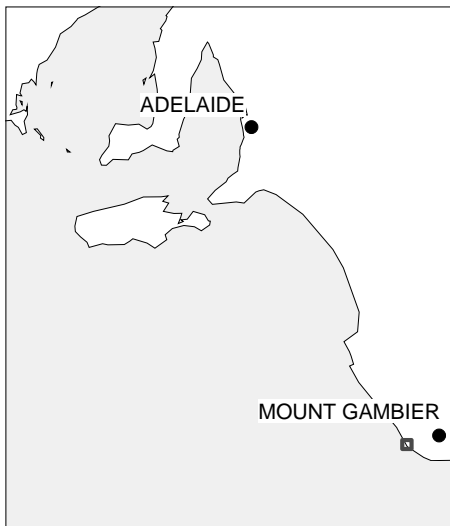
Carpenter Rocks Conservation Park protects 30.5 hectares of coastal habitat, comprised of Allotment 7 in Filed Plan number 1606. A number of threatened species and plant communities are conserved within the park. It protects part of the only known population of Carpenter Rocks Manna Gum (*Eucalyptus splendens* ssp. *arcana*), which is a newly-described species, along with several other plants of national, state or regional significance (Nicolle & Brooker, 1998). The park protects significant habitat for the Orange-bellied Parrot (*Neophema chrysogaster*), which is critically endangered at a national level. This important threatened species was recorded more regularly at the Carpenter Rocks site than at any other site in South Australia during the 1980s and early 1990s (Orange-bellied Parrot Recovery Team, 1999). While no individuals have been sighted within the park since 1993 there is the possibility that they may return with the re-establishment of the native grassy shrublands (Orange-bellied Parrot Recovery Team, 1994).

Bucks Lake Game Reserve is 138 hectares of near pristine seasonally-inundated coastal wetland and is comprised of Allotment Pieces 1, 2, 3 and 4 of Deposited Plan number 34791 (DEH, 2005a). The reserve is situated at the southern end of Lake Bonney, which was the primary source of water to Bucks Lake. Due to alterations of the local hydrological regimes, the water level of Lake Bonney decreased, resulting in Bucks Lake and other wetlands near Lake Bonney becoming degraded from the lack of water supply (Bachmann, 2002a). The vegetation around Bucks Lake is primarily comprised of swamp sedgeland which grades into closed shrubland in the areas of higher topography. This wetland ecosystem provides habitat for notable fauna species such as the state endangered Swamp Antechinus (*Antechinus minimus maritimus*) and the Southern Bush Rat (*Rattus fuscipes*).

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve have cultural significance for Boandik people. One site of archaeological significance is located in Carpenter Rocks Conservation Park and another two significant sites are located within close proximity of the reserves (Tindale, 1974). Both reserves experience low visitor numbers with only a minimal number of recreational hunters visiting Bucks Lake Game Reserve during its proclaimed hunting season.

Carpenter Rocks Conservation Park is part of a 182 hectares area of unique coastal habitat. The other blocks of land contributing to this larger area of remnant vegetation include Heritage Agreements under the *Native Vegetation Act 1991* owned by the Field Naturalists' Society of South Australia Inc or other environmentally-conscious landowners (Figure 2). In 1997, a site inspection in conjunction with research of the flora and fauna found on the block now known as Carpenter Rocks Conservation Park was conducted. This indicated the presence of a number of threatened species. The prospect of possible housing developments led to the purchase of the land for conservation. The Friends of Mount Gambier Parks have been involved in the removal of pine trees, rubbish, old car bodies and scrap steel from the park. Work has also been done to more clearly define the northern boundary through the placement of markers to prevent people from entering the neighbouring private property via the tracks in the park.

The first management plan for Bucks Lake Game Reserve was part of the *Small Coastal Parks of the South East Management Plan* (1994). Under this management plan the access tracks were maintained, and introduced animal and plant control was implemented. The low water levels found at Bucks Lake was an issue flagged by the last management plan, and this is currently being addressed through the Bucks Lake Rehabilitation Project (see Section 4.2 Hydrology).



- LEGEND**
- (NP) National Park
 - (CP) Conservation Park
 - (GR) Game Reserve
 -  National Parks and Wildlife Reserves
 -  Heritage Agreement
 -  Lake/Ocean
 -  Land Parcel Boundary
 -  Road
 -  River/Creek

Figure 1

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve

Location

Map Produced from PAMS
 Projection: MGA Zone 54 (GDA 94)
 Date: 11 April, 2007

This map is indicative and only intended for the purposes of this management plan.

2 LEGISLATIVE FRAMEWORK

2.1 National Parks and Wildlife Act 1972

Reserves are managed by the Director of National Parks and Wildlife subject to any direction by the Minister for Environment and Conservation or the Chief Executive of the Department for Environment and Heritage (DEH). When managing reserves, the Director is required under section 37 of the *National Parks and Wildlife Act 1972* to have regard to, and provide actions that are consistent with the following objectives of management stated in the Act:

- preservation and management of wildlife;
- preservation of historic sites, objects and structures of historic or scientific interest within reserves;
- preservation of features of geographical, natural or scenic interest;
- destruction of dangerous weeds and the eradication or control of noxious weeds and exotic plants;
- control of vermin and exotic animals;
- control and eradication of disease of animals and vegetation;
- prevention and suppression of bush fires and other hazards;
- encouragement of public use and enjoyment of reserves and education in, and a proper understanding and recognition of, their purpose and significance;
- generally, the promotion of the public interest; and
- preservation and protection of Aboriginal sites, features, objects and structures of spiritual or cultural significance within reserves.

Section 38 of the Act states that a management plan is required for each reserve. A management plan should set forth proposals in relation to the management and improvement of the reserve and the methods by which it is intended to accomplish the objectives of the Act in relation to that reserve.

DEH is responsible for preparing management plans and undertaking the prescribed community consultation process. A standard management planning process is mandated, to ensure that all statutory obligations are met. Help and guidance with plan preparation is sought and obtained from individuals, community groups or relevant advisory committees, although ultimately the decision on whether or not to adopt a management plan remains a ministerial prerogative.

In accordance with the Act, the provisions of this management plan must be carried out and no actions undertaken unless they are in accordance with this plan. In order to achieve this, each year park managers, taking regional and district priorities into account, draw up work programs to implement the strategies proposed in management plans. Implementation of these projects is determined by, and subject to, the availability of resources (eg staffing and funding).

2.2 Native Title Act 1993

Native Title describes the rights and interests Aboriginal and Torres Strait Islander People have in land and waters according to their traditional laws and customs. Commonwealth legislation, in the form of the *Native Title Act 1993* was enacted to:

- provide for the recognition and protection of native title;
- establish ways in which future dealings affecting native title may proceed and to set standards for those dealings;
- establish a mechanism for determining claims to native title; and
- provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.

This management plan is released and adopted subject to any native title rights and interests that may continue to exist in relation to the land and/or waters. Before undertaking any acts that might affect native title, DEH will follow the relevant provisions of the *Native Title Act 1993*.

3 VISION

The vision for Carpenter Rocks Conservation Park and Bucks Lake Game Reserve is for reserves that protect unique coastal habitat and important coastal wetland ecosystems. This includes the conservation of the endemic Carpenter Rocks Manna Gums, roosting habitat for the Orange-bellied Parrot, which is critically endangered at a national level, and habitat for native waterfowl and the state endangered Swamp Antechinus.

3.1 Key Values

- Unique coastal habitat and wetland ecosystems.
- Habitat for threatened fauna species, most notably the critically endangered Orange-bellied Parrot and state endangered Swamp Antechinus.
- The nationally vulnerable Kangaroo Island Pomaderris and part of the only known stand of the Carpenter Rocks Manna Gum.
- The reserves are part of a larger area of remnant coastal habitat.

3.2 Key Pressures

- Lack of flow to Bucks Lake from Lake Bonney and potential loss of threatened vegetation communities that rely on the wetlands.
- Disturbance to native vegetation and fauna from introduced species.
- Possible adverse impacts from inappropriate visitor activities.

4 MANAGING NATURAL HERITAGE

4.1 Geology, Soils and Landform

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve are located in a broad coastal plain that primarily consists of Tertiary and Quaternary sediments, with both of the reserves underlain by Nirranda Group formations including Narrawaturk Marl and Mepunga Sand Formation (Rogers, 1995). The dominant landforms of this coastal plain include a series of regular calcareous sand ridges separated by inter-dune swales, closed limestone depressions and young volcanoes (Environment Australia, 2000). The calcareous ridges that trend to the north-west are the dominant landform of the entire South East region and rise 20 to 50 metres above the low lying plains (Laut et al., 1977). These ridges are parallel to the current coastline and resulted from fluctuating sea levels during the Pleistocene period (1.8 million to 10,000 years ago) that caused the propagation of the coastline (Laut et al., 1977).

Carpenter Rocks Conservation Park is predominantly characterised by gently undulating calcarenite dunes that are of a relatively low elevation. Marine limestone outcrops are visible within the park, particularly towards the coast. It is believed that there are small limestone caves near the southern boundary of the park. These caves are typical of the karst landforms and geology of the local area. The existence and location of these caves needs to be confirmed, for park management and public safety purposes. Near the coast the soils are typically silty sands that occur on limestone; it is likely that these soils would have high erosion potential and this needs to be factored into management activities. Further inland there is a low limestone rise, which mainly protrudes as large limestone outcrops or boulders; otherwise there is generally a relatively shallow clay-loam layer at the surface. Past the limestone rise the park is slightly undulating with primarily sandy soils that grade to terra rossa soils (Nicolle & Booker, 1998).

Bucks Lake Game Reserve lies at the southern end of Lake Bonney and is bound to the east by a slight limestone rise and to the west by coastal sand dunes (DENR, 1994). The reserve consists of low elevation calcarenite dunes further inland that lead down to progressively wetter shallow calcareous and sandy soil flats closer to the coast. The soils on the coastal heathland surrounding Bucks Lake are shallow terra rossa soils.

Objective

Conserve the soils and geological features of the reserves.

Strategies

- Identify any caves or sinkholes in the reserves and address any public safety issues.
- Document and map soil types in the reserves.
- Consider the impacts on geology and soils when undertaking management activities.
- Undertake soil rehabilitation in areas of the park where soils are degraded or susceptible to degradation and would benefit from preventative/remedial work.
- Liaise with neighbouring land managers and other agencies such as the South East Natural Resources Management Board and the District Council of Grant regarding conservation measures for the soils and geological formations in the reserves.

4.2 Hydrology

There are no surface water resources within Carpenter Rocks Conservation Park, however the watertable in the area is relatively high, two to five metres below the surface (SECWMB, 2003). The shallowness of the water table and the relatively low and gradually sloping topography implies that the unconfined aquifer that underlies the park is quite susceptible to contamination from surface water infiltration, which would then gradually migrate out to sea.

Bucks Lake Game Reserve preserves a seasonal wetland ecosystem based around Bucks Lake and experiences a relatively high water table, which is two metres or less below the surface (SECWMB, 2003). Bucks Lake is recharged by precipitation, run-off from grazing land to the north-east, groundwater, and springs located at the fringe of the lake that seep into the lake basin (Bachmann, 2002). Prior to 1958 Bucks Lake's primary source of recharge was Lake Bonney, at which time Bucks Lake formed part of the southerly flow path for water flowing from Lake Bonney to the ocean outlet at Carpenter Rocks in to Gerloff Bay (Figure 2) (Bachmann, 2002a). In 1958 the water level of Lake Bonney was dramatically dropped by cutting a drain directly out to sea from Lake Bonney through the sand dune range. This was to allow for the predicted increase in effluent that would be discharged from a paper mill into the lake; this would be in addition to another paper mill that had been operational since 1940. Lake Bonney has continually been drained over the years to maintain a low water level via this drain and another outlet channel constructed in 1972. This has meant that vast areas of semi-permanent open wetland and vegetated swamps associated with the lake have been opened for grazing.

In recent years there has been strong community and State Government support for the rehabilitation of Bucks Lake and its surrounding wetlands. To achieve this the water level in Lake Bonney must be seasonally increased to approximately two metres above the Australian Height Datum (AHD) and the original flow paths to Bucks Lake restored with minor earthworks. Water will be prevented from flowing into Gerloff Bay by the use of a levee bank at the southern end of Bucks Lake (Figure 2). In the past, the plans to rehabilitate Bucks Lake were postponed due to Lake Bonney's poor water quality. However, from recent water quality monitoring and inspection of riparian zone vegetation, it appears that the condition of the lake is continually improving, and the rehabilitation of Bucks Lake can now proceed (EPA, 2004).

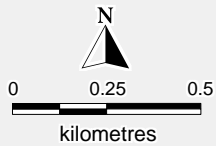
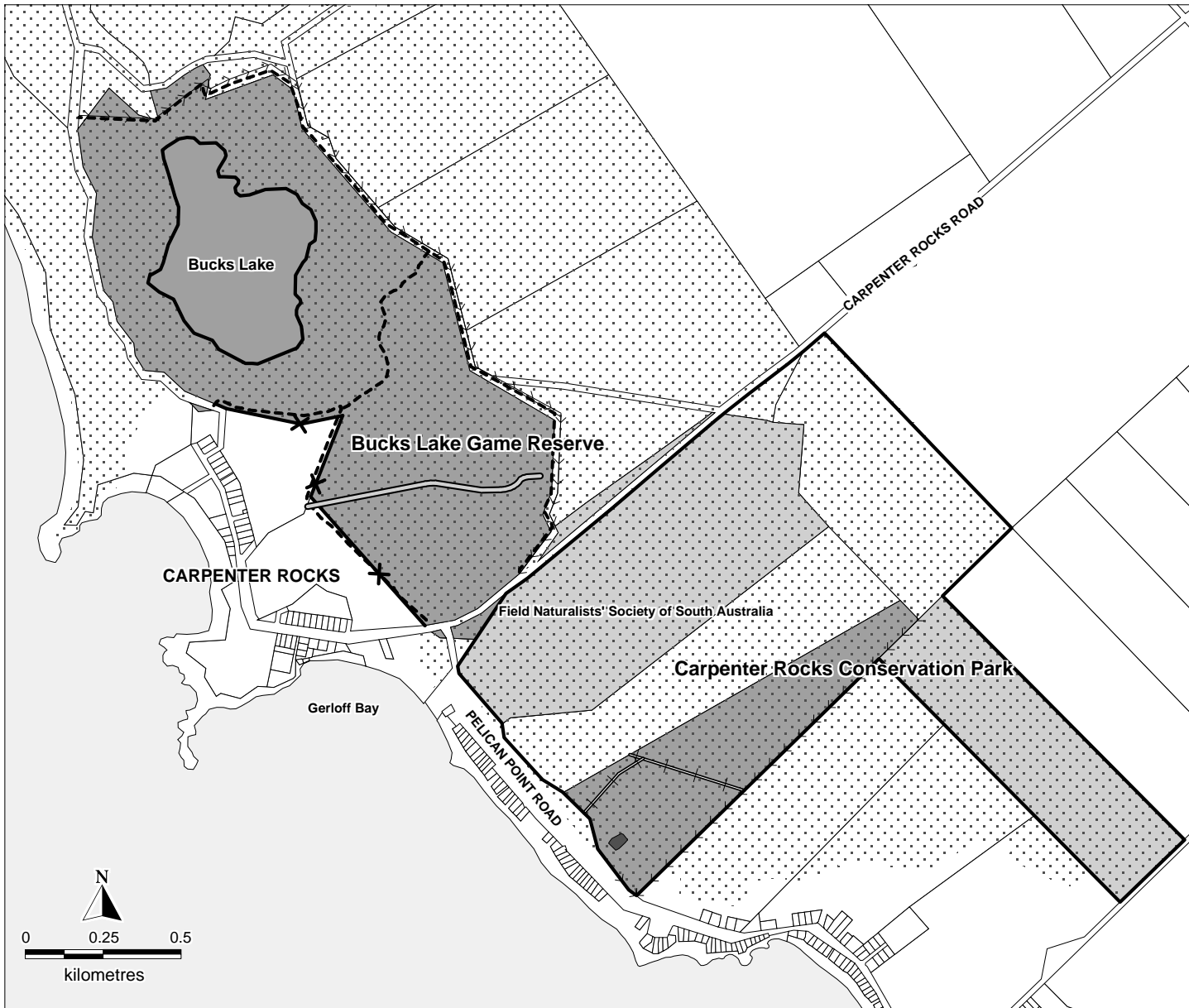
DEH is supporting the Bucks Lake Rehabilitation Project through liaison with other government agencies such as the Environment Protection Agency (EPA), Primary Industries and Resources SA (PIRSA), the Department of Water, Land and Biodiversity Conservation (DWLBC), and the Department of Trade and Economic Development (DTED). Representatives from all of these agencies, including DEH, are working together as the Lake Bonney Management Committee. There has been strong community interest and involvement in the project, which has been facilitated by a community group known as the Lake Bonney Community Forum. The aim of this project is to restore the natural flow paths and the eastern lakeshore habitat of Lake Bonney, after which the Lake Bonney Management Committee will pass responsibilities onto members of the local community. Park managers should consider the management strategies of the Lake Bonney Management Committee when managing the reserve's water resources and habitats.

Objective

Maintain and restore natural hydrological regimes and water quality.

Strategies

- Support surface and groundwater investigations and monitoring within the reserves, with particular regard to Bucks Lake Game Reserve and the Bucks Lake Rehabilitation Project.
- Ensure that management practices do not adversely affect surface/sub-surface water quality.
- Liaise with the South East Natural Resources Management Board regarding regional hydrological projects and any concerns regarding the hydrology of the reserves.



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











-  National Parks and Wildlife Act Reserves
-  Heritage Agreement
-  Cleared Area
-  Larger area of conserved native vegetation
-  Native Vegetation
-  Bucks Lake
-  Ocean
-  Land Parcel Boundary
-  4WD / Management Track
-  ETSA Powerlines
-  Fence
-  Proposed Vehicle Barrier
-  Proposed Levee Bank

Figure 2

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve

Features

Map designed and created by Reserve Planning using PAMS
 Projection: MGA Zone 54 (GDA 94)
 Date: 11 April, 2007

This map is indicative and only intended for the purposes of this management plan.

4.3 Native Vegetation

Carpenter Rocks Conservation Park

Carpenter Rocks Conservation Park has been identified by Croft et al. (1999) as being of great conservation significance since it is part of a remnant area of vegetation in an important coastal area in the Lower South East region.

The vegetation of the park is relatively dense with a low canopy. There are four key vegetation associations found within Carpenter Rocks Conservation Park: Kangaroo Grass (*Themeda triandra*) open grassland; Cutting Grass (*Gahnia trifida*) and Bare Twig-rush (*Baumea juncea*) wetland complex sedgeland; Messmate Stringybark (*Eucalyptus obliqua*) low woodland; and Coastal Wattle (*Acacia longifolia* var. *sophorae*) grassy shrubland.

Kangaroo Grass open grasslands have been identified as an endangered plant community at a state and regional level. Cutting Grass and Bare Twig-rush wetland complex sedgelands are vulnerable within South Australia and the South East region (Croft et al., 1999; DEH, 2005). These ecosystems provide important habitat for the Swamp Skink (*Egernia coventryi*) and Swamp Antechinus (*Antechinus minimus maritimus*), which are both endangered within South Australia. Messmate Stringybark low woodland ecosystem is important to the survival of threatened avifauna species such as the Blue-winged Parrot (*Neophema chrysostoma*) and Chestnut-rumped Heathwren (*Hylacola pyrrhopygia*) (Table 3).

The Coastal Wattle grassy shrubland ecosystem found in the park was originally more open than it is now. The invasive nature of the Coastal Wattle has meant that its distribution has become denser and appears to be displacing the grassland species within the ecosystem. In places within the park where the Coastal Wattle species have been removed, grassland species appear to have recovered. Past grazing pressure by *Macropus* species may have prevented shrublands from developing to the density found at Carpenter Rocks today. There is potential to re-establish native grasslands at Carpenter Rocks by managing this shrubland appropriately, thereby possibly increasing the area of state endangered Kangaroo Grass open grasslands and Bare Twig-rush and Cutting Grass wetland complex sedgeland. Ecological burning could be an effective management tool for achieving this and for enhancing the native vegetation in the park (see Section 5 Managing Fire). Re-establishing the structural complexity of the park will benefit the critically endangered Orange-bellied Parrot (*Neophema chrysogaster*), which tends to feed on or close to the ground, but also requires protection from predators (see Section 4.4 Native Fauna).

The population of Carpenter Rocks Manna Gum (*Eucalyptus splendens* var. *arcana*) situated on the western boundary of the park is of great conservation significance. The specimens found in the park are part of the only known population of Carpenter Rocks Manna Gum, which has a very restricted natural distribution, spreading over a single kilometre (Nicolle & Brooker, 1998). Thus far this species has been assigned a state status of vulnerable, however as a newly identified species, protection at a national level may be allocated in the future (Nicolle & Brooker, 1998). Other noteworthy species include the nationally vulnerable Kangaroo Island Pomaderris (*Pomaderris halmaturina* ssp. *halmaturina*), the state vulnerable Slender Speedwell (*Veronica gracilis*) and the state rare Prickly Grevillea (*Grevillea aquifolium*). Given the rarity and importance of some of the flora species found in Carpenter Rocks Conservation Park, the conservation of significant flora species is a key management issue of this plan (Table 1).

Another management issue relating to the park's native vegetation, concerns a small cleared area, which was supposedly for housing purposes and should be revegetated (Figure 2). The rehabilitation of this area would involve the removal of introduced plant species and various forms of hard rubbish, and as the site has appeared to progressively revegetate naturally the last step of revegetation using plants of local provenance is optional.

Bucks Lake Game Reserve

DEH has carried out a number of biological surveys for Bucks Lake Game Reserve over the years. The reserve had experienced some intermittent grazing when it was held under a licence for grazing purposes just prior to it being constituted under the *National Parks Act 1966*. Despite this disturbance, when the 1994 management plan was developed for the reserve, the groundcover and understorey vegetation appeared to be relatively intact. The reserve has also been subjected to a number of fires, which have adversely impacted on the native vegetation of the reserve. It is suggested that ecological burning could be a useful management tool and might lessen the severity of any future burns (see Section 5 Managing Fire).

Table 1: Flora species of conservation significance recorded in Carpenter Rocks Conservation Park

Scientific Name	Common Name	Conservation Status Codes*		
		EPBC Act	NP&W Act	South East Region
<i>Danthonia eriantha</i>	Hill Wallaby-grass			K
<i>Dichelachne crinita</i>	Long-hair Plume-grass			U
<i>Eucalyptus splendens</i> ssp. <i>arcana</i>	Carpenter Rocks Manna Gum		V	
<i>Eutaxia microphylla</i> var. <i>microphylla</i> (<i>prostrate</i>)	Common Eutaxia			K
<i>Grevillea aquifolium</i>	Prickly Grevillea		R	R
<i>Lasiopetalum schulzenii</i>	Drooping Velvet-bush			U
<i>Leucopogon lanceolatus</i>	Lance Beard-heath			U
<i>Pomaderris halmaturina</i> ssp. <i>halmaturina</i>	Kangaroo Island Pomaderris	V	V	V
<i>Scaevola angustata</i>	Coast Fanflower			U
<i>Stipa mundula</i>	Neat Spear-grass			U
<i>Veronica calycina</i>	Hairy Speedwell			U
<i>Veronica gracilis</i>	Slender Speedwell		V	V

* See Appendix A for Conservation Status Codes

Swamp sedgeland, dominated by Thatching Grass (*Gahnia filum*) and Sea Rush (*Juncus kraussii*), with patches of South Australian Swamp Paperbark (*Melaleuca halmaturorum*) and Silky Tea-tree (*Leptospermum lanigerum*), surround Bucks Lake and cover the southern third of Bucks Lake Game Reserve. The western section of the reserve is dominated by Coast Daisy-bush (*Olearia axillaris*) and Sword Rush (*Lepidosperma gladiatum*) within the vicinity of the lake. On the higher grounds this vegetation association grades into closed shrubland dominated by Dryland Tea-tree (*Melaleuca lanceolata*), Golden Wattle (*Acacia pycnantha*), Coastal Wattle (*Acacia longifolia* var. *sophorae*), Swamp Gum (*Eucalyptus ovata*) and Messmate Stringybark (*Eucalyptus obliqua*). Plant species of conservation significance found in Bucks Lake Game Reserve are indicated in Table 2.

There is a considerable amount of rubbish that has been dumped in Bucks Lake Game Reserve (see Section 9 Involving the Community). As this has an impact on the native vegetation and overall environmental health of the reserve, this rubbish needs to be removed as a component of vegetation rehabilitation programs.

Table 2: Flora species of conservation significance recorded in Bucks Lake Game Reserve

Scientific Name	Common Name	Conservation Status Codes*		
		EPBC Act	NP&W Act	South East Region
<i>Lawrenzia spicata</i>	Salt Lawerencia			U
<i>Ozothamnus ferrugineus</i>	Tree Everlasting			U
<i>Baumea rubiginosa</i>	Soft Twig-rush			U
<i>Villarsia umbricola</i> var. <i>umbricola</i>	Lax Marsh-flower			U
<i>Senecio minimus</i> var. <i>minimus</i>	Fine-tooth Groundsel			U
<i>Urtica incisa</i>	Scrub Nettle			U
<i>Myoporum parvifolium</i>	Creeping Boobiolla		R	R
<i>Veronica gracilis</i>	Slender Speedwell		V	V

* See Appendix A for Conservation Status Codes

The significant alterations to the water regime in the reserve, due to the lack of flow from Lake Bonney, may have had a dramatic effect on the distribution and structure of the vegetation associations in the low-lying areas. For example, the loss of spring flow to Silky Tea-tree habitat is causing degradation and a decline of this habitat in the reserve (Bachmann, 2002).

The Bucks Lake Rehabilitation Project will significantly affect the native vegetation of the reserve, providing relief to dehydrated and degraded habitat. Native vegetation communities, all of which are considered vulnerable in the South East region (including Silky Tea-tree wet shrublands, Cutting Grass (*Gahnia trifida*) sedgeland and Thatching Grass sedgeland) prefer moister environments and will start to rehabilitate from the increase in water supply to the area. It is anticipated that the overall condition of the Bucks Lake wetlands will improve and will therefore benefit the many different native vegetation species the reserve protects. On-going monitoring of the impacts of the Bucks Lake Rehabilitation Project on the native vegetation of the reserve will be conducted by DEH in accordance with the *Bucks Lake Rehabilitation Project Native Vegetation Management Plan* (2006).

Phytophthora

Phytophthora is a generic name for a group of parasitic soil-borne root-rot fungi (most commonly *Phytophthora cinnamomi*). Phytophthora attacks the root system of a plant and reduces or stops the movement of water and nutrients; there is no known cure for Phytophthora, and once an area is infested it remains infested. DEH has identified Phytophthora as a key threatening process and has developed a National Threat Abatement Plan (Environment Australia, 2001). The South East region is classified as being at Moderate Risk from the threat of Phytophthora fungus (Phytophthora Technical Group, 2003).

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve are in a relatively high rainfall area (650 – 800 mm) and have soil of a neutral pH, plus Bucks Lake Game Reserve experiences inundation. These factors imply that both reserves are ideal environments for Phytophthora infection (Laut et al., 1977; Blackburn, 1983). Additionally, Messmate Stringybark, Cushion Ground-berry (*Acrotiche serrulata*), Silver Banksia (*Banksia marginata*) and Horny Cone-bush (*Isopogon ceratophyllus*) found within Carpenter Rocks Conservation Park, and the tea-tree and wattle species found in both reserves, are susceptible to Phytophthora (DEH, 2002). The possible threat of Phytophthora should always be kept in mind and the DEH *Biodiversity Conservation Program Standard Operating Procedures for Phytophthora Threat Management* (2002) should be referred to when undertaking management activities in the reserves.

Mundulla Yellows

Mundulla Yellows is a syndrome that affects eucalypts and other native plants, resulting in the death of the affected plants over several years. It is characterised by progressive yellowing and dieback of foliage and can look similar to lime-induced chlorosis or iron-induced chlorosis (leaf yellowing due to lime intolerant plants striking limestone). The latest theory suggests that Mundulla Yellows is caused by a complex interaction of soil conditions, induced by humans, not by pathogenic organisms or pests (Luck et al., 2004; Luck et al., 2006).

To date, none of the plants within the reserves have shown symptoms of Mundulla Yellows. According to the Mundulla Yellows Task Group (2004), the following plant species found in Carpenter Rocks Conservation Park and Bucks Lake Game Reserve have been diagnosed with Mundulla Yellows within South Australia: eucalyptus; wattle; Flax-lily (*Dianella* sp.); Coast Beard-heath (*Leucopogon parviflorus*); and Tea-tree/Honey-myrtle (*Melaleuca* sp.). As research is still being conducted into the precise cause of Mundulla Yellows conclusions of how to treat or prevent it are yet to be reached. However, it can be advised that when conducting revegetation projects local seed from plants not affected by Mundulla Yellows should be used.

Objective

Conserve the native vegetation protected by the reserves, particularly species and vegetation communities of conservation significance.

Strategies

- Survey and monitor species of conservation significance and identify and mitigate any threats, particularly with regard to the Carpenter Rocks Manna Gum.
- Manage the Coastal Wattle grassy shrublands to promote a more open grassland environment to assist with the conservation of the Orange-bellied Parrot.
- Undertake any necessary rehabilitation programs in the reserves, particularly with regard to the cleared area in Carpenter Rocks Conservation Park and the necessary removal of any rubbish from either reserve.
- Maintain and establish programs to comprehensively monitor changes in vegetation communities. In particular, support the monitoring programs associated with the Bucks Lake Rehabilitation Project.
- Monitor and investigate the need to rehabilitate riparian zone and wetland native vegetation in Bucks Lake Game Reserve once the rehabilitation project is completed.
- Integrate management of threatened species with regional, district and national plans.
- Consider the threat of Mundulla Yellows and Phytophthora and take steps to prevent the introduction of either whenever practicable, report and investigate suspected infections, and treat whenever possible.

4.4 Native Fauna

Fauna surveys have not been conducted in Carpenter Rocks Conservation Park. Therefore, in the absence of verified data, the results of site inspections, information from local environmentalists and research into the species of significance within the local area, have all been utilised to predict the species of conservation significance that are likely to occur in the park.

Fauna surveys have been conducted in Bucks Lake Game Reserve, with the most recent one in 1997 (excluding the survey of small mammal species that incorporated Bucks Lake Game Reserve in 1999/2001 (Bachmann & van Weenen, 2001)). It is likely that the alterations to the water regimes of Bucks Lake and consequently to the habitat would have influenced the abundance and diversity of the fauna species found in the reserve. The implementation of the Bucks Lake Rehabilitation Project will begin to improve conditions for these native fauna species that rely upon wetland habitat and have consequently been impacted by the lack of water supply to Bucks Lake. It is hoped that waterfowl activity will increase during spring with the rehabilitation of the wetlands. Therefore avifauna surveys will be conducted by DEH at this time (DEH, 2006).

Birds

Carpenter Rocks Conservation Park is considered to be of particular importance to threatened avifauna species. One of the most significant is the Orange-bellied Parrot (*Neophema chrysogaster*) (Table 3). The Orange-bellied Parrot is protected by State and Commonwealth legislation throughout its range. It is listed as critically endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) and the *National Parks and Wildlife Act 1972*. It is also considered to be critically endangered by the IUCN (World Conservation Union). In an effort to conserve the Orange-bellied Parrot a national threatened species recovery project has been developed (Commonwealth of Australia, 2005). Although no individuals have been sighted within the park since 1993, the area is still considered to be a known roosting sight and there is the possibility that they may return with the re-establishment of the native grassy shrublands (Orange-bellied Parrot Recovery Team, 1994) (see Section 4.3 Native Vegetation).

Another noteworthy species, the state vulnerable Rufous Bristlebird (*Dasyornis broadbenti*), which has a fragmented distribution due to habitat clearance has been identified in both of the reserves (Tables 3 and 4). Other bird species of significance that have been recorded during site inspections, by a local environmentalist (Neville Bonney) or sighted within the vicinity of Carpenter Rocks Conservation Park according to Blakers et al. (1984), are displayed in Table 3.

The wetland habitat provided by Bucks Lake has been known to support a variety of waterfowl, including migratory waders, such as the state rare and regionally uncommon Bar-tailed Godwit (*Limosa lapponica*). It also provides important habitat for the Sharp-tailed Sandpiper (*Calidris acuminata*) and Common Greenshank (*Tringa nebularia*), which are listed on the annexures of Australia's international treaties with China and Japan regarding migratory birds (ie CAMBA and JAMBA, Appendix B). However, reports tend to indicate that since the change in water regime

fewer have been utilising the wetlands. Fauna surveys have indicated that at least 40 different avifauna species have been identified in the reserve, including 12 of state or regional conservation significance. The threatened bird species that have been recorded in Bucks Lake Game Reserve are displayed in Table 4. The species likely to occur in Carpenter Rocks Conservation Park (Table 3) could also be found within Bucks Lake Game Reserve. It should also be noted that the south-eastern subspecies of the Southern Emu-wren (*Stipiturus malachurus polionotum*), which is rare at a state and regional level, is believed to be present within the reserve (Bachmann, 2002).

Table 3: Fauna species of conservation significance likely to be found in Carpenter Rocks Conservation Park (species without an Asterisk (*) still need to be verified in the park)

Scientific Name	Common Name	Conservation Status Codes*		
		EPBC Act	NP&W Act	South East Region
<i>Antechinus minimus maritimus</i>	Swamp Antechinus		E	
<i>Cisticola exilis</i>	Golden-headed Cisticola		R	R
<i>Dasyornis broadbenti</i> *	Rufous Bristlebird		V	V
<i>Delmar impar</i>	Striped Legless Lizard	V	E	
<i>Egernia coventryi</i>	Swamp Skink		E	
<i>Falco peregrinus</i>	Peregrine Falcon		R	R
<i>Falcunculus frontatus frontatus</i>	Crested Shrike-tit		V	V
<i>Hylacola pyrrhopygia</i>	Chestnut-rumped Heathwren		V	V
<i>Isoodon obesulus obesulus</i>	Southern Brown Bandicoot	E	V	
<i>Macropus giganteus</i>	Eastern Grey Kangaroo		R	
<i>Neophema chrysogaster</i> *	Orange-bellied Parrot	CE	E	E
<i>Neophema chrysostoma</i>	Blue-winged Parrot		V	V
<i>Phylidonyris melanops</i>	Tawny-crowned Honeyeater			U
<i>Pomatostomus superciliosus</i>	White-browed Babbler			U
<i>Wallabia bicolor</i>	Swamp Wallaby		V	
<i>Vombatus ursinus</i> *	Common Wombat		R	

* See Appendix A for Conservation Status Codes

Table 4: Fauna species of conservation significance recorded in Bucks Lake Game Reserve

Scientific Name	Common Name	Conservation Status Codes*	
		NP&W Act	South East Region
<i>Antechinus minimus maritimus</i>	Swamp Antechinus	E	
<i>Anthochaera chrysoptera</i>	Little Wattlebird		U
<i>Corvus tasmanicus</i>	Forest Raven		U
<i>Dasyornis broadbenti</i>	Rufous Bristlebird	V	V
<i>Eopsaltria australis</i>	Eastern Yellow Robin		U
<i>Falco longipennis</i>	Australian Hobby		U
<i>Limosa lapponica</i>	Bar-tailed Godwit	R	U
<i>Pachycephala olivacea</i>	Olive Whistler	V	V
<i>Phaps elegans</i>	Brush Bronzewing		U
<i>Stagonopleura bella</i>	Beautiful Firetail	R	
<i>Thinornis rubricollis</i>	Hooded Plover	V	V

* See Appendix A for Conservation Status Codes

Fish, Reptiles and Amphibians

While very little is known about fish species that may seasonally inhabit Bucks Lake it is known that prior to the draining of Lake Bonney there were a number of fish and eel species. It could be assumed that the lake periodically contained some of the same species currently found in Lake Bonney, as these two water bodies were once connected. Lake Bonney has been found to provide habitat for native fish species such as the Southern Pygmy Perch (*Nannoperca australis*), Common Galaxias (*Galaxias maculatus*), Small-mouthed Hardyhead (*Atherinosoma microstoma*) and nationally vulnerable Dwarf Galaxias (*Galaxiella pusilla*). Native fish and eel species should re-populate Bucks Lake from Lake Bonney once the flowpath restoration project is complete and suitable habitat is available.

It is highly probable that a variety of reptile and amphibian species inhabit Carpenter Rocks Conservation Park given the type of habitat protected and the park's proximity to fresh water sources. DEH surveys of the nationally vulnerable and state endangered Striped Legless Lizard (*Delmar impar*) have found the lizard in native grassland environments near Bool Lagoon (Croft et al., 1999). However, in 2006, it is believed that this species was identified on a property adjacent to Carpenter Rocks Conservation Park and may be found in the park. The state endangered Swamp Skink (*Egernia coventryi*) could also be found within the park, considering the suitability of the park's sedgeland wetland complex habitat (Table 3) (Foulkes & Heard, 2003). Six specimens have been recorded in South Australia (three in 1997) two of which were found within five kilometres of the park (Croft et al., 1999; Foulkes & Heard, 2003).

Various reptiles and amphibians use the wetland habitat and surrounding dense scrubland of Bucks Lake Game Reserve. Aside from the two reptiles and five amphibians that have been recorded, it is highly likely that the Swamp Skink also inhabits the reserve, given the location of the reserve and the Silky Tea-tree (*Leptospermum lanigerum*) swamp and dense sedgeland habitat that it protects (Bachmann, 2002; Foulkes & Heard, 2003).

The Eastern Three-lined Skink (*Bassiana duperreyi*) and Four-toed Earless Skink (*Hemiergis peronii*) are the two reptiles that have been recorded in the reserve. These species are relatively common in the South East region with the Four-toed Earless Skink being particularly widespread in the Lower South East (Foulkes & Heard, 2003). The five amphibian species sighted in the reserve are the Brown Tree Frog (*Litoria ewingi*), Brown Froglet (*Crinia signifera*), Spotted Grass Frog (*Limnodynastes tasmaniensis*), Eastern Banjo Frog (*Limnodynastes dumerili*) and Brown-striped Frog (*Limnodynastes peroni*). All of these species are widespread in the South East region and are relatively common apart from the Spotted Grass Frog (Foulkes & Heard, 2003).

Mammals

The Common Wombat (*Vombatus ursinus*) and the Echidna (*Tachyglossus aculeatus*) are the only mammal species that have been confirmed in Carpenter Rocks Conservation Park thus far. However, it is believed that threatened species such as the Swamp Antechinus (*Antechinus minimus maritimus*), Swamp Wallaby (*Wallabia bicolor*) and Eastern Grey Kangaroo (*Macropus giganteus*) use the park (Table 3). Other mammal species that are likely to be found in the park include the Eastern Swamp Rat (*Rattus lutreolus lutreolus*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecula*). It is also believed that bats frequent small limestone caves within the park and on nearby properties, and then return to Naracoorte to breed (pers. comm. Neville Bonney).

The Swamp Antechinus is a small carnivorous marsupial, which has a scattered distribution ranging from sub-coastal and coastal areas of Victoria through to the Lower South East of South Australia (Bachmann & van Weenen, 2001). Carpenter Rocks Conservation Park protects Cutting Grass (*Gahnia trifida*) sedgeland habitat which is one of the preferred habitats of the Swamp Antechinus, and ten individuals were captured on the Field Naturalists' Society of South Australia block between December 1977 and January 1978 by the property owners (Figure 2). The park is also within the distribution range of the Eastern Grey Kangaroo, which is a widespread species found in forests, woodlands and grasslands (Foulkes & Heard, 2003). Additionally, the park protects habitat, which is suitable for the Southern Brown Bandicoot (*Isodon obesulus obesulus*) and is also within the range of distribution for this species (Croft et al., 1999; Foulkes & Heard, 2003).

The mammal species identified in Bucks Lake Game Reserve tend to be small native rodents such as the Bush Rat (*Rattus fuscipes*) and Swamp Rat (*Rattus lutreolus*), with the exception of the Swamp Antechinus, which is a small native carnivorous marsupial. The endangered Swamp

Antechinus has been recorded in Bucks Lake Game Reserve, with the capture of one young female in 1999/2001 during a small mammal survey (Bachmann & van Weenen, 2001). Due to the clearance and drainage of habitat preferred by Swamp Antechinus, Bucks Lake Game Reserve is of great importance to this species (Foulkes & Heard, 2003). Populations of the Bush Rat are restricted to the more southern areas of the South East region, where it can be found in eucalypt forest and coastal scrub with a dense understorey, implying that it could be found in Carpenter Rocks Conservation Park as well. The Swamp Rat is also widespread and relatively common in the Lower South East and occurs mainly in swampy areas with dense cover, such as sedgeland and wet grassland. In addition, other native mammal species that are likely to be found in Carpenter Rocks Conservation Park might also be found in Bucks Lake Game Reserve given the location and habitat of the reserve.

Invertebrates

The habitat found in the Lower South East is important for many invertebrate species. The vegetation found in this region is unique and therefore also provides for unique invertebrates, particularly with regard to butterflies, with 11 butterfly species found in the area not found anywhere else in South Australia (Grund, 2007).

The wetland, sedgeland and grassland habitats protected by the reserves are particularly important for various species of butterfly and dragonfly, including some that are of conservation significance (Grund, 2007). The Grassland Copper (*Lucia limbaria*) is a rare butterfly species (Grund, 2007) which has been identified in the coastal grassland and woodland habitat of Carpenter Rocks Conservation Park and surrounding properties (Haywood, 2006). This species is dependant on native grasslands for its survival and as such this is another reason for re-establishing the Coastal Wattle (*Acacia longifolia* var. *sophorae*) grassy shrubland to its original state (see Section 4.3 Native Vegetation) (Haywood, 2006).

Invertebrate species are good indicators of ecosystem health and should also be considered when undertaking biological surveys, particularly those of conservation significance. For example, the Chrysotricha Sedge-skipper (*Hesperilla chrysotricha cyclopsila*), which is considered vulnerable (Grund, 2007) has been found at Bucks Lake Game Reserve and indicates how pristine a wetland habitat is (Grund, 2002).

Objective

Identify and protect native fauna inhabiting or using the reserves.

Strategies

- Encourage and support biological surveys, research and monitoring of native species in the reserves and on neighbouring properties with landowners consent, especially with regard to the avifauna monitoring associated with the Bucks Lake Rehabilitation Project.
- Encourage approved volunteer groups and individuals to conduct fauna surveys and undertake population monitoring.
- Use the results of fauna monitoring to determine any required habitat rehabilitation and identify any threats that need to be mitigated.
- Undertake any necessary habitat rehabilitation projects or threat mitigation to support the survival of fauna species, ensuring that a regional, state-wide or national perspective is taken when needed. Concentrate on the protection of the Orange-bellied Parrot and the Swamp Antechinus.
- Provide assistance to threatened species recovery projects that are applicable to the reserves.

4.5 Introduced Plants

One of the current priorities for controlling introduced plants in Carpenter Rocks Conservation Park and Bucks Lake Game Reserve is to prevent the introduction of weeds and maintain the current situation, as the current level of weed infestation in the reserves is considered to be manageable.

In Carpenter Rocks Conservation Park the majority of introduced plant species are found in the grassy areas. There are infestations of Radiata Pine (*Pinus radiata*) in the park, which should be removed for rehabilitation purposes. Radiata Pines have been found to crowd out important native species such as the nationally vulnerable Kangaroo Island Pomaderris (*Pomaderris halmaturina* ssp. *halmaturina*), and are considered a threat to remnant native vegetation within reserves (Croft et al., 1999). Bridal Creeper (*Asparagus asparagoides*) and Horehound (*Marrubium*

vulgare) are two of the more threatening introduced plant species found in the park. It is believed that Bridal Creeper is relatively under control due to the rust parasite, which was introduced in Naracoorte during 2000, however while the rust parasite has been effective, further control measures may still need to be considered. With regards to Horehound, liaison with the District Council of Grant is required to determine its location within the reserves, so that control measures can be undertaken. In the damper areas of Carpenter Rocks Conservation Park, Buckthorn (*Rhamnus* sp.) and New Zealand Mirror-bush (*Coprosma repens*) could be a problem if they are not monitored and readily removed, as could Milkwort (*Polygala* sp.) in the drier areas of the park. Pincushion Flower (*Scabiosa columbaria*) and Plantain (*Plantago* sp.) have also been identified as possible threats to the biodiversity of the park, as they compete with native undergrowth species and are difficult to isolate for control.

To date (2007) 33 introduced plant species have been recorded in Bucks Lake Game Reserve, and there is a relatively low amount of weed infestation. Action needs to be taken to monitor and treat introduced plant species to control and prevent any further spread of weeds. New Zealand Mirror-bush, Tall Meadow Fescue (*Festuca arundinacea*) and Horehound are priority introduced species within Bucks Lake Game Reserve that need to be controlled and monitored. Also, Spiny Rush (*Juncus acutus*), which is highly invasive and has been identified just north of Bucks Lake Game Reserve, needs to be monitored and controlled to prevent it from spreading into the reserve.

Given the relatively weed-free environment of both reserves a management regime should be employed to maintain this situation, particularly because as the township of Carpenter Rocks continues to be developed both reserves will come under increased threat from weed invasion. To effectively manage the threat of weed invasion a regionally-integrated approach needs to be taken, involving surrounding property owners/managers, the District Council of Grant and the South East Natural Resources Management Board. Weed control activities should be coordinated according to priorities determined in a DEH district pest plant management program and should recognise the legal requirements of the *Natural Resources Management Act 2004*.

Objective

Control and if possible eliminate introduced pest plant species, and minimise the adverse impacts that introduced plant species have on the biodiversity of the reserves.

Strategies

- Monitor and control introduced plant infestations through establishing pest plant control priorities and actions, with particular attention paid to the removal of Radiata Pines from Carpenter Rocks Conservation Park.
- Develop partnerships with local land managers, including the South East Natural Resources Management Board and the District Council of Grant, and contribute to integrated regional weed control programs.

4.6 Introduced Animals

A number of introduced animals have been recorded in Bucks Lake Game Reserve and it is likely that similar introduced species also inhabit Carpenter Rocks Conservation Park. The priorities for pest animal control programs include Fox (*Vulpes vulpes*), European Rabbit (*Oryctolagus cuniculus*) and Feral Cat (*Felis catus*). Due to the close proximity of the reserves to rural and coastal living areas, cats and foxes are present in reasonable numbers. Anecdotal observations suggest that foxes and cats are potentially serious threats to the Orange-bellied Parrot (*Neophema chrysogaster*) (Commonwealth of Australia, 2005). In 1995 and 1996 cat trapping was conducted inside the eastern border of Bucks Lake Game Reserve with considerable success. High cat numbers may have been associated with the open-cut rubbish dump across from the reserve (see Section 9 Involving the Community). Other introduced species that have been recorded in the reserve include the Black Rat (*Rattus rattus*) and House Mouse (*Mus musculus*). In addition, it is suspected that hares and feral deer could be found in both reserves and if confirmed they should be monitored and controlled as priority introduced species.

Careful management through integrated pest control programs is the most effective way to ensure that pest animal numbers are reduced with minimal impact on native flora and fauna, until a long-term biological control alternative is found. There is no one set method of control for any of the introduced species, but rather a range of available methods. A coordinated multi-species approach is more effective with regards to control of the priority pest animals, due to the interrelatedness of fox, cat and rabbit populations.

Domestic dogs and cats either stray into the reserves or, in the case of dogs, are brought in to Bucks Lake Game Reserve. The use of 1080 baits for fox control presents a great danger to domestic dogs and may also affect domestic cats. DEH promotes education initiatives regarding responsible pet ownership as a way to reduce the number of stray animals within reserves and visitors will be adequately warned of any control programs as necessary.

From a DEH perspective, the current situation in the reserves does not warrant immediate plans for introduced animal control. Any introduced animal control activities undertaken should be integrated with district-wide programs. As is the case for introduced plants, park managers should if at all possible, integrate their activities with those of neighbouring property managers.

Objective

Control introduced animal populations in the reserves, preferably as a component of regional programs.

Strategies

- Devise introduced animal control programs in accordance with regional priorities and any existing plans that address introduced animal control, such as the Orange-bellied Parrot Recovery Plan.
- Work in cooperation with adjoining landowners, the South East Natural Resources Management Board and the District Council of Grant, to achieve effective pest animal control on a regional basis.

5 MANAGING FIRE

There have been no significant fires recorded for Carpenter Rocks Conservation Park. It has been estimated that there has not been a fire for the past 10 to 20 years, as the Messmate Stringybark (*Eucalyptus obliqua*) within the park do not display any charcoal scarring. In contrast, Bucks Lake Game Reserve has experienced three significant fires. In March 1981, 40 hectares in the northern area of the reserve were burnt and this was followed by another fire in October of the same year, which burnt 60 hectares of the south-eastern section of the reserve. The third significant fire did not occur until October 2004, which burnt approximately 90 hectares of the reserve and about 10 hectares of neighbouring private property. Additionally, there is a Country Fire Service (CFS) record of a grass and scrub fire on the Carpenter Rocks Road in October 2002.

Carpenter Rocks Conservation Park and Bucks Lake Game Reserve do not currently have a fire management plan and consequently one will be prepared. The fire management zones designated within this fire management plan will be consistent with the primary purpose of conserving the biodiversity values of the reserves.

During the fire management planning process it should be considered that due to the relatively small size of Carpenter Rocks Conservation Park and its location within a large block of remnant native vegetation, there is no justification for putting firebreaks or tracks along the park boundary. The entire 182 hectares block of native vegetation that is managed for environmental conservation, of which the park is a small component, should be assessed for fire management purposes. Consequently, relationships with neighbouring property owners need to be established and maintained with regards to fire management for the entire block of native vegetation.

Carpenter Rocks Conservation Park does not have any fire tracks. However, the well-cleared path that traverses the park (ETSA easement) could be used for fire fighting purposes (Figure 2). Within Bucks Lake Game Reserve there are a number of fire access tracks that are well maintained owing to its fire history. The need to construct any additional vehicle access tracks in Bucks Lake Game Reserve will be determined through the fire management planning process, which will take into consideration the impacts of hydrological restoration (see Section 4.2 Hydrology). However, if fire management measures, such as the creation of firebreaks and access tracks are required prior to the preparation of the fire management plan, these measures will be considered if they are necessary for the protection of native habitat or public safety.

It is recommended that applied fire (ie ecological burning) only be used if the benefits of such a practice are justified upon the basis of scientific principles, it is required for reducing fuel hazards and steps are taken to ensure that the burning is performed safely. This recommendation should be adhered to until a fire management plan is prepared at which time further advice as to how applied fire should be used as a management tool will be available. One of the factors that needs to be considered with regards to ecological burning is that the availability of food for the Orange-bellied Parrot (*Neophema chrysogaster*) is dependant on maintaining a mosaic of habitats of different ages, and this can be accomplished through the use of applied fire (Brown & Wilson 1982, 1984). Any bushfires should be suppressed as soon as practicable. This is due to the small size of the reserves and proximity to the township of Carpenter Rocks and other residential properties.

The fire management plan will be prepared in consultation with CFS Groups and the District Council of Grant Bushfire Prevention Committee, in order to integrate it with fire management in the district. Stakeholders and the wider community will also be consulted to ensure an understanding of the fire risks and mitigating actions being proposed or undertaken in the reserves.

Fire management planning will:

- identify natural and cultural heritage values and built assets;
- provide a framework for the management of bushfire suppression, including identification of fire management zones, strategic access and control lines;
- provide objectives and strategies for the use of fire for ecological purposes; and
- identify performance indicators.

Objective

Manage fire to ensure the protection of life and property, the maintenance of biodiversity and the protection of natural, cultural and built values in and near the reserves.

Strategies

- Develop, implement and review the fire management plan associated with the reserves in cooperation with the CFS and the District Council of Grant Bushfire Prevention Committee.
- Work with neighbouring landholders to develop fire management strategies for Carpenter Rocks Conservation Park as part of a large block of native vegetation.
- Continue to work with the relevant District Bushfire Prevention Committee and the CFS to minimise risk to life and property within and surrounding the reserves.
- Liaise with the ETSA regarding fire management access along the cleared ETSA easement within Carpenter Rocks Conservation Park.
- Suppress all bushfires within the reserves as soon as practicable.
- Until a fire management plan is prepared:
 - maintain existing fire tracks and only create new tracks or firebreaks in Bucks Lake Game Reserve, post hydrological restoration, if there are no other alternatives that can be used to protect native habitat or for ensuring public safety; and
 - only use applied fire as a management tool if it would be beneficial according to sound scientific principles or is required for fuel reduction purposes.

6 MANAGING CULTURAL HERITAGE

Boandik Culture and Heritage

The land comprising Carpenter Rocks Conservation Park and Bucks Lake Game Reserve is traditionally associated with the Boandik people (Tindale, 1974).

Following colonial settlement, the Boandik population was substantially reduced as a result of introduced diseases, dispersal, dispossession of their land and water supplies, and sometimes through violent conflict.

Today, Boandik people live on their country and practise their culture and language. Some of the language and traditional stories have been recorded. However, to date, the full extent of Aboriginal heritage at Carpenter Rocks Conservation Park and Bucks Lake Game Reserve has not been comprehensively researched.

However, due to historical or cultural reasons, any knowledge of the cultural heritage of the region may be privileged to selected Boandik people and therefore unable to be recorded. Given the lack of existing information, it is considered important that further research be undertaken in order to gain a better understanding of the Aboriginal occupancy and use of the area.

Aboriginal Heritage Act 1988

The purpose of the *Aboriginal Heritage Act 1988* is the protection and preservation of Aboriginal sites, objects and remains. 'Aboriginal site' and 'Aboriginal object' are defined under the Act as 'an area of land or an object that is of significance according to Aboriginal tradition; or that is of significance to Aboriginal archaeology, anthropology or history.' The Aboriginal Affairs and Reconciliation Division (AARD) of the Department of the Premier and Cabinet maintains a Central Archive, including the Register of Aboriginal Sites and Objects.

Currently one archaeological site listed on the Central Archive is located within Carpenter Rocks Conservation Park. It is noteworthy that another site listed on the Central Archive is within very close proximity of the park. To date, no archaeological sites have been identified within Bucks Lake Game Reserve, although one has been found within the vicinity of the reserve. These recordings do not reflect a comprehensive survey of the reserves and there may be other, as yet unidentified, Aboriginal sites, objects and remains in the reserves. In carrying out the activities and strategies proposed in this plan, DEH will ensure that it complies with the *Aboriginal Heritage Act 1988*.

Objective

Ensure that any Aboriginal sites, objects and remains are protected and preserved.

Strategies

- Consult with the relevant regional Aboriginal heritage committees and relevant Government Aboriginal heritage authorities in decisions regarding the management of Aboriginal heritage.
- Identify and protect any Aboriginal sites, objects and remains in cooperation with the relevant regional Aboriginal heritage committees, AARD and other relevant authorities.
- In consultation with the relevant regional Aboriginal heritage committees, submit cultural sites and stories that relate to the park for inclusion on the AARD Central Archive.

7 MANAGING TOURISM AND RECREATION

7.1 Visitor Use and Access

Carpenter Rocks Conservation Park experiences very low visitor numbers (less than 100 people per year). From time to time local people with an interest in nature observation visit the park. The situation is similar for Bucks Lake Game Reserve, which also receives relatively low visitor numbers and during proclaimed hunting seasons tends to be visited by no more than 10 hunters, probably due to the low waterfowl numbers. Since the primary role of both reserves is nature conservation, visitors will not be actively encouraged and it is desirable that this situation continues into the foreseeable future. The few people that do visit the reserves tend to be self-sufficient and amenities are available within close proximity of both reserves. Consequently, there is no immediate demand or requirement for visitor facilities and none are planned for the term of this management plan. Additionally, to date (2007) there has been no interest shown in the reserves with regards to commercial tourism. Any future tours organised for the benefit of fee or reward will require the tour operator to obtain the mandatory Commercial Users Licence, consistent with regulation 37 of the *National Parks and Wildlife (National Parks) Regulations 2001*.

Public vehicles are prohibited from entering Carpenter Rocks Conservation Park without appropriate authorisation from DEH. Walking trails will not be established in the park. There are tracks within Carpenter Rocks Conservation Park, however their use as walking trails will not be encouraged. However, if these tracks do happen to be used markers have been placed along the boundary between Carpenter Rocks Conservation Park and the north-eastern property, by the Friends of Mount Gambier Parks, so that visitors are aware when they are entering or leaving the park. It is suggested that measures of a similar nature be put in place to indicate the boundary with the south-eastern neighbouring property. All property boundary markers should be maintained and updated if they appear to be ineffective.

Public vehicles can not enter Bucks Lake Game Reserve without suitable authorisation from DEH. There is unsupported bushwalking in Bucks Lake Game Reserve, along the boundary management tracks and within the reserve in general (Figure 2). There is a history of public vehicles entering the reserve via the southern boundary of the reserve and to discourage this it is proposed that a suitable vehicle barrier be constructed along this boundary as depicted in Figure 2. Currently, hunters access the reserve on foot once they have parked their vehicles along the main road outside of the reserve. If hunting opportunities increase in the future with the rehabilitation of the Bucks Lake wetlands this form of access and the requirement of any facilities for hunters will be reviewed. Amendment to this management plan may be required if anything other than basic facilities (eg car park, walking access or an information bay) are needed.

Dogs

Traditionally dogs have been allowed in Bucks Lake Game Reserve to accompany hunters during open season. This arrangement will continue to be permitted in accordance with regulation 27(6) of the *National Parks and Wildlife (National Parks) Regulations 2001*. The regulation specifies that when someone chooses to bring a dog into a Game Reserve to assist them when hunting, they must restrain the dog on a lead while the dog is not assisting them in hunting. Dog owners are required to remove their dog's faeces. As dogs will be permitted within the reserve, it is stressed that when introduced animal control (ie baiting) is being carried out, it is clearly signposted at the entrances to the reserve (see Section 5.6 Introduced Animals). It must be noted that dogs are not permitted within Carpenter Rocks Conservation Park.

Objective

Ensure that visitors respect the conservation role of the reserves and have a minimal impact.

Strategies

- Monitor visitor numbers and their impact on the environment to assess if any controls on reserve access are required.
- Manage the reserves for low-key visitor use, without the need for any facility development, unless the reviews of the level of access in Bucks Lake Game Reserve indicate that the provision of additional basic facilities is necessary.
- Construct, realign and maintain fencing, boundary markers and vehicle barriers where necessary.
- Provide access for dogs accompanying hunters in Bucks Lake Game Reserve, consistent with the conditions of this management plan.

8 MANAGING RESOURCE USE

8.1 Exploration and Mining

The South East of South Australia is considered to be a proven petroleum region by Primary Industries and Resources South Australia (PIRSA). Therefore, when Carpenter Rocks Conservation Park was constituted in 2001, it was simultaneously proclaimed under the *National Parks and Wildlife Act 1972* to provide for exploration and mining access under the *Petroleum Act 2000*. Bucks Lake Game Reserve does not permit access for exploration and mining under State mining legislation.

The proclamation for Carpenter Rocks Conservation Park (Appendix C) outlines the rights and expectations for licensees with regards to access to the park for petroleum prospecting, exploration or mining. These provisions include a statement of environmental objectives and a recovery plan for the rehabilitation of the vegetation, if the latter is deemed necessary due to the likelihood of vegetation disturbance.

The Minister for Environment and Conservation must approve, and may set conditions that must be carried out in relation to, exploration and extraction in the park. Additionally, if a plan of management such as this one is in operation under section 38 of the *National Parks and Wildlife Act 1972* anyone exercising rights of entry for prospecting, exploration or mining must have regard to the provisions of the plan. To this end, the following conditions may be specified for inclusion in licence and activity approvals for exploration and extraction activities in the park:

- licensees are to avoid exploratory activity that will have a significant impact on native vegetation and fauna, in particular disturbance of habitat that provides important refuge for fauna;
- no exploration activity will be permitted in the park that could disrupt the roosting habits of the Orange-bellied Parrot (*Neophema chrysogaster*) which is critically endangered at a national level (generally during winter months);
- activities associated with petroleum prospecting will be conducted in a way that avoids impacts to the endemic Carpenter Rocks Manna Gum (*Eucalyptus splendens ssp. arcana*) and the nationally vulnerable Kangaroo Island Pomaderris (*Pomaderris halmaturina ssp. halmaturina*);
- disturbance associated with exploration works will be progressively rehabilitated within six months from the cessation of activities;
- contact must be made with the District Ranger at least ten working days prior to commencement of activities, and must be maintained throughout the work program; and
- operators must comply with any additional, reasonable recommendations made by the District Ranger in relation to carrying out their activities to improve on the protection provided above or to minimise the impact on DEH staff operations in the park.

Details of environmentally sensitive areas that should not receive undue disturbance may be specified in licence conditions or works approvals.

Due to the small size of the park, exploration in the park should only be undertaken as part of a staged regional process. Activity within Carpenter Rocks Conservation Park will only be approved once a resource has been identified as a result of regional investigation and no alternative for either confirming the extent of that resource or extracting the resource is available. Consequently, the order of preference for exploration activities is as follows:

- regional exploration such as airborne geophysical surveys, to better define prospectivity;
- should access be required to delineate a resource, non-invasive techniques will be allowed within the park, such as hand-carried seismic equipment, performed on pre-existing tracks and in areas that have already experienced some disturbance;
- techniques that require vehicle access will be determined on a case by case basis; and
- underground resources may be explored and extracted, but only from outside the park.

No exploration or production well is to be drilled within the park.

Objective

Ensure that petroleum and mineral exploration and any subsequent extraction activities are conducted in a manner that does not intrude upon or adversely impact the natural values of Carpenter Rocks Conservation Park.

Strategy

- Liaise with operators engaged in petroleum exploration or extraction activities associated with Carpenter Rocks Conservation Park to prevent undue disturbance and ensure compliance with the provisions of this management plan.

8.2 Duck Hunting

Hunting is permitted within Bucks Lake Game Reserve during a proclaimed open season, in accordance with the *National Parks and Wildlife Act 1972* and the *National Parks and Wildlife (Hunting) Regulations 1996*. The purpose of a Game Reserve is the conservation of wildlife and management of game.

Bucks Lake Game Reserve can be declared open at prescribed times for strictly controlled hunting. To hunt in Bucks Lake Game Reserve during the proclaimed open season an endorsed hunting permit is required. Within South Australia, the timing of the open season, bag limits and permitted species can be varied from year to year according to seasonal conditions and population trends. The reserve will be declared open or closed during the proclaimed open season based upon scientific advice regarding water availability, waterfowl abundance and the condition of other key wetlands in Australia.

Hunting at Game Reserves is generally subject to additional restrictions and Bucks Lake Game Reserve can be closed to hunters on short notice by the Minister or the Director of National Parks and Wildlife. This could occur if observations or surveys indicate that there is a risk to species of conservation significance, the possibility of disturbance to breeding birds or concerns for public safety.

The duck species commonly harvested in Bucks Lake Game Reserve, include Grey Teal (*Anas gracilis*), Chestnut Teal (*Anas castanea*), Pacific Black Duck (*Anas superciliosa*), Pink-eared Duck (*Malacorhynchus membranaceus*) and Australian Shelduck (Mountain Duck) (*Tadorna tadornoides*).

The number of hunters that use Bucks Lake Game Reserve are relatively low (less than 10 each year) compared to other Game Reserves in the South East region. However, with the plans to rehabilitate Bucks Lake wetlands there is the possibility that this might change in the near future and this should be monitored to ensure that the activity remains sustainable at the site.

Objective

Permit duck hunting at Bucks Lake Game Reserve consistent with its status as a Game Reserve, while minimising impacts on non-game species.

Strategies

- Allow the reserve to be open for duck hunting in accordance with the *National Parks and Wildlife Act 1972* and the annual open season declaration by the Minister.
- Assess the risk of hunting on non-game species, based on surveys, monitoring and biological criteria, and review arrangements prior to the declaration of the open season and open days.
- If considered necessary for public safety or specific conservation concerns, close the reserve, or part of the reserve, during hunting events.
- Upon the completion of the Bucks Lake Rehabilitation Project, monitor changes in waterfowl populations to guide decision-making with regards to declaring open seasons and hunting arrangements.

9 INVOLVING THE COMMUNITY

Friends and Volunteers

Volunteer support and community-based involvement that conserves and improves biodiversity and cultural values, and establishes quality management of recreational use, has become an essential component of park management. DEH acknowledges and supports the active volunteer contribution of the Friends of Mount Gambier Parks towards the management of the reserves through activities such as weed control and rubbish removal. The Field Naturalists' Society of South Australia owns one of the properties within close proximity of Carpenter Rocks Conservation Park and there is an opportunity to develop a partnership that enables the cooperative management of these blocks of land (Figure 2).

It is important for DEH to continue communication with volunteers, provide support and assistance, including legal and policy advice, technical, planning and management direction.

Regional Communities, Non-government Organisations and Park Neighbours

DEH supports and promotes partnerships and cooperative management arrangements to establish integrated natural resource management. This requires the development of effective working relationships with government agencies, local authorities, non-government organisations and the local community. With regard to Carpenter Rocks Conservation Park and Bucks Lake Game Reserve, this involves ongoing management links to the:

- District Council of Grant;
- South East Natural Resources Management Board;
- Kungari Heritage Association Inc;
- Friends of Mount Gambier Parks;
- Field Naturalists' Society of South Australia;
- Birds SA;
- Birds South East;
- Birds Australia;
- Friends of Shorebirds SE;
- South East South Australian Orange-bellied Parrot Working Group;
- South Australian Field and Game Association;
- Combined Hunters and Shooters South Australia;
- Greening Australia (Victoria);
- Portland Field Naturalists (Victoria);
- Lake Bonney Management Committee, Lake Bonney Community Forum and members of the local community involved in the Bucks Lake Rehabilitation Project; and
- park neighbours, particularly those who also manage their properties for conservation purposes.

Currently, both reserves are located within a Primary Industry Zone, which does not have any objectives or allowances for the conservation of native habitat (District Council of Grant, 2006). As there is currently no Conservation Zone within District Council of Grant area it is suggested that such a zone be established and that it incorporate the two reserves and the contiguous blocks of native vegetation around Carpenter Rocks Conservation Park. It should be noted that the land adjacent to part of the south-eastern boundary of the park is within a Country Township Zone, which allows for developments and subdivision of land. Thus highlighting the importance of encouraging the establishment of a Conservation Zone that protects the reserves and the blocks of remnant native coastal habitat.

With changes to land use within the region, it is important for DEH to actively work with the District Council of Grant and development bodies to ensure proposed developments do not adversely impact on biodiversity conservation values of the reserves. For example, park managers should liaise with the District Council of Grant with regards to the possible issue of an increase in run-off from a land development adjacent to Carpenter Rocks Conservation Park, which could impact

on the park's biodiversity values, soils and landforms through the introduction of polluted waters into the park. It should also be noted that the Grant District Council operates an open-cut rubbish dump opposite Bucks Lake Game Reserve and as this only operates two and a half days a week at other times rubbish has been dumped at the gate or within the reserve. However, as the council also operates a 'big bin' service there is very little rubbish being dumped there now but is an issue worthy of monitoring. DEH will remove the rubbish from the reserve (see Section 4.3 Native Vegetation) and will liaise with the District Council of Grant with regard to its appropriate disposal, as the Council has offered to work in partnership with the EPA and Zero Waste SA to achieve this.

While Carpenter Rocks Conservation Park is part of a 182 hectare area of remnant native vegetation that is managed for conservation purposes, both reserves are located within a much larger area of remnant native vegetation (Figure 2). It is evident that some of the adjacent landowners manage their land for conservation purposes. For example, these landowners, including members of the Field Naturalists' Society of South Australia, have collected information about the surrounding properties, including lists of the flora and fauna identified on the properties. DEH should encourage neighbouring landowners to enter into a cooperative environmental management agreement. These arrangements can vary from formal cooperative environmental management agreements (CEMA's) to informal voluntary meetings between park managers and neighbours to discuss issues of common interest.

Cooperative management arrangements can result in effective pest plant and animal control programs through an integrated approach, practical fire prevention and fencing arrangements, and opportunities for landowners to improve the biodiversity values of their land. Fences and firebreaks are usually established on legal boundaries, often at high cost and can require the removal of native vegetation. This is often not the most practical option, particularly in terms of managing wildlife and suppressing fires and would usually be best achieved by incorporating other areas of native vegetation adjacent to a reserve. Similarly, attempts to conduct prescribed burning, within land parcel boundaries is less likely to contribute to regional biodiversity objectives. The ability to have more flexibility in these matters of biodiversity management is desirable.

Aboriginal Partnerships

DEH is committed to reconciliation and to the development of partnerships with the Boandik community and the Kungari Heritage Association Inc to effectively manage Carpenter Rocks Conservation Park and Bucks Lake Game Reserve in a way that respects both contemporary and traditional culture, knowledge and skills. A partnership with the appropriate Aboriginal representatives needs to be developed. If such a partnership were developed for Carpenter Rocks Conservation Park and Bucks Lake Game Reserve, it could involve the delivery of programs that promoted reconciliation, cultural awareness, and Indigenous cultural heritage management.

Objective

Maintain cooperative working relationships that contribute to the conservation of biodiversity in the reserves.

Strategies

- Develop partnerships with organisations that want to be involved in the sustainable management of the reserves, particularly those that are concerned with protecting threatened species or want to contribute to on-ground management activities.
- Work with the District Council of Grant and other local agencies to explore the benefits of partnership arrangements to deal with issues of common interest and to integrate biodiversity management in the region.
- Ensure that the District Council of Grant considers the establishment of a Conservation Zone within its jurisdiction and that the reserves and contiguous areas of native vegetation around Carpenter Rocks Conservation Park are rezoned as 'Conservation Zone' in the Council's Development Plan.
- Provide landowners within the vicinity of the reserves with the opportunity of entering into a cooperative management arrangement with DEH.
- Build ongoing partnerships with Aboriginal groups to support the future management of Carpenter Rocks Conservation Park and Bucks Lake Game Reserve.

10 MANAGING RESERVE TENURE

10.1 Public Utilities

Above-ground power lines owned and managed by ETSA Utilities traverse Carpenter Rocks Conservation Park. Vegetation along this easement has been cleared to enable access and prevent any interference with these powerlines. Ongoing maintenance is required to ensure vegetation does not make the ETSA easement impassable. ETSA needs to ensure that there is no unnecessary disturbance to native flora and fauna when undertaking maintenance activities. ETSA liaises with DEH prior to undertaking any work in the park and has standard operating procedures to ensure minimal impact on native vegetation.

DEH would oppose the establishment of any new public utilities on Carpenter Rocks Conservation Park or Bucks Lake Game Reserve, given their small size and significance for biodiversity conservation. DEH policy discourages the location of utilities on reserves, unless proponents can demonstrate that:

- alternative locations have received full consideration; and
- the utility will not compromise the conservation values of the reserve.

Protection of reserve values is a priority, and reserves should not be considered to be a convenient option for the location of public utilities due to their status as public land. Any future proposal for public utilities within the reserves will be subject to an environmental assessment, and must be consistent with DEH policy and the provisions of this management plan.

Objective

Minimise the impact of authorised users on reserve values.

Strategy

- Liaise with public utilities and impose appropriate conditions to ensure that maintenance of services and activities has minimal impact on the values of Carpenter Rocks Conservation Park.

SUMMARY OF MANAGEMENT STRATEGIES

MANAGING NATURAL HERITAGE

Geology, Soils and Landform

- Identify any caves or sinkholes in the reserves and address any public safety issues.
- Document and map soil types in the reserves.
- Consider the impacts on geology and soils when undertaking management activities.
- Undertake soil rehabilitation in areas of the park where soils are degraded or susceptible to degradation and would benefit from preventative/remedial work.
- Liaise with neighbouring land managers and other agencies such as the South East Natural Resources Management Board and the District Council of Grant regarding conservation measures for the soils and geological formations in the reserves.

Hydrology

- Support surface and groundwater investigations and monitoring within the reserves, with particular regard to Bucks Lake Game Reserve and the Bucks Lake Rehabilitation Project.
- Ensure that management practices do not adversely affect surface/sub-surface water quality.
- Liaise with the South East Natural Resources Management Board regarding regional hydrological projects and any concerns regarding the hydrology of the reserves.

Native Vegetation

- Survey and monitor species of conservation significance and identify and mitigate any threats, particularly with regard to the Carpenter Rocks Manna Gum.
- Manage the Coastal Wattle grassy shrublands to promote a more open grassland environment to assist with the conservation of the Orange-bellied Parrot.
- Undertake any necessary rehabilitation programs in the reserves, particularly with regard to the cleared area in Carpenter Rocks Conservation Park and the necessary removal of any rubbish from either reserve.
- Maintain and establish programs to comprehensively monitor changes in vegetation communities. In particular, support the monitoring programs associated with the Bucks Lake Rehabilitation Project.
- Monitor and investigate the need to rehabilitate riparian zone and wetland native vegetation in Bucks Lake Game Reserve once the rehabilitation project is completed.
- Integrate management of threatened species with regional, district and national plans.
- Consider the threat of Mundulla Yellows and Phytophthora and take steps to prevent the introduction of either whenever practicable, report and investigate suspected infections, and treat whenever possible.

Native Fauna

- Encourage and support biological surveys, research and monitoring of native species in the reserves and on neighbouring properties with landowners consent, especially with regard to the avifauna monitoring associated with the Bucks Lake Rehabilitation Project.
- Encourage approved volunteer groups and individuals to conduct fauna surveys and undertake population monitoring.
- Use the results of fauna monitoring to determine any required habitat rehabilitation and identify any threats that need to be mitigated.
- Undertake any necessary habitat rehabilitation projects or threat mitigation to support the survival of fauna species, ensuring that a regional, state-wide or national perspective is taken when needed. Concentrate on the protection of the Orange-bellied Parrot and the Swamp Antechinus.
- Provide assistance to threatened species recovery projects that are applicable to the reserves.

Introduced Plants

- Monitor and control introduced plant infestations through establishing pest plant control priorities and actions, with particular attention paid to the removal of Radiata Pines from Carpenter Rocks Conservation Park.
- Develop partnerships with local land managers, including the South East Natural Resources Management Board and the District Council of Grant, and contribute to integrated regional weed control programs.

Introduced Animals

- Devise introduced animal control programs in accordance with regional priorities and any existing plans that address introduced animal control, such as the Orange-bellied Parrot Recovery Plan.
- Work in cooperation with adjoining landowners, the South East Natural Resources Management Board and the District Council of Grant, to achieve effective pest animal control on a regional basis.

MANAGING FIRE

- Develop, implement and review the fire management plan associated with the reserves in cooperation with the CFS and the District Council of Grant Bushfire Prevention Committee.
- Work with neighbouring landholders to develop fire management strategies for Carpenter Rocks Conservation Park as part of a large block of native vegetation.
- Continue to work with the relevant District Bushfire Prevention Committee and the CFS to minimise risk to life and property within and surrounding the reserves.
- Liaise with the ETSA regarding fire management access along the cleared ETSA easement within Carpenter Rocks Conservation Park.
- Suppress all bushfires within the reserves as soon as practicable.
- Until a fire management plan is prepared:
 - maintain existing fire tracks and only create new tracks or firebreaks in Bucks Lake Game Reserve, post hydrological restoration, if there are no other alternatives that can be used to protect native habitat or for ensuring public safety; and
 - only use applied fire as a management tool if it would be beneficial according to sound scientific principles or is required for fuel reduction purposes.

MANAGING CULTURAL HERITAGE
<p>Indigenous Heritage</p> <ul style="list-style-type: none"> • Consult with the relevant regional Aboriginal heritage committees and relevant Government Aboriginal heritage authorities in decisions regarding the management of Aboriginal heritage. • Identify and protect any Aboriginal sites, objects and remains in cooperation with the relevant regional Aboriginal heritage committees, AARD and other relevant authorities. • In consultation with the relevant regional Aboriginal heritage committees, submit cultural sites and stories that relate to the park for inclusion on the AARD Central Archive.
MANAGING TOURISM AND RECREATION
<p>Visitor Use and Access</p> <ul style="list-style-type: none"> • Monitor visitor numbers and their impact on the environment to assess if any controls on reserve access are required. • Manage the reserves for low-key visitor use, without the need for any facility development, unless the reviews of the level of access in Bucks Lake Game Reserve indicate that the provision of additional basic facilities is necessary. • Construct, realign and maintain fencing, boundary markers and vehicle barriers where necessary. • Provide access for dogs accompanying hunters in Bucks Lake Game Reserve, consistent with the conditions of this management plan.
MANAGING RESOURCE USE
<p>Exploration and Mining</p> <ul style="list-style-type: none"> • Liaise with operators engaged in petroleum exploration or extraction activities associated with Carpenter Rocks Conservation Park to prevent undue disturbance and ensure compliance with the provisions of this management plan.
<p>Duck Hunting</p> <ul style="list-style-type: none"> • Allow the reserve to be open for duck hunting in accordance with the <i>National Parks and Wildlife Act 1972</i> and the annual open season declaration by the Minister. • Assess the risk of hunting on non-game species, based on surveys, monitoring and biological criteria, and review arrangements prior to the declaration of the open season and open days. • If considered necessary for public safety or specific conservation concerns, close the reserve, or part of the reserve, during hunting events. • Upon the completion of the Bucks Lake Rehabilitation Project, monitor changes in waterfowl populations to guide decision-making with regards to declaring open seasons and hunting arrangements.

INVOLVING THE COMMUNITY

- Develop partnerships with organisations that want to be involved in the sustainable management of the reserves, particularly those that are concerned with protecting threatened species or want to contribute to on-ground management activities.
- Work with the District Council of Grant and other local agencies to explore the benefits of partnership arrangements to deal with issues of common interest and to integrate biodiversity management in the region.
- Ensure that the District Council of Grant considers the establishment of a Conservation Zone within its jurisdiction and that the reserves and contiguous areas of native vegetation around Carpenter Rocks Conservation Park are rezoned as 'Conservation Zone' in the Council's Development Plan.
- Provide landowners within the vicinity of the reserves with the opportunity of entering into a cooperative management arrangement with DEH.
- Build ongoing partnerships with Aboriginal groups to support the future management of Carpenter Rocks Conservation Park and Bucks Lake Game Reserve.

MANAGING RESERVE TENURE

Public Utilities

- Liaise with public utilities and impose appropriate conditions to ensure that maintenance of services and activities has minimal impact on the values of Carpenter Rocks Conservation Park.

REFERENCES AND BIBLIOGRAPHY

- Bachmann, M. R. (2002) *Silky Tea-tree and Cutting Grass Wetland Rehabilitation Project Summary 1999-2002*. Nature Conservation Society of South Australia, Adelaide.
- Bachmann, M. R. (2002a) *Biodiversity Assessment of Lake Bonney (South East) 2002*. Conservation Strategies South East, National Parks and Wildlife SA, South Australia.
- Bachmann, M. R. and van Weenen, J. (2001) *The Distribution and Status of the Swamp Antechinus Antechinus minimus maritimus (Marsupialia : Dasyruidae) in South Australia*. Nature Conservation Society of South Australia, Adelaide.
- Blackburn, G. (1983) 'Soils', in Tyler, M. J., Twidale, C. R., Ling, J. K. and Holmes, J. W. (eds) *Natural History of the South East*. Royal Society of South Australia Inc., South Australia, Northfield.
- Blakers, M., Davies, S. J. J. F. and Reilly, P. N. (1984). *The Atlas of Australian Birds*. Melbourne University Press, Melbourne.
- Brown, P. B. and Wilson, R. I. (1982) 'Orange-bellied Parrot' in *Species at Risk: Research in Australia*. pp. 107-115. Australian Academy of Science, Canberra.
- Brown, P. B. and Wilson, R. I. (1984) *Orange-bellied Parrot Recovery Plan – management recommendations to the governments of Tasmania, Victoria and South Australia*. NPWS, Hobart.
- Commonwealth of Australia (2005) *Orange-bellied Parrot Recovery Plan - Draft*. Commonwealth of Australia, Canberra.
- Croft, T., Carruthers, S., Possingham, H. and Inns, B. (1999) *Biodiversity Plan for the South East of South Australia*. Department for Environment, Heritage and Aboriginal Affairs, South Australia, Adelaide.
- Department for Environment and Heritage (DEH) (2006) *Bucks Lake Rehabilitation Project Native Vegetation Management Plan*, Department for Environment and Heritage, South Australia, unpublished.
- Department for Environment and Heritage (DEH) (2005) *Provisional List of Threatened Ecosystems of South Australia*, Department for Environment and Heritage, South Australia, unpublished.
- Department for Environment and Heritage (DEH) (2005a) *South Australia Wetland Inventory Database – Wetland Report*, generated on 24 November 2005, Department for Environment and Heritage, South Australia.
- Department for Environment and Heritage (DEH) (2002) *Biodiversity Conservation Program Standard Operating Procedure (SOP-002) Phytophthora Threat Management*. Department for Environment and Heritage, South Australia, Adelaide.
- Department of Environment and Natural Resources (DENR) (1994) *Small Coastal Parks of the South East Management Plan*. DENR, South Australia, Adelaide.
- District Council of Grant (2006) Development Plan.
<http://www.planning.sa.gov.au/edp/pdf/GRA.PDF>
- Environment Australia (2000) *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1 – Summary Report*. Author, Canberra. Retrieved 28 April 2005, from <http://www.ea.gov.au/parks/nrs/ibra/version5-1/summary-report/index.html>.
- Environment Australia (2001) *National Threat Abatement Plan for Dieback caused by the root-rot fungus Phytophthora cinnamomi*. Commonwealth of Australia, Canberra.
- Environmental Protection Authority (2004) *Lake Bonney, South East, South Australia 'Past, Present and Possible Future'*. Government of South Australia.
- Foulkes, J. N. and Heard, L. M. B. (Eds.) (2003) *A Biological Survey of the South East, South Australia, 1991 and 1997*. Department for Environment and Heritage, South Australia.

- Grund, R. (2002) *Butterfly Site Summaries 2000-2001*, in Bachmann, M. R. (2002) *Silky Tea-tree and Cutting Grass Wetland Rehabilitation Project Summary 1999-2002*. Nature Conservation Society of South Australia, Adelaide.
- Grund, R. (2007) *South Australian Butterflies*. Retrieved 21 March 2007, from <http://users.chariot.net.au/~rgrund/index.htm>.
- Haywood, B. (2006) 'New Butterfly Distribution Records for the Lower South East Region of South Australia'. *Victorian Entomologist*, Vol 36 (5), pp. 84-89.
- Laut, P., Heyligers, P.C., Keig, G., Löffler, C., Margules, C., Scott, R.M., and Sullivan, M. E. (1977) *Environments of South Australia - Province I South East*. CSIRO, Canberra.
- Luck, J., Crnov, R., Czerniakowski, B., Smith, I. W., Sinclair, S., Cheal, D., Thomson, F., Franz, P. and Moran, J. (2004) *Mundulla Yellows in Eucalyptus: An abiotic or biotic disorder? A multi-disciplinary investigation of an unknown etiology*. South Australian Department for Environment and Heritage and the Federal Department of the Environment and Heritage. Retrieved 30 August 2005, from http://www.environment.sa.gov.au/biodiversity/pdfs/mundulla_yellows.pdf.
- Luck, J., Crnov, R., Czerniakowski, B., Smith, I. W., and Moran, J. (2006) 'Investigating the presence of biotic agents associated with Mundulla Yellows'. *Plant Dis.*, Vol 90 (4), pp. 404-410.
- Mundulla Yellows Task Group (2004) *A report On Mundulla Yellows In Australia*. Department of the Environment and Heritage, Retrieved 23 August, 2006, from <http://www.deh.gov.au/biodiversity/invasive/publications/mundulla-yellows/index.html>.
- Nicolle, D. and Brooker, M.I.H. (1998) '*Eucalyptus splendens* subsp. *arcana* (Myrtaceae) an endangered new subspecies endemic to South Australia'. *Adelaide Bot. Gard.*, Vol. 18 (2), pp. 103-106.
- Orange-bellied Parrot Recovery Team (1994) *Orange-bellied Parrot: Carpenter Rocks Site Management Plan*. Department of Environment and Natural Resources, South Australia.
- Orange-bellied Parrot Recovery Team (1999) *Orange-bellied Parrot Recovery Plan 1998 - 2002*. Department of Primary Industries, Water and Environment, Tasmania.
- Phytophthora Technical Group (2003) *Phytophthora Management Guidelines*. Government of South Australia, Retrieved 5 September, 2005, from http://www.environment.sa.gov.au/biodiversity/pdfs/pc_management_guidelines.pdf.
- Rogers, P. A. (1995) *Geology of the South-East, South Australia*. Second Edition. Geological Survey of South Australia, Adelaide.
- South East Catchment Water Management Board (SECWMB) (2003) *South East Catchment Water Management Plan 2003-2008*. South East Catchment Water Management Board, South Australia, Mount Gambier.
- Tindale, N. B. (1974) *Aboriginal Tribes of Australia*, ANU Press, Canberra.

APPENDIX A: CONSERVATION STATUS CODES

Australian Conservation Status Codes

The following codes are based on the current listing of species under Section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

- EX Extinct:** there is no reasonable doubt that the last member of the species has died.
- EW Extinct in the Wild:** known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- CE Critically Endangered:** facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
- E Endangered:** facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
- V Vulnerable:** facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- CD Conservation Dependent:** the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Note: Prescribed criteria as defined under the IUCN Red List of Threatened Species.

South Australian Conservation Status Codes

The following codes are based on the current listing of species under Schedules of the *National Parks and Wildlife Act 1972*, as amended in 2000. To align with other States, Territories and the Commonwealth (EPBC Act) listing categories and ratings, the IUCN criteria were used as a basis for determining threatened species status under the *National Parks and Wildlife Act 1972*. For IUCN criteria see:

IUCN (1994) *IUCN Red List Categories*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland (www.redlist.org).

IUCN (2001) *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, United Kingdom (www.redlist.org).

- E Endangered:** (Schedule 7) in danger of becoming extinct in the wild.
- V Vulnerable:** (Schedule 8) at risk from potential or long term threats which could cause the species to become endangered in the future.
- R Rare:** (Schedule 9) low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant threats, but warrants monitoring and protective measures to prevent reduction of population sizes.

Regional Status Codes

The categories below apply to the species distribution at a regional level. There are no regional conservation status categories developed for mammals, reptiles or amphibians to date.

Birds

Regional conservation status for birds follow:

Carpenter and Reid (1998) *The Status of Native Birds in the Agricultural Areas of South Australia*. Unpublished and regularly updated database.

The regions are defined as follows:

ML	Mount Lofty	MN	Mid-North	SE	South-Eastern	KI	Kangaroo Island
MM	Murray Mallee	EP	Eyre Peninsula	YP	Yorke Peninsula		

Plants

Regional conservation ratings for plants follow:

Lang, P. J. and Kraehenbuehl, D. N. (2001) *Plants of Particular Conservation Significance in South Australia's Agricultural Regions*.

Department for Environment and Heritage (undated) *Florlist*. Unpublished and regularly updated database.

The regions are as defined by the State Herbarium (Plant Biodiversity Centre), illustrated in the front cover of:

Barker, W. R., Barker, R. M., Jessop, J. P. and Vonow, H. P. (Eds) (2005) *Census of South Australian Vascular Plants. Fifth Edition. J. Adelaide Bot. Gard. Supplement 1*. Botanic Gardens of Adelaide and State Herbarium, Adelaide.

NW	North-Western	FR	Flinders Ranges	NL	Northern Lofty	SL	Southern Lofty
LE	Lake Eyre	EA	Eastern	MU	Murray	KI	Kangaroo Island
NU	Nullarbor	EP	Eyre Peninsula	YP	Yorke Peninsula	SE	South-Eastern
GT	Gairdner-Torrens						

In order of decreasing conservation significance:

- X Extinct/Presumed extinct:** not located despite thorough searching of all known and likely habitats; known to have been eliminated by the loss of localised population(s); or not recorded for more than 50 years from an area where substantial habitat modification has occurred.
- E Endangered:** rare and in danger of becoming extinct in the wild.
- T Threatened:** (*Plants only*) likely to be either Endangered or Vulnerable but insufficient data available for more precise assessment.
- V Vulnerable:** rare and at risk from potential threats or long term threats that could cause the species to become endangered in the future.
- K Uncertain:** likely to be either Threatened or Rare but insufficient data available for a more precise assessment.
- R Rare:** has a low overall frequency of occurrence (may be locally common with a very restricted distribution or may be scattered sparsely over a wider area). Not currently exposed to significant or widespread threats, but warrants monitoring and protective measures to prevent reduction of population sizes.
- U Uncommon:** less common species of interest but not rare enough to warrant special protective measures.
- Q Not yet assessed:** but flagged as being of possible significance.
- N Not of particular significance:** (*Plants only*) also indicated by a blank entry.
- C Common:** (*Birds only*) also indicated by a blank entry.
- O Occasional Visitor Only:** (*Birds only*) not considered of conservational status.

APPENDIX B: THE JAMBA/CAMBA INTERNATIONAL TREATIES

The Australian Government signed agreements in 1981 and 1988 respectively, with the Governments of Japan and the People's Republic of China, for the protection of migratory birds and their environments. These treaties recognise:

- birds constitute an important element of migratory species;
- the international concern for the protection of migratory birds;
- the existence of bilateral and multilateral agreements for the protection of migratory birds;
- many species of migratory birds occur in Australia, Japan and China on a seasonal basis and consequently require cooperation between countries for continued conservation, and;
- the desire to cooperate in taking measures for the management and protection of migratory birds and their environments.

Each Government shall endeavour to 'establish sanctuaries and other facilities for the management and protection of migratory birds and also of their environment' (CAMBA - Article 4) and shall endeavour to 'take appropriate measures to preserve and enhance the environment of birds protected under the provisions of this Agreement' (JAMBA - Article 6).

The agreements prohibit the taking, sale and exchange of migratory birds and their eggs; encourage research and conservation of the listed species through joint research programs; and require measures to control the importation of animals and plants that could be hazardous to the preservation of migratory birds.

DEH has an obligation to implement these Agreements on behalf of the Australian Government and to provide for the protection and conservation of migratory birds listed in the Annexures to the Agreements.

APPENDIX C: PROCLAMATION FOR CARPENTER ROCKS CONSERVATION PARK

[6 September 2001]

THE SOUTH AUSTRALIAN GOVERNMENT GAZETTE

3920

NATIONAL PARKS AND WILDLIFE ACT 1972 SECTIONS 30 AND 43: CONSTITUTION OF CARPENTER ROCKS CONSERVATION PARK

Proclamation By The Governor

(L.S.) E. J. NEAL

PURSUANT to sections 30 and 43 of the *National Parks and Wildlife Act 1972*, being of the opinion that the land described in the schedule should be protected or preserved for the purpose of conserving wildlife and the natural and historic features of that land and with the advice and consent of the Executive Council, I make the following proclamation:

1. I constitute the Crown land described in the schedule as a conservation park and I assign the name *Carpenter Rocks Conservation Park* to the conservation park.
2. Subject to clause 4, existing rights of entry, prospecting, exploration or mining under the *Petroleum Act 2000* may continue to be exercised in respect of the land constituting the conservation park.
3. Subject to clause 4, rights of entry, prospecting, exploration or mining may, with the approval of the Minister for Minerals and Energy and the Minister for Environment and Heritage, be acquired pursuant to the *Petroleum Act 2000* in respect of the land constituting the conservation park.
4. A person in whom rights of entry, prospecting, exploration or mining are vested pursuant to the *Petroleum Act 2000* (whether those rights were acquired before or after the making of this proclamation) must not exercise those rights in respect of the land constituting the conservation park unless the person complies with the following conditions:
 - (a) if work to be carried out in relation to the land of the park in the exercise of those rights is a regulated activity within the meaning of the *Petroleum Act 2000*, the person must ensure that—
 - (i) the work is not carried out until a statement of environmental objectives in relation to the activity that has been approved under that Act has also been approved by the Minister for Environment and Heritage; and
 - (ii) the work is carried out in accordance with the statement as so approved;
 - (b) if any drilling, excavation, vegetation clearance, construction or other work in relation to the land of the park in the exercise of those rights has not previously been authorised (whether by inclusion in an approved statement of environmental objectives referred to in paragraph (a) or otherwise), the person must give at least 3 months notice of that proposed work to the Minister for Minerals and Energy and the Minister for Environment and Heritage and supply each Minister with such information in relation to the proposed work as the Minister may require;
 - (c) if any proposed work in relation to the land of the park in the exercise of those rights would have the effect of disturbing vegetation in the park, the person must ensure that—
 - (i) the work is not undertaken until a recovery plan for the rehabilitation of the vegetation prepared by the person (being a plan that does not reduce or other-wise detract from any requirement as to rehabilitation contained in an approved statement of environmental objectives referred to in paragraph (a)) has been approved by the Minister for Minerals and Energy and the Minister for Environment and Heritage; and

- (ii) the vegetation is rehabilitated in accordance with that plan;
- (d) if directions have been agreed upon by the Minister for Minerals and Energy and the Minister for Environment and Heritage and given to the person in writing in relation to—
 - (i) carrying out work in relation to the land of the park in a manner that minimises damage to the land (including vegetation or wildlife on the land) and the environment generally; or
 - (ii) preserving objects, structures or sites of historical, scientific or cultural interest; or
 - (iii) rehabilitating the land (including vegetation or wildlife on the land) on completion of the work; or
 - (iv) (where the work is being carried out in exercise of rights acquired after the making of this proclamation) prohibiting or restricting access to any specified area of the land that the Ministers believe would suffer significant detriment as a result of carrying out the work,

(being directions that do not reduce or otherwise detract from any requirement in respect of any of those matters contained in an approved statement of environmental objectives referred to in paragraph (a)), the person must comply with those directions in carrying out the work;

- (e) if a plan of management is in operation under section 38 of the *National Parks and Wildlife Act 1972* in respect of the land, the person must have regard to the provisions of the plan of management;
- (f) in addition to complying with the other requirements of this proclamation, the person—
 - (i) must take such steps as are reasonably necessary to ensure that objects, structures and sites of historical, scientific or cultural interest and any vegetation or wildlife on the land are not unduly affected by the exercise of those rights; and
 - (ii) must maintain all work areas in a clean and tidy condition; and
 - (iii) must, upon the completion of any work, obliterate or remove all installations and structures (other than installations and structures designated by the Minister for Minerals and Energy and the Minister for Environment and Heritage as suitable for retention) used exclusively for the purposes of that work;
- (g) if no direction has been given by the Minister for Minerals and Energy and the Minister for Environment and Heritage under paragraph (d)(iii), the person must (in addition to complying with the vegetation recovery plan referred to in paragraph (c) and any approved statement of environmental objectives referred to in paragraph (a)) rehabilitate the land (including vegetation or wildlife on the land) on completion of the work to the satisfaction of the Minister for Environment and Heritage.

5. If—

- (a) the Minister for Minerals and Energy and the Minister for Environment and Heritage cannot agree as to whether—
 - (i) approval should be granted or refused under clause 3; or

- (ii) approval of a vegetation recovery plan should be granted or refused under clause 4(c);
or
- (iii) a direction should be given under clause 4(d); or
- (b) the Minister for Environment and Heritage does not approve a statement of environmental objectives referred to in clause 4(a),

the Governor may, with the advice and consent of the Executive Council—

- (c) grant or refuse the necessary approval under clause 3 or 4(c); or
- (d) give a direction in writing under clause 4(d); or
- (e) grant or refuse the necessary approval under clause 4(a).

SCHEDULE

Allotment 7 of FP 1606, Hundred of Kongorong, County of Grey.

Given under my hand and the Public Seal of South Australia, at Adelaide, 6 September 2001.

By command,

DIANA LAIDLAW, for Premier

01EH/0021 CS
