King Island Biodiversity Management Plan

2012–2022

King Island
Natural Resource Management Group Inc

Australian Government

Tasmania

ACKNOWLEDGMENTS

This Plan is a King Island Community document prepared by Debbi Delaney under a Steering Committee composed of King Island Community representatives and Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) representatives. The content of the plan reflects the knowledge and experience of the King Island Community augmented by inputs from staff of the Threatened Species Section of DPIPWE and the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC). The Plan was based upon a draft prepared by Lauren Barrow in 2008. The preparation of the Plan was funded by King Island Natural Resource Management Group, the King Island Council, DSEWPaC, and DPIPWE.

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Note: The King Island Biodiversity Management Plan (KIBMP) has been prepared under the provisions of both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Tasmanian *Threatened Species Protection Act 1995* (TSP Act). Adoption as a national Recovery Plan under the EPBC Act refers only to species listed under the EPBC Act.

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Abbreviations

DECCW	New South Wales Department of Environment, Climate Change and Water[1]
DSEWPaC	Australian Government Department of Sustainability, Environment, Water, Population and Communities[2]
DPI	Victorian Department of Primary Industries
DPIPWE	Tasmanian Department of Primary Industries, Parks, Water and Environment [3]
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FPA	Forest Practices Authority
FP Act	Tasmanian *Forest Practices Act 1985*
KI	King Island
KIC	King Island Council
KIBMP	King Island Biodiversity Management Plan
KIFMAC	King Island Fire Management Area Committee
KINRMG	King Island Natural Resource Management Group
NC Act	Tasmanian *Nature Conservation Act 2002*
NRM	Natural Resource Management
OBPRT	Orange-bellied Parrot Recovery Team
PWS	Tasmanian Parks and Wildlife Service, DPIPWE
RMCD	Resource Management and Conservation Division, DPIPWE
TLC	Tasmanian Land Conservancy
TSP Act	Tasmanian *Threatened Species Protection Act 1995*
TSS	Threatened Species Section, DPIPWE

[1] Now Office of the Environment and Heritage

[2] Formerly the Department of the Environment, Water, Heritage and the Arts (DEWHA)

[3] Formerly the Department of Primary Industries and Water (DPIW) and the Department of Primary Industries, Water and Environment (DPIWE).

EXECUTIVE SUMMARY

King Island, located at the western entrance to Bass Strait, is treasured by residents and visitors alike for its valuable natural assets and way of life — the natural assets underpinning the Island's main industries and leisure activities.

The Island is home to a range of native plants and animals, some of which are under threat of extinction. Plant species under threat include, but are not restricted to, native orchids and ferns, whilst the animal species include the locally endemic threatened birds, the King Island Brown Thornbill and King Island Scrubtit amongst others.

It is important to manage these valuable natural assets that make King Island special to ensure their future. The management of biodiversity, including threatened species, is a crucial part of protecting the environment. This does not necessarily mean dramatically changing existing land use practices, but instead developing better approaches within them.

The King Island Biodiversity Management Plan aims to manage the Island's biodiversity in a manner that not only improves the viability of threatened flora and fauna, but also acknowledges the social and economic needs of the Island's residents. The Plan has been developed as a cooperative approach between the Australian Government Department of Sustainability, Environment, Water, Population and Communities, the Tasmanian Government Department of Primary Industries, Parks, Water and Environment and the King Island Natural Resource Management Group. In addition King Island Council, residents and a range community groups, have been actively involved in many elements of the Plan.

The overall aim of the Plan is that by 2020 there are viable, healthy populations of priority flora and fauna species and vegetation communities on King Island. To achieve this overall aim, the Plan identifies actions to:

- recover threatened species;
- address biodiversity management on the Island;
- address threats to biodiversity and priority species;
- monitor biodiversity trends to inform decision making; and
- research to address knowledge gaps to inform adaptive management.

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1. INTRODUCTION

King Island is part of the State of Tasmania and is located at the western entrance to Bass Strait, midway between Victoria and Cape Grim on northwest Tasmania. It is 64 km from north to south and 26 km from east to west, and its area is approximately 110,000 ha. The Island lies at 144° longitude East and 40° latitude South, placing it in the path of the 'Roaring Forties', a strong prevailing westerly wind. The land is generally flat, with the high point being 168 metres above sea level at Gentle Annie in the southeast (Morgan 1998).

King Island has many natural values, including the often rugged coastline, beautiful beaches, lagoons, wetlands and a range of plants and animals. The island is also home to a number of endemic and/or threatened species of plant and animal. Residents and visitors alike are strongly linked to the Island and its 'environment'. Its natural resources provide the basis for the main industries of agriculture, fishing and tourism and are a major source of recreation for residents, such as fishing, horse riding, diving and camping. The responsible management of these natural values is fundamental to protecting the Island's industries and way of life for the community as a whole.

All species provide an interesting variety and richness to King Island; from the smallest snail to the largest trees, they play a role in keeping the ecosystems of the Island working. Across Australia and the world, many plant and animal species are under threat of extinction: unfortunately King Island has not been immune to this, and a number of its species are at risk of being lost forever. Currently there are 50 plant species and 12 animal species on King Island that are listed as threatened.

The King Island Biodiversity Management Plan (the Plan) endeavours to manage the Island's biodiversity in a manner that ensures the viability of threatened flora and fauna, whilst balancing this with the social values and economic needs of the people.

1.1 Scope of the Plan

The Plan covers King Island, New Year and Christmas Islands located off the northwest coast of King Island, and Councillor Island, located off King Island's east coast (Figure 1). The Plan includes:

- an overview of the Island, covering the physical environment and the dynamics of the human community;
- information about plant and animal species;
- an outline of the threats to biodiversity; and
- actions to manage both the threats and the long term viability of these species.

The Plan includes plant and animal species on King Island that are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the Tasmanian *Threatened Species Act 1995* (TSP Act). Additional species are included where:

- King Island is a stronghold in their range;
- the species is endemic to King Island;
- there is significant breeding habitat on King Island; or
- the species is considered by the King Island community as important to manage.

Figure 1. Map of King Island

The Plan does not include the management of the immediately surrounding marine species, as these are managed through other mechanisms.

The Plan takes a whole-of-island approach to biodiversity management, addressing management of priority species regardless of land tenure. There are a range of government and non-government organisations involved in the management of the Island's natural resources including, but not restricted to, private landowners, King Island Council (KIC), King Island Natural Resource Management Group Inc (KINRMG), Tasmanian Parks and Wildlife Service (PWS) and the Resource Management & Conservation Division (RMCD) — both part of the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE), Birds Tasmania, Tasmanian Land Conservancy (TLC), the Tasmanian Farmers and Grazers Association, Forestry Tasmania and Tasmanian Fire Service.

On the Island several properties have been covenanted for conservation through government programs such as DPIPWE's Private Land Conservation Program, and by non-government conservation organisations such as the TLC. In 2003, utilising funding from the Australian Government through the KINRMG, the TLC established a program to purchase land, covenant key vegetation communities on the property and then sell the properties on to private purchasers.

Approximately 14% of the Island is Crown Land, including several different reserve types (Figure 2). The Island has four State Reserves: Lavinia State Reserve and Disappointment Bay State Reserve in the northeast, Seal Rocks State Reserve in the southwest and Cape Wickham State Reserve in the far north. State Reserves, along with Nature Reserves, Conservation Areas, Game Reserves and Crown land, are administered by PWS. These reserves are variously managed for recreation and conservation, although some are used by adjacent landowners under licence for grazing, particularly where reserves adjoin waterways. Forestry Tasmania administers the State Forest at Pegarah.

PWS administer the three off-shore islands: New Year Island Game Reserve (130 ha), Christmas Island Nature Reserve (95 ha), and Councillor Island Nature Reserve (11 ha). Unallocated Crown land is also administered by PWS and has recently been assessed as part of the Crown Land Assessment and Classification Project (CLAC Project Team 2005a & 2005b). Crown reserves also border some parts of the river systems, around some wetlands and lagoons and around much of coastline of the Island. Further details regarding the classes of reserves can be found at:

http://www.dpipwe.tas.gov.au/inter.nsf/WebPages/LBUN-64N2HQ?open.

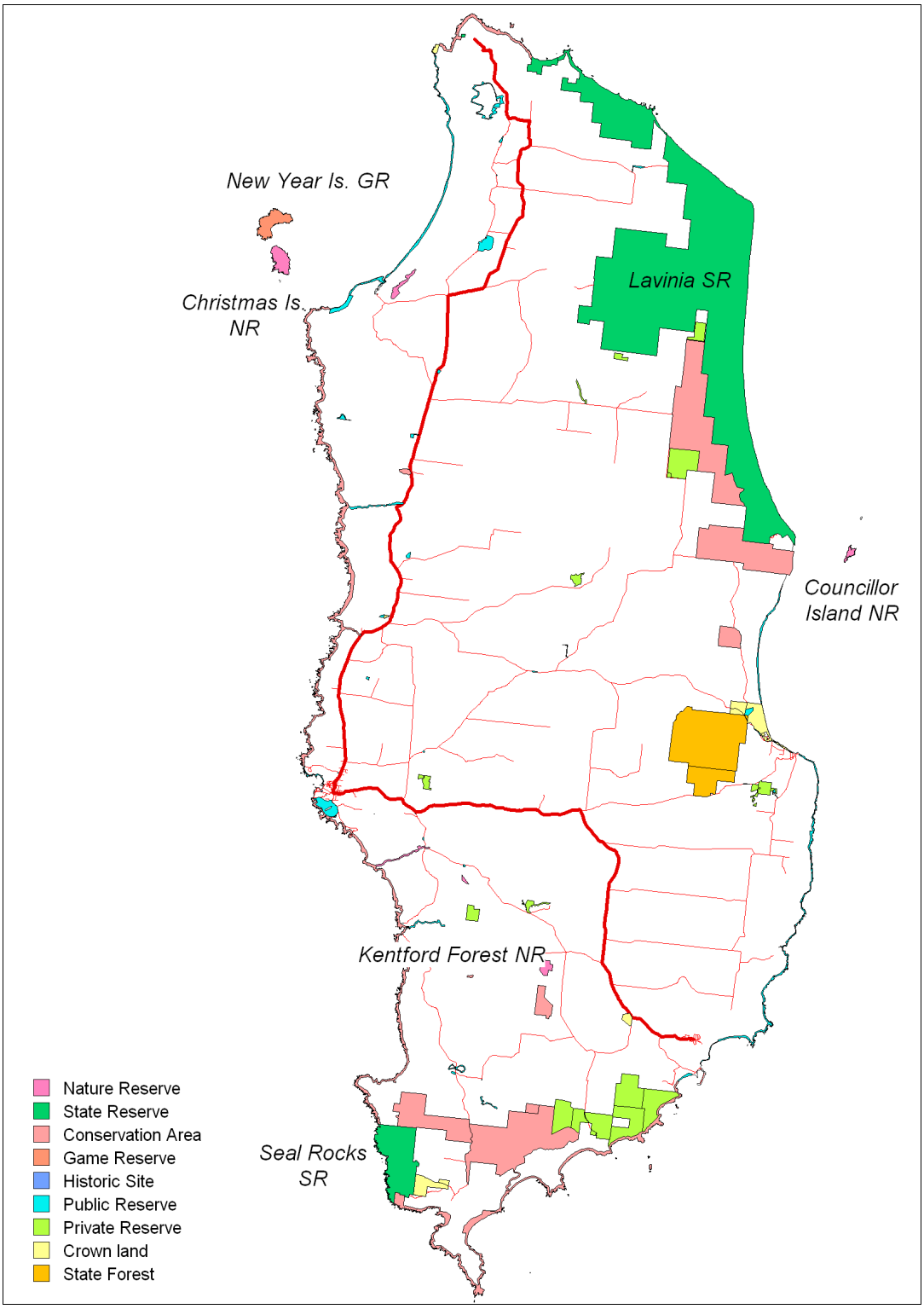

Figure 2. Reserves on King Island

1.2 Interaction with other documents

There are nine existing national or Tasmanian recovery plans and draft recovery plans that discuss threatened species present on King Island. For more background information refer to separate Recovery Plans for the scrambling groundfern (*Hypolepis distans*) (Threatened Species Section 2011a), leafy greenhood (*Pterostylis cucullata* subsp. *cucullata*) (Threatened Species Section 2006a; Duncan 2009), coast dandelion (*Taraxacum cygnorum*) (Carter 2004), Green and Gold Frog (*Litoria raniformis*) (Clemann & Gillespie 2007; Threatened Species Section 2007a), White-bellied Sea Eagle (*Haliaeetus leucogaster*) (Threatened Species Section 2006b), Orange-Bellied Parrot (*Neophema chrysogaster*) (OBPRT 2006), Southern Hairy Red Snail (*Austrochloritis victoriae*) (Threatened Species Section 2007b) and Australian Grayling (*Prototroctes maraena*) (Backhouse *et al.* 2008). The Plan complements these plans, outlining species-specific management actions for King Island. These actions have been prioritised for inclusion in the Plan.

The *Lavinia State Reserve Draft Management Plan* (PWS 2004), details management objectives and prescriptions for natural and cultural values within the Reserve. PWS are currently reviewing the Management Plan; consultation undertaken in the development of the King Island Biodiversity Management Plan should ensure that actions identified in the two plans are complementary.

The King Island Strategy Plan Report (Connell Wagner 2008), was commissioned by the King Island Council to address a wide range of planning and development issues that had been identified across the Island, including coastal development, township enhancement, agricultural and industrial land protection and development, and environmental issues in sensitive coastal and resource valued areas. A summary of current management documents, recovery plans, policies and strategies can be found in Appendix 1.

1.3 Legislative context

Various Acts of Parliament that either protect native plants and animals directly and/or protect the habitats that support them and/or or integrate conservation objectives with other land management uses, are relevant to this Plan. The primary Acts that relate to the King Island Biodiversity Management Plan are described below.

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the Act as matters of national environmental significance.

The eight matters of National Environmental Significance (NES) to which the EPBC Act applies are:

- world heritage sites;
- national heritage places;
- wetlands of international importance (known as 'Ramsar' wetlands after the international treaty under which such wetlands are listed);
- nationally threatened species and ecological communities;
- migratory species;
- Commonwealth marine areas;
- Great Barrier Reef Marine Park; and
- nuclear actions.

Actions require approval by the Minister under the EPBC Act if they are likely to have a significant impact on a matter of national environmental significance.

The EPBC Act provides for the listing of nationally threatened native species and ecological communities, native migratory species and marine species. The EPBC Act protects Australia's native species and ecological communities by providing for:

- identification and listing of species and ecological communities as threatened;
- development of conservation advice and recovery plans for listed species and ecological communities;
- development of a register of critical habitat;
- recognition of key threatening processes; and
- where appropriate, reducing the impacts of these processes through threat abatement plans.

Further details on the EPBC Act can be found at http://www.environment.gov.au/epbc/index.html.

The King Island Biodiversity Management Plan may be adopted and constitute the full or part range recovery plan for listed threatened species occurring on King Island including the King Island Brown Thornbill and King Island Scrubtit. These subspecies are listed as threatened under the EPBC Act (Table 1). For details on relevant species refer to Chapter 3 and Appendices 2 and 3.

Threatened Species Protection Act 1995

The *Threatened Species Protection Act 1995* is an Act of the Parliament of Tasmania that provides the statute relating to conservation of flora and fauna in Tasmania. The TSP Act provides for the protection and management of threatened native flora and fauna and enables and promotes the conservation of native flora and fauna.

Clauses within the TSP Act that are applicable to the King Island Biodiversity Management Plan include:

- the development of Recovery Plans, which set out long-term strategies for the protection and enhancement of a particular species; and
- the provision for the listing of native species as threatened species within the State of Tasmania.

Further details on the TSP Act can be found at http://www.thelaw.tas.gov.au/.

Nature Conservation Act 2002

The *Nature Conservation Act 2002* (NC Act) is an Act of the Parliament of Tasmania that makes provisions with respect to the conservation and protection of the flora, fauna and geological diversity of the State of Tasmania, and includes a schedule of threatened vegetation communities. It also provides for the declaration of national parks and other reserved land.

Further detail on the NC Act can be found at http://www.thelaw.tas.gov.au/.

Forest Practices Act 1985

Under the *Forest Practices Act 1985* (FP Act), an Act of the Parliament of Tasmania, forest vegetation cannot be cleared unless the landowner has a certified forest practices plan that permits the clearing. Forest vegetation is defined as any woody plant that has the potential to grow to 5 m in height. Clearing of threatened forest and non-forest vegetation is prohibited. Small scale clearing of non-threatened forest vegetation and clearing of non-threatened non-forest vegetation is exempt from the requirements for a forest practices plan. Further information can be found at http://www.fpa.tas.gov.au.

Other Regulations

The National Parks and Reserved Land Regulations 1999, the Crown Land Regulations 2001, the Tasmanian Reserve Management Code of Practice 2003, the Crown Land Act 1976 and the National Parks and Reserves Management Act 2002 provide for the management of national parks and other reserved land within Tasmania. Further information can be found at http://www.parks.tas.gov.au or http://www.thelaw.tas.gov.au.

1.4 International obligations

There are a number of international agreements and conventions relevant to this Plan, including the Convention on Biological Diversity, the Ramsar Convention on Wetlands, the Convention on International Trade in Endangered Species, the China-Australia Migratory Bird Agreement, Japan-

Australia Migratory Bird Agreement, the Republic of Korea-Australia Migratory Bird Agreement and the Convention on Migratory Species.

All of the actions identified in the Plan are consistent with Australia's obligations under these agreements.

1.5 Management Plan preparation and exhibition

The draft King Island Biodiversity Management Plan was placed on public exhibition between 2 February 2011 and 28 February 2011 and submissions were invited from the public. All submissions to that draft Plan were considered, and a summary of submissions and proposed responses was provided to the Tasmanian Minister for the Environment, Parks and Heritage prior to final approval of the Plan.

2. KING ISLAND AND ITS PEOPLE

2.1 Description of King Island

King Island is one of the largest of more than 120 Bass Strait islands which together represent the remains of the land bridge that connected Tasmania to the Australian mainland more than 12 000 years ago (Barnes *et al.* 2002). It lies approximately 140 km from both Cape Otway on Victoria's south coast and Cape Grim on the north-west tip of Tasmania, between 39°35' and 40°09' South and 143°52' and 144°08' East. The Island is about 65 km long and 25 km at its widest point and covers an area of approximately 110 000 ha (Figure 1). It forms part of the King Bioregion which also includes the north-west corner of mainland Tasmania (Peters & Thackway 1998). Bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities.

Geology and geomorphology

King Island has typically a low relief with a network of rivers, streams, and creeks dividing the landscape. Detailed descriptions of the Island's landforms, geology and soils are given by Jennings (1957), Morgan (1998) and Barnes *et al.* (2002). There are four main land units: the plateau country, the plains, the swamps and lagoons, and the dune formations (Richley 1984).

The plateau country occupies most of the central and southern areas of the Island, including the Island's highest peak, Gentle Annie, at 168 m above sea level. The northern part of the Island forms an extensive undulating plain, with the highest point reaching a mere 86 m at Counsel Hill (Donaghey 2003). Swamps, marshes and lagoons typically characterise low-lying areas where drainage is blocked by bordering coastal dunes (Barnes *et al.* 2002).

Prevailing westerly and south-westerly winds have led to the formation of a series of sand dunes that form a rim around the Island. There are two major dune systems: New Dunes and Old Dunes (Jennings 1957; Richley 1984).

Originating in the Holocene (the last 10,000 years of the Earth's history), parabolic dunes of the New Dunes system surround the Island, forming a continuous belt that is up to 4 km wide along the west coast. The New Dunes of the north-east coast are quartz sand, and the most widespread New Dunes of the west coast are calcareous and have been attributed to the Yellow Rock Land System. The Old Dunes can reach a height of 80 m in places and occur sporadically around the Island, extending further inland than the New Dunes.

Rock such as quartzite and slate, and glacial and volcanic rocks occur between Grassy and Naracoopa (see Dixon 1994; Donaghey 2003).

The Island has several geological sites of National and State Significance. Nationally significant sites include Egg Lagoon, Boggy Creek tufa terraces, Iron Monarch Cave and the City of Melbourne Bay foreshore. Sites of State Significance include Wickham granite, the oldest granite in Tasmania (730 million years old), Seal Rocks calcareous solution tubes, the 'Calcified Forest' (Donaghey 2003), Cowper Point Dunes and the Lavinia Peatland Complex (Corbett & Corbett 2010).

Climate

The Island experiences a mild maritime climate, with an average winter minimum of 9°C and an average summer maximum of 20°C. Average annual rainfall in Currie on the west coast is 850 mm, most of which falls between April and October (Bureau of Meteorology 2008). Frosts are infrequent and the prevailing south-westerly winds ('Roaring Forties') can reach over 100 km/h (Donaghey 2003).

Pre-European vegetation

French zoologist Francis Péron visited King Island in 1802 describing the vegetation in the area they explored as 'strong and vigorous':

> *'… in various places the trees and shrubs are so close to the surface of the ground and their debris is so plentiful everywhere, that it is almost impossible to penetrate into the middle of the forests; but, in general, the plants which*

make up these forests do not show the gigantic proportions that we admired in those of Van Diemen's Land; yet they belong to the same species as these last.....The fern-families, the mosses and the fungi have a great number of species as beautiful as they are vigorous' (in Finzel 2004, p. 17).

A visit by the Field Naturalists' Club of Victoria to the Island in November 1887, commented that they:

'…had considerable difficulty traversing the Island, owing to the fact that it's northern half was covered with dense scrub and its southern part with impenetrable forest' (Campbell 1888).

2.2 European settlement

There is still debate over who originally 'discovered' King Island, however it was first named by Mr John Black who arrived on the *Harbinger* in 1801 (Alexander 1921). The Island was not settled permanently until nearly a century later in 1888, when it was sectioned off for farming (Donaghey 2003). King Island's history of settlement, farming and associated burning regimes, have all played an important role in influencing the biodiversity of the Island. Eight fauna species and at least four plant species have become locally and one globally extinct since European settlement (Donaghey 2003). Other species, particularly little known invertebrate species, may have also become extinct since settlement.

Since permanent settlement in 1888 approximately 70% of the native vegetation has been cleared to support a prosperous beef and dairy industry.

2.3 King Island's people

In the 2006 census, there were 1,639 people residing on King Island; 53% were males and 47% were female. At this time approximately 30% of King Island residents were aged over 55 and 42% were aged 25–54.

King Island is both geographically and economically isolated — freight is moved by the vessel '*Searoad Mersey*' on a weekly basis only. Air travel is the only means of passenger transport, and mail and some freight items are also transported by air. Daily services operate from both Tullamarine and Moorabbin in Victoria and Devonport in Tasmania.

The isolation means that people live, work and play on the Island – there is no other alternative on a day-to-day basis. Many of the recreational pursuits undertaken are outdoor-based and reliant on the natural values of the Island, such as fishing, surfing, bird watching, diving, beach combing, camping, horse riding and motor bike riding.

King Island is characterised by a strong sense of place — many people feel deeply connected to the Island. The coast plays a strong bearing on the culture of King Island (Lovibond 2007):

'I live here because you can smell, see and hear the sea every day.' [4]

Similarly there is an apparent awareness and connection with natural values; many will talk of a favourite rock, wind-pruned tea-tree, remnant patch of blackwoods or spots where they have seen a sea eagle nest or an endemic plant (Lovibond 2007).

The major industries on King Island are mostly reliant on natural resources, including agriculture (beef and dairy), fishing (crayfish and abalone), tourism and kelp harvesting.

Agriculture

Much of the initial development of the beef and dairy industries occurred through soldier settler schemes following both World Wars, the scheme that enabled people to enter into agriculture; 'we would never have had a property of our own without it.' [5]

King Island has a reputation for excellence in both beef and dairy products. Beef is grown and processed through the local abattoir, King Island Meat, owned by Swift Australia. Similarly milk is produced and manufactured into premium cheese at King Island Dairy, owned by National Foods. The gross value of

[4] King Island Biodiversity Management Plan – Community Workshop Quote
[5] King Island Biodiversity Management Plan – Community Workshop Quote

agricultural production was $30.7 million in 2006 (Australian Bureau of Statistics 2006). Agriculture, including fishing, remains the main employer as of 2006.

Of the 110,000 ha of King Island, 61,800 ha is utilised as beef and dairy pasture. A further 21,600 ha is shrubby pasture and 16,300 ha is closed forest (Bureau of Rural Sciences 2007).

Sustainable management of King Island's agricultural industries is important for the future economy of the Island:

'Every serious farmer wants to make things environmentally better' [6]

'All King Island farmers are conservationists' [7]

Fishing

The crayfish industry is a large employer, with eighteen boats operating, the majority operating out of Currie Harbour, with a smaller number using Grassy Harbour. The industry is protected by a quota system, allowing fishermen to land a maximum of 143 kg/pot/year, seasonal closures, no females to be taken between May and mid-November and a complete yearly shut-down from mid-September until November. These measures ensure breeding stock can carry and dispatch their eggs, therefore securing the viability of both the species and the industry. Crayfish is sold to the live export market via Victorian processors.

Black and greenlip abalone are targeted by the Island's two divers. This product is destined for the export market, live, canned or dried. This sector is also protected by a strict quota system.

An oyster farm at Sea Elephant River produces approximately 5,000 dozen oysters per annum for the King Island market.

It is estimated that the fishing industry brings about $20 million into the community annually.

Tourism

The tourist market, whilst still relatively small, is important to the economy of King Island and is seeking to grow for future prosperity. Approximately 6% of the Island's labour force is directly employed through the tourism industry (www.censusdata.abs.gov.au).

Kelp Harvesting

Since the 1970s storm-cast Bull Kelp (*Durvillaea potatorum)* has been collected from King Island's coastline by harvesters and carted to the Kelp Industries factory for drying and milling. The dried Kelp is exported to European customers for use in the biopolymer industry as well as into the Australian market for fertiliser, animal feed and a wide variety of other uses. Kelp is a significant source of employment, through both the factory and Kelp carters.

2.4 Community consultation

A draft King Island Multi-Species Recovery Plan was prepared in 2008, based on a desk top study with little community consultation apart from the option to comment on the draft; this was met with opposition from sectors of the King Island community. The concern included a desire for the people of the Island to be more involved in the Plan's development as well as controversy regarding the initial actions identified within the Plan.

As a consequence, the Plan was redrafted and expanded to a Biodiversity Management Plan and a community consultation program was incorporated into the Plan's redrafting.

A significant component of the community consultation was a workshop held over the weekend of 17–19 July 2009, which approximately 100 people attended. Workshop sessions were held on the Friday evening, Saturday morning and Sunday. The sessions included active debate and discussion of:

[6] King Island Biodiversity Management Plan – Community Workshop Quote
[7] King Island Biodiversity Management Plan – Community Workshop Quote

- What is a Biodiversity Management Plan and what should it achieve?
- Values of King Island's residents.
- Relevant legislation.
- Threatened species and priority species for management.
- Priority sites for management.
- Threats to biodiversity, including priorities for management.
- Actions for the future.

The workshop demonstrated an array of knowledge and information within the community regarding the Island's biodiversity, which has been incorporated into the Plan. In addition, dynamics of the *'human population'* on King Island were also discussed. Those residents present at the workshop believe that the community has a strong passion, love and commitment for the Island. The sense of place and *ownership* that people feel towards the Island and what happens on *their* Island was considered to be immense, including comments such as:

> 'We have a sense of responsibility for our own future' [8]
>
> 'King Island has a sense of belonging, a caring society' [9]
>
> 'The place draws people back, like a magnetic force' [10]

Also evident at the workshop was a strong connection to the environment that is King Island:

> 'We have a diversity in our environment that is important to protect'
>
> 'There is a "willingness and an ability to co-exist with our environment'

Values identified as important to protect for the future of the Island included, but were not limited to:

- Sense of community;
- Love of the environment in which we live;
- Freedom;
- Successful and productive industries;
- Shared history;
- Diverse recreational activities such as horse riding, fishing, surfing, bird watching, walking dogs on the beach, diving, beach combing, motor bike riding, walking and camping;
- The location;
- The people.

In addition to the workshop, a community meeting was held on the 7 September 2009 to review preliminary actions within the Plan. The preliminary Plan was available for comment to the King Island community from the 14 September to 2 October 2009. Comments received were reviewed by the Plan's steering committee for inclusion in the Plan.

Evident throughout the community consultation period were tensions among social, economic and environmental interests caused by different values, expectations and knowledge. This has been particularly evident in the development of actions to protect shorebirds including threatened species, which centre on the way in which beaches are accessed and used by both humans and birds.

The support, co-operation and inclusion of the King Island community, is fundamental to successfully implement the Plan. This will require the acknowledgement of differences in values, expectations and knowledge within the King Island community and the need to reconcile these in a manner that considers social, economic and environmental sustainability of the Island, to provide the way forward for community-led environmental management in the future.

[8] King Island Biodiversity Management Plan – Community Workshop Quote
[9] King Island Biodiversity Management Plan – Community Workshop Quote
[10] King Island Biodiversity Management Plan – Community Workshop Quote

3. KING ISLAND FLORA AND FAUNA

3.1 Threatened species categories

A plant or animal is described as threatened if it is at risk of becoming extinct. Plants and animals have become threatened through a range of factors that may be natural or human induced; these are discussed in Chapter 4, Threats.

Species may be listed under the Commonwealth EPBC Act and the Tasmanian TSP Act. The EPBC Act categorises species into:

i. Extinct
ii. Extinct in the wild: species that can no longer be found in the wild, but still exist in captivity.
iii. Critically Endangered: species in extreme danger of becoming extinct in the immediate future.
iv. Endangered: species in danger of extinction, while the factors causing them to be endangered continue operating.
v. Vulnerable: species which are at risk of becoming endangered.
vi. Conservation Dependent: species who's survival is dependent on conservation activities.

In addition species can be listed as *migratory species* or as *marine species*. Species in the Critically Endangered, Endangered and Vulnerable categories are considered threatened species.

The TSP Act categorises threatened species into:

i. Endangered: species is in danger of extinction because long-term survival is unlikely while factors causing it to be endangered continue operating, within this category a species may be *presumed extinct* if it has not been recorded in the wild within the past 50 years.
ii. Vulnerable: species likely to become endangered while factors causing it to be vulnerable continue operating.
iii. Rare: species that have a small population or distribution within Tasmania that is not endangered or vulnerable but is at risk.

3.2. Flora

On King Island, low physical variation and geographic isolation has led to vegetation that is relatively low in structural and floristic diversity. About 470 native vascular plant species have been recorded on the Island (Appendix 2). The main influences on the distribution of vegetation across the Island are soil fertility, drainage, exposure to marine influences, and fire history (Barnes *et al.* 2002). The flora contains elements with affinities to both mainland Tasmania and Victoria, with listed species in the latter category including Australian mulberry (*Hedycarya angustifolia*), blueberry ash (*Elaeocarpus reticulatus*) and bootlace bush (*Pimelea axiflora* subsp. *axiflora*). A total of 50 flora species are currently listed under State and/or Commonwealth legislation as threatened (Table 1).

3.3 Vegetation communities

King Island has 28 broadly defined native vegetation communities (mapped at the state level as TASVEG mapping units [11]), including forest and woodland, scrubs, grasslands, heathlands, wetlands and salt marsh. These are described in detail by Barnes *et al.* (2002) and Harris & Kitchener (2005). The mapping of TASVEG units or vegetation communities for King Island should only be used as a very broad indicator of the distribution of vegetation on the Island. [12]

There are six vegetation communities on King Island that are listed as threatened under Schedule 3a of the Tasmanian *Nature Conservation Act 2002*:

[11] TASVEG is a Tasmanian-wide map of the State's vegetation (see Harris & Kitchener 2005).
[12] A vegetation community is a grouping of vegetation that is described through a combination of its floristics, life forms and ecological characteristics. A vegetation community is not a single species, for example *Melaleuca ericifolia* swamp forest does not just comprise *Melaleuca ericifolia,* but a range of species and life forms.

1. Coastal complex on King Island (SCK)
2. *Eucalyptus brookeriana* wet forest (WBR)
3. *Eucalyptus globulus* King Island forest (WGK, DKW)
4. *Melaleuca ericifolia* swamp forest (NME)
5. Seabird rockery complex (SRC)
6. Wetlands (AWU, AHL, ASF, AHS, AHF)

Vegetation communities on King Island have been modified and fragmented to varying degrees, as discussed in Chapter 4, Threats. Priority vegetation communities for management on the Island are identified in Chapter 5 and Appendix 2.

3.4 Fauna

Fish

King Island's freshwater fish fauna consists of six species: the Southern Shortfin Eel (*Anguilla australis*), Climbing Galaxias (*Galaxias brevipinnis*), Trout Galaxias (*Galaxias truttaceus*), Common Galaxias (*Galaxias maculatus*), Southern Pygmy Perch (*Nannoperca australis*) and Congolli (*Pseudaphritis urvillii*). The migratory Australian Grayling (*Prototroctes maraena)* has been recorded from the Ettrick River (Backhouse *et al.* 2008), but its current status is unknown.

Frogs

The frogs of King Island closely reflects that found in far north-west Tasmania (Donaghey 2003). There are six frog species recorded from King Island, the Green and Gold Frog *(Litoria raniformis)*, Brown Tree Frog (*Litoria ewingii*), Mottled Banjo Frog (*Limnodynastes dumerilii variegatus*), Striped Marsh frog (*Lymnodynastes peronii*), Common Froglet (*Crinia signifera*), and Smooth Froglet (*Geocrinia laevis*) (Littlejohn & Martin 1965). The Green and Gold Frog is listed as vulnerable under the EPBC and TSP Acts, and the Striped Marsh frog is listed as endangered in TSP Act.

Reptiles

King Island has a relatively low diversity of reptiles compared to the Australian mainland. It is home to only nine reptile species, comprising three species of snakes and six of lizards (Donaghey 2003). The reptile fauna comprises species that are commonly found in northwest Tasmania: White's Skink (*Liopholis whitii*), Blotched Bluetongue (*Tiliqua nigrolutea*), Southern Grass Skink (*Pseudemoia entrecasteauxii*), Metallic Skink (*Niveoscincus metallicus*), Tasmanian Tree Skink (*Niveoscincus pretiosus*), Eastern Three-lined Skink (*Acritoscincus duperreyi*), White-lipped Snake (*Drysdalia coronoides*), Tiger Snake (*Notechis scutatus humphreysii*), and the Lowland Copperhead (*Austrelaps superbus*). The Tasmanian Tree Skink is the only Tasmanian endemic reptile species found on King Island (Rawlinson 1965, Donaghey 2003).

Birds

The terrestrial vertebrate fauna on King Island is dominated by birds, with 164 species recorded. Fifty are non-passerines, 36 are passerines [13], 12 are breeding or resident marine and shorebirds, 39 are irregular migrants and visitors, 14 are migratory shorebirds and gulls and terns, and 24 are resident and visiting marine birds (Donaghey 2003).

King Island supports a number of endemic subspecies such as the Brown Thornbill, Green Rosella, Yellow Wattle Bird (*Anthochaera paradoxa kingi*), Dusky Robin (*Melanodryas vittata kingi*), Black Currawong (*Strepera fuliginosa colei*) and Scrubtit. King Island is also home to 10 of Tasmania's 12 endemic resident breeding birds (Green & McGarvie 1971). The endemic King Island Emu (*Dromaius ater*) is presumed to be extinct (listed under TSP Act) and the Glossy Black-cockatoo (*Calyptorhynchus lathami*), Gang-gang (*Callocephalon fimbriatum*) and the Forty-spotted Pardalote (*Pardalotus quadragintus*) are considered to be

[13] Birds of the order Passeriformes, comprise perching birds and songbirds such as honeyeaters, fairy-wrens, magpies and robins.

locally extinct on King Island (Donaghey 2003). Seven species are currently listed as threatened under State and/or Commonwealth legislation.

King Island is an important stopover point for a number of migratory species during their passage over Bass Strait. Migratory species which regularly use the Island include the Orange-bellied Parrot, Swift Parrot, Ruddy Turnstone and Red-necked Stint.

Mammals

Twelve mammal species are recorded for King Island (Donaghey 2003). Native mammals include the Platypus (*Ornithorhynchus anatinus*), Echidna (*Tachyglossus aculeatus*), Swamp Antechinus (*Antechinus minimus*), Common ringtail possum (*Pseudocheirus peregrinus*), Brushtail Possum (*Trichosurus vulpecula*), Eastern Pygmy Possum (*Cercartetus nanus*), Long-nosed Potoroo (*Potorous tridactylus*), Bennett's Wallaby (*Macropus rufogriseus*), Tasmanian Pademelon (*Thylogale billardierii*), Swamp Rat *(Rattus lutreolus*), Lesser Long-eared Bat (*Nyctophilus geoffroyi*) and Gould's Wattled Bat (*Nyctophilus gouldi*). The Spotted-tailed Quoll (*Dasyurus maculatus maculatus*) was seen until the 1950s (N. Burgess, pers. comm.) and is now considered to be locally extinct and local populations of the Wombat (*Vombatus ursinus ursinus*), and Southern Elephant Seal (*Mirounga leonina*) became extinct shortly after European settlement.

Invertebrates

Invertebrates account for more than 99% of all global diversity but remain a poorly studied group. They play key roles in nutrient cycling, pollination, soil conditioning, seed dispersal and the delivery of essential other ecosystem services.

Little is known about the invertebrate diversity on King Island. The lack of baseline data on invertebrates makes it difficult to discuss population trends or to propose management strategies. However, it is likely that habitat loss and fragmentation has had an impact on their abundance and diversity. The Southern Hairy Red Snail (*Austrochloritis victoriae)* is the only invertebrate currently listed under the TSP Act that is known to occur on King Island (Table 1). This snail is known only from the northeastern coast on King Island and southern Victoria, south of the Great Dividing Range (Smith & Kershaw 1981). Until 1996 the Southern Red Hairy Snail was considered extinct in Tasmania. It lives in damp areas with well-developed paperbark, tea tree and *Banksia* scrub (Bonham 2009).

3.5 Current EBPC Act and TSP Act listings

A summary of flora and fauna species on King Island listed as threatened under the EPBC Act and TSP Act is provided in Table 1.

Prioritisation of species for management can be found in Chapter 5 and Appendices 2 and 3.

Listed species not considered in the Plan

Marine listed species under the EPBC Act, are not considered in the Plan, unless they are also listed as threatened under the TSP Act and/or have a significant breeding population on the Island.

Migratory listed species under the EPBC Act have been considered within the Plan, but management actions have been prioritised on the basis of their threatened status under the EPBC and TSP Acts, the relative contribution of King Island to their conservation in Tasmania, the occurrence of breeding on King Island and their population size and distribution on the Island.

The terrestrial plants coast banksia (*Banksia integrifolia* subsp. *integrifolia*), sticky longheads (*Podotheca angustifolia*) and coast dandelion (*Taraxacum cygnorum*), whilst presumed extinct either locally or within Tasmania, are still included in the Plan due to the possibility of their being discovered again as further survey work of the Island is undertaken.

Table 1. Threatened flora and fauna on King Island

Scientific Name	Common Name	TSP Act Status	EPBC Act Status	Australian Distribution
FLORA				
Australina pusilla subsp. *muelleri*	shade nettle	rare		NSW, ACT, Vic, Tas
Austrocynoglossum latifolium	forest houndstongue	rare		Qld, NSW, Vic, Tas
Banksia integrifolia subsp. *integrifolia*	coast banksia	presumed extinct		NSW, Vic, Tas (KI & Furneaux Group)
Caladenia pusilla	tiny caladenia	rare		Vic, SA, Tas
Callitriche sonderi	matted waterstarwort	rare		SA, Qld, NSW, Vic, Tas (KI only)
Centipeda cunninghamii	common sneezeweed	rare		All States except Qld.
Cotula vulgaris var. *australasica*	slender buttons	rare		Vic, SA, WA, Tas
Cyathea cunninghamii	slender treefern	endangered		Qld, Vic, Tas (& NZ)
Cyathea x *marcescens*	skirted treefern	endangered		Vic, Tas (NE & KI).
Cynoglossum australe	coast houndstongue	rare		Southeast Aust & Tas
Cyrtostylis robusta	large gnat-orchid	rare		WA, SA, Vic, Tas
Elaeocarpus reticulatus	blueberry ash	rare		Qld, NSW, Vic, Tas (KI & Flinders Island)
Epilobium pallidiflorum	showy willowherb	rare		All States except Qld (& NZ)
Gratiola pubescens	hairy brooklime	vulnerable		WA, SA, Vic, NSW, Tas.
Haloragis myriocarpa	prickly raspwort	rare		Vic, Tas
Hedycarya angustifolia	Australian mulberry	rare		Vic, NSW, Qld, Tas (KI only)
Hypolepis distans	scrambling groundfern	endangered	Endangered	Tas (NW & KI) (& NZ)
Hypolepis muelleri	harsh groundfern	rare		Vic, NSW, Qld, Tas (north)
Juncus vaginatus	clustered rush	rare		Qld, NSW, Vic, Tas
Lachnagrostis scabra subsp. *scabra*	rough blowngrass	rare		Vic, SA, Tas
Lepilaena patentifolia	spreading watermat	rare		SA, Vic, Tas
Leucopogon lanceolatus var. *lanceolatus*	lance beardheath	rare		Qld, Vic, SA, Tas (Furneaux Group & KI)
Myriophyllum muelleri	hooded watermilfoil	rare		WA, SA, Vic, Tas
Orthoceras strictum	horned orchid	rare		Qld, NSW, Vic, SA, Tas
Parietaria debilis	shade pellitory	rare		Temperate Aust (& NZ)
Persicaria decipiens	slender knotweed	vulnerable		Mainland Aust (& NZ), northern Tas
Phyllangium distylis	tiny mitrewort	rare		WA, SA, Vic, Tas (north & KI)
Phylloglossum drummondii	pigmy clubmoss	rare		WA, SA, Vic, NSW, Tas (north) (& NZ)
Pimelea axiflora subsp. *axiflora*	bootlace bush	endangered		NSW, Vic, Tas (KI only)
Pneumatopteris pennigera	lime fern	endangered		Qld, Vic, Tas (NW & KI) (& NZ)
Poa halmaturina	dune tussockgrass	rare		SA, Tas
Podotheca angustifolia	sticky longheads	presumed extinct		Temperate Aust & Tas (NW & KI)

Scientific Name	Common Name	TSP Act Status	EPBC Act Status	Australian Distribution
Pomaderris paniculosa subsp. *paralia*	shining dogwood	rare		WA, SA, Vic, Tas (NE, Furneaux & KI)
Pterostylis cucullata subsp. *cucullata*	leafy greenhood	endangered	Vulnerable	SA, Vic, Tas (NW, FI & KI)
Pterostylis sanguinea	banded greenhood	rare		Vic, SA, Tas (NE & Bass Strait Islands)
Schoenoplectus tabernaemontani	river clubsedge	rare		All Aust. States (& NZ)
Senecio psilocarpus	swamp fireweed		Vulnerable	Vic, Sa, Tas
Solanum opacum	greenberry nightshade	endangered		SA, Vic, NSW, QLD, Tas
Sporobolus virginicus	salt couch	rare		All Aust States
Stuckenia pectinata	fennel pondweed	rare		Vic, NSW, WA, SA, Tas
Stylidium beaugleholei	fan triggerplant	rare		WA, SA, Vic, Tas (NW, NE, Furneaux & KI)
Stylidium despectum	small triggerplant	rare		WA, SA, Vic, NSW, Tas (NE, Furneaux & KI)
Stylidium perpusillum	tiny triggerplant	rare		WA, SA, Vic, Tas (NW, NE, Furneaux & KI)
Taraxacum cygnorum	coast dandelion		Vulnerable	VIC, WA, Tas (extinct on KI & Furneaux)
Thelymitra holmesii	bluestar sun-orchid	rare		SA, Vic, NSW, Tas
Thelymitra malvina	mauve tufted sun-orchid	endangered		Qld, NSW, Vic, Tas
Tmesipteris parva	small forkfern	rare		Qld, NSW, Vic, Tas (FI & KI)
Triglochin minutissimum	tiny arrowgrass	rare		WA,SA, Vic, NSW, Tas
Trithuria submersa	submerged watertuft	rare		WA, SA, Vic, NSW, Tas
Utricularia tenella	pink bladderwort	rare		WA, SA, Vic, Tas (NE, Furneaux & KI)
FAUNA				
Acanthiza pusilla archibaldi	King Island Brown Thornbill	endangered	Endangered	Endemic to KI
Acanthornis magna greeniana	King Island Scrubtit	endangered	Critically Endangered	Endemic to KI
Austrochloritis victoriae	Southern Hairy Red Snail	vulnerable		Northeast coast of KI & southern Vic, south of Great Dividing Range
Haliaeetus leucogaster	White-bellied Sea Eagle	vulnerable	Migratory	All states
Limnodynastes peronii	Striped Marsh Frog	endangered		SA, Vic, ACT, NSW, Qld. Distinct population in north Tas including KI
Litoria raniformis	Green and Gold Frog	vulnerable	Vulnerable	Tas including the Bass Strait islands (KI, FI), Vic, SA, NSW, ACT
Neophema chrysogaster	Orange-bellied Parrot	endangered	Critically endangered	Tas, Vic, SA and rarely in NSW
Platycercus caledonicus brownii	King Island Green Rosella	vulnerable		Endemic to KI
Prototroctes maraena	Australian Grayling	vulnerable	Vulnerable	Tas, NSW, Vic
Botaurus poiciloptilus	Australasian Bittern		Endangered	Tas, SA, Qld, WA, also NZ
Sternula albifrons sinensis	Little Tern	endangered	Migratory	Tas, Vic, NSW, Qld, SA, NT
Sternula nereis nereis	Fairy Tern	vulnerable	Vulnerable	Tas, NSW, Vic, SA, WA and rare in Qld and NT

4. THREATS

4.1 Introduction

Threatened species are subject to a wide variety of stresses or threats that may contribute to their continued decline. Identification and management of specific threats for each species is central to retaining and expanding populations. Threats can also affect biodiversity at the landscape scale, thus identification and management of the threats to biodiversity per se is important to the overall ecology of the Island.

In addition to the listing of threatened species and ecological communities the EBPC Act provides for the identification and listing of Key Threatening Processes. A threat is defined as a Key Threatening Process if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community and impacts at the national level. Currently the EBPC Act lists seventeen Key Threatening Processes, of which seven either currently threaten species on King Island or have the potential to in the future:

- Land clearance;
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases;
- Dieback caused by the root-fungus *Phytophthora cinnamomi*
- Predation by feral cats;
- Predation by introduced rats;
- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species;
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis.

This chapter identifies and discusses threats to threatened species and the native biodiversity of King Island. Relevant Key Threatening Processes have been included for discussion as a threat.

Ratings of the impact of each threat to individual species are available in Appendix 3. Priority threats and actions to minimise the threats are outlined in Chapter 5.

4.2 The past

European settlement of King Island began in the early 1800s, with the arrival of sealers. Permanent settlement and land clearing for agricultural development began in 1888 and increased after the First World War, when farms were developed for soldier settlers (Finzel 2004). After the Second World War heavy machinery was brought in for large-scale clearing, and wide-scale burning added to the removal of the original vegetation.

The expansion of agriculture on King Island has continued to today, the result being a highly fragmented and developed landscape, with large areas of productive pasture used for grazing of the beef and dairy cattle. Figure 3 provides an aerial composite image of the King Island landscape.

Permanent settlement and development of King Island has had an enormous impact on the biodiversity. Vegetation clearance, logging, fire and hunting have permanently changed the landscape and ecology – about a third of the Island now supports native vegetation. Species that are now presumed extinct on the Island are numerous and include for example Emus, Wombats, Southern Sea Elephants, Tiger Cats, celery-top pine, coast banksia and sticky long-heads (Barnes *et al.* 2002). In addition some species that are widespread elsewhere have become uncommon on King Island, and as discussed in Chapter 3, a number of species are listed as threatened on either the EPBC or TSP Acts.

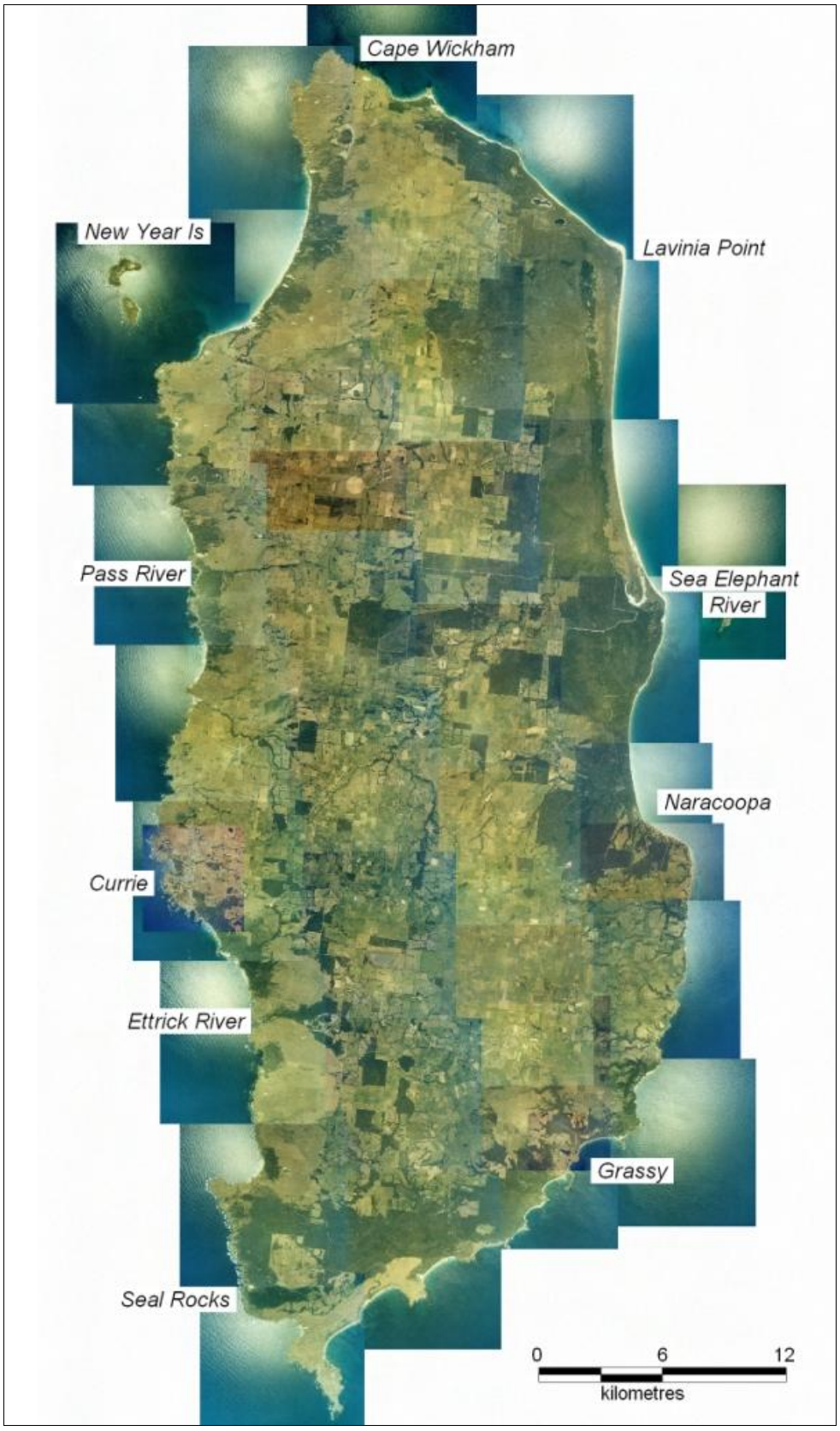

Figure 3. Aerial map of King Island
(5 December 2006)

4.3 Known and potential threats to King Island's biodiversity

Existing or potential threats have been identified and assessed for their impact on King Island's native biodiversity, as described below.

Some threats are poorly understood or there is little data from which to quantify their degree of impact. Complicating the matter is that whilst threats have been noted individually, there may be cumulative effects due to strong links and synergies between many threats, resulting in cumulative impacts to species, communities and the King Island ecosystem. For example the high wallaby population is linked to the highly fragmented landscape, with extensive areas of productive agricultural pasture that has resulted in a high abundance on the Island. The actions identified within Chapter 5 reflect the relationship between threats and between species to encompass a holistic approach to biodiversity management.

Under the *Forest Practices Act 1995* a Forest Practices Plan is required for the clearing of forest vegetation. Small-scale clearing is exempt from the requirements of a Forest Practices Plan, allowing up to 1 hectare of land to be cleared per property per year of *non-vulnerable* land for new or existing infrastructure development and of *vulnerable* land to protect public safety or to maintain existing infrastructure such as fences. Vegetation clearance and conversion on King Island is regulated by the Forest Practices Authority. For the purposes of the Plan, clearing of vegetation is considered to be part of the habitat fragmentation and degradation threat.

Habitat degradation and fragmentation, including trampling, grazing & hydrological changes

About two-thirds of King Island's vegetation has been cleared for agricultural production since European settlement (Richley 1984, Barnes *et al.* 2002). In the early twentieth century a number of significant lagoons and swamp forests in the Island's north were drained (e.g., Egg Lagoon, Southeast Lagoon), impacting in particular on *Melaleuca ericifolia* swamp forest and *Acacia melanoxylon* swamp forest; these are communities that may take over 100 years to reach maturity. Much of the dune system that fringes the island's west coast has also been cleared for rough grazing, with the loss of extensive tracts of coastal scrub, while extensive *Eucalyptus globulus* forests on the island's 'plateau' have also been decimated, their demise being aided by a series of major burns in the late 19th and early 20th century (Finzel 2004). The remaining remnant native vegetation is scattered throughout this rural landscape and most patches are small, fragmented and isolated — at least 8% occur in narrow bands and as small remnants (Barnes *et al.* 2002). Most patches of vegetation are separated by pasture, with limited or no connectivity, particularly for native species with low mobility, such as snails.

The loss of structural and floristic diversity and the low mean age class of forest vegetation communities has had a dramatic impact on the fauna that they support. Many species that rely on old growth elements of forests such as tree hollows or coarse woody debris have become uncommon or threatened. For example, the Southern Hairy Red Snail is restricted to dense piles of twigs and rotting banksia logs found in mature forest communities (Barnes *et al.* 2002), and the endemic King Island Scrubtit is only found in mature *Melaleuca ericifolia* swamp forest.

As King Island is a small island with relatively little and highly fragmented native vegetation, some species are more susceptible to local ('island') extinction than they would be in areas of comparable size on the Tasmanian mainland where larger patches of native vegetation remain (Barnes *et al.* 2002). Fragmentation of the remnant vegetation also makes it more susceptible to further degradation, by creating conditions that encourage damage, such as invasion by weeds and disease.

Whilst grazing of stock can be used successfully as a management tool, for example to reduce pasture competition in planted shelterbelts, unchecked grazing can degrade native habitat. Stock browsing can damage delicate understorey plants and the seedlings of regenerating trees, shrubs and sedges. Many of the forest remnants on private land have suffered from stock browsing in the past, and as a result exotic species dominate their ground layer (Barnes *et al.* 2002). Similarly riparian vegetation and wetlands which provide habitat for species such as frogs can be damaged by stock trampling and grazing.

Drainage of swamps, inundation of land for in-stream dams and other changes to hydrology have impacted upon a range of native flora and fauna on King Island (Barnes *et al.* 2002). Downstream impacts of dams may include alteration to sediment and flow regimes. Such alterations may impact species

through the removal of regeneration triggers associated with disturbance caused by flood flows, the removal of regeneration microsites associated with sediment scouring and deposition, and disruption to episodic dispersal of propagules.

Many other activities also degrade the native habitat of the Island, such as weed invasion and wildfire, but for simplicity where a threat is discussed later, it is not considered within habitat degradation.

Both individuals and community groups have undertaken activities such as fencing and weed control to improve connectivity and protect remnant vegetation from further degradation. Despite these efforts, habitat degradation and fragmentation remains a large threat to King Island's biodiversity. Species at particular risk include: Green and Gold Frog, Striped Marsh Frog, King Island Brown Thornbill, King Island Scrubtit, Orange-bellied Parrot, White-bellied Sea Eagle, Australasian Bittern, scrambling groundfern, lime fern and leafy greenhood.

Fire

Fires have had dramatic and adverse effects on King Island's forest communities since the 1800s (PWS 2004). In 1880 a single fire left a moonscape of large stumps and blackened vegetation from Mount Stanley to the Fraser River (Barnes *et al.* 2002). Explorers used fire to clear paths through dense scrub, and settlers soon realised the potential of fire as a tool for clearing vast tracts of land for agriculture (Brown 1887). Frequent and intense fires over the Island's European history have eliminated most rainforest and wet forest associated flora and fauna from areas of the Island (Barnes *et al.* 2002).

In recent times, fires in 2001 and 2007 have burnt extensive tracts of the Island's remaining native vegetation, in particular within Lavinia State Reserve. *Melaleuca ericifolia* swamp forest has been especially affected, with important habitat for a number of threatened flora and fauna species being compromised (RMCD 2007), while a significant proportion of peat within Nook Swamp and on the plains to the west has been lost (RMCD 2007, Corbett & Corbett 2010; Figure 4). More than 95% of the vegetation burnt in 2001 is thought to have burnt again in 2007, and the relatively short period between fires is likely to have disadvantaged the regeneration of a number of flora species (RMCD 2007).

Fire is a major threat for vegetation, flora species with limited distribution and sessile fauna species on King Island. Three of the vegetation communities recorded within the 2007 burn area are considered highly sensitive to fire (Pyrke & Marsden-Smedley 2005), and at least ten threatened flora species were known to occur within the burn area (RMCD 2007). Fire has been identified as the single major ongoing threat to King Island populations of the Southern Hairy Red Snail (Bonham 2009). The 2001 and 2007 wildfires, along with earlier fire events in the Island's history, have had considerable negative effects on threatened flora and fauna.

Wildfire continues to be a major ongoing threat to both the quality and extent of King Island's biodiversity and is considered to be a major threat to threatened species on King Island. Species at high risk from fire include: King Island Thornbill, King Island Scrubtit, Orange-bellied Parrot, King Island Green Rosella, Southern Hairy Red Snail, Tasmanian blue gum, sassafras, musk daisy bush, slender and skirted treeferns and scrambling groundfern. Fire is a significant threat to the two endemic bird species, the King Island Thornbill and King Island Scrubtit. For example, the area of habitat for the King Island Scrubtit at Nook Swamp prior to the 2007 fire was estimated to be 600 ha; the area post fire is estimated to be only 90 ha. The loss of over 90% of forest and scrub habitat at Nook Swamp is also likely to have permanently removed a significant area of potential habitat for the King Island Thornbill (RMCD 2007). In addition, the following vegetation communities are particularly vulnerable to fire: *Acacia melanoxylon* swamp forest, *Eucalyptus brookeriana* wet forest, King Island eucalypt woodland, *Eucalyptus globulus* King Island forest and *Melaleuca ericifolia* swamp forest.

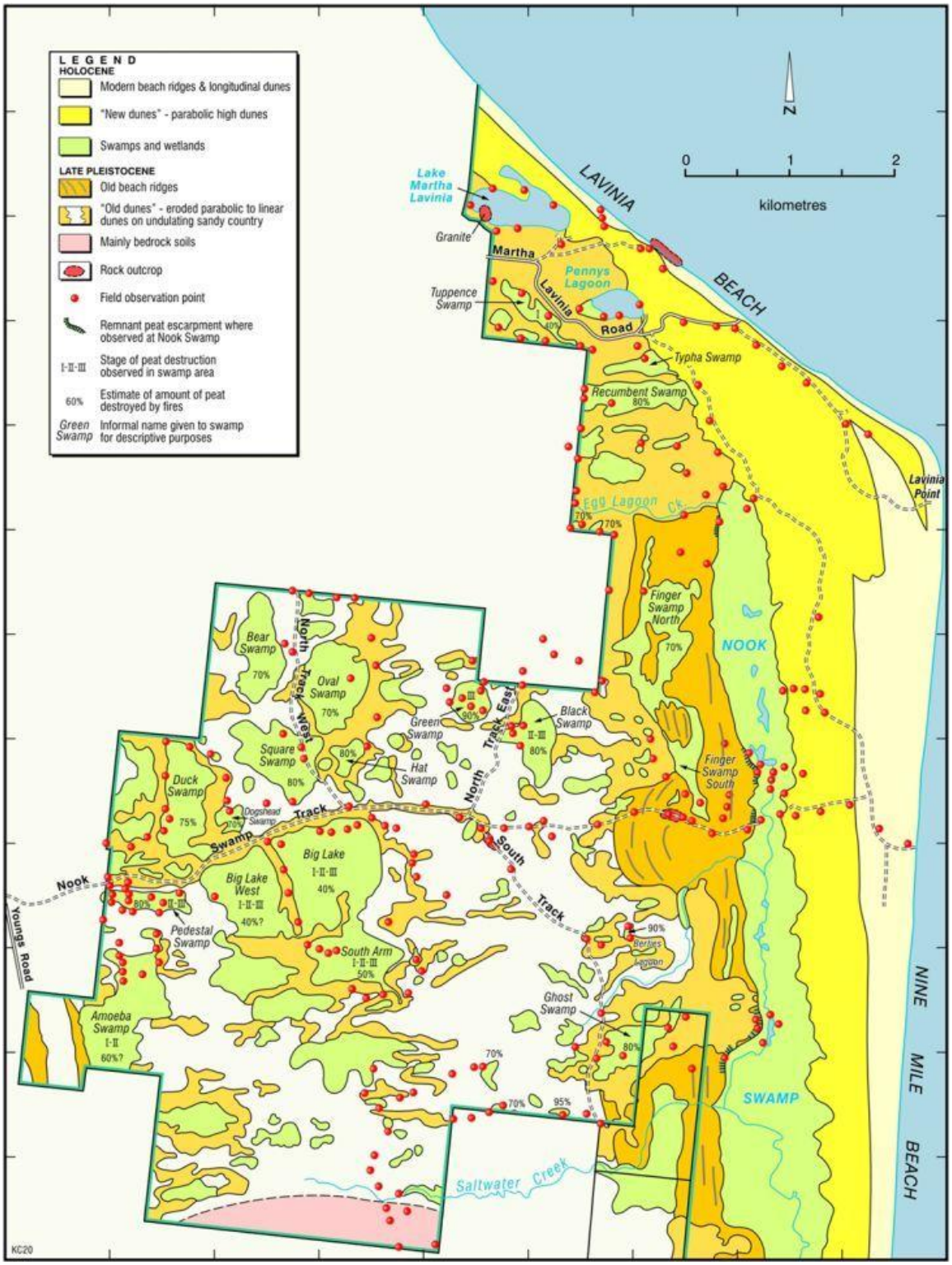

Figure 4. Peat loss in Lavinia State Reserve (Corbett & Corbett 2010)

Weed invasion

Weed invasion is an important issue for biodiversity conservation on King Island and affects many of the native vegetation communities. Weeds threaten native habitats by competing with native species, and they have the potential to modify habitats to the detriment of native species. For the purposes of the Plan, a weed is defined as a plant that was not present on King Island prior to European settlement, and that is now considered to be naturalised. This threat includes existing significant weed species and 'sleepers'. Sleepers are introduced plant species already on the Island (e.g., those growing in gardens) which may have the potential to become major weeds in the future.

There are approximately 180 weed species on King Island, 6 are 'Weeds of National Significance' and 21 are 'Declared Weeds' under the Tasmanian *Weed Management Act 1999*. A total of 38 species have been identified as priorities for management in the King Island Weed Management Strategy (North 2003), having the potential to significantly impact the Island's economy and biodiversity.

The location and impacts of the 41 major (priority) weed species on King Island are described in Appendix 4.

Dieback caused by the root-rot fungus Phytophthora cinnamomi

The exotic soil-borne plant pathogen *Phytophthora cinnamomi* is known to effect elements within moorland, heathland, woodlands and open forests in Tasmania. The fungus causes the roots of susceptible plants to rot, in many cases killing the plants. This can alter the structure, floristics and ecology of infected vegetation communities (Environment Australia 2001). The Strategic Regional Plan for *Phytophthora cinnamomi* in Tasmania (Schahinger *et al.* 2003) identifies a number of vegetation communities on King Island as being susceptible to infection by the fungus, those at greatest risk being the King Island Heath/Scrub Complex and Coastal Heathland. Root-rot fungus has been isolated from wet heath in Lavinia State Reserve, with symptoms observed in the Counsel Hill and Seal River Road areas.

Root-rot fungus can easily be spread by movement of infected soil or plant material by people and animals.

Amphibian chytrid fungus

Chytrid fungus is a water-borne pathogen that is potentially lethal to frogs. Its spread throughout Tasmania, represents an important threat to all frog species (Threatened Species Section 2007a). The disease Chytridiomycosis has been implicated in the decline and extinction of frog species in New South Wales, Victoria and Queensland over the past fifteen years, but its full impact on populations remains uncertain (Tyler 1997). Declines in the range and abundance of the Green and Gold Frog are considered to be linked directly to the establishment and spread of Chytridiomycosis (Clemann & Gillespie 2007). Individual frogs are thought to contract the disease when their skin comes into contact with water that contains the spores from infected animals. Chytrid fungus was recently confirmed to occur on King Island (A. Philips DPIPWE, pers. comm.). Its distribution across the Island is yet to be determined.

Predation by feral cats

Predation by feral cats (*Felis catus*) is thought to have contributed to the extinction of small to medium-sized ground-dwelling mammals and ground-nesting birds in Australia (Environment Australia 1999). In NSW, feral cats have thwarted attempts to re-introduce species, by simply hunting and killing newly released animals (DECCW 2008a).

Early settlers introduced cats to King Island and today feral cats are widespread on the Island. They may have had an impact on various threatened fauna on the Island including the Green and Gold Frog, Orange-bellied Parrot, King Island Brown Thornbill and King Island Scrubtit.

Little is known regarding the exact nature of the impact of feral cats on the Island's threatened fauna. Preliminary studies of feral cat stomach contents indicate a diet of 40% either Pademelon or Wallaby, 30% Black Rat and House Mouse, and 15% birds (Whisson 2009). Whisson indicates that further study on the distribution and abundance of priority species and activity of cats in different habitats on King Island would elucidate which species are vulnerable to cat predation.

Predation by introduced rats

Predation by introduced rats represents a potential threat to the island's native fauna, particularly to native skinks and ground nesting shorebirds and burrow-nesting bird species such as petrels (Brothers 1984; Pye at al. 1999). The Black Rat (*Rattus rattus*) is likely to be more of a threat to native fauna as this species is able to establish self-sustaining populations in native vegetation considerable distances away from human habitation (Pye et al. 1999; Mallick and Driessen 2010). Successful attempts to control feral cat numbers are likely to result in an increase in introduced rat numbers on King Island, which may in turn exacerbate potential impacts of rats on the island's native and threatened fauna (Pye et al. 1999).

Predation by Crows

Forest Ravens (*Corvus tasmanicus),* known locally as Crows, may have arrived on the Island during the 1950's and it is presumed that since then the Crow population has steadily grown. Local observations suggest that artificially elevated populations of Crows are maintained today through abundant food sources, such as road kill, and by the predation of hatchlings of ground-nesting birds. Crows have been observed by King Island residents stealing eggs and actively predating on the young of bird species, including Plovers, Little Penguins and Shearwaters.[14]

Crows may be impacting on some of the Island's threatened species. Assessment of the relative impact of Crows on the Island's threatened fauna would be required before the development of any management actions.

Browsing and trampling by Bennett's wallabies and Brushtail possums

Since the development of King Island for agriculture there has been an explosion in the number of Bennett's Wallabies and Brushtail Possums. It is estimated that between 440,000 and 535,000 Bennett's Wallabies forage on pasture (Branson 2008a). This figure does not include the additional animals grazing in native vegetation on pastoral properties, public reserves and other sites. Similarly the number of Brushtail Possums is high, with a fairly even distribution across the Island and an estimated population of 55,000 to 93,000 in pasture (Branson 2008a).

There is strong local evidence that the elevated populations of Bennett's Wallabies and Brushtail Possums are causing significant damage to native flora by browsing and trampling.

There has also been particular concern that Wallabies have been grazing seedlings of regenerating native vegetation following the 2007 wildfires. After the erection of Wallaby proof fencing at sites with minimal regeneration, an increase in regeneration was observed.

The Tasmanian Institute of Agricultural Research and DPIPWE have undertaken research to improve the understanding of the impact of abundant native herbivores at selected sites across the Island (Finzel, pers. comm.).

Beyond this research, further quantification of the impact of high Bennett's Wallaby numbers on threatened species and biodiversity at a landscape scale on King Island needs to be determined and management actions developed.

Competition from introduced fauna

Introduced species present on King Island have established permanent populations either by self or deliberate introduction by people. Introduced species include, but are not restricted to:

- Common Pheasant;
- Peacock;
- Wild Turkey;

[14] A number of observations of egg stealing and predating on young chicks by Crows have been reported during the compilation of the Plan by local fishermen, bird watchers, farmers etc. Observations have not been collected as part of a systematic survey.

- House Sparrow;
- Common Blackbird;
- Common Starling;
- Fallow Deer;
- White Italian Snail; and
- House Mouse.

There are also many species of invertebrates that are introduced to King Island, but little is known of this group (Donaghey 2003). The degree of the impact from these introduced species and their interaction with native species are poorly known and the need for a management response for each needs to be determined.

Domestic dogs

Uncontrolled dogs can disturb or destroy threatened fauna species and on beaches can have an adverse impact on shorebirds (Dowling & Weston 1999, Weston & Elgar 2005, Banks & Bryant 2007, Weston & Elgar 2007). King Island has approximately 500 registered domestic and working dogs, which are managed under the Tasmanian *Dog Control Act 2000*. The Island does not have a feral dog population.

Off road vehicles/ recreational activities along coastline

King Island is renowned for its beautiful coastline; the beaches support high numbers of beach-nesting resident shorebirds and provide important habitat for migratory shorebirds.

Much of the Island's coastline can be accessed by off-road vehicles such as four-wheel drives and motorbikes. Off-road vehicles are used by locals, for example to access fishing and surfing 'spots'.

Experience elsewhere indicates that off-road vehicles on beaches can be harmful to shorebird breeding, and this may also be the case on King Island. Lovibond (2007) highlights that King Islander's place a high value on coastal environments, which creates an opportunity to protect shorebirds through community based management actions. During development of this Plan, this was further demonstrated at the community workshops where respect for the coastline was displayed, along with a willingness to implement management actions that protect nesting, feeding and roosting shorebirds on the Island's beaches. Threatened species most at risk are Fairy and Little Terns and Hooded Plover.

Tourism

Alongside agriculture and fishing, tourism plays an important role in the economy of King Island. The impact of tourism on native biodiversity on the Island is generally considered low at this time. The King Island Tourism Incorporated has been proactive in developing infrastructure such as boardwalks and interpretive information that aims to minimise the impact of tourism.

As the number of tourists seeking secluded coastal escapes, and eco-tourism grows, so too can the potential impacts, particularly to coastal ecosystems, where there is currently little infrastructure to carry an increased load.

Habitat important to the survival of threatened flora and fauna on King Island, for example the Sea Elephant Estuary, needs to be identified in collaboration with tourism organisations such as King Island Tourism Incorporated. This should be sensitive to all natural values on the Island and identify different management regimes for classes of natural values.

Pollution

The potential for pollution affecting King Island includes sources such as from fertiliser use, agricultural effluent management and marine debris on beaches. Particular fertilisers can eliminate threatened flora such as orchids from sites with a single application (Threatened Species Section 2006a). Fertiliser use also poses a threat to water quality in freshwater and estuary ecosystems, and the species within these systems, including threatened frogs. Whilst a great deal of effort has been undertaken within Australia regarding the management of fertilisers in agriculture, it is important that the short and long term impacts of

fertiliser use continue to be considered on the Island. On farm effluent in Tasmania is required to be kept within property boundaries including out of drains, watercourses or groundwater. Both the Green and Gold Frog and the Striped Marsh Frog are especially vulnerable to the affects of pollution.

Hunting and collecting

Hunting is a popular recreational past time for many King Island residents. The Wildlife Management Branch in DPIPWE administers the Tasmanian *Nature Conservation Act 2002* wildlife regulations. Hunting seasons are consistent with the rest of Tasmania and are restricted to native Black Duck (*Anas superciliosa*), Grey Teal (*Anas gracilis),* Chestnut Teal (*Anas castanea*), Australian Shelduck (*Tadorna tadornoides*), Wood Duck (*Chenonetta jubata*), Brown Quail (*Coturnix ypsilophora*), Muttonbird/Short-tailed Shearwater (*Puffinus tenuirostris*), Bennett's Wallaby, Pheasant and Wild Turkey. Current hunting practices are not considered a threat to King Island's native fauna. However populations of targeted species should be monitored and bag limits altered accordingly.

Climate change

Climate change is a potential threat to species on King Island. Trends predict changes in fire regimes, the frequency and severity of storm events and the frequency and intensity of drought in Australia (Hughes 2003).

The types and severity of these future impacts on King Island are unclear. The most appropriate way forward is a flexible approach, which builds resilience within the native species to respond and adapt to the impacts of climate change.

Introduction of new invasive weeds, fauna and disease

The establishment of for example rabbits, new weed species, beak and feather disease or invertebrates such as the Argentine ant could have a negative consequence on the Island's biodiversity. The introduction of new exotic invasive species or pathogens constitutes an ongoing threat to King Island's ecological integrity, requiring continuing management.

Stochastic events

Stochastic events such as severe storms, drought and disease outbreaks, constitute a perennial threat to the biodiversity of King Island. As a general rule, the fewer populations of a threatened species that are known to exist, and the more restricted their geographical distribution, then the more susceptible it is to extinction by freak events such as flood, fire, and disease (Barnes *et al.* 2002).

5. KING ISLAND BIODIVERSITY MANAGEMENT

The overall aims of the Plan are that by 2020: there will be viable and healthy populations of all priority flora and fauna species, and vegetation communities on King Island; and the current biodiversity of King Island is maintained with no additional species considered threatened. Within this broad aim, seven management objectives have been identified to guide implementation of the Plan.

5.1 Management objectives

1. To promote the recovery of priority species, ensuring that each species persists in the long term on King Island.
2. To stop the decline and retain presence of the King Island Brown Thornbill, and King Island Scrubtit at known sites.
3. To reduce current levels of threats and risks to biodiversity on King Island.
4. To maintain and improve the extent of vegetation, including quality, connectivity and functionality for priority species on King Island.
5. To ensure no further native species or ecological communities become threatened on King Island.
6. To inform, encourage and support community participation in the implementation of the Plan.
7. To improve baseline information of biodiversity on King Island over the life of the Plan and to ensure that information is appropriately recorded and disseminated.
8. To implement the Plan and measure its success in achieving the management objectives in cooperation with relevant government and non-government organisations.

The following chapter identifies for management:

- priority species and vegetation communities;
- priority sites;
- priority threats; and
- specific actions

to achieve an integrated package in which to tackle biodiversity conservation on King Island.

Actions and priorities have been determined using a combination of information and data sources including specialist technical knowledge, community consultation and existing management plans. Actions utilise and build on past biodiversity related programs, as well as existing legislations and current biodiversity programs.

5.2 Priority species for management on King Island

Flora and fauna species that are considered priorities for management on King Island are presented in Table 2. They include all listed species, except for those discussed in Section 3.6 and those considered irregular migrants or visitors to the Island (Appendix 3). Each priority species has been placed in one of four categories, viz., very high, high, medium or low. The species' ranking is based on the following:

- status under the EPBC Act and TSP Act;
- endemicity;
- relative contribution of King Island to its conservation in Tasmania;
- range, distribution and abundance;
- susceptibility to threats;
- capacity for actions on King Island to address the threats to the species; and

- whether the King Island community regard it as a priority due to restricted distribution on the Island.[15]

5.3 Priority vegetation communities for management on King Island

Twelve vegetation communities are identified as a priority for management (Table 2):

- *Acacia melanoxylon* swamp forest (NAF)
- Coastal complex on King Island (SCK)
- Coastal heathland (SCH)
- *Eucalyptus brookeriana* wet forest (WBR)
- *Eucalyptus globulus* King Island forest (WGK)
- King Island eucalypt woodland (DKW)
- *Melaleuca ericifolia* swamp forest (NME)
- Seabird rookery complex(SRC)
- Wetlands – four communities (AHF, AHL, ASF, AWU)

Ten of these twelve communities are listed as threatened under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, the two non-listed communities being *Acacia melanoxylon* swamp forest and Coastal heathland. Detailed descriptions of each vegetation community can be found in Barnes *et al.* (2002) and Harris & Kitchener (2005). The approximate distribution of the priority vegetation communities is shown in Figure 5; the current TASVEG mapping for King Island is imperfect, so the mapping should be taken as a broad guide only. A full list of vegetation communities known on King Island is included in Appendix 2 and the associated threats for each community are ranked in Appendix 3.

5.4 Priority threats for management on King Island

At the community workshop(s) threats to biodiversity at the landscape scale were prioritised for:

- management; and/or
- to assess the magnitude of the threat.

Seven threats were identified as a priority for management of King Island's biodiversity:

- fire;
- habitat degradation and fragmentation;
- weed invasion;
- predation by feral cats;
- off road vehicles/recreational activities along the coastline;
- browsing and trampling by Bennett's Wallabies and Brushtail Possums; and
- predation by Crows.

Threats to individual species are ranked for their degree of impact in Appendix 3.

[15] Four flora species that are not listed as threatened on either the TSP or EPBC Acts, sassafras (*Atherosperma moschatum),* tasmanian blue gum (*Eucalyptus globulus* subsp. *globulus)*, native olive (*Notelaea ligustrina*) and musk daisybush (*Olearia argophylla*), were identified at the Community Workshop as a priority for management within the Plan, due to their restricted distribution and abundance on the Island. This provides a snapshot of species that are a priority for management within King Island's biodiversity – this list of additional species may vary over time as knowledge gaps are addressed.

Table 2. Priority species & vegetation communities for management on King Island
(species and communities are arranged alphabetically within each priority category)

FLORA	
Very High Priority	
Cyathea cunninghamii	slender treefern
Cyathea x *marcescens*	skirted treefern
Hypolepis distans	scrambling groundfern
Pneumatopteris pennigera	lime fern
High Priority	
Australina pusilla subsp. *muelleri*	shade nettle
Callitriche sonderi	matted waterstarwort
Gratiola pubescens	hairy brooklime
Pimelea axiflora subsp. *axiflora*	bootlace bush
Pterostylis cucullata subsp. *cucullata*	leafy greenhood
Senecio psilocarpus	swamp fireweed
Thelymitra malvina	mauvetuft sun-orchid
Tmesipteris parva	small forkfern
Medium Priority	
Atherosperma moschatum	sassafras
Austrocynoglossum latifolium	forest houndstongue
Centipeda cunninghamii	common sneezewort
Cotula vulgaris var. *australasica*	slender buttons
Cynoglossum australe	coast houndstongue
Cyrtostylis robusta	large gnat-orchid
Elaeocarpus reticulatus	blueberry ash
Epilobium pallidiflorum	showy willowherb
Eucalyptus globulus subsp. *globulus*	Tasmanian blue gum
Haloragis myriocarpa	prickly raspwort
Hedycarya angustifolia	australian mulberry
Juncus vaginatus	clustered rush
Lepilaena patentifolia	spreading watermat
Leucopogon lanceolatus var. *lanceolatus*	lance beardheath
Myriophyllum muelleri	hooded watermilfoil
Notelaea ligustrina	native olive
Olearia argophylla	musk daisy bush
Orthoceras strictum	horned orchid
Parietaria debilis	pellitory
Persicaria decipiens	slender knotweed
Phyllangium distylis	tiny mitrewort
Phylloglossum drummondii	pygmy clubmoss
Pomaderris paniculosa subsp. *paralia*	shining dogwood
Pterostylis sanguinea	banded greenhood
Schoenoplectus tabernaemontani	river clubsedge
Solanum opacum	greenberry nightshade
Sporobolus virginicus	salt couch
Stuckenia pectinata	fennel pondweed
Stylidium beaugleholei	fan triggerplant
Stylidium despectum	swamp triggerplant
Stylidium perpusillum	tiny triggerplant
Thelymitra holmesii	bluestar sun-orchid
Triglochin minutissimum	tiny arrowgrass
Trithuria submersa	submerged watertuft
Utricularia tenella	pink bladderwort
Low Priority	
Banksia integrifolia subsp. *integrifolia*	coast banksia
Caladenia pusilla	tiny fingers
Hypolepis muelleri	harsh groundfern
Lachnagrostis scabra subsp. *scabra*	rough blowngrass
Poa halmaturina	dune tussockgrass
Podotheca angustifolia	sticky longheads
Taraxacum cygnorum	coast dandelion
AMPHIBIANS & REPTILES	
Very High Priority	
Green and Gold Frog	
Striped Marsh Frog	
Low Priority	
Tasmanian Tree Skink	
BIRDS	
Very High Priority	
Fairy Tern	
Little Tern	
Hooded Plover	
Orange-bellied Parrot	
White-bellied Sea Eagle	
King Island Brown Thornbill	
King Island Scrubtit	
High Priority	
King Island Green Rosella	
Australasian Bittern	
Black Currawong	
Medium Priority	
Dusky Robin	
Southern Boobook	
Yellow-tailed Black-cockatoo	
Yellow Wattlebird	
Low Priority	
Brown Goshawk	
Golden-headed Cisticola	
Nankeen Kestrel	
Nankeen Night Heron	
Painted Button-quail	
MAMMALS	
High Priority	
Eastern Pygmy Possum	
Platypus	
Medium Priority	
Gould's Wattled Bat	
Lesser Long-eared Bat	
Long-nosed Potoroo	
Swamp Antechinus	
Low Priority	
Common Ringtail Possum	
INVERTEBRATES	
High Priority	
Southern Hairy Red Snail	
VEGETATION COMMUNITIES	
Very High Priority	
Acacia melanoxylon swamp forest (NAF)	
Eucalyptus brookeriana wet forest (WBR)	
Eucalyptus globulus King Island forest (WGK)	
King Island eucalypt woodland (DKW)	
Melaleuca ericifolia swamp forest (NME)	
Seabird rookery complex (SRC)	
Wetlands (AHF, AHL, ASF, AWU)	
High Priority	
Coastal complex on King Island (SCK)	
Medium Priority	
Coastal heathland (SCH)	

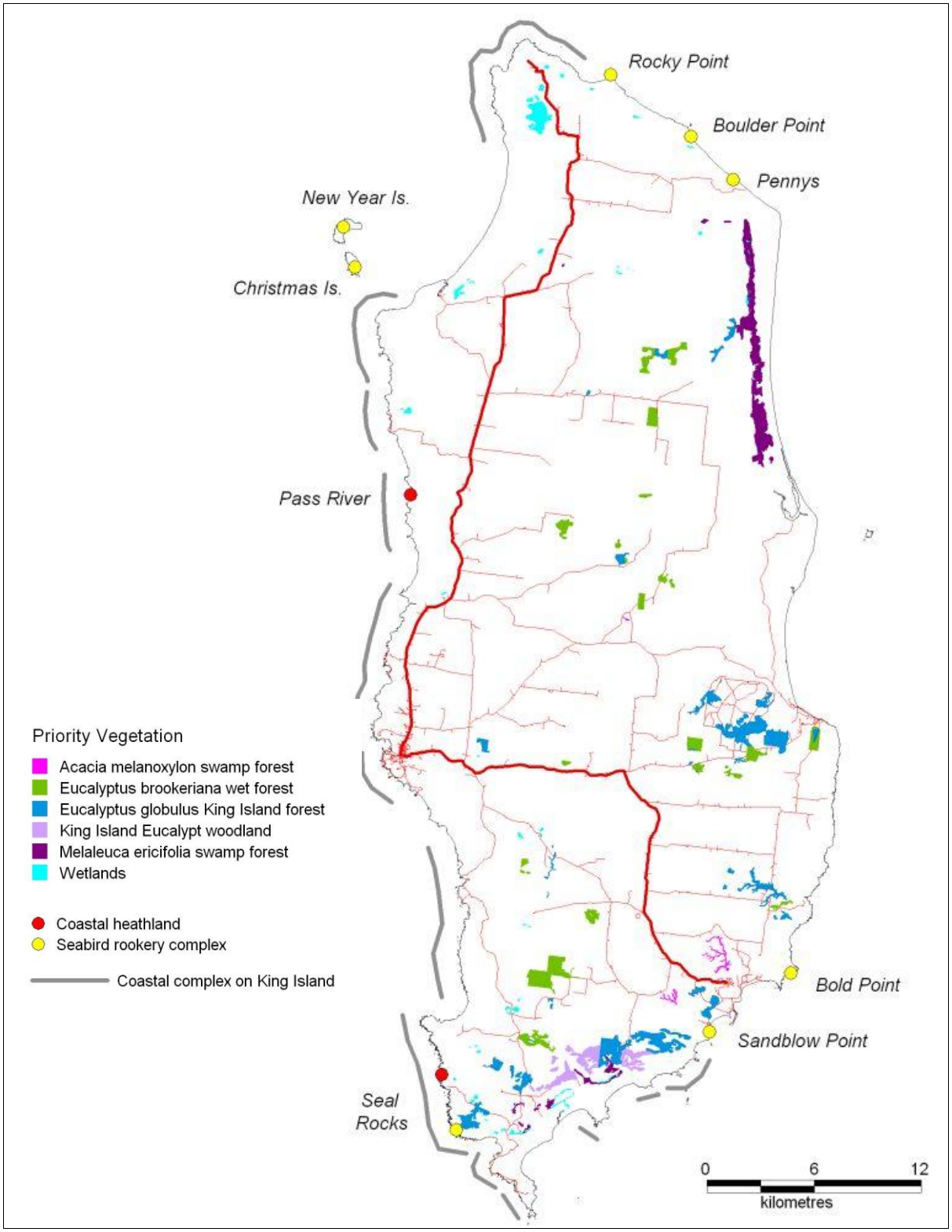

Figure 5. Distribution of priority vegetation communities on King Island

5.5 Priority sites for management on King Island

Table 3 presents priority sites for management on King Island, whilst Figure 6 illustrates the location of High and Medium priority sites. Each priority site has been ranked as High, Medium or Low priority based on both the priority species and vegetation communities which occur there. At the Community Workshop, sites that were ranked as a priority for threatened species management that are also of high value culturally were nominated. It provides a snapshot from the Community Workshop of sites that highlight the combined needs of both environmental and social objectives.

Unranked sites are not considered priorities for specific management activities within this Plan; but this does not preclude other sites from management. Specific management actions are targeted to priority sites, as these are anticipated to have the greatest influence on threatened species conservation in most instances.

Table 3. Priority sites for management on King Island

PRIORITY SITES	SPECIES & VEGETATION COMMUNITIES	COMMUNITY PRIORITY
High priority		
Nook Swamps/Lavinia State Reserve	King Island Scrubtit, King Island Brown Thornbill, Southern Hairy Red Snail, Green and Gold Frog, Striped Marsh Frog, scrambling groundfern, swamp fireweed, *Melaleuca ericifolia* swamp forest, Wetlands (RAMSAR site)	High social values
Colliers Swamp, including Seal River	King Island Scrubtit, King Island Brown Thornbill, bootlace bush, forest houndstongue, Australian mulberry, King Island eucalypt woodland, *Melaleuca ericifolia* swamp forest	
Sea Elephant Estuary	Orange-bellied Parrot, RAMSAR site	High social values
Yellow Rock Estuary	Orange-bellied Parrot, Fairy Terns and shorebirds	High social values
Pegarah State Forest	*Eucalyptus globulus* King Island forest, bootlace bush, sassafras, range of forest birds	High social values
Grassy River	*Acacia melanoxylon* swamp forest, skirted and slender tree ferns, bootlace bush, Australian mulberry	
Yarra Creek	*Acacia melanoxylon* swamp forest, bootlace bush, Australian mulberry	High social values
Ettrick River	Lime fern, australian mulberry	
Bronzewing Creek	*Acacia melanoxylon* swamp forest, Australian mulberry, blueberry ash, musk daisybush	
Lake Flannigan	Wetland, Orange-bellied Parrot	
Deep Lagoons	Scrambling groundfern, wetland	
Lavinia Point	Shorebird spp. and Little and Fairy Terns	High social values
Pennys Lagoon	Southern Hairy Red Snail, Striped Marsh Frog, wetland	High social values
Medium priority		
Seal Rocks	Seabird rookeries, shining dogwood, triggerplants, Coastal complex on King Island	
Yellow Rock to The Springs (Calcareous dunes)	Leafy greenhood	
Muddy Lagoon	Wetland, *Melaleuca ericifolia* swamp forest	
Bungaree Lagoon	Wetland, *Melaleuca ericifolia* swamp forest, Orange-bellied parrot	
Pass River	Riparian vegetation, Australian mulberry	
Christmas and New Year Islands	Seabird rookery complex, small terns	
Big Lake	Wetland, *Acacia melanoxylon* swamp forest	
Red Hut to Sandblow Point	Seabird rookery complex, Coastal complex on King Island	
Priority beaches to be determined	Fairy Terns, Little Terns, Hooded Plover	High social values

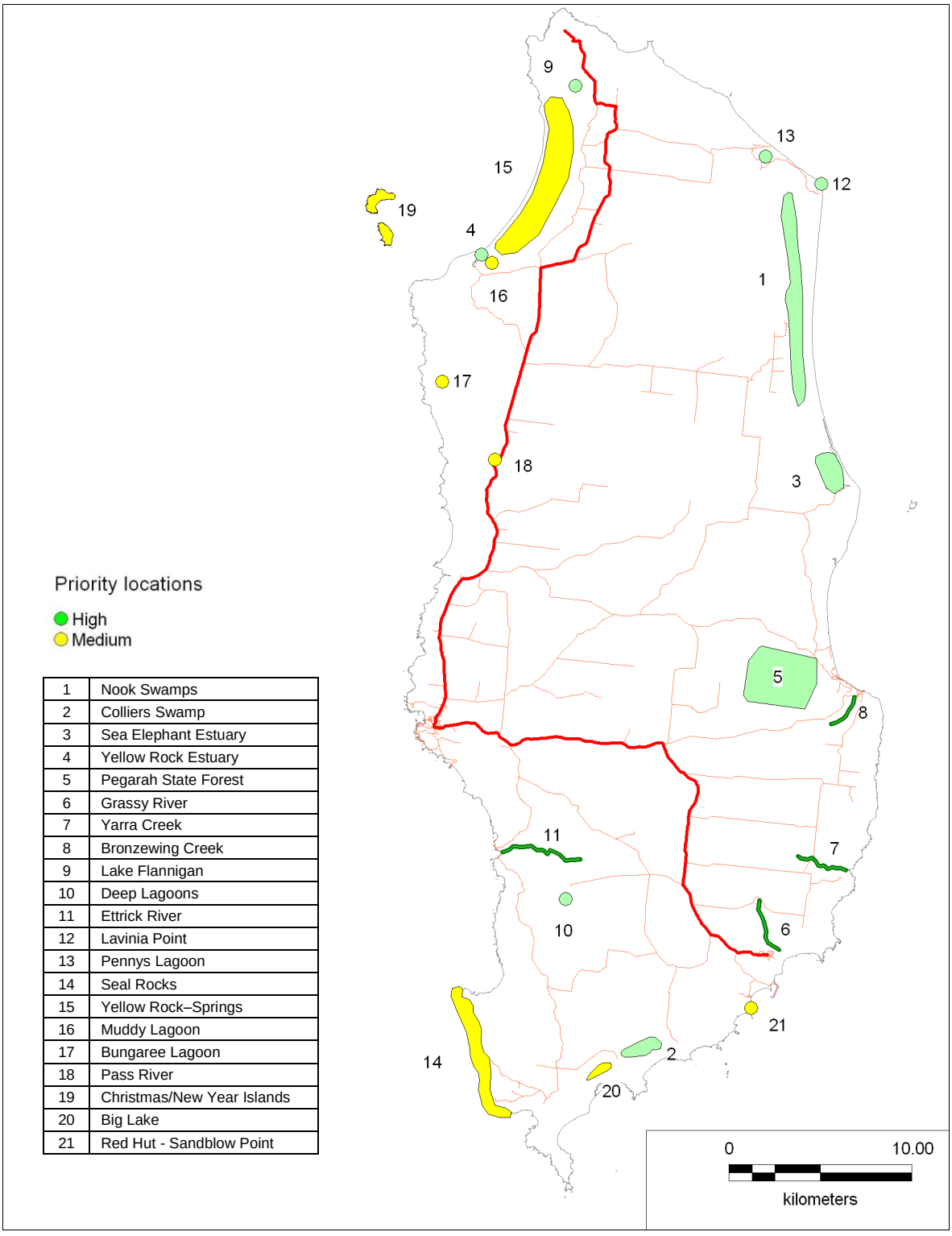

Figure 6. Priority sites for management on King Island

5.6 Actions

A list of specific actions that addresses threatened species management and biodiversity management at a landscape scale, or both, is included in Table 4. Each action is prioritised and has a specified timeframe and estimated cost over the 10-year period of the Plan.

5.7 Performance criteria

1. Demonstrate that there has not been any loss of known sites for listed threatened species, nor any loss of known sites for 90% of other priority species on a biennial basis. Specifically for the King Island Brown Thornbill and King Island Scrubtit, ensure and demonstrate no loss of known sites on a biennial basis.
2. By year 5 of the Plan, have information to be able to assess population health and/or range for all priority species. Specifically for the King Island Brown Thornbill, and King Island Scrubtit, by year 5 of the Plan, have information to be able to assess population health at all listed sites, have conducted surveys to detect any other subpopulations present on the island, and assess and implement time-critical actions required to ensure survival of specific subpopulations and of the two species including translocations and captive breeding programs.
3. From year 5 to 10 demonstrate that population health and/or range is maintained or improved for all priority species. Specifically for the King Island Brown Thornbill, and King Island Scrubtit, by year 10 of the Plan, have instigated all required actions to ensure survival of specific subpopulations of the two subspecies.
4. All priority vegetation communities have maintained their extent, on an ongoing yearly basis.
5. Demonstrate that connectivity has been increased and improved between sites that support high biodiversity values over the life of the project.
6. Demonstrate an improvement in the quality of vegetation remnants by year 5 and 10. Assess the quality of remnant vegetation utilising TASVEG Vegetation Condition Benchmarks, using a representative sample with a range of community types.
7. No new native species added to the TSP Act or EPBC Act threatened species lists, or declines in listed status due to declines on King Island.
8. Information, mapping, monitoring and research results are readily available on the King Island website (www.kingisland.net.au) and updated at least biannually.
9. Plan implementation recognises and utilises community, non-government and government knowledge in a collaborative fashion.

5.8 Biodiversity benefits

Whilst many of the actions identified within the Plan target species ranked as a priority, it is anticipated that broader biodiversity benefits will be an outcome of the Plan's implementation. Many of the species-related actions will provide positive outcomes for other species and biodiversity more generally, and mitigation of threats will reduce the pressure on a range of flora and fauna species to improve the overall health of King Island's biodiversity. The presence of a Biodiversity Management Plan and its successful implementation will reduce knowledge gaps and may assist the community in improving the management of the island's biodiversity.

5.9 Role and interests of indigenous people

In the preparation of this plan the important role Tasmanian Aboriginal people have played in land management was recognised, and the impact of European settlement on this role acknowledged.

The following Aboriginal organisations have been consulted on the significance of King Island in Aboriginal cultural tradition, and on their knowledge, role and interest in biodiversity management on the island: Aboriginal Land Council of Tasmania, Tasmanian Aboriginal Centre, and Tasmanian Aboriginal Land and Sea Council.

Implementation of this plan will involve consideration of knowledge sharing with the Tasmanian Aboriginal people, participation in education and training relevant to biodiversity management, and engagement in recovery actions where relevant to aboriginal land management and communities.

5.10 Social and Economic Consequences

Implementing the King Island Biodiversity Management Plan is not expected to cause significant adverse social or economic impacts. Implementation in the longer term is expected to have positive social and economic consequences for the island through the maintenance and enhancement of biodiversity and the recovery of threatened species.

There may be some initial and ongoing social and economic impacts as a result of implementing some of the actions in the Plan including actions that may temporarily restrict access to some areas supporting significant and sensitive biodiversity values such as Fairy Tern and Little Tern breeding sites.

There are potential social and economic benefits to the King Island community through implementation of this Plan as a key objective is to foster greater community appreciation and stewardship of the unique biodiversity, threatened species and vegetation communities of the island. The King Island community will be encouraged to undertake natural resource management activities and the Plan may assist groups in obtaining community and other grants for conservation projects. Longer term social and economic benefits are expected to include healthier ecosystems, increased pride and stewardship in the King Island community for their natural asset, and increased tourism to the island to appreciate natural values.

Although the information in this Plan may be used to help assess the impacts of proposals that may trigger the assessment and approval provisions under the EPBC Act, proponents (organisations and individuals) are required to comply with the provisions of the EPBC Act regardless of whether a recovery plan is in place or not. In addition, the Plan does not affect: the operation of activities undertaken consistent with an existing approval under the EPBC Act; or subject to exemptions under the EPBC Act, including activities undertaken consistent with a 'prior authorisation' or that constitute a 'continuing use'.

The production of a King Island Biodiversity Management Plan provides an efficient use of resources, both in terms of plan preparation and through targeting multiple benefits in the recovery actions. The total cost of implementing the recovery actions is estimated to be $6,827,000 over the ten year period covered by the Plan.

Social and economic impacts were considered as they were identified during development of the King Island Biodiversity Management Plan. This included debate within the King Island community during consultation processes. It is anticipated that there will be no significant adverse social or economic impacts associated with the implementation of the Plan in its entirety.

Table 4. Prioritised actions for implementation of the Plan, with estimated costs and timeframes
(Priority: 'A' = very high, 'B' = high, 'C' = medium and 'D' = low)

Actions	Priority	Timeframe	Estimated Cost (10 years)
1. Manage the threat of habitat degradation and fragmentation to biodiversity			
1.1. Seek financial assistance to develop and implement vegetation management agreements for five priority remnants per year, targeting priority vegetation communities. Exclude stock and wallabies from grazing these sites.	A	Annually	$100,000
1.2. Continue to promote the importance of maintaining and managing native remnants with high species diversity and with the presence of threatened species values.	A	Ongoing	Incorporated into Action 28
1.3. Encourage landowners to manage native vegetation for the preservation of threatened flora and fauna through government and non-government initiatives.	A	Ongoing	Incorporated into Action 29.1
1.4. Continue to liaise with government and non-government organisations, including the Tasmanian Land Conservancy to identify properties of high conservation value. Encourage properties with high conservation values to develop vegetation management agreements.	A	Ongoing	Incorporated into Action 29.1
1.5. Maintain and improve the quality of vegetation, connectivity and buffering of remnants through participation in and planning of fencing and revegetation programs. Priority locations for this action should be those with priority species, or vegetation communities and identified priority sites.	B	Ongoing	$100,000
1.6. Encourage the development of farm property management plans that include biodiversity management through fencing and revegetation programs.	A	Ongoing	$100,000
1.7. Promote practical and cost effective alternatives for the use of natural waterways for watering stock, targeting locations with priority threatened species.	A	Ongoing	Incorporated into Action 28
1.8. Monitor water levels across the Island and ensure that environmental flows are maintained in all catchment areas.	B	Ongoing	$100,000
2. Minimise the threat of fire to biodiversity			
2.1 Support the implementation of the draft King Island Wildfire Management Plan 2009 (KIFMAC 2009) through the provision of information regarding the distribution of priority populations of flora, fauna and vegetation communities.	A	Ongoing	Incorporated into Action 27
2.2 Support KIFMAC to explore future opportunities to protect remnant vegetation with high conservation values from the impacts of fire.	A	Ongoing	Incorporated into Action 27
3. Minimise the impact of weeds to biodiversity			
3.1. Develop and implement an education program for King Island that encourages cultural change, and acknowledges and manages weeds as a whole of Island issue, not just for farmers. The program should include: – the establishment of an annual King Island "Control the weeds" day; and	B	Ongoing	Incorporated into Action 5.6

Actions	Priority	Timeframe	Estimated Cost (10 years)
– promoting and sharing weed control success stories.			
3.2. Continue to develop and implement a weed control program for King Island that: – includes the lessons learnt from successful weed control projects in other locations e.g. Sea spurge; – aims to eradicate Weeds of National Significance; – addresses both public and private land; and – targets priority sites and weeds to minimise the threat of weeds to threatened species.	A	Years 1–10	$500,000
3.3. Continue current weed mapping and monitoring programs.	B	Ongoing	Incorporated into Action 5.6
3.4. Develop a weed hygiene plan including weed hygiene/machine wash down protocols for King Island.	A	Year 1	$10,000
3.5. Take a proactive approach to emerging weeds.	A	Ongoing	$30,000
3.6. Encourage the appointment of an authorised weeds officer on King Island.	A	Years 1–10	$750,000
3.7. Work collaboratively with retail outlets on King Island to develop a Code of Ethics for plant sales, which prevents weeds being sold through local stores.	C	Ongoing	Incorporated into Action 5.6
4. Minimise the impact of Root-rot fungus on biodiversity			
4.1. Map the current distribution of Root-rot fungus and monitor its ongoing distribution. Provide mapping to the KIFMAC to assist in wildfire planning and management.	B	Year 1, then annual updates	$5,000
4.2. Raise community awareness of the impact of Root-rot fungus on native vegetation and how it is spread.	C	Ongoing	Incorporated into Action 31
4.3. Ensure Root-rot fungus hygiene specifications are communicated to relevant machinery operators and industries. Erect signage in areas infected with Root-rot fungus and limit movement of vehicles/machinery to 'dry' conditions.	C	Ongoing	$15,000
5. Improve understanding and management of the threat of feral cats to biodiversity			
5.1. Continue the feral cats control program, previously co-ordinated by the KINRMG.	B	Years 1–5	$50,000
5.2. Conduct additional dietary studies across all four seasons and priority habitat types.	B	Years 1–5	$100,000
5.3. Monitor the abundance or activity of prey species prior to and following cat control programs to determine the response of native prey and introduced species (rats and mice) to cat control.	B	Years 1–5	$100,000
5.4. Continue education program regarding responsible cat ownership, including de-sexing.	B	Ongoing	Incorporated into Action 28
5.5. Provide information to King Island Council to assist in the development of a King Island Cat Management By-law according to the *Local Government Act 1993*.	B	Ongoing	Incorporated into Action 27
6. Improve understanding and management of the threat from Crows to biodiversity			
6.1. Determine the impact of Crows on King Island's biodiversity, focussing on priority threatened species. This may	B	Years 1–3	$100,000

Actions	Priority	Timeframe	Estimated Cost (10 years)
involve experiments to assess the effect of crow predation on biodiversity.			
6.2. If crows are having an impact on threatened species and/or biodiversity: – investigate how Crows have been controlled elsewhere such as on the Tasmanian mainland. – develop a King Island program to manage Crow numbers.	C	Years 3–7	$100,000
7. Improve understanding and management of the threat of Bennett's Wallabies and Brush-tail Possums to biodiversity			
7.1. Encourage the recognition within the King Island community and within government agencies that Wallabies are an Island-wide problem, not just for farmers.	B	Ongoing	Incorporated into Action 28
7.2. Continue and expand the monitoring of the effects of Bennett's Wallabies on King Island's biodiversity.	A	Years 1–3	$100,000
7.3. If Bennett's Wallabies and Brush-tail Possums are demonstrated to be having an impact on biodiversity and/or threatened species, then continue to work with the Alternatives to 1080 program to develop processes to manage Bennett's Wallabies and Brush-tail Possum numbers on King Island. This should consider: – management practices for private and public land; – the efficient use and management of wallabies; and – focussing management efforts in strategic and priority sites.	B	Years 1–3	$50,000
7.4. Use the results of the Alternatives to 1080 program to implement a co-ordinated control program. The program to incorporate responsible practices regarding animal ethics and responsible disposal of carcasses	C	Years 3–7	$150,000
8. Assess the threat of introduced fauna on biodiversity			
8.1. Assess if other species of introduced fauna should be monitored to determine their impact on biodiversity and develop monitoring programs as appropriate.	B	Years 5–10	$50,000
9. Minimise the impact of pollution on biodiversity			
9.1. Continue to promote and encourage responsible use of chemicals, particularly around waterways and priority threatened species sites.	B	Ongoing	Incorporated into Action 28
10. Manage the threat of climate change to biodiversity			
10.1. Make use of National and State climate change research results and programs to inform decision making and actions for biodiversity management.	A	Ongoing	$10,000
10.2. Identify species and sites at risk from climate change. Develop a program to monitor these sites and species and respond to changing environmental conditions.	A	Years 1–3	$50,000
10.3. Identify the risk of emerging weeds in the face of changing climate.	B	Years 1–10	$10,000
10.4. Investigate mechanisms such as seed banks to respond to the risk of extinction due to climate change.	B	Years 2–10	$40,000
11. Manage the risk of invasive weeds, fauna or disease entering King Island.			
11.1. Encourage the development of a quarantine inspection service for King Island.	A	Years 1–3	$800,000

Actions	Priority	Timeframe	Estimated Cost (10 years)
11.2. Review existing quarantine arrangements for King Island. Identify gaps and develop and implement strategies to address these.	A	Review: Year 1 Strategies: Years 2–10	$250,000
12. Stop the decline and support the recovery of skirted treefern and slender treefern			
12.1. Encourage landholders to consider protection of the Grassy River site through voluntary agreements, including covenants or vegetation management agreements.	A	Years 1–2, then monitor 5-years	$55,000
12.2. Ensure the known sites are secure from cattle and check the condition of existing fences annually.	A	Year 1, then annually	$5,000
12.3. Map the extent of weeds in the Grassy River catchment and implement a control/eradication program to protect skirted treefern and slender treefern.	A	Year 1, then annually	Incorporated into Actions 5.2 & 5.3
12.4. Identify the Grassy River catchment as a fire-exclusion area in the King Island Wildfire Management Plan.	A	Year 1	Incorporated into Action 1
12.5. Investigate the feasibility of propagating slender treefern plants from spores collected from the Grassy River site and supplementing the wild population.	A	Years 1–5	$7,500
12.6. Monitor populations annually.	A	Annually	Incorporated into Action 29.3
13. Stop the decline and support the recovery of scrambling groundfern			
13.1. Encourage landholders to consider protection of the Deep Lagoons site through voluntary agreements, including covenants or vegetation management agreements	A	Years 1–2, then monitor 5-years	$10,000
13.2. Maintain the existing fencing at Deep Lagoons. Check condition and maintain annually.	A	Annual checks	$2,000
13.3. Identify the Nook Swamps site as a fire-exclusion area in the King Island Wildfire Management Plan	A	Year 1	Incorporated into Action 1
13.4. Survey areas of potential habitat, such as Blowhole Creek, for unknown populations.	A	Year 1	$10,000
13.5. Monitor existing and any new populations discovered during the life of the Plan every two years.	A	Years 3, 5, 7 & 9	Incorporated into Action 29.3
14. Stop the decline and support the recovery of lime fern			
14.1. Encourage landholders to consider protection of vegetation adjacent to the Ettrick River population through voluntary agreements, including covenants or vegetation management agreements.	A	Years 1–2, then monitor 5-years	$10,000
14.2. Maintain the existing fencing along the Ettrick River; check condition and maintain annually.	A	Year 1, then annually	$7,500
14.3. Inspect known sites along the Ettrick River annually and prune back *Tetragonia implexicoma* as required.	A	Year 1, then	$5,000

Actions	Priority	Timeframe	Estimated Cost (10 years)
		annually	
14.4. Investigate the feasibility of propagating lime fern plants from spores collected from the Ettrick River site and supplementing the wild population.	A	Years 1–5	$7,500
14.5. Monitor populations annually.	A	Annually	Incorporated into Action 29.3
15. Stop the decline and support the recovery of bootlace bush			
15.1. Encourage landholders to consider protection of the Naracoopa and Grassy River sites through voluntary agreements, including covenants or vegetation management agreements.	B	Years 1–2, then monitor 5-years	Incorporated into Action 12.1 (plus $15,000)
15.2. Ensure known sites are secure from cattle and check the condition of existing fences annually	B	Year 1, then annually	$7,500
15.3. Identify known sites as fire-exclusion areas in the King Island Wildfire Management Plan	B	Year 1	Incorporated into Action 1
15.4. Monitor populations every two years.	B	Years 3, 5, 7 & 9	Incorporated into Action 29.3
16. Stop the decline and support the recovery of leafy greenhood			
16.1. Encourage landholders to consider protection of at least two sites in the Yellow Rock area through voluntary agreements, including covenants or vegetation management agreements.	B	Years 1–2, then monitor 5-years	$50,000
16.2. Encourage landowners to fence off vegetation supporting the species to prevent damage by stock; check condition of fences and maintain annually.	B	Years 1–2, then annually	$50,000
16.3. Determine the risk from onion weed and the White Italian Snail and implement control measures as appropriate.	B	Year 1, then annually	Incorporate into Actions 5.2 & 5.3
16.4. Survey potential habitat in the Yellow Rock land system for unknown populations.	B	Year 1	$10,000
16.5. Monitor existing and any new populations discovered during the life of the Plan every two years.	B	Years 3, 5, 7 & 9	Incorporated into Action 29.3
17. Stop the decline and support the recovery of small forkfern			
17.1. Encourage landholders to consider protection of the Naracoopa and Grassy River sites through voluntary agreements, including covenants or vegetation management agreements.	B	Year 1	Incorporated into Action 15.1
17.2. Ensure the Naracoopa and Grassy River sites are secure from cattle and check the condition of existing fences annually	B	Year 1, then annually	$7,500
17.3. Identify the Naracoopa and Grassy River sites as fire-exclusion areas in the King Island Wildfire Management Plan.	B	Year 1	Incorporated into

Actions	Priority	Timeframe	Estimated Cost (10 years)
			Action 1
17.4. Survey of potential habitat for unknown populations.	B	Years 1–3	$5,000
17.5. Undertake annual monitoring.	B	Annually	Incorporated into Action 29.3
18. Address knowledge gaps for priority flora species that do not have specific actions identified.			
18.1. Survey potential habitat for flora species identified as being data deficient (as listed in Appendix 3), with especial attention to the following high priority species: shade nettle, hairy brooklime, matted waterstarwort, swamp fireweed and mauvetuft sun-orchid.	A	Years 1–3	$20,000
18.2. Monitor any populations found every two years.	A	Years 3, 5, 7 & 9	Incorporated into Action 29.3
18.3. Identify conservation management priorities for each species.	A	Year 1, then ongoing	$5,000
19. Protect and enhance habitat for Green and Gold Frog and the Striped Marsh Frog.			
19.1. Undertake surveys to determine distribution and abundance.	A	Year 1	$20,000
19.2. Undertake survey work to determine the distribution of Chytrid fungus.	A	Year 1	In conjunction with Action 19.1
19.3. Develop a program to manage the threat of Chytrid fungus.	B	Years 2–10	$10,000
19.4. Encourage landholders in the responsible use of chemicals, especially around permanent freshwater waterbodies such as natural lagoons, wetlands and swamps, as well as artificial ponds and farm dams	A	Years 1–10	Incorporated into Actions 7 and 28
19.5. Identify priorities for frog management on King Island and implement conservation actions.	A	Years 2–10	$20,000
19.6. Encourage landholders to consider protection of wetland habitat through voluntary agreements, including covenants or vegetation management agreements	A	Years 1–2, then monitor 5-years	$20,000
20. Stop the decline and support the recovery of the King Island Brown Thornbill and King Island Scrubtit			
20.1. For the King Island Brown Thornbill, survey all areas of remaining habitat to determine whether the subspecies is still extant on the island. For the King Island Scrubtit, survey all known sites and any new potential sites to determine distribution and abundance.	A	Year 1	$10,000
20.2. Identify conservation actions for new sites and implement as required	A	Years 2–10	$20,000
20.3. Identify Nook Swamps and Colliers Swamp as fire-exclusion areas in the King Island Wildfire Management Plan.	A	Year 1	Incorporated into Action 1
20.4. Develop and implement a monitoring program for the King Island Brown Thornbill (if still extant) and King Island Scrubtit..	A	Year 1, then ongoing	$50,000

Actions	Priority	Timeframe	Estimated Cost (10 years)
20.5. For both subspecies, establish thresholds of minimum population size as triggers for instigating alternative means of preserving species' genes, and develop contingency plans for methods for preserving species' genes, including translocation of birds within King Island, between islands, and/or for captive breeding purposes.	A	Years 2–5	$10,000
20.6. For both subspecies, conduct trial captive breeding programs for the respective Tasmanian mainland subspecies in preparation for potential implementation of removal of King Island subspecies for captive breeding.	A	Years 2-5	$10,000
20.7. Assess the potential for disease epidemics and other potential threats to both subspecies, and instigate required actions to mitigate.	A	Years 2-5	$10,000
20.8. The actions 20.1 to 20.7 must be undertaken in consultation with the King Island Community and stakeholders, consistent with Actions 28 and 29.	A	Year 1, then ongoing	Incorporated into Action 1
21. Promote successful breeding on King Island of the Fairy Tern, Little Tern and Hooded Plover			
21.1. Utilising existing knowledge, determine priority shorebird habitat/breeding sites for management. Install temporary/seasonal structures (e.g. fences, markers, signage) to prevent damage to priority shorebird habitat/breeding sites from recreational activities.	A	Annually	$100,000
21.2. Notify the King Island community of the installation of structures and the reasons why they have been erected.	A	Annually	Incorporated into Action 28
21.3. Ensure that facilities for access and recreation near threatened species sites do not impact on threatened shorebird habitat (natural values). Where feasible make access trails multi-purpose in nature (e.g. fire management and recreation) to reduce disturbance to native vegetation and habitat.	B	Years 2–10	$7,500
21.4. Develop a King Island Code of Ethics for the recreational use of King Island beaches, addressing threats (off road vehicles / recreation along coastlines and domestic dogs) to priority shorebird habitat/breeding sites.	A	Year 1	$20,000
21.5. Develop and implement a community education program that includes, but is not restricted to the King Island District High School, for the management of threatened shorebirds species on King Island.	A	Ongoing	Incorporated into Action 28
21.6. Monitor populations annually to determine trends and inform conservation actions.	A	Ongoing	Incorporated into Action 29.3
22. Protect and enhance Orange-bellied Parrot habitat			
22.1. Revegetate adjacent roosting habitat where required.	A	Years 1-5	$50,000
22.2. Erect stock exclusion fences, where appropriate.	A	Years 1-5	$15,000
22.3. Promote and establish covenants or other management agreements with stakeholders to ensure the long-term protection of key sites on private land.	A	Years 1–2, then monitor 5-years	$25,000
22.4. Continue to monitor annually to determine population trends and further inform conservation actions.	A	Annually	Incorporated into Action 29.3

Actions	Priority	Timeframe	Estimated Cost (10 years)
23. Protect and enhance King Island Green Rosella habitat			
23.1. Encourage the retention of trees with hollows for nesting.	B	Ongoing	Incorporated into Action 28
23.2. Monitor annually to determine population trends and further inform conservation actions.	B	Annually	Incorporated into Action 29.3
24. Protect and enhance White-bellied Sea Eagle habitat			
24.1. Provide information to the King Island community and properties with known nesting sites about the need to minimise disturbance during breeding season.	B	Ongoing	Incorporated into Action 28
24.2. Survey for additional nest sites.	B	Years 1–5	$10,000
24.3. Monitor every year to determine productivity of nests and further inform conservation actions.	B	Annually	Incorporated into Action 29.3
25. Protect and enhance habitat for the Southern Hairy Red Snail			
25.1. Survey potential habitat for unknown populations.	B	Year 2	$20,000
25.2. Monitor existing and any new populations discovered during the life of the Plan every five years.	B	Years 3 ,5, 7 & 9	Incorporated into Action 29.3
26. Address knowledge gaps for priority fauna species that do not have specific actions identified.			
26.1. Survey potential habitat for priority fauna species that do not have specific actions identified, including surveys to determine the status of the Australian Grayling along the Ettrick River.	A	Year 2	$80,000
26.2. Monitor any populations found every two years.	A	Years 3 ,5, 7 & 9	Incorporated into Action 29.3
26.3. Identify conservation management priorities for each species.	B	Year 2-10	$100,000
27. Address knowledge gaps			
27.1. Improve mapping of vegetation communities (TASVEG mapping) on King Island, through ground-truthing and other appropriate means.	A	Years 1–3	$20,000
27.2. Map the conservation values of King Island for use in environmental impact assessment and land use planning. Make this mapping available to relevant bodies such as KIC, KINRMG, FPA, DPIPWE and DSEWPAC to assist in decision making, such as development applications and forest practices plans.	A	Year 3, then updates as required	$15,000
27.3. Collect, store, distribute and communicate information in a way that all relevant organisations and people can gain access to and understand.	A	Establish year 1, then ongoing	$15,000
27.4. Identify additional research priorities for threatened species on King Island and conduct research.	A	Ongoing	$50,000

Actions	Priority	Timeframe	Estimated Cost (10 years)
27.5. Accept local knowledge as part of the valid knowledge systems and incorporate into research.	A	Ongoing	Incorporated into Actions 27.2& 27.3
27.6. Conduct community and technical workshops on the protection and conservation of threatened species and the relevant provisions of the EPBC Act and TSP Act.	C	As required	Incorporated into Action 28
28. Develop an overarching program at all organisational levels to ensure the Plan informs, encourages and supports community participation at all stages of Plan implementation.	A	Establish year 1, then ongoing	$150,000
29. Co-ordinate implementation of the Plan			
29.1. Employ a Biodiversity Conservation Officer on King Island to: – coordinate implementation of the Plan; – review management plans, including statutory reserve plans, natural resource management plans and local government development plans to ensure threatened species requirements are included appropriately; – ensure recovery actions are implemented as part of existing management programs; – conduct community education programs; and – prioritise on-ground works.	A	Establish year 1, then ongoing	$1,000,000
29.2. Establish a KIBMP Steering Committee, to review progress of all implementation against management objectives on an annual basis, provide guidelines on priorities and communicate results to relevant stakeholders. Determine membership and terms of reference of the KIBMP Steering Committee.	A	Establish year 1, then ongoing	$10,000
29.3. Develop and implement a monitoring program, where applicable utilising existing monitoring undertaken within the Plan, to measure the Plan's success in achieving the performance criteria. Review and revise actions within the Plan, based on the results of performance criteria monitoring.	A	Establish year 1, then ongoing	$1,000,000
29.4. Develop a program to secure funding for implementation of recovery actions from State and Commonwealth governments and non-government organisations.	A	Establish year 1, then ongoing	Incorporated into Actions 29.1 & 29.2

5.11 Responsible parties

Potential stakeholders in the implementation of the King Island Biodiversity Management Plan include:

- Tasmanian Department of Primary Industries, Parks, Water and Environment (including the Parks and Wildlife Service);
- Australian Government Department of Sustainability, Environment, Water, Population and Communities;
- Cradle Coast Natural Resource Management Committee;
- King Island Natural Resource Management Group Inc.;
- King Island Fire Management Area Committee;
- King Island Council;
- King Island Tourism Inc.;
- private landowners;
- King Island Field Naturalists;
- King Island community (groups and individuals);
- Tasmania Fire Service;
- Tasmania Land Conservancy;
- Birds Tasmania;
- Birdlife Australia
- Tasmanian Farmers and Graziers Association;
- Tasmania Institute of Agricultural Research;
- University of Tasmania;
- Australian Quarantine Inspection Services; and
- CSIRO.

A Steering Committee will be established in year 1 of the Plan to oversee the implementation of the recommended actions against the management objectives, provide guidelines on priorities and to communicate results to all relevant stakeholders. The Committee will consist of a cross-section of stakeholders and will review progress on an annual basis.

5.12 Plan review and evaluation

The King Island Biodiversity Management Plan will be reviewed within 5 years of its adoption under the EPBC Act to determine if variations are required.

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Appendix 1. Current management documents, policies, strategies and on-ground management

Various bodies are currently responsible for the preparation and implementation of documents for and the management of biodiversity on King Island. Local, regional, State and Commonwealth groups and agencies with an interest in biodiversity management include:

- King Island Council;
- King Island Natural Resource Management Group;
- Cradle Coast Natural Resource Management Committee;
- Tasmanian Parks and Wildlife Service;
- Threatened Species Section (DPIPWE);
- Crown Land Services (DPIPWE);
- Tasmanian Farmers and Grazers Association;
- Tasmanian Fire Service; and
- Australian Government Department of Environment, Water, Heritage and the Arts.

Documents relevant to the management of biodiversity on King Island, including a brief description of their contents and purpose are listed below.

1.1 Plans of management

Lavinia State Reserve Draft Management Plan

This plan details management of natural and cultural values of Lavinia State Reserve in the north-east of the Island (PWS 2004). This Plan is currently being reviewed by PWS.

King Island Reserves and Crown Land Fire Management Plan

This plan details fire management of Lavinia State Reserve and Seal Rocks State Reserve and the surrounding Crown land (PWS 2002).

1.2 Recovery plans and unpublished reports

There are currently eight National or State multi-species and single species recovery plans and draft recovery plans relevant to King Island.

Threatened Tasmanian Orchids: Flora Recovery Plan 2006–2010 and Draft National Recovery Plan for the leafy greenhood (Pterostylis cucullata)

The Leafy greenhood (*Pterostylis cucullata*) is listed as Vulnerable under the EPBC Act and as endangered under the TSP Act. The species occurs in South Australia, Victoria and Tasmania.

The current Orchid Recovery Plan is a multi-species plan that considers all threatened orchids in Tasmania. Implementation of the Orchid recovery plan aims to provide additional and improved information on present distributions, current threats and declines in Tasmania's orchids (Threatened Species Section 2006a). Objectives of the plan are to:

- Acquire accurate information for sound management decisions and conservation status assessments;
- Ensure priority populations are managed appropriately and are securely protected;
- Increase the number of known populations of threatened orchid taxa;
- Raise public awareness of orchid conservation issues and develop mechanisms to encourage and coordinate community participation in orchid recovery programs;
- Establish a network of government and non-government organisations and individuals that can provide input into recovery programs and undertake recovery actions;
- Develop a better understanding of the life history and ecological requirements of threatened orchids in Tasmania;
- Increase the size of priority populations in the wild;

- Identify critical and potential habitat; and
- Establish a genetically representative *ex situ* collection of orchid taxa facing imminent extinction in the wild.

Priority actions listed for *Pterostylis cucullata* in the plan that are relevant to the King Island population are to secure key populations, undertake extensions surveys of potential habitat, provide maps for land managers and guidelines for management. At the time of publishing this plan, preliminary surveys for *Pterostylis cucullata* on King Island had been conducted and recommended actions included in a listing statement (Threatened Species Section 2010). Relevant actions are included in the KIBMP.

Recovery actions relevant to *Pterostylis cucullata* are also discussed in the draft national recovery plan (Duncan 2009). Objectives of the national plan are to:

- Acquire accurate information for conservation status and assessments;
- Identify habitat that is critical, common or potential;
- Ensure that all populations and their habitat are legally protected;
- Manage threats to populations;
- Develop and undertake fine-scale site management practices;
- Determine the growth rates and viability of populations;
- Build a network of government and non-government organisations and individuals; and
- Cooperate in bioregional policy implementation and manage recovery plan implementation.

Actions relevant to King Island are included in the KIBMP.

Threatened Tasmanian Ferns – Draft Flora Recovery Plan

Scrambling groundfern (*Hypolepis distans*) is listed as Endangered under both the EPBC Act and TSP Act. The multi-species recovery plan for threatened Tasmanian ferns discusses State-wide recovery actions relevant to fourteen ferns (Threatened Species Section 2011a). Specific actions recommended for the recovery of the two known populations of *Hypolepis distans* on King Island included extension surveys of suitable habitat and on-ground protective measures and monitoring. Recommended actions relevant to King Island are included in the KIBMP.

Draft National Recovery Plan for the Southern Bell Frog and the Draft Fauna Recovery Plan: Threatened Tasmanian Frogs

The Southern Bell Frog, known within Tasmania as the Green and Gold Frog (*Litoria raniformis*) is listed as Vulnerable under the EPBC Act and TSP Act. The draft national recovery plan (Clemann & Gillespie 2007), summarises current knowledge of the Southern Bell Frog, documents the research and management actions undertaken to date and identifies the actions required to ensure the ongoing viability of the species in the wild. Objectives of the national recovery plan are to:

- Secure all current populations, particularly those occurring in known breeding habitats, and improve their viability through increases in size and /or area of occurrence;
- Determine distribution, biology and ecology of the species and identify causes for decline across its geographic range;
- Address known or predicted threatening processes, and change or implement appropriate management practices where possible to ensure that land-use activities do not threaten the survival of the species; and
- Increase community awareness of and support for conservation of the species.

Actions relevant to King Island are included in the KIBMP.

The draft recovery plan for Tasmanian Frogs discusses recovery actions for both the Green and Gold Frog (*Litoria raniformis*) and the Striped Marsh Frog (*Limnodynastes peronii*), which are both found on King Island (Threatened Species Section 2007a). Objectives of the plan are to:

- Determine the current Tasmanian range and distribution, the extent of decline, habitat requirements and current or potential threats;
- Protect and monitor known populations;

- Maximise the area of occupancy (as appropriate within environmental and practical constraints); and
- Increase public awareness and involvement in the recovery process.

Actions relevant to King Island populations are included in the KIBMP.

Threatened Tasmanian Eagles Recovery Plan 2006–2010

The White-bellied Sea Eagle (*Haliaeetus leucogaster*) is listed as migratory under the EPBC Act and vulnerable under the TSP Act. The recovery plan for threatened Tasmanian Eagles discusses recovery of the White-bellied Sea Eagle and Wedge-tailed Eagle (*Aquila audax fleayi*). Objectives of the Eagle recovery plan are to increase the breeding success and security of both eagles by protecting nesting habitat from destruction and disturbance, minimising the modification of foraging habitat and decreasing human related mortality (Threatened Species Section 2006b). Specific objectives include to:

- Increase the effectiveness of predictive habitat models;
- Reduce the proportion of nests subject to disturbance, including forestry operations and development;
- Increase breeding success;
- Increase the number and/or density of active territories;
- Monitor the implementation and effectiveness of management prescriptions;
- Identify new threats and implement strategies for their mitigation;
- Reduce the occurrence of Eagle mortalities and injuries, particularly those attributed to human activities;
- Respond to inquiries for information on Eagles' management by affected interests and the public; and
- Undertake research into Eagle biology that targets improved species management.

For more detailed information on objectives and actions refer to the Eagle recovery plan. Actions that are relevant to King Island are included in the KIBMP.

National Recovery Plan for the Orange-bellied Parrot (Neophema chrysogaster) 2006–2010

The Orange-bellied Parrot is listed as Critically Endangered under the EPBC Act and endangered under the TSP Act. The Orange-bellied Parrot recovery plan summarises a large body of information on the Orange-bellied Parrot (*N. chrysogaster*) to provide a concise approach to recovery implementation. It contains detailed information on previous recovery plans, species description, life history, biology, population status and threats (OBPRT 2006).

Specific objectives of the Orange-bellied Parrot recovery plan are:

- Monitor the population size, productivity, survival and life history of the Orange-bellied Parrot;
- Identify all sites used by Orange-bellied Parrots and better understand migration;
- Increase the carrying capacity of habitat by actively managing sites through the species range;
- Identify, measure and ameliorate threats, particularly in migratory and winter habitats;
- Increase the number of breeding sub-populations/groups; and
- Maintain a viable captive population.

A summary of actions relevant to King Island and their status are provided in Table 1. For more detailed information on national recovery actions refer to the plan. Those actions that are relevant to King Island are included in the KIBMP.

Table 1. A summary from the Orange-bellied Parrot Recovery Plan

Action	Status
Conduct winter population surveys and searches of new areas	Completed
Produce 1:25 000 vegetation map of Orange-bellied Parrot Habitat	Completed
Exclude stock from key habitats	Completed
Identify and control priority weed infestations	Completed
Develop a communication plan	Completed
Revegetate sites with roosting habitat	Underway
Undertake targeted cat control	Underway

Draft Threatened Tasmanian Land Snails Recovery Plan

This multi-species plan considers all threatened Tasmanian land snails listed under State and Commonwealth legislation. The Southern Hairy Red Snail is currently the only invertebrate on King Island listed under the TSP Act. The main objective of the Plan is to maintain and where possible improve the conservation status of threatened land snails in the State (Threatened Species Section 2007b).

Specific objectives of the Plan are:

- Improve habitat protection and quality for each species by improving the conservation status, maintaining and improving the total habitat area and quality, minimising habitat losses and managing habitat within near-urban areas, forestry sector and the agricultural sector;
- Ensure each species persists in the long term throughout its area of occupancy by improving our understanding of the species' biology and assess and monitor populations; and
- Increase public awareness and involvement in threatened land snail protection through community involvement and education, and providing expert advice and support for the implementation of all recovery actions.

For more detailed information on objectives and actions refer to the plan (Threatened Species Section 2007b). Those actions that are relevant to King Island are included in the KIBMP.

The Fauna of King Island: A Guide to Identification and Conservation Management

The report prepared by Donaghey (2003) gives a comprehensive account of species found on the Island and issues related to their conservation. The report provides information on the ecology and conservation management of invertebrate and vertebrate fauna of terrestrial and freshwater habitats. Much of the background ecological information and initial recommendations for fauna outlined in the KIBMP have come from Donaghey (2003).

Conservation of Tasmanian Plant Species and Communities Threatened by Phytophthora cinnamomi – Strategic Regional Plan for Tasmania

The report addresses management of *Phytophthora cinnamomi* in Tasmania through the establishment of priority management areas (Schahinger *et al.* 2003). Plant communities were rated for their known susceptibility to infection. The report outlines the process required to meet two objectives of the national *Threat Abatement Plan for Dieback caused by the Root-rot fungus Phytophthora cinnamomi* (Environment Australia 2001):

- To promote the recovery of nationally listed threatened species and ecological communities that are known or perceived to be threatened by *P. cinnamomi;* and
- To limit the spread of *P. cinnamomi* into areas where it may threaten threatened species and ecological communities or into areas where it may lead to further species or ecological communities becoming threatened

For a more detailed description of actions refer to the report (Schahinger *et al.* 2003).

The Tasmanian State Government has also developed interim management and wash down guidelines for the control of *Phytophthora cinnamomi* (DPIWE 2004; Rudman 2005), and these are recommended in the KIBMP.

Threat Abatement Plan for Feral Cats

This plan (DEWHA 2008) discusses the threats posed by feral cats to native wildlife and objectives for their management across Australia.

Key objectives of the feral cat abatement plan that relate to King Island are:

- Eradicate feral cats from islands where they are a threat to endangered or vulnerable native animals;
- Promote the recovery of species and ecological communities that are endangered or vulnerable as a result of predation by feral cats;
- Improve knowledge and understanding of the impacts of feral cats on endangered or vulnerable native animals and the interactions of feral cats with other pest species (e.g. rabbits, rats);
- Communicate the results of the threat abatement plan actions to management agencies, landholders and the public;
- Effectively coordinate feral cat control activities.

King Island Revegetation – Best Practice Notes

This management guide focuses on practical methods of revegetation of native vegetation, specific to King Island. Methods are recommended based on local knowledge, field assessments and professional advice. It outlines the economic and biodiversity values of managing existing native vegetation and methods for revegetation of cleared areas (Duddles 2002). The methods used are recommended in the KIBMP.

Draft Report on the Conservation and Management of Rivers and Streams of King Island

This report considers the geomorphic nature, condition and value of stream systems on King Island. It considers the natural values of drainage systems, classification of streams based on five landscape types and how to prioritise conservation of catchments to get the best possible result from conservation work. The report highlights the importance of maintaining and improving the health of riparian vegetation to improve the geomorphological health of stream systems (Jerie *et al.* 2000). The recommendations are followed in determining the actions in the KIBMP.

1.3 Policies and strategies

A description of the central policies and strategies that relate to the management of King Island's biodiversity is provided below. In addition multiple strategies and policies, at both the State and Commonwealth level, such as Australia's Strategy for the National Reserve System 2009–2030 (2009) and Managing our Coastal Zone in a Changing Climate 2009 are relevant to the KIBMP (National Reserve System Task Group 2009, Commonwealth of Australia 2009). State and Commonwealth policies and strategies have not been described, due to the extensive list that would be required.

King Island Vegetation Management Strategy

This strategy summarises a public consultation process undertaken in 2003, investigating issues related to vegetation conservation on the Island (Blake 2003). The report identifies five strategic goals:

- Maintain the biodiversity, landscape integrity and ecological function of King Island;
- Integrate nature conservation issues with production values on King Island;
- Put in place institutional mechanisms that support goals one and two without compromising the economic viability of individuals or the King Island community;
- Clarify the legal and administrative obligations of the King Island community in relation to nature conservation on the Island; and

- Create mechanisms to align nature conservation goals with the economic wellbeing of the Island.

For a detailed list of recommendations refer to the report (Blake 2003). Any relevant information is included in the KIBMP.

King Island Natural Resource Management Strategy 2010–2020

The Strategy outlines the expectations and aspirations of the King Island Natural Resource Management Group for natural resource management on the Island (KINRMG 2010). It describes the aspirational goal of the KINRMG and the outcomes for the condition of King Island's asset areas of Land, Biodiversity, Coast and Water that should be achieved within ten and twenty years. It consists of the Strategic Plan which briefly describes the Island's NRM assets and their condition, and lists longer term (to be achieved by 2030) and intermediate (2020) outcomes for the state of the asset. The Implementation Plan outlines the outcomes that should be achieved within five years and recommends activities to achieve these outcomes.

Quarantine

The quarantine strategy on King Island is consistent with that of mainland Tasmania. Details of Tasmania's Biosecurity Strategy and policy can be found on the DPIPWE web site and will not be discussed in the KIBMP (http://www.dpipwe.tas.gov.au).

King Island Strategy Plan Report

The King Island Strategy Plan Report (Connell Wagner 2008), was commissioned by the King Island Council to address a wide range of planning and development issues that had been identified across the Island, including coastal development, township enhancement, agricultural and industrial land protection and development and, environmental issues in sensitive coastal and resource valued areas.

Dog control

The King Island Council has adopted a by-law that controls dog ownership and is consistent with the Tasmanian *Dog Control Act 2000*. Under the Act there are provisions to declare an area containing sensitive habitat for native wildlife to be an area where dogs are prohibited from entering. At the printing of this plan the only areas on the Island that dogs are prohibited from entering are Lavinia State Reserve, Seal Rocks State Reserve, Pegarah State Forest and some private reserves.

Draft King Island Wildfire Management Plan

The Draft King Island Wildfire Management Plan was completed by the KIFMAC in 2009. The Wildfire Plan presents treatment strategies for wildfire management, across the four areas of prevention, preparedness, response and recovery based on a risk analysis completed for the Island (KIFMAC 2009).

Inventory reports

The most current published information on flora and fauna is Barnes *et al.* (2002) and Donaghey (2003), respectively. An updated inventory of species found on the Island is presented in Appendix 2.

1.4 Research and surveys

Various research projects relevant to the biodiversity of King Island have been undertaken. Areas of investigation include shorebird management, threatened plant surveys and assessing the impact of fires on natural values. The KIBMP will assist with prioritising research and ensure that existing knowledge gaps are known.

Threatened flora extension surveys

Targeted surveys for threatened flora undertaken on King Island by personnel with the Threatened Species Section in the period 2005–2009 include:

- March 2005: scrambling ground fern (Schahinger 2005);
- February 2007: slender and skirted treefern, limefern, small forkfern, bootlace bush, forest houndstongue;
- November 2007: bootlace bush, limefern, sneezeweed, shade nettle, ephemerals
- October–November 2008: leafy greenhood (Threatened Species Section 2010)
- March 2009: bootlace bush, small forkfern, limefern, forest houndstongue (Wapstra *et al.* 2009)
- November 2009: ephemerals, leafy greenhood (Threatened Species Section 2010).

The results of these surveys are presented in profiles for the flora species rated as a very high or high priority (Appendix 5).

Dietary study of feral cats

From 2006 to 2008, 121 feral cats were either trapped and euthanased, or shot, from a variety of locations and habitats around King Island. Whisson (2009) completed an analysis of the stomach contents of 71 of these cats to gain an insight into the prey base of feral cats on the Island and the relative vulnerability of different species to feral cats. The report also identifies priorities for future control programs and research – these have been incorporated into the actions of the KIBMP.

Coastal values and seabird management

In 2007 a joint project between Birds Tasmania and the University of Tasmania examined the relationship between the social values of coastal ecosystems and shorebird management. It recommended priority areas for management of internationally significant shorebird populations and commentary on expected community responses (Lovibond 2007). These recommendations have been considered in determining priority areas in the KIBMP.

Fun on the Fraser – a snapshot of the Fraser River in 2005

A community based research project was undertaken in 2005 to assess the quality of the Fraser River. Data was gathered over a period of twelve months by community volunteers and was designed to provide baseline information on the health of the river system (KINRMG 2005).

King Island remnant native vegetation – impact of stock proof fences

This study looked at the impact of stock–proof fences on the floristic diversity of fifty-six remnants of *Leptospermum scoparium* forest and *Melaleuca ericifolia* swamp forest. The data suggests that for previously grazed remnants fence age and remnant size do not influence floristic diversity, but the condition of the remnant when it was fenced does and is independent of time since clearance and grazing pressure (North Baker & Associates 2002).

Migratory shorebird parasites

In 1998 research was conducted on parasite communities in four species of shorebird on the Island. Results of the research are published in a paper by Canaris and Kinsella (1998).

King Island 2007 fires – impact on natural values

In February and March 2007 more than 12 500 ha of Crown and private land in the north–east of the Island, including much of Lavinia State Reserve, was burnt by a wild fire. This fire has potentially severe ramifications for the area's threatened flora and fauna, as well as its geoconservation values. Staff from DPIPWE's Resource Management and Conservation Division assessed the impact of the fire on natural values in late March 2007; the results are presented in a report to the Tasmanian Parks and Wildlife Service (RMCD 2007). A subsequent assessment of the impact of the fires on the vegetation and peat was commissioned by the Cradle Coast NRM, and undertaken in 2009–2010 (Corbett & Corbett 2010).

1.5 On-ground management programs

Management activities have been undertaken as part of the implementation of existing management documents. Other actions have been carried out on a more *ad hoc* basis due to perceived need or opportunistic funding. Significant biodiversity management actions that have been or are currently undertaken are described below.

Weed management

A Weed Management Strategy was developed for the Island by North (2003). Goals of the strategy are to:

- Identify and characterise priority weeds on King Island, taking into account social and scientific imperatives to develop appropriate management actions;
- Improve community awareness and knowledge of weed issues to encourage participation;
- Be responsive to State and Commonwealth legislation and policy, to recognise statutory obligations and to be best placed for funding opportunities;
- Develop processes that will reduce the risk of the introduction and spread of weeds to ensure prevention and early intervention; and
- Develop and implement specific weed control and eradication projects, to coordinate actions and maximise their success.

Table 2 outlines strategies for specific weeds as identified in the King Island Weed Management Strategy. Strategies include:

1. Localised species of high threat that should be targeted for eradication;
2. Entrenched species requiring a 'holding pattern' of management;
3. Planted exotics that require a strategy of replacement; and
4. Coastal weeds that should be excluded from beaches with native coastal communities that are currently free or barely infested.

Table 2. Significant weeds found on King Island and relevant strategies for their control

Species	Common Name	WONS	WMA	Strategy
Allium triquetrum	three-cornered garlic			2
Allium vineale	crow garlic		+	1
Ammophila arenaria	marram grass			4
Arctotheca calendula	capeweed			2
Asparagus asparagoides	bridal creeper	+	+	1
Asparagus scandens	asparagus fern			2,3
Asphodelus fistulosus	onion weed		+	1
Berkheya rigida	african thistle		+	1
Carduus sp.	slender thistle		+	1
Chrysanthemoides monilifera	boneseed	+	+	1
Coprosma repens	mirror bush			2,3
Cortaderia richardii	toe-toe		+	1
Cortaderia selloana	pampas grass		+	2,3
Crocosmia X *crocosmiiflora*	montbretia			2,3
Cytisus scoparius	english broom		+	1, 3
Datura sp.	datura		+	1
Delairea odorata	cape ivy			2,3
Ehrharta villosa	pyp grass			1,4
Emex australis	prickly jacks		+	1
Erica lusitanica	spanish heath		+	1
Euphorbia paralias	sea spurge			4
Genista monspessulana	montpellier broom		+	2
Hedera helix	ivy			2,3
Ilex aquifolium	holly			2,3
Lonicera periclymenum	common honeysuckle			2,3
Lupinus arboreus	tree lupin			1,3
Lycium ferocissimum	african boxthorn		+	3

Species	Common Name	WONS	WMA	Strategy
Marrubium vulgare	white horehound		+	2
Moraea flaccida	oneleaf cape tulip		+	2
Nassella trichotoma	serrated tussock	+	+	1
Paraserianthes lophantha	cape wattle			1,3
Passiflora tarminiana	banana passionfruit			2,3
Psoralea pinnata	blue butterflybush			2,3
Rubus fruticosus aggregate	blackberry	+	+	1
Salix sp.	willow	+	+	1
Senecio jacobaea	ragwort		+	2
Ulex europaeus	gorse	+	+	1
Vinca major	periwinkle			2,3
Zantedeschia aethiopica	arum lily			2,3

WONS = Weeds of National Significance; **WMA** = Tasmanian *Weed Management Act 1999*

The King Island Natural Resource Management Group and King Island Council have undertaken weed control programs in accordance with this strategy since 2002. Small grants have been available for Weeds of National Significance and additional funding is delivered through the regional Cradle Coast Natural Resource Management Committee. Boneseed (*Chrysanthemoides monilifera*), bridal creeper (*Asparagus asparagoides*), asparagus fern (*Asparagus scandens*), ragwort (*Senecio jacobaea*), gorse (*Ulex europaeus*) and serrated tussock (*Nassella trichotoma*) have been the focus of current weed programs. A voluntary community group the 'Weedbusters' is currently working to control weeds on the Island. In addition, DPIPWE and KINRMG have been working with landholders to map and control ragwort and gorse. Funding for landholder-based gorse control was secured for 2006–2009. KINRMG has mapped asparagus fern infestations and developed a control program that can be adopted if funding is secured, and in 2010 mapped sea spurge around the island and developed a sea spurge management plan with funding provided by Cradle Coast NRM.

Prioritisation of threatened flora

Tasmania is divided up into three natural resource management (NRM) regions, Cradle Coast, South and North. King Island falls within the Cradle Coast region, and NRM projects funded within the region can include King Island. As part of a 2006–2007 financial agreement between the Cradle Coast Authority and the Threatened Species Section (DPIPWE), a flora prioritisation project has been completed to deliver the following outcomes:

- A more general knowledge of priority flora species in targeted areas of the Cradle Coast region;
- Documentation of the location and proposed management actions for individual and groups of priority species; and
- Provision of a broad-scale planning tool for threatened flora species management within the region.

About 200 vascular flora species listed on the TSP Act have been recorded in the Cradle Coast NRM region, including 43 from King Island. Results of the study are reported by Schahinger (2007), and relevant actions are included in the KIBMP. For current prioritisation of flora species refer to Table 2 of the KIBMP.

Cat control

The Tasmanian Parks and Wildlife Service have been carrying out cat trapping across the Island since approximately 1993. Control has been focused on the protection of threatened species and Lavinia State Reserve. In addition to this in 2005–2006 the KINRMG obtained funding from the World Wild Fund for Nature to run a short-term cat control program. The KINRMG continued with the program in a reduced form for another six months to secure samples for a dietary analysis of feral cats. This was completed in 2009. The project was aimed at the protection of threatened species. The KINRMG developed the King Island Cat Management Plan 2008–2013, outlining various objectives and actions. In

2010 an intensive feral cat trapping and domestic cat de-sexing program was conducted, funded by Cradle Coast NRM, and a report developed which reviewed past cat management work by the KINRMG and outlined future options for a community cat management program with the requirements of the *Cat Management Act 2009* in mind. King Island Council also conducts sporadic trapping in rural areas.

Wildlife management and monitoring

The Tasmanian PWS has been responsible for a number of projects on the Island including:

- recording sightings of vagrant birds, waterfowl, threatened species and marine mammals;
- habitat management including the construction of walking tracks, stock exclusion fences, viewing platforms, breeding boxes and weed control;
- management of feral goats and cats within Reserves; and
- fire management and rehabilitation within Reserves.

Threatened birds

In 2004 KINRMG secured funding from the Threatened Species Network to carry out a Threatened Bird Recovery project. The aim of the project was to: determine the extent of six forest birds of King Island and to address their habitat needs; raise awareness in the community about the Island's threatened bird species; collate data on bird sightings; and encourage Green Rosellas (*Platycercus caledonicus brownii*) to breed through volunteers setting up and regularly checking nest boxes.

In 2007/08 KINRMG conducted a project aimed at the management and restoration of Orange-bellied parrot habitat across the Island. Project objectives are consistent with the national Orange-bellied parrot recovery plan and actions are included in the KIBMP.

Waterwatch

From 2001–2009 KINRMG has been running a Waterwatch program, which aims to assess the quality of the Island's waterways. It included monthly monitoring of nine sites to obtain baseline data of the quality of streams and a community education component.

Devolved grant work

Devolved grant work, funded through the Natural Heritage Trust was conducted from 2000–2003 aimed at management of vegetation communities across the Island. Works included fencing, re-vegetation and direct seeding projects, the development of several strategies and the publication of a number of books and reports. A community group worked intensely for over a year on the publication of a field guide to King Island's flora (KINRMG 2002). A revolving fund was set up with the assistance of the Tasmanian Land Conservancy to protect valuable ecosystems through buying properties, covenanting and re-selling them.

Threatened species education

To support the development and adoption of the KIBMP and foster community ownership, a series of threatened species brochures have been completed by KINRMG with support from the Cradle Coast Authority. The aim of the brochures is to introduce the King Island community to the broad range of threatened species found on the Island and to develop a sense of pride and ownership in their management.

APPENDIX 2. SPECIES LISTS FOR KING ISLAND

2.1 Vascular flora

Plant nomenclature follows Buchanan (2009), and common names Wapstra *et al.* (2005). The plant list is an updated version of that presented in Barnes *et al.* (2002) and is arranged alphabetically by species name. Species descriptions for 300 of the native species recorded on the Island can be found in *King Island flora: a field guide* (KINRMG 2002).

Status

e Tasmanian endemic;
t within Australia, occurs only in Tasmania;
k within Tasmania, occurs only on King Island;
i introduced and naturalised in Tasmania;
~ introduced to King Island, but native to Tasmania;
< possibly extinct on King Island but not listed as such on the TSP Act.

TSP Act r = rare, v = vulnerable, e = endangered, x = presumed extinct.

EPBC Act VU = Vulnerable, EN = Endangered, CR = Critically Endangered, EX =Presumed Extinct)

Priority **A** = Very High, **B** = High, **C** = Medium, **D** = Low, Not ranked = Very Low

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Acacia implexa	hickory wattle			
	Acacia longifolia subsp. *sophorae*	coast wattle			
	Acacia melanoxylon	blackwood			
	Acacia mucronata subsp. *dependens*	blunt caterpillar wattle			
	Acacia mucronata subsp. *mucronata*	erect caterpillar wattle			
	Acacia suaveolens	sweet wattle			
	Acacia verniciflua	varnish wattle			
	Acacia verticillata var. *ovoidea*	prostrate prickly moses			
	Acacia verticillata var. *verticillata*	prickly moses			
~	*Acacia uncifolia*	coast wirilda	r		
	Acaena novae-zelandiae	common buzzy			
	Acaena pallida	dune buzzy			
i	*Acetosella vulgaris*	sheep sorrel			
i	*Achillea millefolium*	yarrow			
	Acianthus caudatus	mayfly orchid			
	Acrotriche serrulata	ants delight			
	Actites megalocarpus	dune thistle			
	Adiantum aethiopicum	common maidenhair			
i	*Agrostis capillaris*	browntop bent			
i	*Agrostis stolonifera*	creeping bent			
	Agrostis venusta	graceful bent			
i	*Aira caryophyllea* subsp. *caryophyllea*	silvery hairgrass			
i	*Aira elegantisissima*	delicate hairgrass			
	Ajuga australis	australian bugle			
i	*Allium triquetrum*	triangular garlic			
i	*Allium vineale*	crow garlic			
	Allocasuarina littoralis	bulloak			
e	*Allocasuarina monilifera*	black sheoak			
	Allocasuarina verticillata	drooping sheoak			
e	*Allocasuarina zephyrea*	western sheoak			
	Alyxia buxifolia	seabox			
i	*Ammophila arenaria* subsp. *arenaria*	marram grass			
	Amperea xiphoclada var. *xiphoclada*	broom spurge			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Amphibromus recurvatus	dark swampgrass			
i	*Anagallis arvensis*	pimpernel			
i	*Anthoxanthum odoratum*	sweet vernalgrass			
	Aotus ericoides	golden pea			
	Apalochlamys spectabilis	sticky firebush			
	Apium prostratum	sea-celery			
i	*Arctotheca calendula*	capeweed			
e	*Aristotelia peduncularis*	heartberry			
i	*Asparagus asparagoides*	bridal creeper			
i	*Asparagus scandens*	asparagus fern			
i	*Asphodelus fistulosus*	onion weed			
	Asplenium bulbiferum subsp. *gracillimum*	mother spleenwort			
	Asplenium flabellifolium	necklace fern			
	Asplenium obtusatum subsp. *northlandicum*	shore spleenwort			
i	*Aster subulatus*	asterweed			
	Atherosperma moschatum subsp. *moschatum*	sassafras			**C**
?i	*Atriplex australasica*	southern saltbush			
t	*Atriplex billardierei*	glistening saltbush			
	Atriplex cinerea	grey saltbush			
i	*Atriplex prostrata*	creeping orache			
	Australina pusilla subsp. *muelleri*	shade nettle	r		**B**
	Australina pusilla subsp. *pusilla*	small shade nettle			
	Austrocynoglossum latifolium	forest houndstongue	r		**C**
	Austrodanthonia geniculata	kneed wallabygrass			
	Austrodanthonia penicillata	slender wallabygrass			
	Austrodanthonia pilosa	velvet wallabygrass			
	Austrodanthonia setacea	bristly wallabygrass			
	Austrofestuca littoralis	coast fescue			
	Austrostipa flavescens	yellow speargrass			
	Austrostipa stipoides	coast speargrass			
	Azolla filiculoides	pacific azolla			
	Baloskion tetraphyllum subsp. tetraphyllum	tassel cordrush			
	Banksia integrifolia subsp. *integrifolia*	coast banksia	x		**D**
	Banksia marginata	silver banksia			
i	*Bartsia trixago*	mediterranean linseed			
	Bauera rubioides	wiry bauera			
	Baumea arthrophylla	fine twigsedge			
	Baumea juncea	bare twigsedge			
i	*Bellis perennis*	english daisy			
i	*Berkheya rigida*	african thistle			
	Beyeria lechenaultii var. latifolia	pale turpentine-bush			
	Billardiera nesophila	coastal appleberry			
	Blechnum chambersii	lance waterfern			
	Blechnum minus	soft waterfern			
	Blechnum nudum	fishbone waterfern			
	Blechnum patersonii subsp. *patersonii*	strap waterfern			
	Blechnum wattsii	hard waterfern			
	Boronia anemonifolia subsp. *variabilis*	stinky boronia			
	Boronia parviflora	swamp boronia			
	Boronia pilosa subsp. *pilosa*	hairy boronia			
	Bossiaea cinerea	showy bossia			
	Brachyscome diversifolia var. *diversifolia*	tall daisy			
e	*Brachyscome diversifolia* var. *maritima*	coastal tall daisy			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
i	*Bromus carthartícus*	prairie grass			
i	*Bromus diandrus*	great brome			
i	*Bromus hordeaceus*	soft brome			
	Burnettia cuneata	lizard orchid			
	Bursaria spinosa subsp. *spinosa*	prickly box			
i	*Cakile edentula*	american searocket			
i	*Cakile maritima* subsp. *maritima*	searocket			
	Caladenia alata	fairy fingers			
	Caladenia dilatata	greencomb spider-orchid			
	Caladenia latifolia	pink fairies			
	Caladenia mentiens	lesser fingers			
	Caladenia pusilla	tiny fingers	r		**D**
	Caladenia vulgaris	summer fingers			
	Callitriche brachycarpa	short waterstarwort			
k	*Callitriche sonderi*	matted starwort	r		**B**
i	*Callitriche stagnalis*	mud waterstarwort			
	Calochilus herbaceus	pale beard-orchid			
	Calochilus paludosus	strap beard-orchid			
	Calochilus platychila	purple beard-orchid			
	Calorophus elongatus	long roperush			
	Calytrix tetragona	common fringemyrtle			
i	*Capsella bursa-pastoris*	shepherds purse			
i	*Cardamine flexuosa*	wood bittercresss			
i	*Cardamine hirsuta*	hairy bittercress			
	Cardamine lilacina	lilac bittercress			
	Carex appressa	tall sedge			
	Carex breviculmis	shortstem sedge			
	Carex fascicularis	tassel sedge			
	Carex gaudichaudiana	fen sedge			
	Carex pumila	strand sedge			
	Carpobrotus rossii	native pigface			
	Cassinia aculeata	dollybush			
	Cassytha glabella	slender dodderlaurel			
	Cassytha pedicellosa	stalked dodderlaurel			
	Cassytha pubescens	downy dodderlaurel			
i	*Catapodium marinum*	stiff sandgrass			
i	*Catapodium rigidum*	ferngrass			
i	*Centaurium erythraea*	common centaury			
	Centella cordifolia	swampwort			
	Centipeda cunninghamii	erect sneezeweed	r		**C**
	Centrolepis aristata	pointed bristlewort			
	Centrolepis fascicularis	tufted bristlewort			
	Centrolepis strigosa subsp. *strigosa*	hairy bristlewort			
i	*Cerastium glomeratum*	sticky mouse-ear			
i	*Chenopodium glaucum*	pale goosefoot			
	Chiloglottis cornuta	green bird-orchid			
	Chiloglottis gunnii	tall bird-orchid			
	Chiloglottis valida	large bird-orchid			
i	*Chrysanthemoides monilifera*	boneseed			
	Chrysocephalum apiculatum	common everlasting			
i	*Cirsium vulgare*	spear thistle			
	Clematis aristata	mountain clematis			
	Clematis microphylla	small-leaf clematis			
i	*Clematis vitalba* var. *vitalba*	travelers joy			
it	*Collomia linearis*	tiny trumpet			
	Colobanthus apetalus var. *apetalus*	coast cupflower			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Comesperma calymega	bluespike milkwort			
	Comesperma retusum	mountain milkwort			
	Comesperma volubile	blue lovecreeper			
i	*Conyza sumatrensis*	tall fleabane			
	Coprosma quadrifida	native currant			
i	*Coprosma repens*	mirrorbush			
	Correa alba var. *alba*	white correa			
	Correa backhouseana var. *backhouseana*	velvet correa			
	Correa reflexa var. *reflexa*	common correa			
i	*Cortaderia richardii*	toe-toe pampasgrass			
	Cortaderia sp.	pampasgrass			
	Corunastylis archeri	elfin midge-orchid			
	Corybas diemenicus	stately helmet-orchid			
	Corybas unguiculatus	small pelican-orchid			
i	*Cotula coronopifolia*	water buttons			
	Cotula vulgaris var. *australasica*	slender buttons	r		**C**
	Crassula decumbens var. *decumbens*	spreading stonecrop			
	Crassula helmsii	swamp stonecrop			
i	*Crassula natans* var. *minus*	floating stonecrop			
	Crassula peduncularis	purple stonecrop			
	Crassula sieberiana	rock stonecrop			
	Cryptostylis subulata	large tongue-orchid			
	Ctenopteris heterophylla	gypsy fern			
	Cyathea australis subsp. *australis*	rough treefern			
	Cyathea cunninghamii	slender treefern	e		**A**
	Cyathea x*marcescens*	skirted treefern	e		**A**
	Cynoglossum australe	coast houndstongue	r		**C**
	Cynoglossum suaveolens	sweet houndstongue			
i	*Cynosurus cristatus*	crested dogstail			
i	*Cynosurus echinatus*	rough dogstail			
i	*Cyperus eragrostis*	drain flatsedge			
	Cyperus lucidus	leafy flatsedge			
	Cyrtostylis reniformis	small gnat-orchid			
	Cyrtostylis robusta	large gnat-orchid	r		**C**
i	*Cytisus scoparius*	english broom			
i	*Dactylis glomerata*	cocksfoot			
	Daucus glochidiatus	australian carrot			
i	*Delairea odorata*	cape ivy			
	Deyeuxia quadriseta	reed bentgrass			
	Dianella revoluta var. *revoluta*	spreading flaxlily			
	Dianella tasmanica	forest flaxlily			
	Dichelachne crinita	longhair plumegrass			
	Dichelachne rara	common plumegrass			
	Dichondra repens	kidneyweed			
	Dicksonia antarctica	soft treefern			
	Dillwynia glaberrima	smooth parrotpea			
	Dillwynia sericea	showy parrotpea			
	Diplarrena moraea	white flag-iris			
	Diplazium australe	southern ladyfern			
	Disphyma crassifolium subsp. *clavellatum*	roundleaf pigface			
	Distichlis distichophylla	australian saltgrass			
	Diuris orientis	eastern wallflower orchid			
	Dodonaea viscosa subsp. *spatulata*	broadleaf hopbush			
	Drosera auriculata	tall sundew			
	Drosera binata	forked sundew			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Drosera peltata	pale sundew			
	Drosera pygmaea	dwarf sundew			
	Drymophila cyanocarpa	turquoise berry			
	Echinopogon ovatus	hedgehog grass			
i	*Ehrharta erecta* var. *erecta*	panic veldtgrass			
i	*Ehrharta villosa*	pyp grass			
	Einadia nutans subsp. *nutans*	climbing saltbush			
	Elaeocarpus reticulatus	blueberry ash	r		**C**
	Eleocharis acuta	common spikesedge			
	Eleocharis gracilis	slender spikesedge			
	Eleocharis pusilla	small spikesedge			
	Eleocharis sphacelata	tall spikesedge			
i	*Emex australis*	prickly jacks			
	Empodisma minus	spreading roperush			
	Epacris impressa	common heath			
	Epacris lanuginosa	swamp heath			
	Epacris obtusifolia	bluntleafed heath			
	Epilobium billardierianum	willowherb			
	Epilobium pallidiflorum	showy willowherb	r		**C**
i	*Erica lusitanica*	spanish heath			
	Eriochilus cucullatus	pale autumn orchid			
i	*Erodium cicutarium*	common heronsbill			
i	*Erophila verna* subsp. *verna*	spring whitlowgrass			
	Eucalyptus brookeriana	brookers gum			
	Eucalyptus globulus subsp. *globulus*	tasmanian blue gum			**C**
~	*Eucalyptus obliqua*	stringybark			
	Eucalyptus viminalis subsp. *viminalis*	white gum			
	Euchiton collinus	common cottonleaf			
	Euchiton involucratus	star cottonleaf			
i	*Euphorbia paralias*	sea spurge			
i	*Euphorbia peplus*	petty spurge			
i	*Festuca arundinacea*	tall fescue			
	Ficinia nodosa	knobby clubsedge			
i	*Fumaria officinalis* subsp. *officinalis*	common fumitory			
	Gahnia grandis	cutting grass			
	Gahnia radula	thatch sawsedge			
	Gahnia trifida	coast sawsedge			
i	*Galium aparine*	cleavers			
	Galium australe	coast bedstraw			
	Gastrodia procera	tall potato-orchid			
i	*Genista monspessulana*	montpellier broom			
i	*Geranium molle* var. *molle*	soft cranesbill			
	Geranium potentilloides	mountain cranesbill			
	Geranium solanderi	southern cranesbill			
	Gleichenia microphylla	scrambling coralfern			
	Glossodia major	waxlip orchid			
i	*Glyceria maxima*	reed sweetgrass			
	Gompholobium huegelii	common wedgepea			
	Gonocarpus humilis	shade raspwort			
	Gonocarpus micranthus subsp. *micranthus*	creeping raspwort			
	Gonocarpus tetragynus	common raspwort			
	Gonocarpus teucrioides	forest raspwort			
	Goodia lotifolia var. *lotifolia*	smooth goldentip			
	Grammitis billardierei	common fingerfern			
	Gratiola nana	matted brooklime			
	Gratiola pubescens	hairy brooklime	v		**B**

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Halophila australis	sea wrack			
	Haloragis brownii	swamp raspwort			
	Haloragis myriocarpa	prickly raspwort	r		**C**
i	*Hedera helix*	ivy			
k	*Hedycarya angustifolia*	australian mulberry	r		**C**
	Helichrysum luteoalbum	jersey cudweed			
	Hibbertia acicularis	prickly guineaflower			
	Hibbertia empetrifolia subsp. *empetrifolia*	scrambling guineaflower			
	Hibbertia procumbens	spreading guineaflower			
	Hibbertia prostrata	prostrate guineaflower			
	Hibbertia riparia	erect guineaflower			
i	*Hirschfeldia incana*	hoary mustard			
	Histiopteris incisa	batswing fern			
i	*Holcus lanatus*	yorkshire fog			
i	*Holcus mollis*	creeping fog			
i	*Hordeum leporinum*	long-anther barleygrass			
	Hydrocotyle hirta	hairy pennywort			
	Hydrocotyle muscosa	mossy pennywort			
	Hydrocotyle pterocarpa	winged pennywort			
	Hydrocotyle sibthorpioides	shining pennywort			
	Hymenophyllum australe	southern filmyfern			
	Hymenophyllum cupressiforme	common filmyfern			
	Hymenophyllum flabellatum	shiny filmyfern			
	Hymenophyllum rarum	narrow filmyfern			
	Hypericum gramineum	small st johns-wort			
i	*Hypochoeris glabra*	smooth catsear			
i	*Hypochoeris radicata*	rough catsear			
	Hypolaena fastigiata	tassel roperush			
t	*Hypolepis distans*	scrambling groundfern	e	EN	**A**
	Hypolepis glandulifera	downy groundfern			
	Hypolepis muelleri	harsh groundfern	r		**D**
	Hypolepis rugosula	ruddy groundfern			
i	*Ilex aquifolium*	holly			
	Isolepis aucklandica	slender clubsedge			
	Isolepis cernua	nodding clubsedge			
	Isolepis fluitans	floating clubsedge			
	Isolepis inundata	swamp clubsedge			
?i	*Isolepis levynsiana*	fan clubsedege			
	Isolepis marginata	little clubsedge			
	Isolepis producta	nutty clubsedge			
	Isotoma fluviatilis subsp. *australis*	swamp stars			
i	*Juncus acutiflorus*	sharpflower rush			
	Juncus amabilis	gentle rush			
i	*Juncus articulatus*	jointed rush			
	Juncus bufonius	toad rush			
	Juncus caespiticius	grassy rush			
	Juncus filicaulis	thread rush			
	Juncus holoschoenus	jointleaf rush			
	Juncus kraussii subsp. *australiensis*	sea rush			
	Juncus pallidus	pale rush			
	Juncus pauciflorus	looseflower rush			
	Juncus planifolius	broadleaf rush			
	Juncus procerus	tall rush			
	Juncus vaginatus	clustered rush	r		**C**
	Lachnagrostis aemula	tumbling blowngrass			
	Lachnagrostis filiformis	common blowngrass			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Lachnagrostis scabra subsp. *scabra*	rough blowngrass	r		**D**
	Lagenophera stipitata	blue bottledaisy			
i	*Lagurus ovatus*	harestail grass			
	Lastreopsis acuminata	shiny shieldfern			
	Lemna disperma	common duckweed			
	Lemna trisulca	star duckweed			
i	*Leontodon taraxacoides* subsp. *taraxacoides*	hairy hawkbit			
	Lepidium foliosum	leafy peppercress			
	Lepidosperma concavum	sand swordsedge			
	Lepidosperma elatius	tall swordsedge			
	Lepidosperma filiforme	common rapiersedge			
	Lepidosperma gladiatum	coast swordsedge			
	Lepidosperma laterale	variable swordsedge			
	Lepilaena bilocularis	smallfruit watermat			
	Lepilaena cylindrocarpa	longfruit watermat			
	Lepilaena patentifolia	spreading watermat	r		**C**
e	*Leptecophylla juniperina* subsp. *juniperina*	common pinkberry			
	Leptinella filicula	ferny buttons			
	Leptinella longipes	coast buttons			
	Leptocarpus tenax	slender twinerush			
	Leptoceras menziesii	hares ears			
	Leptospermum laevigatum	coast teatree			
	Leptospermum lanigerum	woolly teatree			
	Leptospermum scoparium var. *scoparium*	common teatree			
	Lepyrodia muelleri	erect scalerush			
i	*Leucanthemum vulgare*	oxeye daisy			
	Leucophyta brownii	cushionbush			
	Leucopogon australis	spike beardheath			
	Leucopogon collinus	white beardheath			
	Leucopogon ericoides	pink beardheath			
	Leucopogon lanceolatus var. *lanceolatus*	lance beardheath	r		**C**
	Leucopogon parviflorus	coast beardheath			
	Leucopogon virgatus var. *virgatus*	twiggy beardheath			
	Lilaeopsis polyantha	jointed swampstorks			
	Limosella australis	southern mudwort			
	Lindsaea linearis	screw fern			
	Linum marginale	native flax			
	Lobelia anceps	angled lobelia			
	Lobelia gibbosa var. *gibbosa*	tall lobelia			
i	*Lolium loliaceum*	stiff ryegrass			
i	*Lolium perenne*	perennial ryegrass			
i	*Lotus corniculatus*	birdsfoot trefoil			
i	*Lotus uliginosus*	greater birdsfoot-trefoil			
i	*Lupinus arboreus*	tree lupin			
it	*Luzula campestris*	field wood-rush			
	Luzula flaccida	pale wood-rush			
i	*Lycium ferocissimum*	african boxthorn			
	Lycopodiella lateralis	slender clubmoss			
	Lycopodiella serpentina	bog clubmoss			
	Lycopodium deuterodensum	conifer clubmoss			
	Lythrum hyssopifolia	small loosestrife			
i	*Malva dendromorpha*	tree mallow			
	Mazus pumilio	swamp mazus			
	Melaleuca ericifolia	coast paperbark			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Melaleuca squarrosa	scented paperbark			
i	*Melilotus indicus*	sweet melilot			
	Mentha diemenica var. *serpyllifolia*	thymeleaf mint			
	Microlaena stipoides	weeping grass			
	Microsorum pustulatum subsp. *pustulatum*	kangaroo fern			
	Microtis arenaria	notched onion-orchid			
	Microtis oblonga	sweet onion-orchid			
	Microtis unifolia	common onion-orchid			
	Mimulus repens	creeping monkeyflower			
	Mitrasacme pilosa var. *pilosa*	hairy mitrewort			
i	*Moenchia erecta*	erect chickweed			
	Monotoca elliptica	tree broomheath			
	Monotoca glauca	goldey wood			
	Monotoca scoparia	prickly broomheath			
	Montia australasica	white purslane			
i	*Moraea flaccida*	oneleaf cape tulip			
	Muehlenbeckia australis	climbing lignum			
	Myoporum insulare	common boobialla			
	Myosotis australis	southern forgetmenot			
i	*Myosotis discolor*	changing forgetmenot			
i	*Myosotis laxa* subsp. *caespitosa*	lesser forgetmenot			
i	*Myosotis scorpioides*	water forgetmenot			
	Myriophyllum amphibium	broad watermilfoil			
e	*Myriophyllum austropygmaeum*	highland watermilfoil			
	Myriophyllum muelleri	hooded watermilfoil	r		**C**
	Myriophyllum salsugineum	lake watermilfoil			
	Myriophyllum simulans	amphibious watermilfoil			
e	*Nablonium calyceroides*	spiny everlasting			
i	*Nassella trichotoma*	serrated tussock			
i	*Nasturtium officinale*	two-row watercress			
	Nematolepis squamea subsp. *squamea*	satinwood			
	Notelaea ligustrina	native olive			C
	Notodanthonia semiannularis	marsh wallabygrass			
	Olearia argophylla	musk daisybush			C
	Olearia axillaris	coast daisybush			
	Olearia floribunda	flowery daisybush			
	Olearia glandulosa	swamp daisybush			
	Olearia glutinosa	sticky daisybush			
	Olearia lepidophylla	clubmoss daisybush			
	Olearia phlogopappa	dusty daisybush			
	Olearia ramulosa	twiggy daisybush			
	Olearia stellulata	sawleaf daisybush			
	Opercularia varia	variable stinkweed			
	Ophioglossum lusitanicum subsp. *coriaceum*	adders-tongue			
	Orthoceras strictum	horned orchid	r		**C**
i	*Oxalis corniculata* subsp. *corniculata*	yellow woodsorrel			
	Oxalis perennans	grassland woodsorrel			
	Ozothamnus ferrugineus	tree everlastingbush			
	Ozothamnus turbinatus	coast everlastingbush			
i	*Papaver aculeatum*	bristle poppy			
i	*Paraserianthes lophantha* subsp. *lophantha*	cape wattle			
i	*Parentucellia viscosa*	yellow glandweed			
	Parietaria debilis	shade pellitory	r		**C**
	Parsonsia brownii	twining silkpod			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
i	*Passiflora tarminiana*	banana passionfruit			
	Patersonia fragilis	short purpleflag			
	Patersonia occidentalis var. *occidentalis*	long purpleflag			
	Pelargonium australe	southern storksbill			
	Pelargonium inodorum	annual storksbill			
	Pellaea falcata	sickle fern			
i	*Pennisetum clandestinum*	kikuyu grass			
	Persicaria decipens	slender waterpepper	v		**C**
	Persicaria hydropiper	green waterpepper			
?i	*Persicaria prostrata*	creeping waterpepper			
	Persoonia juniperina var. *juniperina*	prickly geebung			
i	*Petrorhagia nanteuilii*	proliferous pink			
	Philotheca virgata	twiggy waxflower			
	Phyllangium distylis	tiny mitrewort	r		**C**
	Phyllanthus gunnii	shrubby spurge			
e	*Phyllocladus aspleniifolius*	celerytop pine			
	Phylloglossum drummondii	pigmy clubmoss	r		**C**
i	*Phytolacca octandra*	red inkweed			
k	*Pimelea axiflora* subsp. *axiflora*	bootlace bush	e		**B**
	Pimelea drupacea	cherry riceflower			
	Pimelea humilis	dwarf riceflower			
	Pimelea ligustrina subsp. *ligustrina*	tall riceflower			
	Pimelea linifolia subsp. *linifolia*	slender riceflower			
	Pimelea serpyllifolia subsp. *serpyllifolia*	thyme riceflower			
i	*Pinus radiata*	radiate pine			
i	*Piptatherum miliaceum*	rice millet			
	Pittosporum bicolor	cheesewood			
e	*Plantago bellidioides*	herbfield plantain			
i	*Plantago coronopus*	buckshorn plantain			
i	*Plantago lanceolata*	ribwort plantain			
i	*Plantago major*	great plantain			
e	*Plantago paradoxa*	hairtuft plantain			
	Plantago varia	variable plantain			
	Pneumatopteris pennigera	lime fern	e		**A**
i	*Poa annua*	winter grass			
	Poa halmaturina	dune tussockgrass	r		**D**
i	*Poa infirma*	early medowgrass			
	Poa labillardierei var. *acris*	blue tussockgrass			
	Poa labillardierei var. *labillardierei*	silver tussockgrass			
	Poa poiformis var. *poiformis*	coastal tussockgrass			
i	*Poa pratensis*	kentucky bluegrass			
	Poa tenera	scrambling tussockgrass			
	Podotheca angustifolia	sticky longheads	x		**D**
i	*Polycarpon tetraphyllum*	fourleaf allseed			
i	*Polypogon monspeliensis*	annual beardgrass			
	Polystichum proliferum	mother shieldfern			
	Pomaderris apetala subsp. *apetala*	common dogwood			
	Pomaderris paniculosa subsp. *paralia*	shining dogwood	r		**C**
	Poranthera microphylla	small poranthera			
	Potamogeton australiensis	thin pondweed			
	Potamogeton ochreatus	blunt pondweed			
	Potamogeton tricarinatus	floating pondweed			
	Prasophyllum australe	austral leek-orchid			
	Prasophyllum flavum	yellow leek-orchid			
	Pratia irrigua	salt pratia			
	Pratia pedunculata	matted pratia			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
i	*Prunella vulgaris*	selfheal			
i	*Psoralea pinnata*	blue butterflybush			
	Pteridium esculentum	bracken			
	Pteris comans	netted brake			
	Pteris tremula	tender brake			
	Pterostylis cucullata subsp. *cucullata*	leafy greenhood	e	VU	**B**
	Pterostylis foliata	slender greenhood			
	Pterostylis melagramma	blackstripe greenhood			
	Pterostylis nana	dwarf greenhood			
	Pterostylis nutans	nodding greenhood			
	Pterostylis pedunculata	maroonhood			
	Pterostylis sanguinea	banded greenhood	r		**C**
	Pterostylis tasmanica	small bearded greenhood			
	Puccinellia stricta	australian saltmarshgrass			
	Pultenaea daphnoides var. *obcordata*	heartleaf bushpea			
	Pultenaea gunnii var. gunnii	golden bushpea			
	Pultenaea juniperina	prickly beauty			
	Pyrorchis nigricans	fire orchid			
	Ranunculus amphitrichus	river buttercup			
i	*Ranunculus repens*	creeping buttercup			
i	*Reseda alba*	white mignonette			
i	*Reseda lutea*	cutleaf mignonette			
	Rhagodia candolleana subsp. *candolleana*	coastal saltbush			
	Rhytidosporum procumbens	starry appleberry			
i	*Rorippa palustris*	marsh yellowcress			
i	*Rubus fruticosus* aggregate	blackberry			
	Rumex brownii	slender dock			
i	*Rumex conglomeratus*	clustered dock			
i	*Rumex crispus*	curled dock			
	Rumohra adiantiformis	leathery shieldfern			
	Ruppia polycarpa	manyfruit seatassel			
i	*Sagina apetala*	annual pearlwort			
i	*Sagina maritima*	sea pearlwort			
i	*Sagina procumbens*	spreading pearlwort			
i	*Salix sp.*	willow			
	Sambucus gaudichaudiana	white elderberry			
	Samolus repens	creeping brookweed			
	Sarcocornia blackiana	thickhead glasswort			
	Sarcocornia quinqueflora	beaded glasswort			
	Scaevola hookeri	creeping fanflower			
	Schizaea bifida	forked combfern			
	Schizaea fistulosa	narrow combfern			
	Schoenoplectus pungens	sharp clubsedge			
	Schoenoplectus tabernaemontani	river clubsedge	r		**C**
	Schoenus apogon	common bogsedge			
	Schoenus maschalinus	leafy bogsedge			
	Schoenus nitens	shiny bogsedge			
	Scleranthus biflorus	twinflower knawel			
i	*Sclerochloa dura*	hard meadowgrass			
	Sebaea albidiflora	white sebaea			
	Sebaea ovata	yellow sebaea			
	Selaginella uliginosa	swamp selaginella			
	Selliera radicans	shiny swampmat			
	Senecio biserratus	jagged fireweed			
i	*Senecio elegans*	purple groundsel			
	Senecio glomeratus subsp. *longifructus*	longfruit purple fireweed			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Senecio linearifolius	fireweed groundsel			
	Senecio minimus	shrubby fireweed			
	Senecio odoratus	scented groundsel			
	Senecio pinnatifolius	coast groundsel			
	Senecio psilocarpus	swamp fireweed		VU	**B**
	Senecio quadridentatus	cotton fireweed			
e	*Senecio spathulatus var. spathulatus*	dune groundsel			
i	*Sherardia arvensis*	field madder			
i	*Silybum marianum*	variegated thistle			
i	*Sisymbrium irio*	london rocket			
	Solanum laciniatum	kangaroo apple			
i	*Solanum nigrum*	blackberry nightshade			
	Solanum opacum	greenberry nightshade	e		**C**
i	*Solanum pseudocapsicum*	winter cherry			
i	*Sonchus asper*	prickly sow thistle			
i	*Spergularia tasmanica*	greater seaspurrey			
	Sphaerolobium minus	eastern globepea			
	Spinifex sericeus	beach spinifex			
	Spiranthes australis	lowland spiral-orchid			
	Sporadanthus tasmanicus	branching scalerush			
	Sporobolus virginicus	salt couch	r		**C**
	Sprengelia incarnata	pink swampheath			
	Stackhousia monogyna	forest candles			
	Stellaria flaccida	forest starwort			
i	*Stellaria media*	garden chickweed			
	Stellaria pungens	prickly starwort			
i	*Stenotaphrum secundatum*	buffalo grass			
	Sticherus tener	silky fanfern			
	Stuckenia pectinata	fennel pondweed	r		**C**
	Stylidium beaugleholei	blushing triggerplant	r		**C**
	Stylidium despectum	small triggerplant	r		**C**
	Stylidium graminifolium	narrowleaf triggerplant			
	Stylidium perpusillum	tiny triggerplant	r		**C**
	Suaeda australis	southern seablite			
	Swainsona lessertiifolia	coast poisonpea			
<	*Taraxacum cygnorum*	coast dandelion		VU	**D**
i	*Taraxacum officinale*	common dandelion			
	Tasmannia lanceolata	mountain pepper			
	Tecticornia arbuscula	shrubby glasswort			
i	*Teesdalia nudicaulis*	shepherds cress			
	Tetragonia implexicoma	bower spinach			
	Tetragonia tetragonoides	new zealand spinach			
	Tetraria capillaris	hair sedge			
	Tetrarrhena distichophylla	hairy ricegrass			
	Thelionema caespitosum	tufted lily			
	Thelymitra aristata	great sun-orchid			
	Thelymitra carnea	tiny sun-orchid			
	Thelymitra circumsepta	naked sun-orchid			
	Thelymitra cyanea	veined sun-orchid			
	Thelymitra flexuosa	twisted sun-orchid			
	Thelymitra holmesii	bluestar sun-orchid	r		C
	Thelymitra improcera	coastal sun-orchid			
	Thelymitra ixioides	spotted sun-orchid			
	Thelymitra juncifolia	large-spotted sun-orchid			
	Thelymitra malvina	mauvetuft sun-orchid	e		**B**
	Thelymitra pauciflora	slender sun-orchid			

Status	Scientific Name	Common Name	TSP Act	EPBC Act	Priority
	Thelymitra rubra	pink sun-orchid			
	Thelymitra X*irregularis*	crested sun-orchid			
	Thelymitra X*truncata*	truncate sun-orchid			
	Themeda triandra	kangaroo grass			
	Tmesipteris elongata	narrow forkfern			
	Tmesipteris obliqua	common forkfern			
	Tmesipteris parva	small forkfern	v		**B**
	Todea barbara	southern kingfern			
i	*Trifolium repens*	white clover			
i	*Trifolium subterraneum*	subterraneum clover			
	Triglochin minutissimum	tiny arrowgrass	r		C
	Triglochin procerum	greater waterribbons			
	Triglochin striatum	streaked arrowgrass			
	Trithuria submersa	submerged watertuft	r		**C**
i	*Typha latifolia*	great reedmace			
	Typha orientalis	broadleaf cumbungi			
i	*Ulex europaeus*	gorse			
	Urtica incisa	scrub nettle			
i	*Urtica urens*	stinging nettle			
	Utricularia dichotoma	fairies aprons			
	Utricularia lateriflora	tiny bladderwort			
	Utricularia tenella	pink bladderwort	r		**C**
	Villarsia reniformis	running marshflower			
i	*Vinca major*	blue periwinkle			
	Viola cleistogamoides	shy violet			
	Viola hederacea subsp. *hederacea*	ivyleaf violet			
i	*Vulpia bromoides*	squirreltail fescue			
	Wahlenbergia gracilenta	annual bluebell			
	Wahlenbergia gracilis	sprawling bluebell			
	Wolffia australiana	tiny duckweed			
	Xanthosia dissecta	cutleaf crossherb			
	Xanthosia pilosa	woolly crossherb			
e	*Xyris marginata*	alpine yelloweye			
e	*Xyris muelleri*	roundhead yelloweye			
	Xyris operculata	tall yelloweye			
i	*Zantedeschia aethiopica*	arum lily			
	Zoysia macrantha subsp. *walshii*	prickly couch			

2.2 Vegetation communities

Vegetation communities recognised in the King Island Biodiversity Management Plan. Community profiles are outlined by Harris and Kitchener (2005).

Priority: A = Very High, **B** = High, **C** = Medium, **D** = Low, Not Ranked = Very Low

NC Act = listed as a threatened vegetation community under Schedule 3A of the Tasmanian *Nature Conservation Act 2002*

Vegetation Community	Tasveg Code	Priority	NC Act
Freshwater aquatic herbland	AHF	**A**	+
Lacustrine herbland	AHL	**A**	+
Saline sedgeland/rushland	ARS		
Freshwater aquatic sedgeland and rushland	ASF	**A**	+
Succulent saline herbfield	ASS		
Wetland (undifferentiated)	AWU	**A**	+
King Island eucalypt woodland	DKW	**A**	+
Eucalyptus ovata forest and woodland	DOV		+
Eucalyptus viminalis shrubby/heathy woodland	DVS		
Lowland grassland complex	GCL		
Coastal grass and herbfield	GHC		
Acacia melanoxylon swamp forest	NAF	**A**	
Bursaria-Acacia woodland and scrub	NBA		
Leptospermum lanigerum – Melaleuca squarrosa swamp forest	NLM		
Melaleuca ericifolia swamp forest	NME	**A**	+
Acacia longifolia coastal scrub	SAC		
Coastal heathland	SCH	**C**	
Coastal complex on King Island	SCK	**B**	+
Dry scrub	SDU		
Lowland sedgy heathland	SHL		
Leptospermum scrub	SLW		
Melaleuca squarrosa scrub	SMR		
Seabird rookery complex	SRC	**A**	+
Coastal scrub	SSC		
Scrub complex on King Island	SSK		
Eucalyptus brookeriana wet forest	WBR	**A**	+
Eucalyptus globulus King Island forest	WGK	**A**	+

2.3 Vertebrate fauna and threatened invertebrate fauna

The species list below is taken from Donaghey (2003): within groups, species are listed alphabetically by scientific names.

Status

e Tasmanian endemic;
t within Australia, occurs only in Tasmania;
k within Tasmania, occurs only on King Island;
kg King Island endemic
i introduced and naturalised in Tasmania;
~ regular migratory visitor
< locally extinct from King Island.

TSP Act r = rare, v = vulnerable, e = endangered, x = presumed extinct.

EPBC Act VU = Vulnerable, EN = Endangered, CR = Critically Endangered, EX = Presumed Extinct, M = migratory.

Priority **A** = Very High, **B** = High, **C** = Medium, **D** = Low, Not Ranked = Very Low.

	Scientific Name	Common name	TSP Act	EPBC Act	Priority
Freshwater Fish					
	Anguilla australis	Southern Shortfin Eel			
	Galaxias brevipinnis	Climbing Galaxias			
	Galaxias maculatus	Common Galaxias			
	Galaxias truttaceus	Spotted Galaxias			
	Nannoperca australis	Southern Pygmy Perch			
i	*Oncorhynchus mykiss*	Rainbow Trout			
<	*Prototroctes maraena*	Australian Grayling	v	VU	Data deficient
	Pseudaphritis urvillii	Congolli			
i	*Salmo trutta*	Brown Trout			
Amphibians					
	Crinia signifera	Common Froglet			
	Geocrinia laevis	Smooth Froglet			
	Limnodynastes dumerilii variegatus	Mottled Banjo Frog			
	Limnodynastes peronii	Striped Marsh Frog	e		**A**
e	*Litoria ewingii*	Brown Tree Frog			
	Litoria raniformis	Green and Gold Frog	v	VU	**A**
Reptiles					
	Acritoscincus duperreyi	Eastern Three-lined Skink			
	Austrelaps superbus	Lowland Copperhead			
	Drysdalia coronoides	White-lipped Snake			
	Liopholis whitii	White's Skink			
	Niveoscincus metallicus	Metallic Skink			
e	*Niveoscincus pretiosus*	Tasmanian Tree Skink			**D**
	Notechis scutatus humphreysii	Tiger Snake			
	Pseudemoia entrecasteauxii	Southern Grass Skink			
	Tiliqua nigrolutea	Blotched Bluetongue			
Birds					
Extant land and freshwater native birds - breeding residents or regular migrants and visitors					
e	*Acanthiza ewingii rufifrons*	Tasmanian Thornbill			
kg	*Acanthiza pusilla archibaldi*	King Island Brown Thornbill	e	EN	**A**
kg	*Acanthornis magna greeniana*	King Island Scrubtit	e	CR	**A**
	Accipiter fasciatus	Brown Goshawk			**D**

	Scientific Name	Common name	TSP Act	EPBC Act	Priority
	Accipiter novaehollandiae	Grey Goshawk			
	Anas castanea	Chestnut Teal			
	Anas gracilis	Grey Teal			
	Anas rhynchotis	Australian Shoveler			
	Anas superciliosa	Pacific Black Duck			
e	*Anthochaera paradoxa*	Yellow Wattlebird			**C**
	Anthus novaeseelandiae	Richard's Pipit			
	Ardea ibis	Cattle Egret		M	
	Ardenna tenuirostris	Short-tailed Shearwater		M	
	Artamus cyanopterus	Dusky Woodswallow			
	Biziura lobata	Musk Duck			
	Botaurus poiciloptilus	Australasian Bittern		EN	**B**
	Cacatua galerita	Sulphur-crested Cockatoo			
	Cacomantis flabelliformis	Fan-tailed Cuckoo			
	Cacomantis pallidus	Pallid Cuckoo			
<	*Callocephalon fimbriatum*	Gang-gang Cockatoo			
	Calyptorhynchus funereus	Yellow-tailed Black-cockatoo			**C**
<	*Calyptorhynchus lathami*	Glossy black-Cockatoo			
	Cereopsis novaehollandiae	Cape Barren Goose			
	Chalcites basalis	Horsfield's Bronze-cuckoo			
	Chalcites lucidus	Shining Bronze-cuckoo			
	Charadrius ruficapillus	Red-capped Plover			
	Chenonetta jubata	Australian Wood Duck			
	Chroicocephalus novaehollandiae	Silver Gull			
	Circus approximans	Swamp Harrier			
	Cisticola exilis	Golden-headed Cisticola			**D**
	Colluricincla harmonica	Grey Shrike-thrush			
	Coracina novaehollandiae	Black-faced Cuckoo-shrike			
	Corvus mellori	Little Raven			
	Corvus tasmanicus	Crow/Forest Raven			
	Coturnix pectoralis	Stubble Quail			
	Coturnix ypsilophora	Brown Quail			
	Cracticus tibicen	Australian Magpie			
	Cygnus atratus	Black Swan			
kg	*Dromaius ater*	King Island Emu	x	EX	
	Egretta novaehollandiae	White-faced Heron			
	Elseyornis melanops	Black-fronted Dotterel			
	Epthianura albifrons	White-fronted Chat			
	Eudyptula minor	Little Penguin			
	Excalfactoria chinensis	King Quail			
	Falco berigora	Brown Falcon			
	Falco cenchroides	Nankeen Kestrel			**D**
	Fulica atra	Eurasian Coot			
	Gallinago hardwickii	Latham's Snipe		M	
	Gallinula tenebrosa	Dusky Moorhen			
	Gallirallus philippensis	Buff-banded Rail			
	Gliciphila melanops	Tawny-crowned Honeyeater			
	Haematopus fuliginosus	Sooty Oystercatcher			
	Haematopus longirostris	Pied Oystercatcher			
	Haliaeetus leucogaster	White-bellied Sea Eagle	v	M	**A**
	Hirundapus caudacutus	White-throated Needletail		M	
	Hirundo neoxena	Welcome Swallow			
	Hydroprogne caspia	Caspian Tern		M	
	Larus pacificus	Pacific Gull			
	Lewinia pectoralis	Lewin's Rail			
	Lichenostomus flavicollis	Yellow-throated Honeyeater			

	Scientific Name	Common name	TSP Act	EPBC Act	Priority
	Malurus cyaneus	Superb Fairy-wren			
	Megalurus gramineus	Little Grassbird			
kg	*Melanodryas vittata kingi*	Dusky Robin			**C**
	Melithreptus affinis	Black-headed Honeyeater			
	Melithreptus validirostris	Strong-billed Honeyeater			
	Myiagra cyanoleuca	Satin Flycatcher		M	
	Neophema chrysogaster	Orange-bellied Parrot	e	CR	**A**
	Neophema chrysostoma	Blue-winged Parrot			
	Ninox novaeseelandiae	Southern Boobook			**C**
	Nycticorax caledonicus	Nankeen Night Heron			**D**
	Oxyura australis	Blue-billed Duck			
	Pachycephala olivacea	Olive Whistler			
	Pachycephala pectoralis	Golden Whistler			
	Pardalotus punctatus	Spotted Pardalote			
<	*Pardalotus quadragintus*	Forty-spotted Pardalote		EN	
	Pardalotus striatus	Striated Pardalote			
	Petrochelidon nigricans	Tree Martin			
	Petroica phoenicea	Flame Robin			
	Petroica rodinogaster	Pink Robin			
	Phalacrocorax carbo	Great Cormorant			
	Phalacrocorax fuscescens	Black-faced Cormorant			
	Phalacrocorax melanoleucos	Little Pied Cormorant			
	Phaps chalcoptera	Common Bronzewing			
	Phaps elegans	Brush Bronzewing			
	Phylidonyris novaehollandiae	New Holland Honeyeater			
	Phylidonyris pyrrhoptera	Crescent Honeyeater			
kg	*Platycercus caledonicus brownii*	King Island Green Rosella	v		**B**
	Poliocephalus poliocephalus	Hoary-headed Grebe			
	Porphyrio porphyrio	Purple Swamphen			
	Porzana tabuensis	Spotless Crake			
	Rhipidura albiscapa	Grey Fantail			
e	*Sericornis humilis*	Tasmanian Scrubwren			
	Sternula albifrons sinensis	Little Tern	e	M	**A**
	Sternula nereis nereis	Fairy Tern	r	V	**A**
kg	*Strepera fuliginosa colei*	Black Currawong			**B**
	Tadorna tadornoides	Australian Shelduck			
	Thalasseus bergii	Crested Tern			
	Thinornis rubricollis	Hooded Plover			**A**
	Turnix varius	Painted Button-quail			**D**
	Vanellus miles	Masked Lapwing			
	Vanellus tricolor	Banded Lapwing			
	Zoothera lunulata	Bassian Thrush			
	Zosterops lateralis	Silvereye			
Irregular migrants and visitors, vagrants and accidental land and freshwater birds					
	Acanthiza chrysorrhoa	Yellow-rumped Thornbill			
	Acanthorhynchus tenuirostris	Eastern Spinebill			
	Accipiter cirrhocephalus	Collared Sparrowhawk			
	Apus pacificus	Fork-tailed Swift		M	
e	*Aquila audax fleayi*	Wedge-tailed Eagle	e	EN	
~	*Ardea modesta*	Eastern Great Egret		M	
~	*Ardea pacifica*	White-necked Heron			
	Artamus personatus	Masked Woodswallow			
	Artamus superciliosus	White-browed Woodswallow			
	Artamus leucorynchus	White-breasted Woodswallow			
	Aythya australis	Hardhead			
	Cacatua sanguinea	Little Corella			

	Scientific Name	Common name	TSP Act	EPBC Act	Priority
~	*Egretta garzetta*	Little Egret			
	Elanus axillaris	Black-shouldered Kite			
~	*Eolophus roseicapillus*	Galah			
	Erythrogonys cinctus	Red-kneed Dotterel			
	Falco longipennis	Australian Hobby			
	Falco peregrinus	Peregrine Falcon			
	Glossopsitta concinna	Musk Lorikeet			
	Grallina cyanoleuca	Margpie-lark			
	Haliastur sphenurus	Whistling Kite			
	Lalage sueurii	White-winged Triller			
	Lathamus discolor	Swift Parrot	e	EN	
	Lichenostomus chrysops	Yellow-faced Honeyeater			
	Malacorhynchus membranaceus	Pink-eared Duck			
	Pachycephala rufiventris	Rufous Whistler			
~	*Phalacrocorax sulcirostris*	Little black Cormorant			
~	*Phalacrocorax varius*	Pied Cormorant			
	Platalea flavipes	Yellow-billed Spoonbill			
	Platalea regia	Royal Spoonbill			
	Podiceps cristatus	Great Crested Grebe			
	Rhipidura leucophrys	Willie Wagtail			
	Tachybaptus novaehollandiae	Australasian Grebe			
	Threskiornis molucca	Australian White Ibis			
	Threskiornis spinicollis	Straw-necked Ibis			
	Todiramphus sanctus	Sacred Kingfisher			
	Tribonyx ventralis	Black-tailed Native Hen			
~	*Trichoglossus haematodus*	Rainbow Lorikeet			
	Tyto javanica	Eastern Barn Owl			
Regular and irregular migratory shorebirds and irregular gulls and terns					
~	*Actitis hypoleucos*	Common Sandpiper		M	
~	*Arenaria interpres*	Ruddy Surnstone		M	
	Calidris acuminata	Sharp-tailed Sandpiper		M	
	Calidris ferruginea	Curlew Sandpiper		M	
~	*Calidris ruficollis*	Red-necked Stint		M	
~	*Charadrius bicinctus*	Double-banded Plover		M	
	Charadrius mongolus	Lesser Sand Plover / Mongolian Plover		M	
	Larus dominicanus	Kelp Gull			
	Limosa lapponica	Bar-tailed Godwit		M	
	Numenius madagascariensis	Eastern Curlew		M	
~	*Pluvialis fulva*	Pacific Golden Plover		M	
	Sterna paradisaea	Arctic Tern			
	Tringa brevipes	Grey-tailed Tattler		M	
~	*Tringa nebularia*	Common Greenshank		M	
Resident and Visitor Marine Birds					
	Daption capense	Cape Petrel			
	Diomedea chrysostoma	Grey-headed Albatross		M	
	Diomedea exulans	Wandering Albatross		VU & M	
	Eudyptes pachyrhynchus	Fiordland Penguin			
	Eudyptes chrysocome	Rockhopper Penguin			
	Halobaena caerulea	Blue Petrel		VU	
	Lugensa brevirostris	Kerguelen Petrel			
	Macronectes giganteus	Southern Giant-petrel		EN & M	
	Morus serrator	Australasian Gannet			
	Pachyptila belcheri	Slender-billed Prion			
	Pachyptila desolata	Antarctic Prion			
	Pachyptila salvini	Salvin's Prion			
	Pachyptila turtur	Fairy Prion			

	Scientific Name	Common name	TSP Act	EPBC Act	Priority
	Pelagodroma marina	White-faced Storm-petrel			
	Pelecanoides urinatrix	Common Diving-petrel			
	Phoebetria fusca	Sooty Albatross		VU & M	
	Procellaria cinerea	Grey Petrel		M	
	Pterodroma lessonii	White-headed Petrel			
	Ptreodroma macroptera	Great-winged Petrel			
	Puffinus gavia	Fluttering Shearwater			
	Thalassarche cauta	Shy Albatross			
	Thalassarche chlororhynchos	Yellow-nosed Albatross			
	Thalassarche melanophris	Black-browed Albatross		VU & M	
	Thalassoica antarctica	Antarctic (silver-grey) Petrel			
Resident introduced non-Australian land birds					
i	*Alauda arvenis*	Skylark			
i	*Callipepla californica*	Californian Quail			
i	*Carduelis carduelis*	European Goldfinch			
i	*Chloris chloris*	Common Greenfinch			
i	*Meleagris gallopavo*	Wild Turkey			
i	*Passer domesticus*	House Sparrow			
i	*Pavo cristatus*	Peacock (Indian Peafowl)			
i	*Phasianus colchicus*	Common Pheasant			
i	*Streptopelia chinensis*	Spotted Turtle-dove			
i	*Sturnus vulgaris*	Common Starling			
i	*Turdus merula*	Common Blackbird			
Mammals					
	Antechinus minimus	Swamp Antechinus			**C**
	Cercartetus nanus	Eastern Pygmy Possum			**B**
<	*Dasyurus maculatus maculatus*	Spotted-tailed Quoll			
i	*Felis catus*	House Cat			
	Macropus rufogriseus	Bennett's Wallaby			
<	*Mirounga leonina*	Southern Elephant Seal			
i	*Mus musculus*	House Mouse			
	Nyctophilus geoffroyi	Lesser Long-eared Bat			**C**
	Nyctophilus gouldi	Gould's Wattled Bat			**C**
	Ornithorhynchus anatinus	Platypus			**B**
	Potorous tridactylus	Long-nosed Potoroo			**C**
	Pseudocheirus peregrinus	Common Ringtail Possum			**D**
	Rattus lutreolus	Swamp Rat			
i	*Rattus rattus*	Black Rat			
	Tachyglossus aculeatus	Echidna			
	Thylogale billardierii	Tasmanian Pademelon			
	Trichosurus vulpecula	Brushtail Possum			
<	*Vombatus ursinus ursinus*	Common Wombat			
Threatened Invertebrate Fauna					
	Austrochloritis victoriae	Southern Hairy Red Snail	v		**B**

APPENDIX 3. THREAT IMPACT RATING

The impact of identified threats on priority species is indicated below. Threats have been given a ranking of A, B, C or D: A = very high impact, B = high impact, C = moderate impact and D = low impact (or threat) to the species.

Threats are discussed in more detail in Chapter 4 of the Plan and in the species profiles in Appendix 5.

Climate change has not been included in the risk matrix, as the types and severity of the change are unknown. As per the Actions identified in Chapter 5 of the Plan, ongoing identification of risk and response strategies will be undertaken within the Plan's implementation. It is presumed that species with particular vulnerability are species that are associated with wet environments, including but not limited to:

Australina pusilla subsp. *muelleri, Callitriche sonderi, Centipeda cunninghamii, Cyathea spp., Epilobium pallidiflorum, Gratiola pubescens, Haloragis myriocarpa, Juncus vaginatus, Lepilaena patentifolia, Myriophyllum muelleri, Senecio psilocarpus, Stuckenia pectinata, Schoenoplectus tabernaemontani, Stylidium spp., Tmesipteris parva, Trithuria submersa, Utricularia tenella,* Green and gold frog, Striped marsh frog, Fairy tern, Little tern, Hooded plover and Orange-bellied parrot.

Table 1. Threat impact rating for priority flora

	Fire	Feral Cats and Rats	Crows	Wallabies	Habitat deg & fragmentation	Weeds	Off-road vehicles coastal	Potential Intro invasive spp.	Domestic Dogs	Tourism	Hunting	Intro fauna	Stochastic events	Pollution	Dieback	Amphibian fungus	Data deficient
Very High Priority																	
Cyathea cunninghamii	B	na	na	na	B	B	na	D	na	na	na	na	A	D	na	na	
Cyathea x *marcescens*	B	na	na	na	B	B	na	D	na	na	na	na	A	D	na	na	
Hypolepis distans	C	na	na	na	A	C	na	D	na	na	na	na	C	C	na	na	
Pneumatopteris pennigera	B	na	na	D	A	C	na	D	na	na	na	D	B	B	na	na	
High Priority																	
Australina pusilla subsp. *muelleri*																	X
Callitriche sonderi																	X
Gratiola pubescens																	X
Pimelea axiflora subsp. *axiflora*	C	na	na	D	B	C	na	D	na	na	na	D	D	C	na	na	
Pterostylis cucullata subsp. *cucullata*	C	na	na	D	A	C	na	D	na	na	na	D	D	D	na	na	
Senecio psilocarpus																	X
Thelymitra malvina																	X
Tmesipteris parva	B	na	na	D	A	C	na	D	na	na	na	D	A	D	na	na	
Medium Priority																	
Atherosperma moschatum	A	na	na	C	B	C	na	D	na	na	na	D	D	D	na	na	
Austrocynoglossum latifolium	C	na	na	na	B	D	na	D	na	na	na	D	D	C	na	na	
Centipeda cunninghamii	D	na	na	D	B	B	na	D	na	na	na	D	C	C	na	na	
Cotula vulgaris var. *australasica*	D	na	na	D	D	D	na	D	na	na	na	D	C	na	na	na	
Cynoglossum australe	D	na	na	D	A	C	na	C	na	na	na	D	D	D	na	na	
Cyrtostylis robusta																	X
Elaeocarpus reticulatus	C	na	na	D	B	C	na	D	na	na	na	D	D	D	na	na	
Epilobium pallidiflorum																	X
Eucalyptus globulus subsp. globulus	A	na	na	B	B	C	na	D	na	D	na	na	D	D	na	na	
Haloragis myriocarpa																	X

	Fire	Feral Cats and Rats	Crows	Wallabies	Habitat deg & fragmentation	Weeds	Off-road vehicles coastal	Potential Intro invasive spp.	Domestic Dogs	Tourism	Hunting	Intro fauna	Stochastic events	Pollution	Dieback	Amphibian fungus	Data deficient
Hedycarya angustifolia	B	na	na	D	B	C	na	D	na	na	na	D	D	D	na	na	
Juncus vaginatus																	X
Lepilaena patentifolia																	X
Leucopogon lanceolatus var. *lanceolatus*	C	na	na	D	B	C	na	D	na	na	na	D	D	D	na	na	
Myriophyllum muelleri																	X
Notelaea ligustrina																	X
Olearia argophylla	A	na	na	C	B	C	na	D	na	na	na	D	D	D	na	na	
Orthoceras strictum																	X
Parietaria debilis	D	na	na	D	A	C	na	D	na	na	na	D	D	D	na	na	
Persicaria decipiens																	X
Phyllangium distylis	B	na	na	D	D	D	na	D	na	D	na	D	D	D	na	na	
Phylloglossum drummondii																	X
Pomaderris paniculosa subsp. *paralia*																	X
Pterostylis sanguinea																	X
Schoenoplectus tabernaemontani	D	na	na	D	B	C	na	D	na	na	na	D	C	C	na	na	
Solanum opacum																	X
Sporobolus virginicus																	X
Stuckenia pectinata																	X
Stylidium beaugleholei	B	na	na	D	D	D	na	D	na	na	na	D	D	D	na	na	
Stylidium despectum	B	na	na	D	D	D	na	D	na	na	na	D	D	D	na	na	
Stylidium perpusillum	B	na	na	D	D	D	na	D	na	na	na	D	D	D	na	na	
Thelymitra holmesii	B	na	na	D	D	D	na	D	na	na	na	D	D	D	D	na	
Triglochin minutissimum	B	na	na	D	D	D	na	D	na	na	na	D	D	D	na	na	
Trithuria submersa																	X
Utricularia tenella	B	na	na	D	D	D	D	D	na	na	na	D	D	D	na	na	
Low Priority																	
Banksia integrifolia																	X
Caladenia pusilla	A	na	na	B	B	B	C	C	na	C	na	C	C	C	na	na	
Hypolepis muelleri	A	na	na	B	B	B	D	C	na	C	na	C	C	C	D	na	
Lachnagrostis scabra subsp. *scabra*	B	na	na	B	B	B	C	C	na	D	na	D	D	D	D	na	
Poa halmaturina	C	na	na	B	B	B	C	C	na	C	na	D	D	D	D	na	
Podotheca angustifolia																	X
Taraxacum cygnorum																	X

Table 2. Threat impact rating for priority vegetation communities

	Fire	Feral Cats and Rats	Crows	Wallabies	Habitat deg & fragmentation	Weeds	Off-road vehicles coastal	Potential Intro invasive spp.	Domestic Dogs	Tourism	Hunting	Intro fauna	Stochastic events	Pollution	Dieback	Amphibian fungus
Very High Priority																
Acacia melanoxylon swamp forest	A	na	na	C	A	B	D	C	na	D	na	C	D	D	na	na
Eucalyptus brookeriana wet forest	A	na	na	C	A	B	D	C	na	D	na	C	D	C	na	na
Eucalyptus globulus King Island forest	A	na	na	C	A	B	D	C	na	D	na	C	D	D	na	na
King Island eucalypt woodland	A	na	na	C	A	B	C	C	na	D	na	C	D	D	C	na
Melaleuca ericifolia swamp forest	A	na	na	C	C	C	C	D	na	D	n/a	C	D	C	na	na
Seabird rookery complex	C	na	na	D	C	C	B	C	na	C	na	C	D	D	D	na
Wetlands	C	na	na	D	A	C	C	C	na	D	na	C	D	C	D	na
High Priority																
Coastal complex on King Island	D	na	na	D	C	C	C	D	na	C	n/a	D	D	D	na	na
Medium Priority																
Coastal heathland	B	na	na	D	C	C	B	D	na	C	na	D	D	D	C	na

Table 3. Threat impact rating for priority fauna

	Fire	Feral Cats and Rats	Crows	Wallabies	Habitat deg & fragmentation	Weeds	Off-road vehicles coastal	Potential Intro invasives spp.	Domestic Dogs	Tourism	Hunting	Intro fauna	Stochastic events	Pollution	Dieback	Amphibian fungus
Very High Priority																
Fairy Tern	D	B	?	D	C	B	A	C	B	B	D	C	B	C	na	na
Green and Gold Frog	C	B	D	D	A	C	C	B	D	D	D	C	C	A	na	A
Hooded Plover	D	B	A	D	C	B	A	C	C	C	D	D	C	C	na	na
King Island Brown Thornbill	A	B	C	D	A	B	D	C	D	D	D	C	B	D	na	na
King Island Scrubtit	A	B	C	D	A	B	D	C	D	D	D	C	B	D	na	na
Little Tern	D	B	?	D	C	B	A	C	B	B	D	C	B	C	na	na
Orange-bellied Parrot	A	B	D	D	A	B	D	C	D	D	D	C	C	D	na	na
Striped marsh Frog	C	B	D	D	A	C	C	B	D	D	D	C	C	A	na	A
White-bellied Sea Eagle	B	D	D	D	A	D	D	C	D	D	C	C	D	D	na	na
High Priority																
Australasian Bittern	A	D	D	D	B	C	D	C	D	D	D	D	C	B	na	na
Black Currawong	C	D	D	D	C	C	D	C	D	D	D	D	D	D	na	na
Eastern Pygmy Possum	A	B	D	D	B	C	D	C	C	D	D	D	D	D	na	na
King Island Green Rosella	A	B	C	D	B	B	D	C	D	D	D	D	C	D	na	na
Platypus	C	D	D	D	C	C	D	C	D	D	D	D	D	B	na	na
Southern Hairy Red Snail	A	D	D	C	B	C	D	B	D	D	D	C	C	C	na	na
Medium Priority																
Dusky Robin	B	B	C	D	B	B	D	C	C	D	D	C	C	D	na	na
Gould's Wattled Bat	A	B	D	D	B	C	D	C	D	D	D	D	D	D	na	na
Lesser Long-eared Bat	A	B	D	D	B	C	D	C	D	D	D	D	D	D	na	na
Long-nosed Potoroo	A	B	D	D	B	C	D	C	C	D	D	D	D	D	na	na
Southern Boobook	B	C	D	D	C	C	D	C	D	D	D	C	C	C	na	na
Swamp Antechinus	A	A	D	D	B	C	D	C	D	D	D	D	D	D	na	na
Yellow-tailed Black-cockatoo	C	C	D	D	C	B	D	C	D	D	D	D	C	D	na	na
Yellow Wattlebird	A	C	D	D	B	B	D	C	C	D	D	D	C	D	na	na
Low Priority																
Brown Goshawk	B	D	D	D	A	D	D	C	D	D	D	D	C	C	na	na
Common Ringtail Possum	A	C	D	D	C	C	D	C	C	D	D	C	D	D	na	na
Golden-headed Cisticola	B	B	C	D	B	D	D	C	D	D	D	D	C	D	na	na
Nankeen Kestrel	B	D	D	D	C	D	D	C	D	D	D	D	C	D	na	na
Nankeen Night Heron	A	D	D	D	B	D	D	C	D	D	D	D	C	D	na	na
Painted Button-quail	A	B	D	D	B	C	D	C	C	D	D	C	C	C	na	na
Tasmanian Tree Skink	C	B	D	D	B	C	C	C	D	D	D	C	D	C	na	na

APPENDIX 4. MAJOR WEED SPECIES ON KING ISLAND

Following are brief descriptions of the location and impacts of major weed species on King Island. Much of the information has been sourced from North (2003). The first 20 species are declared weeds under the Tasmanian *Weed Management Act 1999*. The first 6 of these are also Weeds of National Significance. Weeds 22 to 38 are identified as priorities in the *King Island Weed Management Strategy* (North 2003). Three additional weeds (39–41) were identified by DPIPWE botanists in 2007 and 2009.

1. Bridal creeper (*Asparagus asparagoides*)
Known from three locations across the Island, Bridal creeper forms a thick mat of underground tubers that impede the root growth of other plants, preventing seedling establishment. It invades undisturbed habitats and is a major threat to shrub communities. Plants can produce more than 1000 berries per square meter and fruits are widely dispersed by wildlife (DEH 2008).

2. Boneseed (*Chrysanthemoides monilifera*)
Populations have been recorded from around Currie, including Council reserves and coastal habitat. Small infestations have also been recorded from Reekara and Grassy. Boneseed is capable of completely dominating the habitat it invades. Plants live for ten to twenty years, producing more than 50 000 seeds annually and fruits are readily dispersed by native and exotic fauna (Muyt 2001).

3. Serrated tussock (*Nassella trichotoma*)
Isolated infestations are known from Red Hut Point, Boulder Hill and Colliers Swamp in the southeast. Serrated tussock is adapted to a range of soil and fertility conditions. Mature plants develop a drooping smothering form, eventually excluding other ground species. Large vigorous plants can produce 100 000 seeds annually with some remaining viable for up to fifteen years (Muyt 2001)

4. Blackberry (*Rubus fruticosus* aggregate)
Infestations are localised to a few road sides on Fraser, North Pegarah, Ridges and Reekara roads. Blackberry forms dense impenetrable thickets that exclude all native vegetation. Thickets grow along watercourses and can eventually destabilise areas, they provide protection for pest animals and have the potential to increase the risk of fire in infested areas (Muyt 2001). Blackberry is recognised as a threat to a number of vegetation communities on the Island including *Acacia melanoxylon* swamp forest, *Eucalyptus globulus* King Island forest, and *Melaleuca ericifolia* swamp forest.

5. Willow (*Salix* sp.)
Infestations are localised along selected rivers, including Sea Elephant and Loorana rivers. Willows compete vigorously for space, water and nutrients, eliminating all indigenous vegetation within an infestation. They alter the shape of banks, streambeds and channels through the capture of significant amounts of sediments (Muyt 2001).

6. Gorse (*Ulex europaeus*)
There are extensive infestations of gorse on a number of properties and roadsides throughout the Island. Gorse forms dense, impenetrable thickets that eventually exclude native vegetation. It acidifies soils and produces nitrogen rich leaf litter that has the potential to alter the nutrient composition of soil. Infestations can produce up to 10 000 seeds per square metre, that can remain viable for up to thirty years (Muyt 2001).

7. Crow garlic (*Allium vineale*)
Small crow garlic infestations have been reported from roadsides. Crow garlic is a pasture weed and has the potential to contaminate milk, meat and grain with an onion odour. It reproduces by bulbs that can remain dormant for several years (AWC 2008b).

8. Onion weed (*Asphodelus fistulosus*)
Onion weed infestations have been reported from roadsides across the Island and are also known from rough pasture in the Yellow Rock area. Onion weed occurs typically in disturbed areas or overgrazed pastures but does not dominate in well maintained pastures. Onion weed has the potential to invade much of the dry coastal vegetation on the Island (DPI 2008d).

9. African thistle (*Berkheya rigida*)

A small infestation has been reported from the refuse disposal site and Camp Creek Reserve, both in Currie. African thistle is a stiff, spiny, perennial herb, preferring lighter, sandy soils and can invade agricultural areas (DPIW 2008a).

10. Slender thistle (*Carduus* sp.)
A single infestation of slender thistle is known from Pearshape quarry. Slender thistle is a strong competitor found in pasture, waste areas and arable crops (Hyde-Wyatt & Morris 1975).

11. Pampas grass (*Cortaderia* sp.)
Pampas grass populations are associated with mine sites in Grassy and Naracoopa. It is also used as a hedging plant in parts of the northern half of the Island. A population of closely-related *Cortaderia richardii* (toe-toe) is known from around the scheelite mine at Grassy. Pampas grasses are aggressive colonizers of disturbed or open sites. They form dense stands that exclude most other ground-flora, seriously impeding overstorey recruitment. Individual flower heads can contain up to 100 000 seeds, that can be dispersed several kilometres away by strong winds (Muyt 2001).

12. English broom (*Cytisus scoparius*)
A small infestation is known from Pegarah Road. English broom is a highly invasive species with the capabilities to totally transform the invaded habitat. It simplifies the structure and diversity of existing floral assemblages. Seeds are explosively dispersed; reaching up to 4.5 m from the parent plant and can remain dormant in the soil for up to twenty years (Muyt 2001).

13. Datura (*Datura* sp.)
There is a historical record of *Datura* sp. from an old house near Pass River, but recent surveys failed to find the infestation. Daturas are herbs that produce trumpet-shaped flowers. They can cause severe or fatal poisoning in humans and stock and have the potential to become significant crop weeds (DPIW 2008c).

14. Prickly jacks (*Emex australis*)
Historically it was known from Charles Street, Currie, but recent surveys have failed to find the infestation. Recent reports indicate its presence on at least a couple of farms. Prickly jacks is a fast growing erect, spreading annual herb. It is a common pasture weed and infestations can be very dense. The spines on the fruits have the potential to harm animals and humans (University of Qld 2008).

15. Spanish heath (*Erica lusitanica*)
A localised but intensive infestation is located in the Grassy township, around several residences and in adjacent bushland. Spanish heath is capable of completely dominating the shrub canopy, preventing virtually all regeneration. Plants reach sexual maturity in three to four years and can live for up to forty years. Each fruit can contain up to 100 seeds, with each plant typically producing nine million seeds annually (Muyt 2001).

16. Montpellier broom (*Genista monspessulana*)
A large infestation is located around the scheelite mine at Grassy and smaller infestations are found along Pegarah Road and around Currie. Montpellier broom infestations are capable of forming dense thickets on grazing land, in native vegetation and on roadsides, preventing regeneration. Germination is stimulated by fire, which breaks the dormancy of soil-stored seed, resulting in dense infestations of seedlings. The seeds of canary broom are ejected with force from the pod and may be dispersed several metres from the parent plant and then further locally dispersed by ants (DPI 2008a).

17. Oneleaf cape tulip (*Moraea flaccida*)
Several large infestations have established at Naracoopa, Camp Creek, and coastal reserves around Currie. Oneleaf cape tulip commonly invades a range of sunny native vegetation communities including dry coastal heathland and heathy woodland, lowland grassland and grassy woodland, dry sclerophyll forest and woodland and freshwater wetland vegetation. Plants take up to three years to reach maturity and can produce 1200 seed annually (DPI 2008c).

18. African boxthorn (*Lycium ferocissimum*)
Boxthorn was one of the first weeds introduced to the Island as a hedging plant. Today it is common in the northern and western parts of the Island. Infestations have spread into coastal vegetation, mutton bird colonies and adjacent paddocks. Boxthorn has been listed as a threat in the national recovery plan for the Orange–bellied parrot (OBPRT 2006). It is also recognised as a threat to a number of vegetation

communities on the Island including *Melaleuca ericifolia* swamp forest (NME) and *Eucalyptus globulus* King Island forest (WGK). African boxthorn shades and crowds out other vegetation preventing regeneration. It is an incredibly tough species and is adapted to a range of climatic conditions. Individual plants can produce thousands of fruits annually, each containing at least twenty seeds (Muyt 2001).

19. White horehound (*Marrubium vulgare*)
Infestations have been reported from Lavinia State Reserve and isolated farming properties. White horehound is a non-woody perennial plant that invades swampy areas such as the edges of lakes, rivers and creeks, showing a preference for disturbed areas. It spreads almost entirely by rhizomes, but plants can also produce millions of tiny spores that need constantly moist environments to germinate (CRC for Australian Weed Management 2008).

20. Ragwort (*Senecio jacobaea*)
Ragwort is an occasional but locally abundant weed of pasture and adjacent bushland. There are notable infestations in Lavinia State Reserve. Ragwort is a major agricultural weed, found in open sunny locations. Perennial plants generate several cabbage-like leaf clusters and seed heads which produce more than 100 000 seeds annually.

21. Triangular garlic (*Allium triquetrum*)

Infestations are located at Bell Hill, Camp Creek and other areas in Currie. Angled onion is a persistent species capable of totally dominating the ground storey. It occurs in seasonally moist, fertile soils and is common in sheltered, shady settings. Dense stands smother and crowd out any competing ground plants, impeding any ground or over story regeneration.

22. Marram grass (*Ammophila arenaria*)
Infestations are spread widely across dune systems. Marram grass was historically used as a dune stabiliser for coastal rehabilitation. It spreads rapidly along coastal fringes preventing natural regeneration. Marram grass has been listed as a threat in the national recovery plan for the Orange–bellied parrot (OBPRT 2006).

23. Capeweed (*Arctotheca calendula*)
Isolated populations are found in paddocks and on roadsides correlating with sandy soils. Capeweed is a pasture weed, smothering grass and clover in dry areas, dominating young and established pastures (DPIW 2008b).

24. Mirror bush (*Coprosma repens*)
Mirror bush is widespread across the Island. Originating from hedges and gardens it has radiated out along roadsides and into native remnants. Mirror bush is a hardy adaptable species; plants are tolerant of salt laden winds and highly variable water availability. Infestations usually establish and are spread by birds (Muyt 2001). Mirror bush is recognised as a threat to a number of vegetation communities on the Island including *Melaleuca ericifolia* swamp forest and *Eucalyptus globulus* King Island forest.

25. Montbretia (*Crocosmia* x*crocosmiiflora*)
Small infestations can be found along Pegarah and Grassy roads. Montbretia is an aggressive invader of moist, fertile areas. It forms extensive closed stands, crowding out native species. Plants produce hundreds of seeds annually and sprout new foliage from corms in early spring. Its vigour makes it a successful invader of moist fertile areas (Muyt 2001).

26. Cape ivy (*Delairea odorata*)
Infestations are associated with African boxthorn (*Lycium ferocissimum*) across the Island. Cape ivy forms dense smothering curtains over herbaceous plants, preventing regeneration. They commonly reach sexual maturity after two years and larger plants are capable of producing upwards of 40 000 seeds annually (Muyt 2001).

27. Pyp grass (*Ehrharta villosa*)
Infestations are rare but can be found at various near-coastal sites in the Island's south. Pyp grass was introduced to King Island as a dune stabiliser in the 1950s (L. Sullivan pers. comm.). It is grown as a sand-binder and has the potential to dominate dune systems, preventing regeneration of native species (DECCW 2008b).

28. Sea spurge (*Euphorbia paralias*)

Sea spurge is wide spread throughout coastal areas of the Island. Sea spurge is a perennial with a long taproot. The thirty to fifty-five centimeter long stems die after flowering and are replaced by new shoots from the root crown. Vigorous three or four year old plants can produce up to 100 stems in a season and between 25-80 fruits per stem, which correlates to over 20 000 seeds per plant per year. It is a rapid coloniser of coastal dunes. Sea spurge has been listed as a threat in the national recovery plan for the Orange–bellied parrot (OBPRT 2006).

29. Ivy (*Hedera helix*)
Ivy is a garden escapee and can be found around most residential areas. It is a slow growing vine, however once established it can potentially eliminate most native vegetation. Plants are found in seasonally moist, sunny or shaded areas. Ivy is recognised as a threat to a number of vegetation communities on the Island including *Melaleuca ericifolia* swamp forest and *Eucalyptus globulus* King Island forest.

30. Holly (*Ilex aquifolium*)
Small infestations can be found in remnant vegetation along Grassy Road. Dense thickets commonly shade out competing native vegetation, preventing regeneration. Plants reproduce by seed and re-shoot vigorously when top growth is damaged or cut down.

31. Honeysuckle (*Lonicera japonica*)
Small patches are found on roadsides around Pegarah, and the species is also known from Camp Creek in Currie. Honeysuckle is a garden escapee, favouring shady moist areas.

32. Tree lupin (*Lupinus arboreus*)
A localised population is known from the scheelite mine in Grassy and Camp Creek in Currie. Tree lupin is a bushy shrub with sweet smelling yellow flowers. It is a dune stabiliser, potentially modifying coastal environments. Reproduction is by seeds that are explosively dispersed from pods (Pickart 2008).

33. Asparagus fern (*Asparagus scandens*)
Extensive infestations are located at Grassy Creek, Pegarah, Lymwood and Naracoopa and Camp Creek in Currie. Asparagus fern is a perennial twining vine. It is an aggressive plant, producing underground tubers that form dense impenetrable mats. Seeds are widely dispersed by birds. It competes with native plants for nutrients, light and space (DLWBC 2006).

34. Banana passionfruit (*Passiflora tarminiana*)
Localised populations can be found around Naracoopa and Grassy. Banana passionfruit is a highly invasive, fast growing species in damp or seasonally moist areas. Once in the canopy vines have the propensity to spread laterally through the foliage. Trailing stems from dense, layered mats smothering other ground flora (Muyt 2001).

35. Cape wattle (*Paraserianthes lophantha* subsp. *lophantha*)
Small localised populations occur in and around Grassy. Cape wattle is an aggressive species capable of dominating invaded habitats. Dense stands will shade out understorey vegetation, preventing regeneration. It commonly establishes along disturbed bushland margins before invading adjacent undisturbed areas. Mature plants produce thousands of seeds annually that can remain dormant for up to ten years (Muyt 2001).

36. Blue butterflybush (*Psoralea pinnata*)
Blue butterflybush is most likely a garden escapee and can be found in patches around Grassy, Naracoopa and Pegarah. Plants commonly establish along disturbed bushland before invading adjacent undisturbed areas. They reach sexual maturity within three years and can live for ten to fifteen years. Mature plants are capable of producing thousands of seeds annually that can remain dormant for up to eight years (Muyt 2001). Blue butterflybush is recognised as a threat to a number of vegetation communities on the Island including *Melaleuca ericifolia* swamp forest and *Eucalyptus globulus* King Island forest.

37. Blue periwinkle (*Vinca major*)
Infestations can be found at Bell Hill, Cape Wickham Lighthouse and Currie. Periwinkle favours fertile soils and most reproduction in Australia appears to be vegetative. It forms dense intertwined mats that smother and exclude native vegetation (Muyt 2001).

38. Arum lily (*Zantedeschia aethiopica*)

Infestations are found along roadsides, wet native remnants, near homesteads and in Pegarah State Forest. A common garden plant, that is known to be toxic to stock and humans, favouring damp soils and stream banks, becoming a serious weed. Seeds germinate readily, but do not remain viable from year to year (AWC 2008a).

39. Bristle poppy (*Papaver aculeatum*)
Small infestations of bristle poppy are known from the northern sections of Lavinia State Reserve and to the north of Granite Lagoon on Crown land.

40. Winter cherry (*Solanum pseudocapsicum*)
Winter cherry is known from a small infestation in paperbark swamp forest along the Pass River to the east of North Road. Winter cherry is a garden escapee that can invade damp sclerophyll forest and riparian vegetation. It is a weed of disturbed areas, rough pasture and along bushland edges (DPI 2008b).

41. Red ink-weed *(Phytolacca octandra)*
Red ink-weed is known to be extensive along the lower reaches of the Fraser River, where it appears to have originated from a garden planting. The species is a native of Tropical America, has bird-dispersed fruit and has the potential to invade riparian vegetation (Walsh 1996).

APPENDIX 5. SPECIES PROFILES

Profiles for selected species rated a 'very high' or 'high' priority for management on King Island (Table 2) are provided. Further information can be obtained from: the DPIPWE website (threatened species under the TSP Act): http://www.dpipwe.tas.gov.au/threatenedspecieslists, or the DSEWPaC Species Profile and Threats Database (for all species) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

Seven flora profiles are provided, for 'very high' or 'high' priority species with sufficient data. These are in alphabetical order by scientific name: *Cyathea cunninghamii*, *Cyathea* x *marcescens*, *Hypolepis distans*, *Pimelea axiflora*, *Pneumatopteris pennigera*, *Pterostylis cucullata* and *Tmesipteris parva*. Five high priority flora species, *Australina pusilla* subsp. *muelleri*, *Callitriche sonderi*, *Gratiola pubescens, Senecio psilocarpus* and *Thelymitra malvina*, are considered 'data deficient' (Appendix 3).

Nine fauna profiles are provided, for 'very high' or 'high' species listed as threatened or Migratory under the EPBC Act. These are in alphabetical order by scientific name: *Acanthornis magna greeniana* (King Island Scrubtit), *Acanthiza pusilla archibaldi* (King Island Brown Thornbill), *Botaurus poiciloptilus* (Australasian Bittern), *Haliaeetus leucogaster* (White-bellied Sea Eagle), *Litoria raniformis* (Green and Gold Frog), *Neophema chrysogaster* (Orange-bellied Parrot), *Sternula albifrons sinensis* (Fairy Tern), *Sternula nereis nereis* (Little Tern), and *Thinornis rubricollis* (Hooded Plover).

Cyathea cunninghamii (slender treefern)

Description

Cyathea cunninghamii is a tall treefern in the Cyatheaceae family with a slender trunk and small crown (Plate 1). Recruitment is from spores, with plants reaching maturity at an age of 25–30 years.

Cyathea cunninghamii has an erect trunk to 20 m tall and 8–10 cm diameter, coated towards the base with adventitious roots; stipe bases are persistent above, crumbly. Fronds are 1.5–3 m long and form a relatively small crown; stipes short, coarse, black, dull, with numerous, very small, sharp tubercles; scales (at base of stipe) papery, shiny, pale fawn to light brown (often with dark central streaks), 1–4 cm long, ovate to linear with hair points, each with a dark seta at the tip. Lamina dark green, sub-triangular to sub-lanceolate, 3-pinnate with pinnae shorter near the stipe; primary and secondary pinnae narrowly oblong with secondary pinnae decreasing abruptly to linear tips; lower surface of rachises with scattered scales (usually membranous and flat, with a terminal seta). Pinnules sessile with adjacent, broad bases continuous, margins shallowly toothed when sterile, and deeply lobed when fertile; lower surface of veins with tiny, colourless, stellate hairs. Sori are arranged in two rows on the lower surface of the pinnules with one sorus per lobe; indusium prominent, deeply but incompletely cup-shaped with a notch towards its margin, membranous, dark at centre of base. On drying the cup may split and appear as two slightly concave half cups (Duncan & Isaac 1986).

Confusing Species: Trunk, stipe, pinnule and indusium characters may be used to distinguish *Cyathea cunninghamii* from the allied taxa *Cyathea australis* and *Cyathea* x *marcescens*. *Cyathea cunninghamii* has a trunk at maturity of <20 cm in diameter, scales at the base of its stipes are often streaked, pinnules that are petiolate, and sori with large cup-like indusia. The other two taxa have trunk diameters >20 cm, scales at the base of stipe that are varnished, pinnules that are joined to the rachis, and an indusium that is semi-circular for *Cyathea* x *marcescens* and absent for *Cyathea australis* (Duncan & Neyland 1986, Forest Practices Board 2003). The three species also mature at different heights: *Cyathea australis* when <1 m, *Cyathea* x *marcescens* 1–1.5 m, and *Cyathea cunninghamii* when >3 m. *Cyathea cunninghamii* and *Cyathea* x *marcescens* also tend grow close to watercourses, while *Cyathea australis* usually occurs higher up the slopes (Garrett 1996).

In the genus *Cyathea* the frond butts (= stipe bases) have hard protuberances and are covered in long chaffy scales, while sori are situated on the forks of veins away from the edges of the pinnules. For the other common treefern in Tasmania, *Dicksonia antarctica*, the frond butts are smooth and are clad with fine soft reddish-brown hairs, and the sori are marginal (Duncan & Isaac 1986, Garrett 1996).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Not listed
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 1. *Cyathea cunninghamii* habit
(Photograph: Oberon Carter)

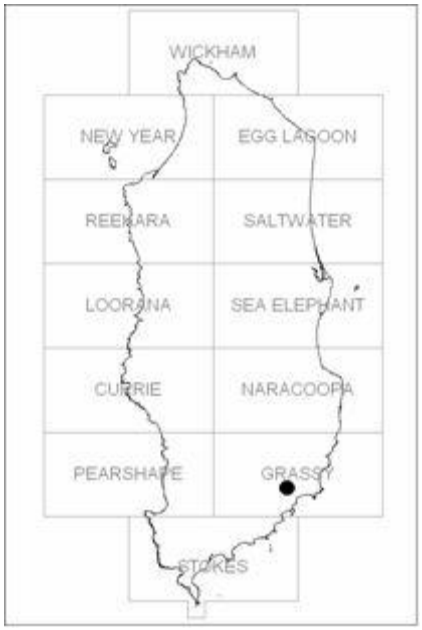

Figure 1. *Cyathea cunninghamii*: King Island distribution

Existing Conservation Measures

Extension surveys of suitable habitat on King Island were undertaken in 2007 and 2009 by TSS personnel as part of threatened flora verification projects funded by the NRM Regions.

Distribution and Habitat

Cyathea cunninghamii occurs in Tasmania, Victoria (from the Otways across into East Gippsland) and Queensland's Lamington National Park (Duncan & Isaac 1986; Walsh & Entwisle 1994). The species is noted as being locally common in New Zealand (Brownsey & Smith-Dodsworth 1989).

In Tasmania *Cyathea cunninghamii* has been recorded from sheltered fern gullies within a few km of the coast at altitudes less than 150 m above sea level. The largest stands are at Lower Marsh Creek in the northeast and Dalco Creek in the south. The linear range of the known extant sites in Tasmania is 480 km, with an extent of occurrence c. 70,000 km² (which includes large areas of unsuitable habitat), and an area of occupancy c. 20–25 ha.

On King Island *Cyathea cunninghamii* is known from a tributary of the Grassy River (Figure 1), where it grows within a deep fern gully dominated by *Acacia melanoxylon* (blackwood). Associated species include *Hedycarya angustifolia* (Australian mulberry), *Pomaderris apetala* (dogwood), *Cyathea australis* (rough treefern), *Cyathea* x *marcescens* (skirted treefern) and *Dicksonia antarctica* (soft treefern).

Populations

Cyathea cunninghamii is known from eighteen extant subpopulations in Tasmania, with a total of about 250 mature plants (Threatened Species Section 2011b). The subpopulation on King Island is thought to consist of a solitary mature plant (5 m high) and two immature plants (1 m apart) about 100 m downstream (Table 1). The known subpopulation, and any new subpopulations found, are considered important for the survival of the species.

Habitat critical to the survival of the species

Habitat critical to the survival of *Cyathea cunninghamii* on King Island includes the known site and nearby potential habitat, as represented by all creeklines within the Grassy River catchment.

Table 1. Population summary for *Cyathea cunninghamii* on King Island

	Location	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of mature plants (& juveniles)
1	Grassy River	Private	Cradle Coast	Grassy	2007 (1990)	0.1	1 (2)

Reservation Status

Cyathea cunninghamii is reserved within Tasman National Park, Little Beach State Reserve, Hastings Caves State Reserve, the Southwest Conservation Area and Lower Marsh Creek Forest Reserve.

Threats and Management

Land clearance and a high fire frequency are likely to have been major contributors to the loss of habitat for *Cyathea cunninghamii* on King Island since European settlement. Drying conditions on King Island associated with climate change is also likely to impact adversely on the species through a further diminution of habitat, as evidenced in recent years by widespread mortality in the treeferns *Cyathea australis* and *Dicksonia antarctica*, and the wholesale loss of epiphytic ferns (Wapstra *et al.* 2009).

Large trunk-forming ferns such as *Cyathea cunninghamii* are susceptible to physical damage due to a range of disturbances, e.g., flash flooding, storm damage, fire, and the direct impact of stock. The latter is not considered an issue on King Island as the only known site is surrounded by stock-proof fencing. However, any activities that disturb the upper catchments of the creek systems in which *Cyathea cunninghamii* occurs will potentially increase the likelihood of such physical destruction, with an unknown impact on recolonisation opportunities due to changes in deposition and scouring levels.

Infestations of *Asparagus scandens* (asparagus fern) are known from the upper reaches of the creekline in which *Cyathea cunninghamii* occurs. The extent of the asparagus fern is unknown, and it is not clear if it has the capacity to compromise the *Cyathea* site, but until demonstrated otherwise it should be treated as a potential threat to the species.

Cyathea cunninghamii does not become fertile until 25–30 years old (Garrett 1996). The Grassy River site is thought to support a single mature trunked plant (5 m high) and two juveniles (c. 5–7 years old), and in consequence the species faces a very high stochastic risk of extinction.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of the known subpopulation and areas of potential habitat;
- Identify the Grassy River site as a fire-exclusion zone within the King Island Wildfire Management Plan and, in the event of wildfire, where practicable take measures to protect the site;
- Negotiate with landholders to ensure the Grassy River site is protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Ensure the known site is secure from cattle and check the condition of existing fences annually;
- Determine the extent and impact of asparagus fern in the vicinity of the known site and treat as required;
- Investigate the feasibility of propagating slender treefern plants from spores collected from the Grassy River site and supplementing the wild population;
- Monitor the known site annually to determine the level of recruitment and/or plant loss; if monitoring identifies a decline, then adopt an adaptive management approach to minimise the impacts of threats.

Cyathea x *marcescens* (skirted treefern)

Description

Cyathea x *marcescens* is a tall treefern in the Cyatheaceae family with a thick trunk and massive crown (Plate 2), known in Tasmania from three near-coastal fern gullies. It was described as a separate species by Wakefield (1942), but is now considered to be a sterile hybrid between *Cyathea australis* and *Cyathea cunninghamii* (Duncan & Isaac 1986, Garrett 1996). *Cyathea* x *marcescens* has been retained as a distinct taxon due to its relatively consistent morphology wherever it occurs (Walsh & Entwisle 1994).

Cyathea x *marcescens* has an erect trunk to 8 m tall and 30 cm diameter. Stipe bases are persistent above, with a skirt of pendent, dead fronds sometimes present. Fronds are 3–5 m long and form a large crown; stipes are 20–30 cm long, coarse, black and shiny, with sharp conical protuberances; scales (at base) are coarse and glossy-brown, almost opaque but with fragile edges, 2–6 cm long and tapering, each with a dark red seta at the tip. Lamina mid-green to dark green, paler below, sub-triangular, 3-pinnate with pinnae slightly shorter near the stipe; primary and secondary pinnae narrowly oblong with shortly acuminate tips; lower surface of rachises with scattered scales. Pinnules attached by their full breadth, slightly decurrent, margins shallowly toothed to lobed. Sori in two rows on the pinnules, spherical, conspicuous; indusium membranous, almost semi-circular, slightly concave, pale with a dark centre and an irregular margin (Duncan & Isaac 1996).

Confusing Species: *Cyathea* x *marcescens* displays typical hybrid vigour in terms of frond length and the overall size of pinnules and sori when compared to its parents *Cyathea australis* and *Cyathea cunninghamii* (Duncan & Isaac 1986, Garrett 1996 & 1997, Bostock 1998a). Stipe and indusium characters may be used to distinguish *Cyathea* x *marcescens* from *Cyathea australis* and *Cyathea cunninghamii*. *Cyathea* x *marcescens* has scales at the base of its stipes that are varnished and dark brown, and its sori have a semi-circular indusium. *Cyathea australis* shares the varnished stipe base scales but they tend to be brown, while the indusium is absent. *Cyathea cunninghamii* has stipe base scales that are often streaked, and a large cup-shaped indusium (Duncan & Neyland 1986, Forest Practices Board 2003).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Not listed
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 2. *Cyathea* x *marcescens* crown
(Photograph: Richard Schahinger)

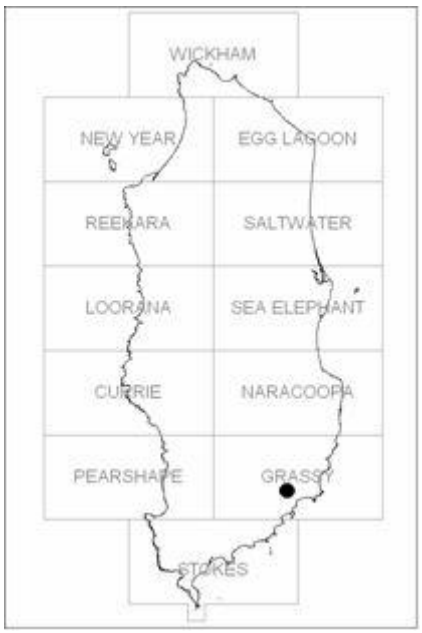

Figure 2. *Cyathea* x *marcescens*: King Island distribution

Existing Conservation Measures

Cyathea x *marcescens* is listed as a priority taxon requiring consideration in the development of the private land component of the Tasmanian CAR reserve system (DPIWE 1998), though no properties have been targeted to date. Extension surveys of suitable habitat on King Island were undertaken by TSS personnel in 2007 as part of a threatened flora verification project funded by the NRM Regions.

Distribution and Habitat

Cyathea x *marcescens* is known in Victoria from 'rainforest jungles' about Mount Drummer and Combienbar, the Tarra Valley in South Gippsland, and the Otway Ranges (Walsh & Entwisle 1994).

Cyathea x *marcescens* was first discovered in Tasmania in 1984 in a forested gully near Elephant Pass in the state's northeast (at Lower Marsh Creek). The taxon was later found at nearby Little Beach Creek, and also on a tributary of the Grassy River on King Island (Figure 2), with an additional site located near Fortescue Bay in early 2010 (Threatened Species Section 2011c). The linear range of the four extant sites in Tasmania is 470 km, the extent of occurrence c. 33,000 km² (which includes extensive areas of sea and unsuitable habitat), and area of occupancy c. 0.2 ha.

On King Island *Cyathea* x *marcescens* is known only from a tributary of the Grassy River, where it grows within a deep fern gully dominated by *Acacia melanoxylon* (blackwood). Associated species include *Hedycarya angustifolia* (austral mulberry), *Pomaderris apetala* (dogwood), *Cyathea australis* (rough treefern), *Cyathea cunninghamii* (slender treefern) and *Dicksonia antarctica* (smooth treefern).

Populations

All known subpopulations of *Cyathea* x *marcescens,* and any new subpopulations found, are considered important for the survival of the taxon in Tasmania. There are four extant subpopulations, with fewer than 40 'mature' plants in total (Table 2). The solitary site on King Island is known to support two trunked individuals separated by about 100 m, the plants being 4 and 6 m high, respectively (as at February 2007).

Habitat critical to the survival of the species

Habitat critical to the survival of *Cyathea* x *marcescens* on King Island includes the known site and nearby potential habitat, as represented by all creeklines within the Grassy River catchment.

Reservation Status

Cyathea x *marcescens* is reserved within Lower Marsh Creek Forest Reserve and Little Beach State Reserve.

Table 2. Population summary for *Cyathea* x *marcescens* in Tasmania

	Location	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of 'mature' plants
1	Lower Marsh Creek	Forest Reserve	North	Piccaninny	1996 (1984)	–	24
2	Little Beach Creek	State Reserve	North	Ironhouse	2006 1980s	–	10
3	Grassy River	Private	Cradle Coast	Grassy	2007 (1990)	0.0001	2
4	Fortescue Bay	State Forest	South	Hippolyte	2010 (2010)	0.0001	2

Threats and Management

The long-term future of *Cyathea* x *marcescens* on King Island is linked inextricably to that of its parents *Cyathea australis* and *Cyathea cunninghamii,* and the availability of microsites suitable for germination. As noted in the preceding section, the latter species is known on King Island from a single mature individual and two juvenile plants in the Grassy River catchment. The threats noted for *Cyathea cunninghamii* on King Island are equally applicable to *Cyathea* x *marcescens*.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of the known subpopulation and areas of potential habitat;
- Identify the Grassy River site as a fire-exclusion zone within the King Island Wildfire Management Plan and, in the event of wildfire, where practicable take measures to protect the site;
- Negotiate with landholders to ensure the Grassy River site is protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Ensure the known site is secure from cattle and check the condition of existing fences annually;
- Determine the extent and impact of asparagus fern in the vicinity of the known site and treat as required;
- Monitor the known site annually to determine the level of recruitment and/or plant loss; if monitoring identifies a decline, then adopt an adaptive management approach to minimise the impacts of threats.

Hypolepis distans (scrambling groundfern)

Description

Hypolepis distans is a terrestrial fern in the Dennstaedtiaceae family. It is known in Australia from Tasmania's northwest, including King Island. Recruitment appears to be primarily from rhizomes. The species' distinctive leaf venation and habit allows it to be identified in the absence of fertile material.

Hypolepis distans has a creeping, slender rhizome that is covered in dark, red-brown hairs. Its erect herbaceous fronds are distributed along the rhizome, and are 30–60 cm long; stipe fine and rough, red-brown, glossy, with sparse hairs. Lamina mid-green in colour, oblong-lanceolate, bipinnate (to tripinnate) with distant pinnae, opposite (or nearly so) and almost perpendicular to the axis. The lowermost pinnae are frequently dead before those near the tip have matured; rachis red-brown, grooved, sparsely hairy. Pinnae are rather distant and subopposite; pinnules oblong with lobed margins, the veins ending in slight indentations. Sori conspicuous, arranged in two rows on the larger pinnules, spherical, each partly protected by the membranous, reflexed, irregular margin of a lobe (Duncan & Isaac 1986).

The common name of scrambling groundfern refers to the species' habit of scrambling up through surrounding vegetation (to a height of 2 or 3 m) or forming tangled mounds, a consequence of its rather weak stipes (Plate 3).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: Endangered

Tasmanian *Threatened Species Protection Act 1995*: endangered

Plate 3. *Hypolepis distans*: scrambling habit
(Photograph: Richard Schahinger)

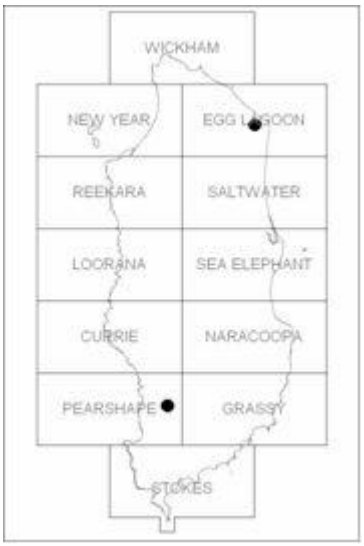

Figure 3. *Hypolepis distans*: King Island distribution

Existing Conservation Measures

Hypolepis distans is listed as a priority species requiring consideration in the development of the private land component of the Tasmanian reserve system (DPIWE 1998). Attempts by the Private Forest Reserves Program to negotiate a conservation covenant for the Deep Lagoons subpopulation on King Island have been unsuccessful to date. However, the site was fenced in 2009 to exclude cattle as part of a threatened flora recovery project funded by the Cradle Coast Authority (Wapstra *et al.* 2009).

In 2004–2005, as part of an NRM-funded project, surveys of known and suspected sites on King Island were undertaken and pertinent management issues identified (Schahinger 2005).

Distribution and Habitat

Hypolepis distans occurs in Tasmania and New Zealand (Duncan & Isaac 1986; Brownsey & Smith-Dodsworth 1989). The species was considered to be endemic to New Zealand until its discovery in 1973 at the margins of Nook Swamps in the far northeastern corner of King Island (Chinnock 1976), with three additional sites located in Tasmania's northwest in the late 1980s and early 1990s (Neyland 1988 & 1989, Garrett 1997). A further site was found at Deep Lagoons on King Island in the early 2000s (Schahinger 2005), and two further sites were discovered on mainland Tasmania in 2008 (with an unconfirmed sighting near Blowhole Creek on King Island in 1997). The linear range of the known extant sites in Tasmania is 175 km, the extent of occurrence 4,300 km^2 (which includes large areas of sea) and the area of occupancy 2.5–3 ha.

On King Island *Hypolepis distans* has been recorded from *Melaleuca squarrosa–Leptospermum scoparium–Acacia melanoxylon* scrubland bordering *Melaleuca ericifolia* swamp forest (Nook Swamps site), and disturbance-induced *Baloskion tetraphyllum* sedgeland within a dune-barred swamp (Deep Lagoons site) (Figure 3). The elevation of the Nook Swamps site is <10 m above sea level and Deep Lagoons 105 m. Soils at both sites are high in organic matter with moderate to poor drainage, while the sites are in areas of moderate rainfall (mean annual figure of about 650 mm at Nook Swamps and about 1000 mm at Deep Lagoons).

Populations

All known subpopulations of *Hypolepis distans,* and any new subpopulations found, are considered important for the survival of the species. There are seven confirmed *Hypolepis distans* subpopulations in Tasmania, two of them on King Island, with the total number of mature individuals estimated to be in the order of 500–1000 (Table 3).

Habitat critical to the survival of the species

Habitat critical to the survival of *Hypolepis distans* on King Island includes the two known sites and areas of potential habitat as represented by wet scrubs adjacent to swamp forests.

Reservation Status

Hypolepis distans is reserved within Lavinia State Reserve.

Table 3. Population summary for *Hypolepis distans* on King Island

	Location	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of mature plants #
1	Nook Swamps	Lavinia State Reserve	Cradle Coast	Egg Lagoon	2007 (1973)	0.4	c. 200
2	Deep Lagoons	Private	Cradle Coast	Pearshape	2009 (2001)	1.0	40–50

= numbers approximate only due to species' rhizomatous nature.

Threats and Management

Threats to *Hypolepis distans* on King Island include:

- land clearance;
- drainage of habitat;
- peat fires.

Substantial areas of King Island have been cleared and drained since European settlement, primarily for the production of dairy cattle (Pannell 1992, Barnes *et al.* 2002). The net result has been the loss and fragmentation of suitable habitat for *Hypolepis distans*. One of the two known sites on King Island occurs on private land and remains at a low risk from land clearance.

The hydrology of the two King Island sites has been affected to an unknown degree, the Nook Swamps site by the drainage of Egg Lagoon Swamp to its west in the early part of the 20th century (Jennings 1959), and the Deep Lagoons site by the relatively recent clearance of surrounding native vegetation and construction of drainage channels.

Fire may impact negatively on *Hypolepis distans*, especially if underlying peat is destroyed. In such cases all below ground tissues and mycorrhizal symbionts may be killed (Wein 1981), thereby confining sources of regeneration to unburned areas. The Nook Swamps subpopulation was partially burnt in January 2001 and again in February–March 2007: the relatively wet conditions in 2001 meant that the fire did not impact upon the underlying peat at the known site and the species recovered rhizomatously (Schahinger 2005). The 2007 fire occurred under extremely dry soil conditions, and extensive areas of peat in Nook Swamps were destroyed (RMCD 2007; Corbett & Corbett 2010). Fortunately, the *Hypolepis distans* site survived the 2007 fire, possibly as a consequence of subtle changes in drainage at the Nook's northern end (Plate 4).

Plate 4. *Hypolepis distans* site at the northern end of Nook Swamps
(Photograph looking south in late March 2007: Richard Schahinger)

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat;
- Identify the Nook Swamps site as a fire-exclusion zone within the King Island Wildfire Management Plan and, in the event of wildfire, where practicable take measures to protect the site;
- Negotiate with landholders to ensure the Deep Lagoons site is protected. Encourage the landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Maintain the stock-proof fence at the Deep Lagoons site — check condition annually;
- Survey areas of suitable habitat (e.g., the Blowhole Creek area) and, should new subpopulations be located, identify and address any threatening issues;
- Monitor the known sites biennially to determine the level of recruitment and/or plant loss; if monitoring identifies a decline in subpopulations, then adopt an adaptive management approach to minimise the impacts of threats.

Pimelea axiflora subsp. *axiflora* (bootlace bush)

Description

Pimelea axiflora subsp. *axiflora* is a woody shrub in the Thymelaeaceae family. Within Tasmania the species is known only from King Island. The tough bark of the species was used by early settlers in Victoria for bootlaces, hence the common name.

Pimelea axiflora subsp. *axiflora* is an open, erect or gracefully arching shrub to 6 m high. Its stems are reddish and mostly hairless, though younger stems may be pubescent. Leaves are narrow, dark green (paler below) and hairless, and 2.5 to 9 cm long. They are arranged opposite each other along the stem and have a prominent midrib and veins on their underside. The species is dioecious, with male and female flowers on separate plants. The male (staminate) flowers are tubular, 3 to 4 mm long, white or cream in colour and hairy on the outside, and have two protruding stamens. The female (pistillate) flowers are smaller, the tube having short erect lobes that enlarge and persist around the dry fruit. The flowers occur in sessile clusters of 4 to 8 in the leaf axils. Flowers are surrounded by small, green or brown papery bracts. The fruit opens to release small seeds. [Description from Curtis 1967 and Entwisle 1996]

Pimelea axiflora subsp. *axiflora* has been observed to recruit in the absence of fire, and is thought to be an obligate seeder. Butterflies and long-tongued flies are the most likely pollination vector for the species. The species flowers from June to December, peaking in September and November, though it may be identified at any time of year due to its distinctive habit and foliage (Plate 5).

Confusing species: *Pimelea axiflora* subsp. *axiflora* may be confused with *Pimelea drupacea*. The latter is a straggly shrub to 3 m high, with flowers in terminal clusters and succulent black fruit. No other subspecies of *Pimelea axiflora* occur in Tasmania.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Not Listed
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 5. *Pimelea axiflora* subsp. *axiflora*: habit
(Photograph: Richard Schahinger)

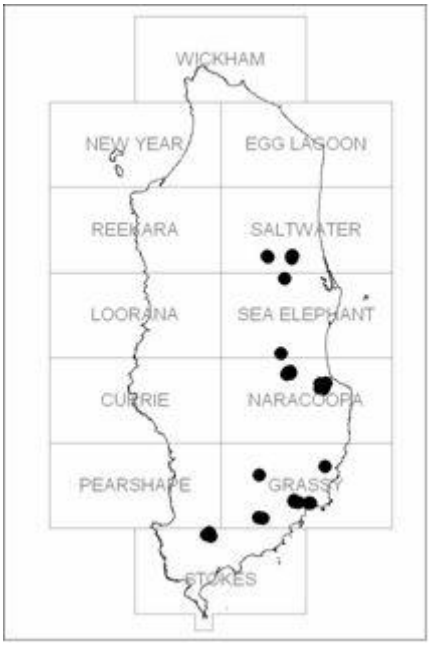

Figure 4. *Pimelea axiflora*: King Island distribution

Existing Conservation Measures

Surveys of the Seal River, Grassy River, Yarra Creek, Pegarah State Forest and Naracoopa areas were undertaken by TSS personnel in 2007 and 2009 as part of flora verification projects funded by the Cradle Coast Authority (Wapstra *et al.* 2009). The surveys revealed the presence of large subpopulations near Naracoopa and along the Seal River, the latter mostly within an area proposed to become a Conservation Area.

The response of the species to fire has been monitored by personnel with DPIPWE's Private Land Conservation Program (Reekara Road subpopulation). The results indicate that the species is likely to be an obligate seeder.

Distribution and Habitat

On mainland Australia *Pimelea axiflora* subsp. *axiflora* occurs in Victoria and New South Wales (Entwisle 1996). In Tasmania the species is restricted to King Island (Figure 4), where it grows as an understorey shrub in wet eucalypt forest and in damp environments along watercourses. *Eucalyptus globulus*, *Eucalyptus viminalis* or *Eucalyptus brookeriana* may be the dominant eucalypt, overtopping a relatively open small tree/tall shrub layer of *Pomaderris apetala*, *Acacia melanoxylon* and *Melaleuca ericifolia*. Smaller shrubs include *Bursaria spinosa* and *Pimelea drupacea*, while the ground layer is typically species poor, with *Australina pusilla* subsp. *pusilla, Clematis aristata*, *Ehrharta stipoides* and *Pteris tremula,* and in less mesic conditions *Pteridium esculentum*. The altitude range of known sites is 30 to 120 m above sea level and the underlying geology is mostly Precambrian sandstones/siltstones, but also includes Quaternary sediments and Devonian granite.

Within Tasmania the species has a linear range of about 35 km, an extent of occurrence of 260 km^2, and an area of occupancy of about 6 to 7 ha.

Populations

Pimelea axiflora subsp. *axiflora* is known from twelve subpopulations on King Island (Table 4). Mature plant numbers are available for six of the subpopulations, with about 2000 plants in total.

The earliest King Island collection of *Pimelea axiflora* subsp. *axiflora* held by the Tasmanian Herbarium is from 1966. Several of the known subpopulations were uncovered during Bushcare surveys of private land in 1998, and it is considered likely that additional stands will be discovered given a concerted survey effort.

Habitat critical to the survival of the species

Habitat critical to the survival of *Pimelea axiflora* subsp. *axiflora* on King Island includes known sites and their immediate catchments.

Reservation Status

Pimelea axiflora subsp. *axiflora* is not known from any formal reserve in Tasmania. One subpopulation on King Island occurs within a 'river reserve' that has been recommended to become a Conservation Area under the Tasmanian *Nature Conservation Act 2002* (CLAC Project Team 2005a), while another occurs on private property that is covered by a conservation covenant under the same Act (Table 4).

Table 4. Population summary for *Pimelea axiflora* subsp. *axiflora* on King Island

	Subpopulation	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area of occupancy (ha)	Number of mature plants
1	Seal River	Private & Crown Land *	Cradle Coast	Stokes	2009 (2007)	1.2	200–300
2	Mount Stanley	Private	Cradle Coast	Grassy	1966 (1966)	unknown	unknown
3	Grassy River	Private	Cradle Coast	Grassy	2007 (1998)	1–2	100–200
4	Grassy (scheelite mine)	Private	Cradle Coast	Grassy	2006 (2005)	0.000001	2
5	Lymwood	Private	Cradle Coast	Grassy	1976 (1976)	unknown	unknown
6	Yarra Creek	Private	Cradle Coast	Grassy	1998 (1998)	unknown	unknown
7	Naracoopa	Private	Cradle Coast	Grassy	2009 (2009)	2.0	1000–1500
8	Yates Creek	State Forest & Private	Cradle Coast	Naracoopa	2007 (2003) 2009 (2009)	0.05 2.0	10 60
9	Fraser River	Private	Cradle Coast	Sea Elephant	1998 (1998)	unknown	unknown
10	Sea Elephant River	Private	Cradle Coast	Sea Elephant	2007 (1998)	unknown	unknown
11	Reekara Road (east of Sea Elephant Hills)	Private #	Cradle Coast	Saltwater	2012 (2002)	0.03	>200
12	Houfes Road (west of Sea Elephant Hills)	Private	Cradle Coast	Saltwater	2001 (1998)	unknown	unknown

* Recommended to become a Conservation Area under the Tasmanian *Nature Conservation Act 2002* (CLAC Project Team 2005a); # Covered by a conservation covenant under the *Nature Conservation Act 2002*.

Threats and Management

Pimelea axiflora subsp. *axiflora* is threatened by land clearance, browsing by stock, inappropriate fire frequencies and climate change.

Land clearance: About 70% of King Island's native vegetation has been cleared since European settlement (Barnes *et al.* 2002, Finzel 2004), including significant areas of the species' preferred habitat, viz., wet eucalypt forest. *Eucalyptus globulus* King Island forest is now listed as a threatened vegetation community under the Tasmanian *Nature Conservation Act 2002*, and as such its clearance is not permitted unless approved under exceptional circumstances.

Stock: *Pimelea axiflora* subsp. *axiflora* has been noted as being very palatable to stock — Barnes *et al.* (2002) suggest that areas where this species occurs should be managed as stock-free zones. All sites observed on private land have had stock-proof fencing in place, so this is considered a potential threat only.

Fire: The species grows within wet eucalypt forest that requires at least 30 years between fires to maintain the defining species (Pyrke & Marsden-Smedley 2005). More frequent fires have the potential to degrade the species' habitat. The time to attain reproductive maturity for *Pimelea axiflora* subsp. *axiflora* is unknown, but it might be expected to in the order of 5–10 years. Successive fires within such a time scale have the potential to eliminate the species.

Climate change: A reduction in rainfall associated with global climate change may lead to a diminution of suitable habitat and exacerbate the risk of fire to the species.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location,

significance and management of known subpopulations and areas of potential habitat;

- Surveys to determine the species' full extent on King Island — this should include determining the status of all reported but undescribed subpopulations, and the identification of management issues;
- Negotiate with landholders to ensure the Naracoopa and Grassy River sites are protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Ensure known sites are secure from cattle and check the condition of existing fences annually;
- Seek formal reservation of areas of Crown land that support the Seal River subpopulation;
- Identify known sites as fire-exclusion zones within the King Island Wildfire Management Plan and, in the event of wildfire, where practicable take measures to protect the sites;
- Monitor known sites biennially to determine the level of recruitment and/or plant loss; if monitoring identifies a decline in subpopulations, and then adopt an adaptive management approach to minimise the impacts of threats.

Pneumatopteris pennigera (lime fern)

Description

Pneumatopteris pennigera is a robust erect, tufted fern in the Thelypteridaceae family, with old plants occasionally forming a small trunk to 1 m high. The species is known in Tasmania from several sites in the northwest and King Island, where it occurs on alluvial flats and the banks of rivers and creeks. Recruitment is primarily from spores, with the occasional plant shooting from the base or lower sections of trunks of old or dying specimens. The species can be identified at any time of year due its distinctive leaf venation (Duncan & Isaac 1986).

Pneumatopteris pennigera has an erect to oblique rhizome covered with broad, brown scales. Fronds are tufted, erect, 40–110 cm long; stipe shorter than lamina, slightly succulent, glabrous, flattened above with a shallow groove; scales near base broadly ovate with attenuate tips, scales also scattered along stipe. Lamina light green to mid-green, oblong-lanceolate, pinnate with pinnae deeply lobed, membranous to herbaceous, almost glabrous. Pinnae more-or-less oblong with lower 3 to 4 pairs reduced in length and well separated; pinnae cut obliquely (to about halfway) into broad, rounded lobes with slightly crenate margins; lobes pinnately veined with the lowest veins from adjacent lobes uniting to form a single excurrent vein. Sori usually copious, unprotected, in two rows, nearer mid-vein than margin (Plate 6).

Confusing species: None.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Not Listed
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 6. *Pneumatopteris pennigera*: habit
(Photograph: Matthew Larcombe)

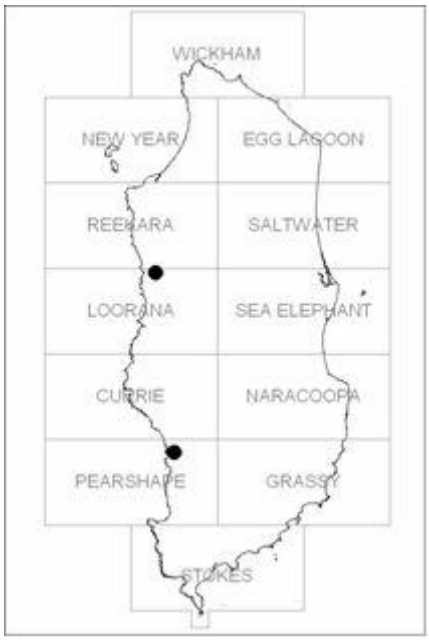

Figure 5. *Pneumatopteris pennigera*: King Island distribution

Existing Conservation Measures

Pneumatopteris pennigera is listed as a priority species requiring consideration in the development of the private land component of the Tasmanian CAR reserve system (DPIWE 1998). The two subpopulations on King Island occur within Public Reserves that are being considered for Nature Reserve status under the Tasmanian *Nature Conservation Act 2002* (CLAC Project Team 2005b).

Targeted surveys for the species were undertaken by TSS personnel in 2007 and 2009 under the auspices of an NRM-funded threatened flora project (Larcombe & Garrett 2009, Wapstra *et al.* 2009).

Distribution and Habitat

Pneumatopteris pennigera occurs in Tasmania, Victoria and Queensland, and is also known from New Zealand (Duncan & Isaac 1986, Bostock 1998b). Like other species in the family Thelypteridaceae, *Pneumatopteris pennigera* is a terrestrial or swamp fern. In Australia the species occurs primarily on calcareous soils, hence its common name, whereas in New Zealand it shows no such affinity.

Pneumatopteris pennigera is very rare in Victoria, having been first 'discovered' in the Otways as recently as 1943, and is currently known from the Glenelg River region in the State's far southwest, and near Port Campbell (Duncan & Isaac 1986, Walsh & Entwisle 1994). In New Zealand *Pneumatopteris pennigera* is reportedly common near streams in lowland forest (Brownsey & Smith-Dodsworth 1989).

Until recently, the largest *Pneumatopteris pennigera* population in Tasmania occurred at Copper Creek (a tributary of the Duck River in the State's northwest), with smaller stands along two creeks flowing into the Arthur River, and along the lower reaches of the Ettrick and Pass Rivers on King Island (Figure 5). *Pneumatopteris pennigera* was collected from the Duck River and Mole Creek areas in the early 1900s, though searches by fern enthusiasts in the period since have failed to relocate these sites. The linear range of extant sites in Tasmania is 165 km, with an extent of occurrence 3,900 km^2 (which includes large areas of sea), and an area of occupancy of less than 2.5 ha.

On King Island the species grows on riverbanks, where it is strongly associated with limey springs. At the Ettrick River site it occurs under a canopy of *Leptospermum lanigerum* (woolly teatree), with *Pteris tremula* (tender brake), *Blechnum chambersii* (lance waterfern), *Blechnum wattsii*, (hard waterfern), *Lastreopsis acuminata* (shiny shieldfern), *Tetragonia implexicoma* (bower spinach) and *Carex appressa* (tall sedge).

Populations

There are five extant *Pneumatopteris pennigera* subpopulations in Tasmania, and a further two historic records. All known subpopulations, and any new subpopulations found, are considered important for the survival of the species in Tasmania. The extant subpopulations support a total of about 350 plants (Table 5). The Copper Creek subpopulation has declined from 2500 to 55–70 plants since the mid 2000s (Larcombe & Garrett 2009), while the more southerly of the three Arthur River stands could not be relocated during TSS surveys in 2005 and 2009 and is presumed to be extinct. The reasons for these declines remain unknown, though drought, hydrological changes and possibly thrip infestations have been suggested as causal factors (Larcombe & Garrett 2009). The Pass River subpopulation on King Island is also close to extinction, supporting only five plants in badly degraded habitat, and is not considered viable (Garrett 1997).

Table 5. Population summary for *Pneumatopteris pennigera* in Tasmania

	Subpopulation	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of plants
1	Copper Creek	Private	Cradle Coast	Lileah	2009 1996 (1948?)	0.5 5–6	55–70 > 2500
2	Arthur River (north)	Conservation Area	Cradle Coast	Bluff	2011 (1996)	< 1	150–170
3	Sawards Creek (Arthur River)	Conservation Area	Cradle Coast	Bluff	2011 (2005)	< 0.1	60–70
4	Ettrick River (King Island)	Public Reserve	Cradle Coast	Pearshape	2009 (1966)	< 0.1	38
5	Pass River (King Island)	Public Reserve	Cradle Coast	Loorana	2007 (1960s?)	0.00001	5
6	Arthur River (south)	Conservation Area	Cradle Coast	Bluff	1996 (1980s)	–	Presumed extinct
7	Mole Creek	Private	North	Mole Creek	1907? (1907?)	–	Presumed extinct

Reservation Status

Pneumatopteris pennigera is reserved within the Arthur-Pieman Conservation Area.

The two subpopulations on King Island, Ettrick River and Pass River, are within Public Reserves that have been recommended for Nature Reserve status under the *Nature Conservation Act 2002* (CLAC Project Team 2005b). Each reserve proposal included the following caveat: 'It is recommended that the reserve not be proclaimed until, where there is no practical alternative, any necessary and suitable access points or arrangements, and impact protection measures to allow for stock watering have been identified. This will require on-site inspection.' The proclamation process also hinges upon the resolution of outstanding financial issues between the Tasmanian Government and the reserves' future land managers, the Tasmanian Parks and Wildlife Service: as at December 2009 the status quo prevails.

Threats and Management

The major threats to the *Pneumatopteris pennigera* subpopulations on King Island are land clearance, dam construction and other hydrological changes, cattle trampling and weed invasion. Climate change and stochastic events also pose a threat to the species.

The clearance of vegetation adjacent to and upstream of the species' riparian habitat may lead to an increase in flood events, higher nutrient and sediment loadings, weed invasion and possible herbicide contamination. The Ettrick River subpopulation, which consists of three patches of plants spread over about one kilometre, has been under threat in recent years from a proposed dam several hundred metres upstream of the site — subsequent changes to river flows are likely to have an impact on the fern's recolonisation opportunities due to changes in deposition and scouring levels. Land clearance and dam construction are considered to be moderate potential threats to the species.

Trampling by cattle is an ongoing issue for the Pass River and Ettrick River sites on King Island, with clear signs of disturbance at the latter site in early 2009 (Wapstra *et al.* 2009). The river reserves that support the species are typically 50 m wide, and are mostly unfenced. This issue was partly addressed in early 2010, with fencing now in place along sections of the Ettrick River's southern bank.

The Pass River site has been overrun by dense infestations of the weedy grass *Festuca arundinacea* (tall fescue). The subpopulation at this site is not considered viable due to the level of habitat degradation and the very low plant numbers (with just 5 plants spread over 4 m).

The small size of the subpopulations on King Island means that the risk of extinction from stochastic events is high, while drying conditions associated with climate change may lead to a diminution of available habitat for the species.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat;
- Maintain the stock-proof fences along the Ettrick River — check condition annually and repair as required;
- Negotiate with landholders to ensure that vegetation to the north and south of the Ettrick River subpopulation is protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Investigate the feasibility of propagating plants from spores collected from the Ettrick River site and supplementing the wild population;
- Monitor the Ettrick River subpopulation annually to determine the level of recruitment and/or plant loss; if monitoring identifies a decline in the subpopulation, then adopt an adaptive management approach to minimise the impacts of threats.

Pterostylis cucullata (leafy greenhood)

Description

Pterostylis cucullata is a terrestrial orchid known from near-coastal calcareous dunes in Tasmania's northwest and King Island (Jones 2006). It has a loose basal rosette of large dark-green, elliptical leaves, and a flowering stem up to 12 cm tall with a solitary semi-nodding flower (Plate 7). The species is best identified during its peak flowering period, October to November. Plants die back to an underground tuber in summer, with new leaves appearing in early winter

Pterostylis cucullata has 5 to 7 fleshy dark green leaves in a loose, stem-encircling basal rosette. The leaves are oblong to elliptical, 40 to 100 mm long and 15 to 30 mm wide. The solitary, semi-nodding flower is 35 to 40 mm long and 20 to 25 mm wide, on a stout stem, 5 to 12 cm tall, with the uppermost leaf sheathing the base of the flower. The flowers are green, white and dark reddish brown. The hood is curved forward in a semicircle with the shortly hairy, lateral sepals, loosely embracing the hood. The lateral sepals are fused at the base, with the free ends often curved and 9 to 12 mm long. The labellum is dark brown, oblong and 14 to 17 mm long, and is shortly curved near the apex (Jones *et al.* 1999, Jones 2006).

Taxonomic Issues: *Pterostylis cucullata* consists of three taxa (Jones 2006; DEWHA 2009): a short subspecies extant in near-coastal areas of Tasmania and Victoria (subsp. *cucullata*), a tall subspecies from forests in inland Victoria and South Australia (subsp. *sylvicola*), and a yet to be described subspecies from Barrington Tops, New South Wales.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Vulnerable
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Pterostylis cucullata sens. lat. was listed as Vulnerable on the EPBC Act in 2000 and endangered on the TSP Act in 2002. Several *Pterostylis cucullata* subsp. *cucullata* subpopulations have been discovered in Tasmania in the interim, including mainland Tasmania (in late 2002, previously thought to be extinct) and the first record for Flinders Island (in 2005).

Plate 7. *Pterostylis cucullata*: flower and leaf detail
(Photograph: Richard Schahinger)

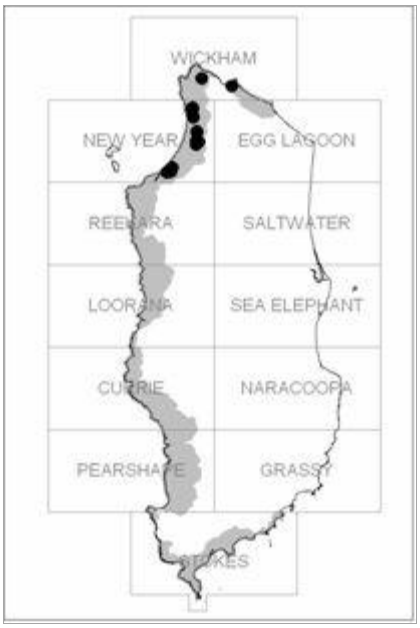

Figure 6. *Pterostylis cucullata:* King Island distribution
(overlain on the Yellow Rock land system)

Existing Conservation Measures

Baseline surveys of known sites in Tasmania were conducted in 2002 as part of an NHT-funded Tasmanian Orchid Recovery Project (Dalgleish & Schahinger 2006).

Extension surveys of suitable habitat were undertaken in 2007–2008 as part of threatened flora projects funded by the NRM Regions. Target areas included the Arthur-Pieman Conservation Area, King Island, Three Hummock Island and Flinders Island. The surveys revealed the presence of significant new subpopulations on King and Three Hummock Islands, and increased the number of known plants in the Arthur-Pieman Conservation Area. Additional surveys were undertaken in 2009 as part of a DEWHA-funded threatened flora project, targeting King Island's Yellow Rock land system; the surveys included areas on the following 1:25000 mapsheets: Wickham, New Year, Egg Lagoon, Reekara, Loorana, Currie, Pearshape and Stokes (Figure 6). New subpopulations were limited to the species' previously known range between Cape Wickham and the Yellow Rock River (Threatened Species Section 2009).

Distribution and Habitat

On mainland Australia *Pterostylis cucullata* subsp. *cucullata* occurs in southern Victoria where it is considered to be extremely rare, and in South Australia where it is thought to be extinct (Jones 2006; EPBC Act website, January 2009).

In Tasmania *Pterostylis cucullata* subsp. *cucullata* is known from near-coastal areas in the northwest, including King Island, Hunter Island and Three Hummock Island, with an outlying occurrence on Flinders Island. There are also nineteenth century records from the north coast at Circular Head and George Town, though these sites are now presumed to be extinct.

On King Island *Pterostylis cucullata* subsp. *cucullata* grows on near-coastal calcareous dunes and sand-sheets associated with the 16,800 ha Yellow Rock land system (Figure 6; Richley 1984), generally within or close to the margins of mature closed scrub dominated by *Leptospermum laevigatum* (coast teatree). Associated species include *Leucopogon parviflorus* (coast beardheath), *Poa* spp. (tussock grasses) and herbs such as *Dichondra repens* (kidney weed). Sites are typically sheltered, with seasonally damp but well-drained humus-rich sandy loams, often with moss and deep leaf litter. Flowering plants typically comprise about 10% of any given colony, with fewer flowers in more exposed situations.

In Tasmania the species grows within an altitude range of 10 to 30 m above sea level. It has a linear range of 350 km, an extent of occurrence of 31,400 km^2 (which includes large areas of sea), and an area of occupancy of perhaps 80 ha.

Populations

Pterostylis cucullata is known from at least 16 extant subpopulations in Tasmania, with a total of around 10,000 to 11,000 plants. All known subpopulations, and any new subpopulations found, are considered important for the survival of the species in Tasmania.

The 5 subpopulations delineated on King Island appear to be the most extensive in Tasmania (Table 6), with an absolute count of over 6,500 individuals in 2008–2009 (Branson 2008b; TSS surveys in 2009). These appear to represent the vestiges of a meta-population stretching from Cape Wickham in the north to Yellow Rock River in the south (with much of the area still to be surveyed).

Habitat critical to the survival of the species

Habitat critical to the survival of *Pterostylis cucullata* on King Island includes all known sites, as well as potential habitat, the latter represented by stands of coast teatree scrub within the Yellow Rock land system between Cape Wickham and the Yellow Rock River.

Reservation Status

Pterostylis cucullata is reserved within Arthur-Pieman Conservation Area, Hunter Island Conservation Area and Three Hummock Island State Reserve.

Table 6. Population summary for *Pterostylis cucullata* on King Island

	Subpopulation	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen #	Area of occupancy (ha) ^	Number of plants
1	Rocky Point	Private	Cradle Coast	Wickham	2009 (2009)	–	1
2	Cape Wickham	Private	Cradle Coast	Wickham	2009 (1998)	1	1700–1900
3	Yellow Rock north	Private	Cradle Coast	New Year	2008 (2008)	5	2000
4	Yellow Rock middle	Private	Cradle Coast	New Year	2009 (2009)	27	1700
5	Yellow Rock south	Private	Cradle Coast	New Year	2009 (1998)	21	1060

first collected from King Island in the late 19th century;
^ Area of occupancy taken to be the subpopulation's extent of occurrence.

Threats and Management

The greatest potential threat to the known *Pterostylis cucullata* subpopulations on King Island is land clearance. Cattle trampling has the potential to have a local impact, as does weed invasion and the White Italian Snail. Climate change also poses a threat to the species.

Land clearance: About 70% of the vegetation of the Yellow Rock land system has been cleared since European settlement for agricultural purposes, with the loss of an unknown number of plants. About half of the remaining vegetation is considered to be potential habitat for the species in the form of scrubs dominated by *Leptospermum laevigatum*. All known subpopulations are on private land and remain at risk from land clearance — this is considered to be a moderate potential threat.

Cattle grazing: Cattle grazing and associated activities may lead to physical trampling of the species, as well as causing dune destabilisation, nutrient enrichment and the introduction of weeds. Cattle continue to be an issue for the Cape Wickham and some of the Yellow Rock subpopulations.

Weed invasion: *Asphodelus fistulosus* (onion weed) is present in low numbers in rough pastures adjacent to some of the Yellow Rock subpopulations. It is unclear if onion weed has the capacity to grow in the shaded conditions favoured by *Pterostylis cucullata*, but in the first instance a precautionary approach should be adopted. Onion weed is a declared weed in Tasmania: DPIWE (2003) describes its distribution on King Island as consisting of 'Isolated occurrences', the stated goal of management being to 'Eradicate existing infestations and prevent future occurrences'.

White Italian Snail: The introduced White Italian Snail (*Theba pisana*) has been observed eating *Pterostylis cucullata.*

Climate change: A reduction in rainfall associated with global climate change may lead to a diminution of habitat suitable for the species, as well as promoting the spread of weeds such as *Asphodelus fistulosus.*

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat;
- Negotiate with landowners in the Yellow Rock area to ensure at least two subpopulations are formally protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Encourage landowners to fence off vegetation supporting the species to prevent damage by stock;

- Survey areas of suitable habitat in the Yellow Rock land system and, should new subpopulations be located, identify and address any threatening issues;
- Determine the extent and impact of onion weed and White Italian Snail in the vicinity of known subpopulations and treat if deemed necessary. Measures to eradicate onion weed or White Italian Snail should be considered by the King Island Natural Resource Management Group in a whole-of-island context;
- Monitor known subpopulations biennially to determine the level of recruitment and/or plant loss; if monitoring identifies a decline in subpopulations, and then adopt an adaptive management approach to minimise the impacts of threats.

Tmesipteris parva (small forkfern)

Description

Tmesipteris parva is a small fern in the Psilotaceae family, known in Tasmania from Flinders Island and King Island. The species occurs in sheltered gullies, where it grows on the trunks of treeferns. Reproduction is by spore.

Tmesipteris parva is a pendulous epiphyte, typically less than 10 cm long, with an unbranched green stem (Plate 8; Duncan & Isaac 1986). Leaves are flattened into one plane and are crowded along the stem (4 to 5 per cm). Leaves are 9 to 14 mm long, soft to firm, simple, gently curved and lanceolate, with acute to shortly pointed tips. The fertile region of the plant may be near the tip, middle, or towards the base of the stem. A capsule-like structure consisting of two fused sporangia (= synangium) occurs at the tip of a short lateral branch, in the axil of paired, leaf-like appendages that are smaller and narrower than the sterile leaves. The synangium is thick-walled, brown and brittle, splitting across the top. Spores are numerous.

Confusing species: *Tmesipteris parva* may be distinguished from the other forkferns in Tasmania, *Tmesipteris obliqua* and *Tmesipteris elongata,* by its rounded synangia, its relatively short stems and small crowded leaves (Duncan & Isaac 1986, Garrett 1996).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Not Listed
Tasmanian *Threatened Species Protection Act 1995*:	vulnerable

Plate 8. *Tmesipteris parva*: habit
(Photograph: Matthew Larcombe)

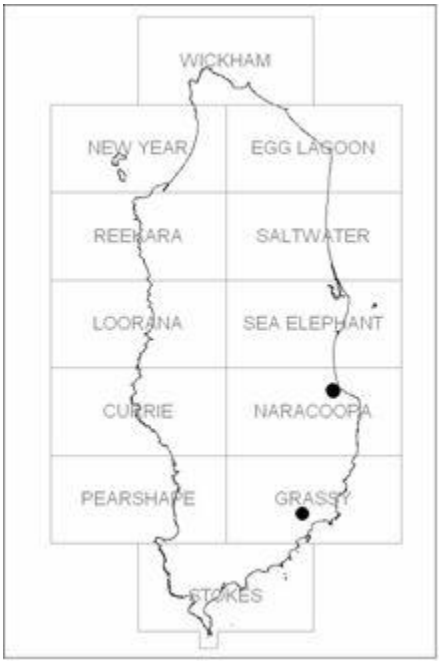

Figure 7. *Tmesipteris parva*: King Island distribution

Existing Conservation Measures

Targeted surveys for *Tmesipteris parva* were conducted on King Island by TSS personnel during 2007–2009 under the auspices of NRM-funded threatened flora verification projects (Wapstra *et al.* 2009).

Tmesipteris parva is listed as a priority species requiring consideration in the development of the private land component of the Tasmanian reserve system (DPIWE 1998).

Distribution and Habitat

Tmesipteris parva occurs in Tasmania, Victoria, New South Wales and Queensland (Garrett 1996), and also reportedly from the Philippines (Duncan & Isaac 1986, Walsh & Entwisle 1994).

Within Tasmania *Tmesipteris parva* has been recorded from Bob Smiths Gully on Flinders Island (Schahinger 2009), and two sites on King Island (Figure 7; Garrett 1996, Chinnock 1998). The linear extent of the three sites in Tasmania is 350 km, the extent of occurrence 2,800 km^2 (which includes large areas of sea) and the area of occupancy less than 1 ha.

On King Island *Tmesipteris parva* grows within fern gullies on the trunks of *Dicksonia antarctica* (soft treefern). The underlying substrate geology is Precambrian sandstones/siltstones, and the altitude range is about 30 to 50 m above sea level.

Populations

All known subpopulations of *Tmesipteris parva,* and any new subpopulations found, are considered important for the survival of the species in Tasmania. There are thought to be only two extant subpopulations in Tasmania, one on Flinders Island and one on King Island (along a creek near Naracoopa) (Table 7). The status of the other recorded site on King Island (Grassy River) is uncertain — surveys in 2007 failed to locate the species and it is considered likely that it may be extinct as a consequence of long-term drought (Wapstra *et al.* 2009).

Habitat critical to the survival of the species

Habitat critical to the survival of *Tmesipteris parva* on King Island includes the two known sites and the creekline vegetation within their catchments.

Table. 7. Population summary for *Tmesipteris parva* in Tasmania

	Subpopulation	Tenure	NRM region	1:25000 mapsheet	Year last (first) seen	Area occupied (ha)	Number of plants
1	Bob Smiths Gully	Strzelecki National Park	North	Loccota	2008 (1990)	0.6	c. 1600
2	Naracoopa	Private	Cradle Coast	Naracoopa	2009 (1970?)	0.000001	10 (single host)
3	Grassy River	Private	Cradle Coast	Grassy	1970?	Unknown	Possibly extinct

Reservation Status

Tmesipteris parva is reserved within Strzelecki National Park on Flinders Island.

Threats and Management

Threats to *Tmesipteris parva* on King Island include land clearing and associated impacts, inappropriate fire regimes, drying conditions associated with climate change, and stochastic events.

Land clearing: The known *Tmesipteris parva* sites are both on private land, and are potentially at risk from the clearance of vegetation adjacent to the species' creekline habitat, with resultant changes in hydrology, and damage to host plants by stock. All sites on private land have stock-proof fencing in place, so stock is considered a potential threat only. Clearance of vegetation is considered to be a very low potential threat, as most remaining vegetation is along deeply incised creeklines.

Inappropriate fire regimes, drought and climate change: A high fire frequency is likely to be deleterious to *Tmesipteris parva.* This scenario might have been considered unlikely in the past given the fire-protected nature of its fern gully habitat. However, drought over the past 10–15 years has caused

widespread mortality in treeferns in gullies and creeks across King Island, the consequence being a diminution of habitat for *Tmesipteris parva* and an increased likelihood of fire (Wapstra *et al.* 2009). Epiphytic ferns have all but disappeared from King Island as a result of the drought, with the probable extinction of *Tmesipteris parva* from the Grassy River catchment. Drying conditions associated with climate change would in all likelihood exacerbate these trends.

Stochastic risk: The small size of the extant subpopulation near Naracoopa, with just ten plants on a single treefern, means that the stochastic risk of endangerment is extremely high.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat;
- Surveys to determine the species' full extent on King Island — this should include determining the status of the reported site in the Grassy River catchment, and the identification of management issues;
- Negotiate with landholders to ensure that the Naracoopa and Grassy River sites are protected. Encourage landholders to consider protection of habitat through a vegetation management agreement or conservation covenant under the Tasmanian *Nature Conservation Act 2002*;
- Ensure known sites are secure from cattle and check the condition of existing fences annually;
- Identify known sites as fire-exclusion zones within the King Island Wildfire Management Plan and, in the event of wildfire, where practicable take measures to protect the sites;
- Monitor known subpopulations biennially to determine the level of recruitment and/or plant loss; if monitoring identifies a decline in subpopulations, and then adopt an adaptive management approach to minimise the impacts of threats.

Acanthiza pusilla archibaldi (King Island Brown Thornbill)

Description

Brown Thornbills (*Acanthiza pusilla*) occur in south-eastern mainland Australia and Tasmania. The King Island Brown Thornbill (*Acanthiza pusilla archibaldi*) is a subspecies and differs from the Tasmanian mainland subspecies, *Acanthiza pusilla diemensis,* by having a distinctly longer bill, 16.2 mm compared to 11–13 mm (Bryant & Jackson 1999).

Acanthiza pusilla archibaldi is a small bird, 9 to 11.5 cm long and weighing about 7 grams, with a russet-brown forehead with indistinct pale scalloping, red eyes, olive-brown upperparts, a grey-brown tail with a dark band near the end, and off-white underparts with bold blackish streaks on the chin, throat and breast (Plate 9). Sexes appear the same, but males are possibly larger than females (Bryant & Jackson 1999). Brown Thornbills on mainland Tasmania usually occur singly, in twos or in small family groups, and this is also likely to be true of the King Island subspecies.

Very little is known about *Acanthiza pusilla archibaldi*. The Tasmanian mainland subspecies feeds mainly on small insects in the canopy foliage, and this is also likely to be the case for the King Island subspecies. A domed nest consisting of shredded bark, grass and moss is built usually near the ground and clutch size is usually 3–4 eggs, which are white with fine reddish-brown spots. The breeding season is thought to run from September to December (Bryant & Jackson 1999).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: Endangered

Tasmanian *Threatened Species Protection Act 1995*: endangered

Plate 9. *Acanthiza pusilla*
(Copyright: The Nature of Tasmania)

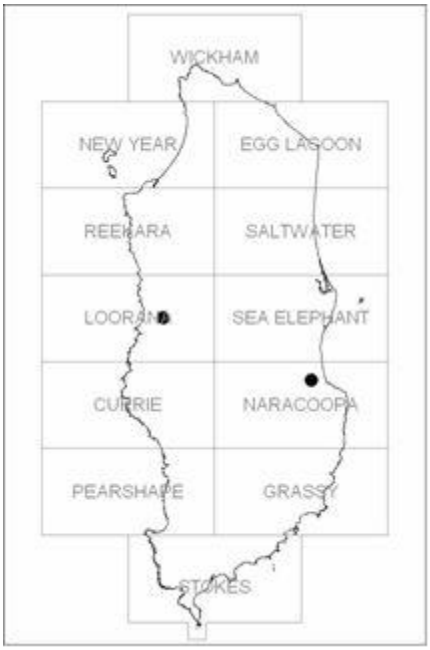

Figure 8. *Acanthiza pusilla archibaldi:* King Island distribution

Existing Conservation Measures

There are no existing conservation measures specifically for *Acanthiza pusilla archibaldi.*

Distribution and Habitat

Acanthiza pusilla archibaldi is endemic to King Island. The only confirmed records of this subspecies are of four birds collected in 1902, one bird collected in Pegarah State Forest in 1968, two birds mist-netted at Loorana in 1971, and two birds seen in Pegarah State Forest in 2002 (Figure 8). The subspecies has not been recorded since 2002 despite several surveys.

Acanthiza pusilla archibaldi is thought to occur in eucalypt forest, woodland and tea tree thickets (Bryant & Jackson 1999). *Acanthiza pusilla archibaldi* may occur in the same habitats as those inhabited by the Critically Endangered King Island Scrubtit (*Acanthornis magna greeniana*) (Garnett & Crowley 2000).

Populations

Acanthiza pusilla archibaldi is thought to have once been widespread across King Island, although it appears never to have been common (Garnett & Crowley 2000). The subspecies in now thought to be restricted to a few remaining habitat remnants. The number of mature individuals has been estimated to be fewer than 50 breeding birds (Table 8; Garnett et al. 2011). All known subpopulations on King Island, and any new subpopulations found, are considered important for the survival of the species.

Habitat critical to the survival of the species

Habitat which is critical to the survival of *Acanthiza pusilla archibaldi* on King Island includes all remaining patches of potential habitat, including wet forest and wet scrub.

Reservation Status

Acanthiza pusilla archibaldi is not known from any formal reserve.

Table 8. Population summary for *Acanthiza pusilla archibaldi* on King Island

	Location	Tenure	NRM region	Year last (first) seen	Area occupied (ha)	Number of mature individuals *
1	King Island	State Forest & private	Cradle Coast	2002 (1902)	Unknown	50

* Assumed population for the whole island (Garnett et al. 2011).

Threats and Management

Known and potential threats to *Acanthiza pusilla archibaldi* on King Island include:

- very small population size;
- genetically isolated subpopulations;
- loss of genetic diversity;
- clearance of potential habitat;
- degradation of potential habitat, particularly by fire;
- predation by cats and black rats.

Substantial areas of King Island have been cleared for agricultural purposes and artificially drained since European settlement, primarily for the production of dairy cattle. The net result has been the loss and fragmentation of suitable habitat for *Acanthiza pusilla archibaldi.*

The vulnerability of the species to wildfire is highlighted by the loss through fire of over 90% of forest and scrub at Nook Swamps in early 2007 (RMCD 2007). Prior to the 2007 fire, Nook Swamps was the largest remaining area of swamp forest on King Island. The 2007 fire has resulted in the long-term, and in some areas, permanent loss of mature swamp forest at Nook Swamps (RMCD 2007).

It has been suggested that the surviving population of *Acanthiza pusilla archibaldi* may be threatened by competition with the Tasmanian Thornbill *Acanthiza ewingii rufifrons* (Garnett & Crowley 2000). Ticks have

also been suggested as a possible threat to *Acanthiza pusilla archibaldi* (Garnett & Crowley 2000), although there is no direct evidence for this.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known populations and areas of potential habitat (Actions 27.1-3, 27.5, 27.6, 28, 29.1);
- Design, plan and implement measures to reliably confirm *Acanthiza pusilla archibaldi* is extant on King Island (Action 20.1). Design of surveys to confirm species is extant to include, but not necessarily to be limited to, the following elements;

  (a) define and map all remaining patches of suitable habitat for the species on King Island, and any other adjacent islands on which the species has the potential to occur (Hunter Island, Three Hummock Island);

  (b) conduct surveys of all areas of habitat, surveys to be conducted by professional and experienced observers within one year of the start of the Plan;

  (c) employ a minimum of two sightings as evidence that species is extant.
- Identify conservation actions for new sites and implement (Action 20.2);
- Continue and strengthen current measures for the retention and rehabilitation of remaining wet forest and swamp forest vegetation on King Island (Actions 1.1-1.6);
- Develop management guidelines in consultation with landholders for protecting remaining habitat from land clearance and drainage (Actions 1.1-6);
- Develop, resource and implement fire management plans to protect remaining habitat (Action 2.1-2).
- If the species is still extant, design and implement a monitoring program within one year of confirmed sighting (Action 20.4). Monitoring program to include, but may not be limited to, the following elements:

  (a) method to be statistically sound and repeatable, with the aim of estimating total population/subpopulation size and trends over time;

  (b) monitoring to be conducted annually and for a minimum period of five years;

  (c) monitoring to use volunteer personnel where this can be accommodated within a statistically sound monitoring program.
- Establish clear and quantifiable thresholds of minimum population size for triggering alternative methods for preserving species genes in the likely invent of extinction (Action 20.5);
- Develop contingency plans for preserving species genes which should include, but may not be limited to, the following potential scenarios (Action 20.5);

  (a) removal of part or all of remaining birds in order to establish a captive breeding program;

  (b) removal of part or all of remaining birds for translocation, within King Island or between islands, including other potentially suitable offshore islands around Tasmania.
- Conduct a trial breeding program for the Tasmanian mainland subspecies (Action 20.6);
- Assess the potential for disease epidemics and other potential threats in populations of the King Island Brown Thornbill and instigate required actions to mitigate (Action 20.7);

Acanthornis magna greeniana (King Island Scrubtit)

Description

Acanthornis magna greeniana is about 11 to 12 cm in length and weighs of 8.5 to 11 grams. The adults are brown above with a prominent cream throat and breast, with a white ring around each eye, yellowish irides, a grey 'mask', a greyish-black bill, two white spots on the shoulder of each wing, white margins on some feathers of the wings, a black band across the posterior end of the tail, and pinkish-brown to grey feet and legs (Plate 10). Juvenile birds can be distinguished from the adults, if viewed at close range, on the basis of the duller plumage, smaller and less prominent white spots on the wings, finer white margins on the feathers of the wings, and pale (rather than black) nape.

Acanthornis magna greeniana has been recorded in pairs and family parties of three or four birds. It is often difficult to see due to its secretive nature, and can be easily confused with the Tasmanian Thornbill and Tasmanian Scrubwren. *Acanthornis magna greeniana* feeds on insects and other invertebrates among bark, litter and foliage. It breeds from September to December, laying three white, lightly spotted eggs in a woven, domed nest.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Critically Endangered
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 10. *Acanthornis magna greeniana* (Photograph: Parks & Wildlife Service)

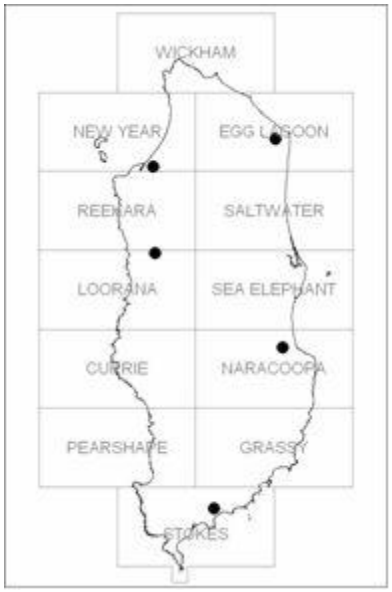

Figure 9. *Acanthornis magna greeniana:* King Island records

Existing Conservation Measures

There are no existing conservation measures specifically for *Acanthornis magna greeniana.*

Distribution and Habitat

Acanthornis magna greeniana is found only on King Island where it occurs in wet forest and swamp forest, most recently only from *Melaleuca ericifolia* swamp forest with a well developed understorey (Donaghey 2003).

Acanthornis magna greeniana may have formerly occurred across much of King Island, but appears to have undergone a significant reduction in range since European settlement (Garnett et al. 2011). *Acanthornis magna greeniana* was recorded at Yellow Rock, the Nook Swamp, Pass River and Pegarah State Forest in the late 1960s and early 1970s, but extensive searches in 2001, 2003–2004 and 2010–2011 indicates it now occurs at only two locations: Nook Swamps and Colliers Swamp (Figure 9 & Table 9). It is possible that a small population could persist in Pegarah State Forest, which is the largest remnant of native forest on King Island, and which is connected to Lavinia State Reserve by corridors of suitable habitat (Donaghey 2003).

Around 90% of potential swamp forest habitat at Nook Swamp was burnt in a wildfire in 2007 (RMCD 2007). The observation of three *Acanthornis magna greeniana* in a single small patch of unburnt swamp forest at the northern extremity of Nook Swamps indicates that some individuals survived the fire in unburnt patches of habitat. However, the fire is likely to result in the medium- to long-term loss of a significant area of remaining habitat for *Acanthornis magna greeniana* on the island.

Populations

The population size of *Acanthornis magna greeniana* is estimated to consist of 50 or fewer mature individuals (Garnett et al. 2011). Two subpopulations are currently known, at Nook Swamps and Colliers Swamp (Table 9). The small size of the *Acanthornis magna greeniana* population makes all surviving subpopulations crucial to the long-term survival of the subspecies.

Habitat critical to the survival of the species

Habitat critical for the survival of *Acanthornis magna greeniana* on King Island includes the sites with known subpopulations (Nook Swamps and Colliers Swamp), and all patches of wet sclerophyll forest and swamp forest.

Reservation Status

Acanthornis magna greeniana is reserved within Lavinia State Reserve and Colliers Swamp Conservation Area.

Table 9. Population summary for *Acanthornis magna greeniana* on King Island

	Location	Tenure	NRM region	1:25 000 mapsheet	Year last (first) seen	Area of habitat (ha)	Number of mature individuals
1	Nook Swamps	Lavinia State Reserve	Cradle Coast	Egg Lagoon	2011 [1] (late 1960s)	600 (pre-2007 fire) [1] 50 (post-2007 fire) [1]	50 [3]
2	Colliers Swamp	Colliers Swamp Conservation Area	Cradle Coast	Stokes	2004 [2] (late 1960s)	150	unknown

1. Donaghey (2011)
2 KINRMG 2003–2004
3 Garnett et al. (2011)

Threats and Management

Known and potential threats to *Acanthornis magna greeniana* on King Island include:

- very small population size;
- genetically isolated subpopulations;
- loss of genetic diversity;
- land clearance;

- drainage of swamp forest;
- wildfire;
- predation by cats and rats;
- disease epidemics.

Substantial areas of King Island have been cleared for agricultural purposes and artificially drained since European settlement, primarily for the production of dairy cattle. The net result has been the loss and fragmentation of suitable habitat for *Acanthornis magna greeniana,* resulting in a significant decline in range and abundance since European settlement. Remaining populations of *Acanthornis magna greeniana* are vulnerable to catastrophic events such as extensive wildfire or disease epidemics. It has also been suggested that ticks may be a threat to *Acanthornis magna greeniana* (Garnett & Crowley 2000).

The vulnerability of the species to wildfire is highlighted by the loss through fire of over 60% of potential habitat at Nook Swamp (Donaghey 2011). Prior to the 2007 fire, Nook Swamp was the largest remaining area of swamp forest habitat for *Acanthornis magna greeniana* (600 ha), and preventing wildfire at Nook Swamps was highlighted by Donaghey (2003) as the highest-priority management action for the species on the island. The 2007 fire has resulted in the long-term, and in some areas permanent loss of mature swamp forest for *Acanthornis magna greeniana* at Nook Swamps (RMCD 2007).

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat (Actions 27.1-3, 27.5, 27.6, 28, 29.1);
- Protect Nook Swamps, Colliers Swamp and other current and potential subpopulations from wildfire (Action 20.3);
- Undertake a post-fire survey of Nook Swamp to determine population size, distribution and habitat, and re-use of areas burnt in 2007 (Action 20.1);
- Undertake searches of sites where *Acanthornis magna greeniana* was previously known to occur (Pass River, Yellow Rock, Pegarah State Forest) (Action 20.1);
- Undertake systematic searches of other potential sites (Bungaree Swamp, Red Hut Point area) (Action 20.1);
- Identify conservation actions for new sites and implement (Action 20.2);
- Continue and strengthen current measures for the retention and rehabilitation of remaining wet forest and swamp forest vegetation on King Island (Actions 1.1-1.6);
- Develop management guidelines in consultation with landholders for protecting remaining habitat from land clearance and drainage (Actions 1.1-6);
- Develop, resource and implement fire management plans to protect the Lavinia State Reserve and Colliers Swamp (Actions 2.1-2).
- Design a monitoring program which includes, but may not be limited to, the following elements (Action 20.4):

  (a) method to be statistically sound and repeatable, with the aim of estimating total population/subpopulation size and trends over time;
  (b) monitoring to be conducted annually and for a minimum period of 10 years;
  (c) monitoring to use volunteer personnel where this can be accommodated within a statistically sound monitoring program.
- Establish clear and quantifiable thresholds of minimum population size for triggering alternative methods for preserving species genes in the likely invent of extinction (Action 20.5);
- Develop contingency plans for preserving species genes which should include, but may not be limited to, the following potential scenarios (Action 20.5);
  (a) removal of part or all of remaining birds in order to establish a captive breeding program;

(b) removal of part or all of remaining birds for translocation, within King Island or between islands, including other potentially suitable offshore islands around Tasmania.

- Conduct a trial breeding program for the Tasmanian mainland subspecies (Action 20.6);
- Assess the potential for disease epidemics and other potential threats in populations of the King Island Scrubtit and instigate required actions to mitigate (Action 20.7);

Botaurus poiciloptilus **(Australasian Bittern)**

Description

The Australasian Bittern (*Botaurus poiciloptilus*) is a large, stocky, thick-necked, heron-like bird. The species can reach a height of 76 cm and has a wingspan of over 1 m. Males weigh approximately 1400 g, females approximately 900 g (Marchant & Higgins 1990). The upper-parts of the body are brown and dark brown to black, mottled and buff, forming a pattern that aids the bird's concealment in swamp vegetation. The under-parts of the body are streaked and scalloped, brown and buff. There is a prominent black-brown stripe running down the side of the neck, the eyebrow is pale, and the chin and upper throat are white. The bill is straight, pointed and straw yellow to buff in colour with a dark grey ridge. The legs and feet are pale green to olive (Marchant & Higgins 1990). Juveniles are generally paler than adults (Marchant & Higgins 1990).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Endangered
Tasmanian *Threatened Species Protection Act 1995*:	not listed

Plate 14. *Botaurus poiciloptilus*
(Photograph: courtesy Chris Tzaros)

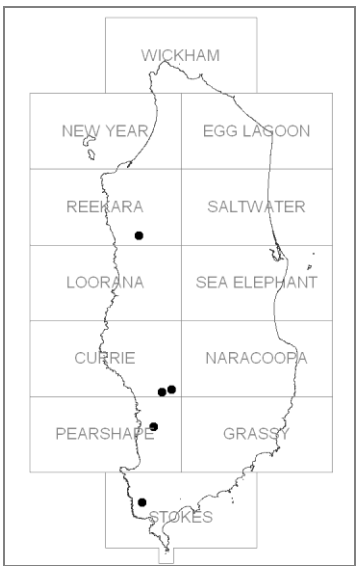

Figure 13. *Botaurus poiciloptilus:* King Island

Existing Conservation Measures

There are no current specific management measures in place for the Australasian Bittern on King Island. However, the species has been recorded breeding in the Nook Swamps within the Lavinia State Reserve, managed by the Tasmanian Parks and Wildlife Service (Lavinia Nature Reserve Management Plan 2000).

Distribution and Habitat

The Australasian Bittern occurs in Australia, New Zealand and New Caledonia, including Ouvea in the Loyalty Islands (Marchant & Higgins 1990). On mainland Australia, the species occurs from south-east Queensland to south-east South Australia, and in the southwest of Western Australia (Marchant & Higgins 1990). In Tasmania, the Australasian Bittern was formerly widespread, particularly in the east of the State (Marchant & Higgins 1990), although recent records suggest that the species may now be confined to coastal regions in the northeast of mainland Tasmania. The species also occurs on islands in Bass Strait, including King Island (Marchant & Higgins 1990).

The Australasian Bittern has a relatively narrow habitat preference, preferring shallow, vegetated freshwater or brackish swamps (Garnett & Crowley 2000). It favours wetlands with tall dense vegetation,

where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. If population density is high, the species may resort to open wetlands for nesting, such as in stunted Acacia swamps (Marchant & Higgins 1990).

On King Island, the Australasian Bittern has been recorded from five locations including Swan Lagoon, Tathams Lagoon, Lily Lagoon, Manresa Lagoon and Seal Rocks Lagoon (Table 10). All records date from 1978 (Birds Australia, 1977–1981 Birds Atlas data). No Australasian Bitterns were recorded from King Island during the 1998-2003 and during the most recent 2003-2008 Bird Atlas survey (Eric Woehler, pers. comm. 2011), indicating a significant decline has occurred on King Island. This decline is likely to be due to a number of years of exceptionally dry conditions leading to drying out of swamp habitat, and is consistent with the apparent state-wide decline in the species since the early 1980s (E. Woehler, Birds Australia, unpublished data).

Populations

Data from the last three Birds Atlas surveys by Birds Australia indicate a steady decline in the numbers and distribution of the Australasian Bittern throughout the species' range including Tasmania. The most recent estimate by Birds Australia give a range of 12 to 100 mature individuals for the whole of Tasmania and no recent records from King Island.

Habitat critical to the survival of the species

All swamp sites where the species has been previously recorded (Table 10) plus other areas of potentially suitable swamp habitat represent critical habitat for the Australasian Bittern on King Island.

Reservation Status

Nook Swamps reserved within the Lavinia State Reserve.

Table 10. Summary of Australasian Bittern records on King Island (source: E. Woehler, Birds Tasmania 2011)

	Location	Tenure	NRM region	1:25000 mapsheet	Number of nesting birds
1	Swan Lagoon	Private	Cradle Coast	Currie	Unknown
2	Tathams Lagoon	Conservation Area	Cradle Coast	Reekara	Unknown
3	Lily Lagoon	Nature Reserve	Cradle Coast	Currie	Unknown
4	Seal Rocks Lagoon	State Reserve	Cradle Coast	Stokes	Unknown
5	Manresa Lagoon	Private	Cradle Coast	Pearshape	Unknown

Threats and Management

Threats to *Botaurus poiciloptilus* on King Island include:

- destruction of wetland habitat;
- decline in water quality due to increased salinity, siltation and pollution;
- overgrazing of wetland habitat by livestock;
- frequent or intense burning of wetland habitat;
- predation of eggs and chicks by introduced cats.

The major threat to the Australasian Bittern across its range is the destruction of its wetland habitat, primarily through diversion of water for irrigation and drainage of swamps for agriculture (Marchant & Higgins 1990, Garnett & Crowley 2000). Because of its comparatively specialised habitat requirements

(i.e. densely vegetated wetlands), the Australian Bittern may be more sensitive to habitat loss than many other wetland birds (Garnett & Crowley 2000).

Widespread degradation of the swamp habitat for the Australasian Bittern across its range has also occurred through a decline in water quality due to increased salinity, siltation and pollution. Pollution in wetlands is likely to cause a decline in many of the species' prey species, such as eels, freshwater crayfish and frogs which in turn may have a negative effect on Australasian Bittern population health and numbers (Marchant & Higgins 1990). Overgrazing by livestock and the frequent or intense burning of wetland areas reduces the dense vegetation that forms the core habitat of the Australasian Bittern (Garnett & Crowley 2000). King Island was characterised by many swampy habitats prior to European settlement, and the number and condition of these has declined significantly over the last century (Donaghey 2003).

Across its range, the Australasian Bittern is subject to the predation of eggs and juveniles by European foxes and feral cats (Garnett & Crowley 2000), and the large number of feral cats on King Island may pose a significant threat to the species. The recent introduction of the European fox to Tasmania represents a novel threat to the species on the mainland of Tasmania, and the introduction of the fox to King Island would have a devastating effect on the Australasian Bittern.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known habitat;
- Protect Nook Swamps from wildfire;
- Utilise existing knowledge to determine priority sites for management;
- Develop and implement a community education program for the management of swamp and wetland habitat on the island.

Haliaeetus leucogaster **(White-bellied Sea Eagle)**

Description

Haliaeetus leucogaster is a large and powerful bird of prey with long broad wings and a short wedge-shaped tail (Plate 11). Adult birds are predominantly white and grey. The head, breast and belly, and the feathering on the legs, are white. The back and upper surfaces of the wings are grey, although the wings have black tips. The undersides of the wings are greyish-black around the distal edges, with a smaller area of white along the leading edge. The tail is grey at the base and has a white tip. The bill is bluish-grey with a blackish tip, and the legs and feet are a cream colour. Young birds are mottled pale brown and may take five years to reach adult plumage. A young White-bellied Sea Eagle can be confused with a Wedge-tailed Eagle, but the Wedge-tailed Eagle has a short white tail and strong patterning on the under-wing (Bryant & Jackson 1999).

Haliaeetus leucogaster is generally seen singly or in pairs. The nests are very large structures constructed of sticks, often in tall eucalypts on sheltered leeward slopes. Birds will often perch for long periods on branches of live or dead trees near lagoons, rivers and estuaries, and on rocks and in trees along the coast (Donaghey 2003). The birds hunt by a gliding attack from a prominent perch, taking eels, birds and fish from the water's surface, as well as lizards, small mammals and carrion on land (Bryant & Jackson 1999).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: Marine and Migratory

Tasmanian *Threatened Species Protection Act 1995*: vulnerable

Plate 11. *Haliaeetus leucogaster*
(Photograph: Bill Brown)

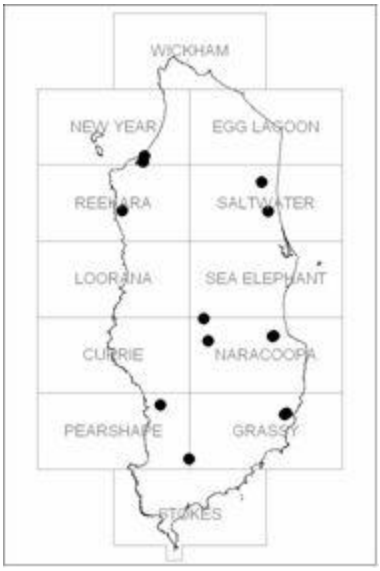

Figure 10. *Haliaeetus leucogaster*: known nest sites on King Island

Existing Conservation Measures

There are no existing conservation measures specifically for *Haliaeetus leucogaster* on King Island.

Distribution and Habitat

Haliaeetus leucogaster is distributed along the coastline of mainland Australia and Tasmania including offshore islands (Figure 10). Birds feed and nest mainly near the coast but will also live near large inland rivers and lakes. Large estuaries and convoluted coastlines are the favoured sites for both nesting and foraging.

Populations

The total population size of *Haliaeetus leucogaster* in Australia is estimated at more than 500 pairs, although no specific information is available on the size of the Tasmanian subpopulation (Commonwealth Species Profiles and Threats Database 2009). In Tasmania, *Haliaeetus leucogaster* effectively occurs as a single subpopulation (Threatened Species Section 2006b). However, although the Tasmanian subpopulation is geographically isolated, the species is present on most of the islands of Bass Strait and are believed to have the ability to island-hop between Tasmania and the mainland. Seven or eight breeding pairs and thirteen known nest sites occur on King Island (Donaghey 2003).

Habitat critical to the survival of the species

Habitat critical to the survival of *Haliaeetus leucogaster* is defined by nesting habitat (Threatened Species Section 2006). Generally, the species nests in mature forests within 5 km of a large water body, and more rarely on sea cliffs and rock stacks. On offshore islands, *Haliaeetus leucogaster* occasionally nests in low coastal scrub where cliffs or tall trees are not available.

Reservation Status

One of the thirteen known *Haliaeetus leucogaster* nest sites on King Island is within Lavinia State Reserve.

Threats and Management

Threats to *Haliaeetus leucogaster* on King Island include:

- loss or desertion of young due to nest disturbance;
- persecution by shooting or poisoning;
- human-related accidents (electrocution, collisions, entanglement, oiling from fish waste);
- continued loss of nesting habitat through land clearing and coastal development.

The principal threat to *Haliaeetus leucogaster* in the past has been the clearing of native forest on King Island and the loss of potential nesting sites. While clearing has slowed substantially and is now largely regulated, there is still the potential for loss and disturbance of remaining nest sites through clearing of native vegetation. The principal ongoing threat to *Haliaeetus leucogaster* is persecution of adult birds, and the loss and desertion of young through both intentional and unintentional disturbance of nest sites.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known and potential nesting sites and habitat;
- Provide information to land-holders with known nest sites on their property about the need to protect the site and minimise nest disturbance during the breeding season;
- Survey for additional nest sites;
- Monitor known nests annually to determine productivity.

Litoria raniformis **(Green and Gold Frog)**

Description

Litoria raniformis is a large aquatic frog reaching a length of up to 80 mm and weighing up to 40 grams (Plate 12). Despite its name, *Litoria raniformis* can vary considerably in dorsal coloration from almost totally green, through green and gold mottling, to a very dark brown and black patterning. However, all colour types have a pale green stripe down the middle of the back and turquoise thigh colouration in adults. *Litoria raniformis* are white and coarsely granular on their underside, lack webbing on their fingers, while the toes are almost fully webbed (Littlejohn 2003).

Litoria raniformis are active during both day and night throughout the warmer months and can sometimes be seen 'basking' out of water amongst vegetation or on rocks and logs. It is the only Tasmanian frog to exhibit this basking behaviour. *Litoria raniformis* has keen eyesight and when approached will jump into the water with a distinctive 'plop'. At night under torchlight they can be approached with relative ease. *Litoria raniformis* feeds on terrestrial invertebrates (beetles, termites, cockroaches, moths, butterflies and various insect larvae), other frogs (including younger frogs of their own species), and occasionally lizards, snakes and small fish.

The breeding season spans September to January, and males can be heard calling at this time. The mating call of *Litoria raniformis* is a very distinctive and complex series of grunts and growls. Calling activity can be erratic, often being restricted to warm calm days and evenings. Choruses (many males calling) can reach peaks mid-morning and early evening. In breeding condition, the male frog exhibits a mottled black throat and develops black nuptial pads (hard calluses) on the back of each thumb with which he grasps the female when mating. Eggs are laid in a mat which sinks to the bottom of the water.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Vulnerable
Tasmanian *Threatened Species Protection Act 1995*:	vulnerable

Plate 12. *Litoria raniformis*
(Photograph: Parks & Wildlife Service)

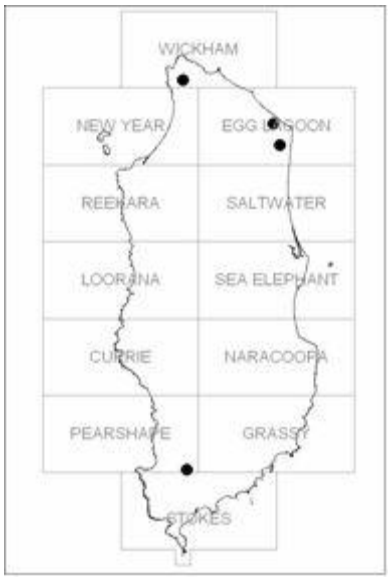

Figure 11. *Litoria raniformis;* King Island distribution

Existing Conservation Measures

There are no existing conservation measures specifically for *Litoria raniformis* on King Island.

Distribution and Habitat

Litoria raniformis lives in or near permanent or temporary freshwater waterbodies, including lagoons, swamps, lakes, ponds and farm dams (Bryant & Jackson 1999). A permanent waterbody is required for breeding. Ideal breeding habitat includes the shallow parts of lagoons or dams where there is underwater or emergent vegetation.

On mainland Tasmania, the range of *Litoria raniformis* is restricted to lowland areas, mainly in coastal zones. *Litoria raniformis* has declined on the Tasmanian mainland and has disappeared from a number of areas such as the Midland and north-west. *Litoria raniformis* was once common on King Island and Flinders Island but anecdotal evidence indicates that the species is now rare on both these islands.

Populations

On mainland Tasmania, the largest populations of *Litoria raniformis* occur at Blackmans Lagoon in the Waterhouse area, and Bowlers Lagoon at the mouth of the Ringarooma River. Populations at other sites are relatively small. An estimate of population numbers is problematic, as not all breeding sites are known. A further complicating factor is that frog populations vary considerably in abundance from year to year. However, the population of *Litoria raniformis* in Tasmania is estimated to be in the region of 5000–10000 adults (Threatened Species Unit 2001).

Despite the fact that *Litoria raniformis* is reported to have been common on King Island in the past, only two records were available from DPIPWE's Natural Values Atlas (Figure 11), with an additional record from the Tasmanian Museum & Art Gallery from the Pass River. In November 2009, sites for these two records were each surveyed by Biodiversity Conservation Branch personnel, together with a number of other sites across King Island including a number where Striped Marsh Frog (*Limnodynastes peronii*) had previously been recorded (Table 11). *Litoria raniformis* was heard to call only at two new sites, both within Lavinia State Reserve, supporting anecdotal reports of a decline in this species on the island (Donaghey 2003). One suggestion is that this species did not recover after a drought at the end of the 1980s, and that this may have been linked to the associated structural changes to dams resulting from concentrated cattle use at the time of the drought. However, single surveys are by no means adequate to confirm the absence of this species at a site, and continued intermittent surveys across King Island are planned.

Limnodynastes peronii was, by contrast, heard calling in abundance at the majority of sites surveyed in November 2009.

The November 2009 surveys also sampled tadpoles for chytrid fungus at three sites: the Currie sewage ponds, Nook Swamps in Lavinia State Reserve and Little Cask Lake near Lake Flannigan (one of the historic sites for *Litoria raniformis*). The first two of these tested positive for chytrid fungus, while Little Cask Lake was negative. That *Limnodynastes peronii* was found at the sewage ponds despite the presence of chytrid may suggest that the species has some resistance to the disease.

All known subpopulations of *Litoria raniformis* on King Island, and any new subpopulations found, are considered important for the survival of the species.

Habitat critical to the survival of the species

All permanent freshwater waterbodies such as natural lagoons, wetlands and swamps on King Island are potential habitat for *Litoria raniformis*. Artificial ponds and farm dams on the island are also potential habitat, particularly where there is submerged and/or emergent vegetation. Any locations where *Litoria raniformis* is found on King Island is considered to be habitat critical to the survival of the species.

Reservation Status

On King Island, *Litoria raniformis* is reserved within Lavinia State Reserve.

Table 11. Location summary for *Litoria raniformis* on King Island

	Location	Tenure	NRM region	1:25000 mapsheet	Year last (first) seen
1	Lavinia State Reserve	Lavinia State Reserve	Cradle Coast	Egg Lagoon	2009 (2009)
2	Nook Swamps	Lavinia State Reserve	Cradle Coast	Egg Lagoon	2009 (2009)
3	Little Cask Lake	Private	Cradle Coast	Wickham	1990 (1990)
4	Millers Rd	Private	Cradle Coast	Pearshape	1963 (1963)

Threats and Management

Threats to *Litoria raniformis* on King Island include:

- drainage of wetlands;
- degradation of wetlands and water quality through stock damage;
- application of agricultural chemicals including fertilizers;
- chytrid fungus;
- drought.

Drainage and clearance of wetlands is the major threat to *Litoria raniformis* on King Island. Greater protection for wetlands through voluntary agreements including covenants and management agreements are important in preventing the loss of natural lagoons that form the bulk of suitable breeding sites.

Stocking of sheep and cattle in and around wetlands is a serious threat to the integrity of habitat, as well as posing a direct threat to the species from trampling. Fencing off natural wetlands to exclude stock is important, as is the provision of alternative stock watering sites.

Chytrid fungus is a waterborne pathogen that causes chytridiomycosis in amphibians. The disease has been implicated in the decline and extinction of frog species on mainland Australia (Tyler 1997). Declines in the range and abundance of *Litoria raniformis* have been limited to the establishment and spread of chytridiomycosis in Tasmania (Obendorf 2005). Chytrid fungus was recently identified on King Island (Annie Philips, DPIPWE pers. comm.).

Insecticide use in agricultural areas, particularly aerial spraying and widely-used herbicides may also pose a threat to *Litoria raniformis*. Glyphosate-based herbicides are toxic to frogs, possibly because of the effect of the dispersant on tadpole gills (Bidwell & Gorrie 1995).

Drought and climate change may be factors in the decline of *Litoria raniformis*. Reduced precipitation increases the likelihood of breeding habitat drying out and impeding recruitment for a population. Lack of recovery rains prevent re-emergence of adults aestivating underground and recolonisation of habitats by migrating frogs.

Another potential threat to *Litoria raniformis* on King Island is the increasing number of Magpies and Forest Ravens on the island. Both these bird species may predate on daytime-active frogs such as *Litoria raniformis* that prefer open areas for basking and often move during the day through paddocks to and from farm dams (Donaghey 2003).

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known subpopulations and areas of potential habitat;
- Encourage landholders to fence around suitable habitat to exclude livestock and provide alternative watering troughs for livestock;

- Encourage landholders to consider protection of wetland habitat through voluntary agreements including covenants and management agreements;
- Encourage landholders in the responsible use of chemicals, especially around permanent freshwater waterbodies such as natural lagoons, wetlands and swamps, as well as artificial ponds and farm dams;
- Survey of potential habitat to determine the distribution of *Litoria raniformis* on King Island;
- Undertake survey work to determine the presence and extent of chytrid fungus;
- Develop a program to manage the threat of chytrid fungus;
- Identify priorities for frog management of King Island and implement conservation actions.

Neophema chrysogaster **(Orange-bellied Parrot)**

Description

Neophema chrysogaster is a small parrot, about 21 cm long and weighing around 45 grams (Plate 13). The plumage is rich grass-green above, with a narrow dark-blue leading edge to the wing, green on the breast, and yellow underneath with a bright orange patch on the belly. The orange patch is brightest in males, paler in females and small and diffuse in juveniles. On the forehead, males have a broad dark-blue frontal band bordered above and below by light blue, which is less distinct in females and often absent in juveniles. The bill is dark grey in adults and yellowish-orange in juveniles. *Neophema chrysogaster* makes a distinctive 'buzz' alarm call when flushed. The similar Blue-winged Parrot occurs on King Island and can be mistaken for *Neophema chrysogaster*, but lacks the grass-green upperparts, distinctive alarm call and intense orange belly (in males) of *Neophema chrysogaster*.

Neophema chrysogaster breeds in coastal southwestern Tasmania then migrates to the coasts of Victoria and South Australia for the winter. Both sexes breed in their first year and birds tend to be monogamous. Natural nest sites consist of a hollow in a limb or trunk of living western peppermint (*Eucalyptus nitida*) or occasionally black gum (*Eucalyptus ovata*). *Neophema chrysogaster* eats seeds and fruits of grasses, chenopods, sedges, saltmarsh succulents and herbs by foraging on the ground or climbing on food plants.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Critically Endangered
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 13. *Neophema chrysogaster*
(Photograph: Dave Watts)

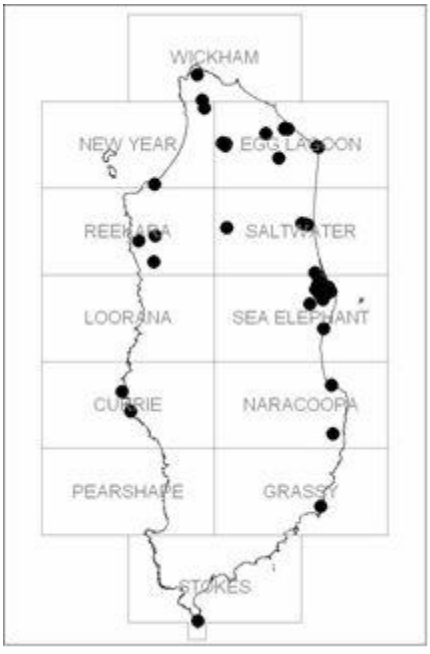

Figure 12. *Neophema chrysogaster:* King Island distribution

Existing Conservation Measures

The *Lavinia State Reserve Draft Management Plan* (Parks & Wildlife Service 2004) recommends investigation of options for a high quality walking track in the Sea Elephant River area to educate and inform visitors about the significance of the reserve as habitat for *Neophema chrysogaster*. The Draft Management Plan also identifies a Special Management Area adjacent to the Sea Elephant River, which will limit access between March and July annually to protect the feeding and roosting habitat of *Neophema chrysogaster*.

In 2007 the King Island Natural Resource Management Group conducted a project aimed at the management and restoration of *Neophema chrysogaster* habitat across the island (Barrow 2008). Project objectives included establishing annual monitoring of *Neophema chrysogaster*, mapping of all foraging and roosting habitat, and the instigation of habitat protection measures on the island.

Protection of roost sites from fire at Sea Elephant is identified as an important action for *Neophema chrysogaster*. Protection of this value is incorporated in the Draft King Island Wildfire Management Plan (KIFMAC, 2009) and the Lavinia State Reserve Draft Management Plan 2004 (P&WS 2004).

Distribution and Habitat

Neophema chrysogaster is endemic to southeastern Australia. The species is migratory, breeding in coastal southwestern Tasmania in summer and migrating to the coasts of Victoria and South Australia for the winter. The species' current breeding range is a narrow coastal strip of eucalypt forest, rainforest and moorland mosaic in southwest Tasmania between Birchs Inlet and Louisa Bay. Most pairs breed within 20 km of Melaleuca Inlet, Bathurst Harbour and Port Davey, in what is considered one breeding population.

Most adults depart the breeding range in February. The first birds arrive at King Island in mid-March and have usually left by June. Adults first reach Victoria in late March and disperse east as far as coastal South Gippsland, and as far west as Lake Alexandrina in South Australia. The majority of birds over-winter in coastal habitats in southern central Victoria, western Victoria and southeast South Australia. In September, the first adults leave the Australian mainland for Tasmania, with the last birds departed by mid-November.

On their migratory passage, the species occurs in dunes, heathland, coastal grasslands, salt marshes and pasture. In Victoria and South Australia, birds use salt marshes as well as beaches, dune frontages and adjacent dune systems, and sheltered areas along rocky foreshores.

Neophema chrysogaster use King Island as a stepping-stone in their journey across Bass Strait during both their northern migration in autumn, and on their return to breeding grounds in spring (Figure 12). On King Island *Neophema chrysogaster* occurs in estuarine salt marsh flanked by dense swamp paperbark scrub, in pasture, and in other grassy areas, including golf courses and sometimes on beaches (Bryant & Jackson 1999). Birds roost in dense clumps of swamp paperbark (*Melaleuca ericifolia*) and coastal wattle (*Acacia longifolia* subsp. *sophorae*) at the edges of estuaries. There is little information on how long the birds remain on the island — anecdotal information suggests they spend up to four weeks during their northern migration, and as little as twenty-four hours during their southern migration (M. Holdsworth pers. comm.)

Population

The total population size of *Neophema chrysogaster* is estimated to be less than 50 individuals (Orange-bellied Parrot Action Plan 2010). King Island represents an important stopover point for the species, and most of the population is believed to pass through King Island on passage across Bass Strait (Table 12).

Habitat critical to the survival of the species

Critical breeding habitat occurs in the narrow coastal strip of eucalypt forest, rainforest and moorland mosaic in southwest Tasmania between Birchs Inlet and Louisa Bay. Habitat critical to the survival of the species during migration includes dunes, heathland, coastal grasslands, salt marshes and some degraded pastures.

Habitat critical for the survival of *Neophema chrysogaster* on King Island includes both foraging and roosting habitat. Thirty-five patches of *Neophema chrysogaster* foraging habitat covering approximately 245 hectares have been identified on King Island, two-thirds of which is considered ephemeral (Barrow 2008).

The largest patch of non-permanent foraging habitat for *Neophema chrysogaster* on King Island is Lake Flannigan, covering more than 148 hectares in the island's northwest. Tathams Lagoon, in the north of the island is also an ephemeral lake, which only provides foraging habitat for *Neophema chrysogaster* during drier years (Barrow 2008).

All remaining areas of permanent salt marsh foraging habitat on King Island are considered critical for the species. Barrow (2008) identifies key sites of non-ephemeral salt marsh habitat on the island, including Bungaree Point, Peerless Point, Surprise Bay, Yellow Rock Estuary and Sea Elephant Estuary. Sea Elephant Estuary is the largest area of salt marsh on the island and includes adjacent areas of suitable roosting habitat.

Roosting habitat is defined as native scrub greater than one and a half metres high, occurring up to 500 m away from foraging habitat (Barrow 2008). Thirty-three patches of possible roosting habitat, covering approximately 455 hectares have been identified on the island (Barrow 2008). Of concern is the lack of roosting habitat adjacent to patches of some foraging habitat, as in many coastal areas scrub has been cleared for agriculture.

Reservation Status

On King Island, *Neophema chrysogaster* foraging and roosting habitat is reserved in Lavinia State Reserve.

Table 12. Principal salt marsh foraging sites for *Neophema chrysogaster* on King Island

	Location	Tenure	NRM region	1:25 000 mapsheet	Area (ha) *
1	Sea Elephant Estuary	Lavinia State Reserve	Cradle Coast	Sea Elephant	300
2	Yellow Rock Estuary	Private & Public Reserve	Cradle Coast	New Year	10

* Includes the TASVEG mapping units ASS (Succulent Saline Herbland) and GHC (Coastal Grass and Herbland) plus a 30 m buffer of adjacent swamp paperbark and coastal wattle vegetation where present.

Threats and Management

Threats to *Neophema chrysogaster* on King Island include:

- drainage and/or degradation of salt marsh foraging habitat;
- clearing and/or degradation of roosting habitat.

Neophema chrysogaster appears to have undergone a significant decline in both range and abundance over the last 100 years. During the early 1920s, *Neophema chrysogaster* was reported widely as being common or locally abundant. In Tasmania the species' original range extended along the western coast and around the southern coast east as far Acteon Islands (Southport) — the species is now restricted to the narrow coastal strip between Birchs Inlet and Louisa Bay (Orange-bellied Parrot Recovery Team 2006). The reasons for the species' decline are not clear, although fragmentation and loss of habitat is likely to be the primary cause. *Neophema chrysogaster* habitat has been degraded and lost throughout its range; however, the majority of this impact has occurred within the non-breeding range.

Substantial areas of King Island have been cleared for agricultural purposes and artificially drained since European settlement, primarily for the production of dairy cattle. The net result has been the loss and fragmentation of a large proportion of the original foraging habitat for *Neophema chrysogaster* on the island. While rates of clearing of native vegetation on King Island have now declined, there is still the potential for loss or degradation of the remaining un-reserved salt marsh foraging habitat and adjacent roosting habitat.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known and potential habitat;
- Revegetate sites with inadequate roosting habitat;
- Erect stock-exclusion fences to protect foraging and roosting habitat where appropriate;

- Promote and establish covenants or other management agreements with stakeholders to ensure the long-term protection of key sites on private land;
- Continue annual monitoring of *Neophema chrysogaster* on King Island to assess use of key sites and effectiveness of conservation management actions.

Sternula albifrons sinensis **(Little Tern)**

Description

Sternula albifrons sinensis is a small tern which can be difficult to distinguish from the very similar fairy tern *Sternula nereis nereis*. In the breeding season, adult *Sternula albifrons sinensis* have a black cap and tapering loral stripe, giving a distinctive triangular white patch on the forehead (Plate 14; lacking in the fairy tern). The rest of the head and neck are white, the upperparts are pale grey, with a contrastingly white rump, uppertail-coverts and tail. There is a white line along the upper edge, and a thin black line along the bottom edge, of the folded primaries, and the outer primaries are a slightly darker grey. The underparts are wholly white. The bill is bright yellow with a small black tip, the eyes blackish, and the legs and feet bright orange.

In non-breeding adults, the forehead, forecrown and anterior lores become white-washed with grey, leaving a dark band extending from in front of the eyes to the nape that merges into dark spotting on the rear-crown. Non-breeding birds also have a pale-grey rump, uppertail-coverts and tail, a black bill, and the legs and feet are a duller, orange-brown. Juveniles resemble non-breeding adults but the black band on the head is narrower and duller; the white forehead, anterior lores and crown are washed brown, the bill is dark brown with a darker blackish tip and base, and the legs and feet are brownish orange.

Sternula albifrons sinensis lay their eggs directly onto the sand. The eggs and chicks are sand-coloured with darker specks which helps to camouflage them. Little Terns are gregarious and are generally seen in small and occasionally very large flocks. The species is partly migratory. Little Terns feed mainly on small fish, plunging in shallow water of channels and estuaries or in the surf on beaches.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Migratory
Tasmanian *Threatened Species Protection Act 1995*:	endangered

Plate 14. *Sternula albifrons sinensis*
(Photograph: DPIPWE)

Figure 13. *Sternula albifrons sinensis:* King Island distribution

Existing Conservation Measures

The *Lavinia State Reserve Draft Management Plan* (Parks & Wildlife Service 2004) recommends restriction of vehicular access to April–September (inclusive) for the area of Nine Mile Beach between Lavinia Point south to the mouth of the Sea Elephant River in order to protect shorebird habitat. Temporary fencing to protect nesting habitat was trialled in 2009 at south Yellow Rock beach, though a larger fenced area may be required to protect chicks as they leave nest sites (Woehler 2009).

Distribution and Habitat

In Australia, *Sternula albifrons sinensis* occurs from Shark Bay in Western Australia, around northern and eastern Australia, to the east coast of Tasmania and around to the Gulf of St Vincent in South Australia. The species is also widely distributed from Europe, eastern and southeastern Asia and Australasia.

Sternula albifrons sinensis occurs in sheltered coastal environments, including lagoons, estuaries, river mouths, lakes, bays, harbours and inlets, and also on exposed ocean beaches. The species usually breeds in small colonies (of up to 50 birds), sometimes with other species of terns including fairy terns, but will also breed solitarily (Woehler 2009).

Sternula albifrons sinensis nests on sand-spits, banks, ridges or islets in sheltered coastal environments, and also on wide and flat or gently sloping sandy ocean beaches. Birds forage in the shallow waters of estuaries, coastal lagoons and lakes. *Sternula albifrons sinensis* is limited to breeding areas with coastal lagoons nearby for fishing in when seas are too rough. Each pair generally has two nest sites to choose from in case of disturbance.

Populations

Fewer than 10 pairs of *Sternula albifrons sinensis* are believed to nest in Tasmania, with more than half of these pairs breeding on King Island, making the island an important breeding site for the species in Tasmania (Woehler 2009). Known nesting sites for *Sternula albifrons sinensis* on King Island include Yellow Rock Beach, Christmas Island, Lavinia Point, and the coast between Sea Elephant River and Cowper Point (Figure 13 & Table 13; Woehler 2009).

Other nest sites for *Sternula albifrons sinensis* may be present on King Island, given their capacity to nest as isolated pairs. These sites may be relatively difficult to locate without dedicated surveys (Woehler 2009).

Habitat critical to the survival of the species

Habitat critical to the survival of *Sternula albifrons sinensis* on King Island includes all known nesting sites.

Reservation Status

Sternula albifrons sinensis is reserved within Christmas Island Nature Reserve and Lavinia State Reserve.

Table 13. Summary of fairy tern and little tern nesting colonies on King Island (2008/2009 season, Woehler pers. comm.)

	Location	Tenure	NRM region	1:25000 mapsheet	Number of nesting pairs [1]
1	Lavinia Point	State Reserve	Cradle Coast	Egg Lagoon	100 [2]
2	Sea Elephant River – Cowper Point	State Reserve	Cradle Coast	Egg Lagoon	150 [2]
3	Yellow Rock Beach	Public Reserve	Cradle Coast	New Year	15
4	Christmas Island	Nature Reserve	Cradle Coast	New Year	15 [3]

1 Includes both *Sternula albifrons sinensis* and *Sternula nereis nereis*.
2 Simultaneous surveys not yet conducted to determine if the Lavinia Point and Cowper Point areas are used simultaneously or alternatively.
3 Surveyed in 2006/2007 season.

Threats and Management

Threats to *Sternula albifrons sinensis* on King Island include:

- disturbance and destruction of nests and nesting habitat through recreational use of nesting beaches;
- disturbance and destruction of nests and nesting habitat through coastal development;
- predation of eggs, chicks and adults by introduced rats, cats and dogs.

Threats to *Sternula albifrons sinensis* on King Island are similar to threats on mainland Tasmania and elsewhere in Australia, and centre around threats to beach nesting-sites (Woehler 2009). A rapid increase in 4WD and quad-bike traffic on beaches during summer months can destroy nests and eggs and crush chicks, dogs off-leash can predate on eggs and chicks, and recreational activities on King Island beaches can lead to disturbance to nesting and feeding shorebirds and terns (Woehler 2009).

All disturbance events to migratory shorebirds reduce their capacity to store food for their migration, resulting in leaner birds with lower body masses unlikely to migrate successfully. To reduce human impacts to shorebirds and small terns will require innovative and concerted efforts by the King Island community through changes in lifestyle and traditional coastal activities.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known breeding sites;
- Utilising existing knowledge, determine priority shorebird habitat and breeding sites for management;
- Install temporary/seasonal structures to prevent damage to these priority shorebird habitat and breeding sites;
- Notify the King Island community of the installation of structures and the reasons why they have been erected;
- Develop a King Island Code of Ethics for the recreational use of beaches addressing threats to shorebird habitat and breeding sites;
- Develop and implement a community education program for the management of threatened shorebirds on the island.

Sternula nereis nereis (Fairy Tern)

Description

Sternula nereis nereis is a small tern which can be difficult to distinguish from the very similar little tern *Sternula albifrons sinensis*. In the breeding season, adult *Sternula nereis nereis* have a black crown, pale grey upperparts, and a white forehead, throat, chest and belly (Plate 15). The bill is orange-yellow and the legs are dull yellow. In non-breeding plumage the crown is largely a mottled black and white and the bill becomes blackish at the base and tip. Immature fairy terns are similar to non-breeding adults, and young birds are similar to immatures, but the upper-wing coverts and mantle are mottled grey and brown.

The Fairy Tern can be distinguished from the Little Tern as the latter has a triangular white patch on the forehead when breeding. The Little Tern is also slightly smaller, with dark outer primaries, rather than grey outer primaries in the Fairy Tern.

Sternula nereis nereis feeds almost entirely on fish. Foraging birds fly several metres above the sea surface, hovering on rapidly beating wings with bill pointing downwards, then dive with wings held in a steep V before plunging into the water, rising again after a few seconds.

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*:	Vulnerable
Tasmanian *Threatened Species Protection Act 1995*:	vulnerable

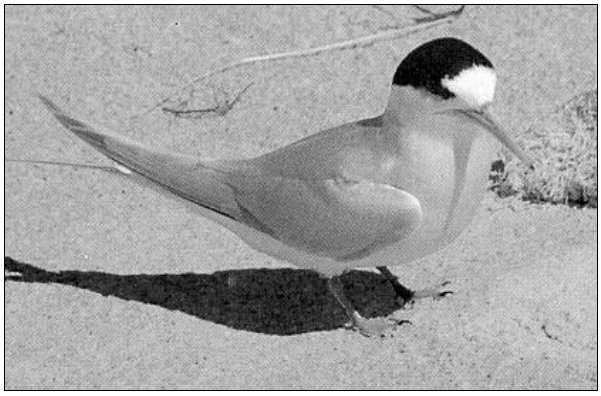

Plate 15. *Sternula nereis nereis*
(Photograph: DPIPWE)

Figure 14. *Sternula nereis nereis:* King Island distribution

Existing Conservation Measures

The *Lavinia State Reserve Draft Management Plan* (Parks & Wildlife Service 2004) recommends restriction of vehicular access to April–September (inclusive) for the area of Nine Mile Beach between Lavinia Point south to the mouth of the Sea Elephant River in order to protect shorebird habitat. Temporary fencing to protect nesting habitat was trialled in 2009 at south Yellow Rock beach, though a larger fenced area may be required to protect chicks as they leave the nest sites (Woehler 2009).

Distribution and Habitat

The range of *Sternula nereis nereis* extends from the Dampier Archipelago, Western Australia, southward to Victoria and Tasmania including its offshore islands. *Sternula nereis nereis* is also found in New Zealand and New Caledonia.

Sternula nereis nereis is found on coastal beaches, inshore and offshore islands, sheltered inlets, sewage farms, harbours, estuaries and lagoons. It occurs in both fresh and saline wetlands, including lakes and salt-ponds. *Sternula nereis nereis* nests in small colonies on elevated exposed sandy beaches.

Sternula nereis nereis occurs as solitary birds or in small to large flocks. Movements are poorly known and the species appears to be partly migratory and partly non-migratory. The Tasmanian population is migratory, moving away in winter, possibly to the mainland. The nest is a shallow scrape in sand, often rimmed with small pebbles, shell fragments or gravel. *Sternula nereis nereis* typically nest colonially and can occur in mixed-species colonies with the little tern.

Populations

Approximately 180 pairs of *Sternula nereis nereis* are believed to nest in Tasmania and about two-thirds of them breed on King Island, making King Island the most important breeding site for this species in Tasmania (Woehler 2009). All other colonies of *Sternula nereis nereis* on the Tasmanian coast are typically between 2 and 25 pairs, so the large colonies at Sea Elephant River – Cowper Point and Lavinia Point are significant breeding localities for Tasmania and Australia.

Known nesting sites for *Sternula nereis nereis* on King Island include Yellow Rock Beach, Christmas Island, Lavinia Point, and the coast between Sea Elephant River and Cowper Point (Figure 14 & Table 14). Surveys and monitoring of these sites in the 2006 to 2009 summer breeding seasons suggest a combined total of approximately 120 to 140 pairs of *Sternula nereis nereis* nest on King Island (Woehler 2009).

Habitat critical to the survival of the species

Habitat critical to the survival of *Sternula nereis nereis* on King Island includes all known nesting sites.

Reservation Status

Sternula nereis nereis is reserved within Christmas Island Nature Reserve and Lavinia State Reserve.

Table 14. Summary of fairy tern and little tern nesting colonies on King Island (2008/2009 season, Woehler pers. comm.)

	Location	Tenure	NRM region	1:25000 mapsheet	Number of nesting pairs [1]
1	Lavinia Point	State Reserve	Cradle Coast	Egg Lagoon	100 [2]
2	Sea Elephant River – Cowper Point	State Reserve	Cradle Coast	Egg Lagoon	150 [2]
3	Yellow Rock Beach	Public Reserve	Cradle Coast	New Year	15
4	Christmas Island	Nature Reserve	Cradle Coast	New Year	15 [3]

1 Includes both *Sternula albifrons sinensis* and *Sternula nereis nereis*.
2 Simultaneous surveys not yet conducted to determine if the Lavinia Point and Cowper Point areas are used simultaneously or alternatively.
3 Surveyed in 2006/2007 season.

Threats and Management

Threats to *Sternula nereis nereis* on King Island include:

- disturbance to and destruction of nests and nesting habitat through recreational use of nesting beaches;
- disturbance and destruction of nests and nesting habitat through coastal development;
- predation of eggs, chicks and adults by introduced rats, cats and dogs.

Threats to *Sternula nereis nereis* on King Island are similar to threats on mainland Tasmania and elsewhere in Australia, and centre around threats to beach nesting-sites (Woehler 2009). A rapid increase in 4WD and quad-bike traffic on beaches during summer months can destroy nests and eggs and crush chicks, dogs off-leash can predate on eggs and chicks, and recreational activities on King Island beaches can lead to disturbance to nesting and feeding shorebirds and terns (Woehler 2009).

All disturbance events to migratory shorebirds reduce their capacity to store food for their migration, resulting in leaner birds with lower body masses unlikely to migrate successfully. To reduce human impacts to shorebirds and small terns will require innovative and concerted efforts by the King Island community through changes in lifestyle and traditional coastal activities.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island council, Government agencies and the local community on the location, significance and management of known breeding sites;
- Utilising existing knowledge, determine priority shorebird habitat and breeding sites for management;
- Install temporary/seasonal structures to prevent damage to these priority shorebird habitat and breeding sites;
- Notify the King Island community of the installation of structures and the reasons why they have been erected;
- Develop a King Island Code of Ethics for the recreational use of beaches addressing threats to shorebird habitat and breeding sites;
- Develop and implement a community education program for the management of threatened shorebirds on the island.

Thinornis rubricollis rubricollis **(Hooded Plover)**

Description

Thinornis rubricollis rubricollis is a small, short-legged plover of ocean beaches of south-eastern Australia. The head and throat are black with a broad white rear collar, giving the bird its distinctive 'hooded' appearance. The bird is also blank on the shoulders, sometimes extending to the sides of the breast; otherwise silvery grey-brown above and white below. The bill is red with a black tip and the eyes are ringed with red. Immature Hooded Plovers have a plainer colouration and no hood. Hooded Plovers occur in pairs or family groups, and can be seen pottering slowly around jetsam and along the edges of spent waves. The species has a distinctive behaviour when approached; birds will run and then turn their back and squat motionless, or fly briskly over the waves to settle further along the beach. While flying, there is a distinctive broad white wingbar crossing the black flight feathers and a white tail with a black 'hourglass' pattern (Pizzey and Doyle 1980).

Current Status

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: Not listed

Tasmanian *Threatened Species Protection Act 1995*: Not listed

Plate 14. *Thinornis rubricollis rubricollis*
(Photograph: Chris Tzaros Birdlife Australia)

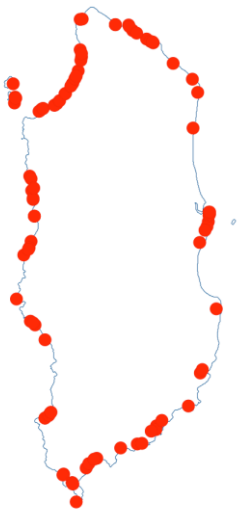

Figure 13. *Thinornis rubricollis rubricollis:* King Island distribution (source of data: S. Lovibond, V. Ruoppolo & E. Woehler, Birds Tasmania 2011)

Existing Conservation Measures

The *Lavinia State Reserve Draft Management Plan* (Parks & Wildlife Service 2004) recommends restriction of vehicular access to April–September (inclusive) for the area of Nine Mile Beach between Lavinia Point south to the mouth of the Sea Elephant River in order to protect shorebird habitat. Temporary fencing to protect nesting habitat was trialled in 2009 at south Yellow Rock beach, though a larger fenced area may be required to protect chicks as they leave nest sites (Woehler 2009).

Distribution and Habitat

There are two subspecies of *Thinornis rubricollis; T. r. rubricollis* in the south-east and *T. r. tregellasi* in the south-west of Australia. On mainland Australia, *Thinornis rubricollis rubricollis* is found along coasts from south-east Queensland to South Australia including Kangaroo Island, although there had been no recent

records north of the Shoalhaven River since the 1940s (Garnet and Crowley 2000). In Tasmania, the species is found around the coast on ocean beaches, particularly wide beaches with large amount of beach-washed seaweed, and creek mouths and inlet entrances which large flat areas of sand and some storm wrack (Garnet and Crowley 2000). Birds forage in the wave-washed zone, taking polychaetes, molluscs, crustaceans and seeds (Marchant and Higgins 1990). Typically 2-3 eggs are laid in a scrape in the sand a few metres above the high tide zone.

Populations

On King Island, Hooded Plovers occur in high numbers on Yellow Rock Beach and White Beach, with lower numbers of breeding territories at Cowper Point, and on the smaller beaches on the west and south-east coasts (Woehler 2009; Fig. 2). Woehler (2009) estimated the population size of Hooded Plovers on King Island to be 60 breeding pairs. Breeding Hooded Plovers on King Island constitute a single population with birds from different locations freely interbreeding (Woehler pers. comm. 2011). This population size is significant at a national and international level (Woehler 2009).

Habitat critical to the survival of the species

Habitat critical to the survival of *Thinornis rubricollis rubricollis* on King Island includes all known breeding sites.

Threats and Management

Threats to *Thinornis rubricollis rubricollis* on King Island include:

- disturbance and destruction of nests and nesting habitat through recreational use of nesting beaches;
- disturbance and destruction of nests and nesting habitat through coastal development;
- predation of eggs, chicks and adults by introduced rats, cats and dogs.

Threats to *Thinornis rubricollis rubricollis* on King Island are similar to threats on mainland Tasmania and elsewhere in Australia, and centre around threats to beach nesting-sites (Woehler 2009). A rapid increase in 4WD and quad-bike traffic on beaches during summer months can destroy nests and eggs and crush chicks, dogs off-leash can predate on eggs and chicks, and recreational activities on King Island beaches can lead to disturbance to nesting and feeding shorebirds (Woehler 2009). To reduce human impacts to shorebirds and small terns will require innovative and concerted efforts by the King Island community through changes in lifestyle and traditional coastal activities.

Recovery Actions specific to King Island

- Provide information and extension support to the King Island Natural Resource Management committee, King Island Council, Government agencies and the local community on the location, significance and management of known breeding sites;
- Utilising existing knowledge, determine priority shorebird habitat and breeding sites for management;
- Install temporary/seasonal structures to prevent damage to these priority shorebird habitat and breeding sites;
- Notify the King Island community of the installation of structures and the reasons why they have been erected;
- Develop a King Island Code of Ethics for the recreational use of beaches addressing threats to shorebird habitat and breeding sites;
- Develop and implement a community education program for the management of threatened shorebirds on the island.