**Biosecurity Management Strategy for Ravensthorpe Shire**

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**Southern Biosecurity Group**

**Ravensthorpe Agricultural Initiative Network**

***Rain logo.tiff *** **

Biosecurity Management Strategy for Ravensthorpe Shire

Southern Biosecurity Group (SBG)

Ravensthorpe Agricultural Initiative Network (RAIN)

Morgans Street Ravensthorpe WA 6346

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*However beautiful the strategy, you should occasionally look at the results.*

Winston Churchill, Wartime United Kingdom Prime Minister

*The essence of strategy is choosing what not to do.*

Prof. Michael Porter, Harvard Business School

*Strategy requires thought, tactics require observation.*

Max Euwe, Mathematician and Chess Grand Master

Cover images, clockwise from top left: Tambookie grass Ravensthorpe to Lake King section of Brookton Highway 2016, N McQuoid; plague minnow Bremer River 2006, N McQuoid; droopy pear cactus Oldfield River 2016, N McQuoid; dingo, DAFWA; centre *Phytophthora cinnamomi* dieback Lake Shaster, Tilo Massenbauer.

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**Summary**

Pests and weeds pose a serious threat to the agriculture, biodiversity, amenity, land and seascapes of the Ravensthorpe Shire. Biosecurity involves the management of introduced (and some native) animals, plants and phytophthora dieback that impact these values and commercial activities.

The aim of this Biosecurity Strategy for the Ravensthorpe Shire area is to provide the framework that guides the Southern Biosecurity Group (SBG) to meet its objectives. The SBG plays the key role of assisting land managers to manage and control high risk declared animal, plant and phytophthora dieback species in the Ravensthorpe Shire, its objectives are:

* To manage the impact of declared and other priority pest species so that they have minimal impact on the agricultural industry, landscapes, and biodiversity values within the Ravensthorpe Shire.
* To assist and encourage a consistent, integrated and cooperative approach to the management of declared and other priority pest species across all land types within the Ravensthorpe Shire.

This strategy has been guided by consultation with the Ravensthorpe community and stakeholders to identify and prioritise pest animals, plants and other organisms present and in need of management efforts in the Ravensthorpe Shire.

Phytophthora dieback is a very significant threat to the native vegetation of the Ravensthorpe Shire. The vegetation communities of the Shire are among the most diverse on Earth spread across some of the most attractive landforms in Western Australia, a natural phenomenon of very considerable conservation value and economic significance for tourism and lifestyle that characterises Ravensthorpe. Such value and significance brings great responsibility to best conserve the natural resource for the long term.

Phytophthora dieback does not respect tenure boundaries and its potential to cause damage in the Shire is enormous. As such, respect for its impacts and careful and considered management to ensure its containment is a broad and serious responsibility.

Through the assessment of the outcomes of the consultation process, Commonwealth and State priorities, the strategy identifies three animal pests of High Priority, seven of Medium Priority and four of Low Priority; and five weeds of High Priority, eight of Medium Priority and seventeen of Low Priority.

Implementation of this strategy is achieved through a series of management recommendations that form an Action Plan (Section 6), for the three themes of priority pest animals, priority weeds and Phytophthora dieback. Priorities have been determined by stakeholder consultation and to maintain the continuity, investment and momentum of some existing pest animal, weed and Phytophthora dieback management programs.

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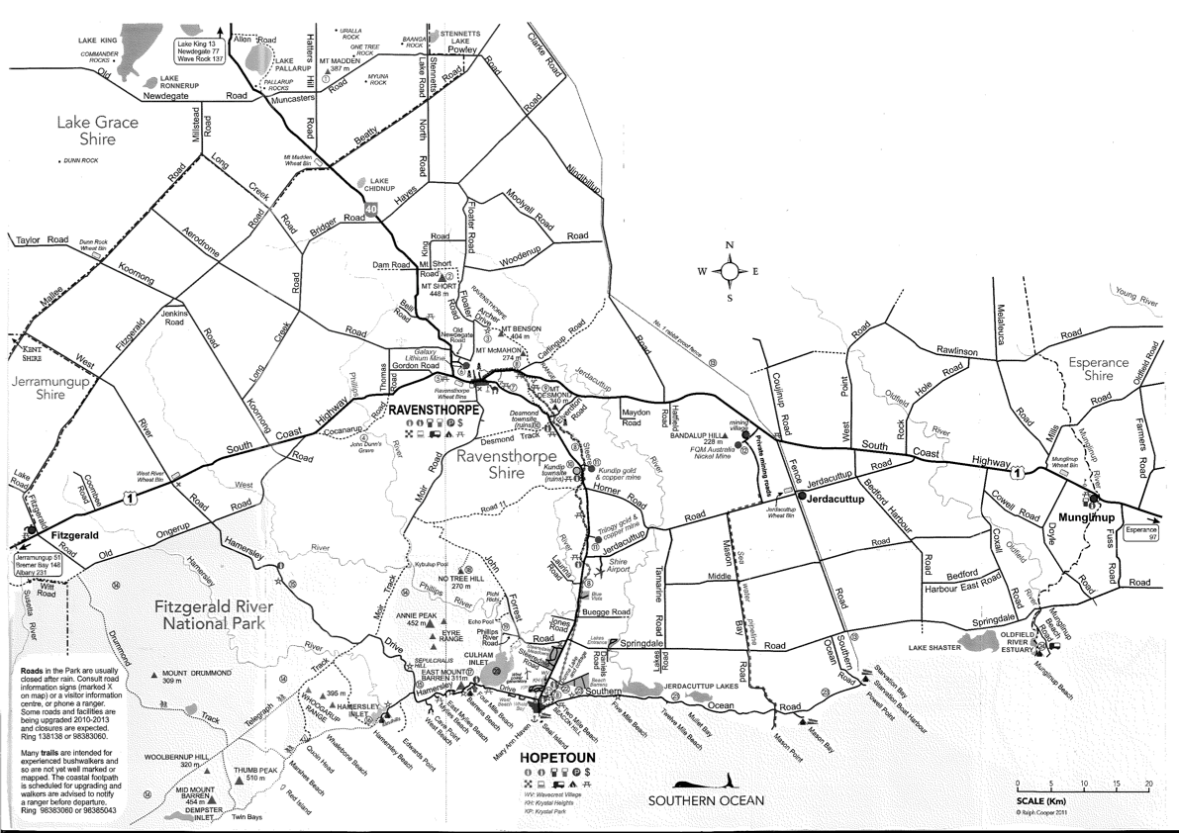
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# 1. Introduction

## 1.1. Why a Biosecurity Management Strategy?

Biosecurity involves the management of introduced (and some native) animals, plants and phytophthora dieback that impact agriculture, biodiversity, amenity, land and seascapes. There are also social impacts such as damage to cultural values, infrastructure and creation of nuisance. These pest animals and weeds and diseases can have significant impacts in Australia causing damage to crops, stock losses, creating competition for pasture, creating erosion, threaten the survival of native plants and animals, cause habitat destruction and predation of native animals. A conservative estimate of the impact of major pest animals is valued at more than $720 million annually (McLeod 2004). In addition, the estimated cost of weeds to nature conservation, landscape amenity and agriculture in Australia is more than eight billion dollars annually (NRMMC 2006).

Ravensthorpe Shire covers approximately 12,872 square kilometres and is home to more than 2,288 people, with the population size influenced by various mining cycles (Shire of Ravensthorpe 2014). Stretching from the coast northwards inland, the shire encompasses a diversity of landscapes. There are three towns, Ravensthorpe, Hopetoun (on the coast) and Munglinup. The shire comprises more than two thirds natural bush and the three main economic drivers are based around the agricultural, mining and tourism industries (Shire of Ravensthorpe 2014). As a growing industry, tourism relies on the pristine coast, world-renowned wildflowers and national parks of the region, values requiring a coordinated approach to biosecurity to ensure long-term protection.

**

Map 1. Ravensthorpe Shire area. Map courtesy Shire of Ravensthorpe***Biodiversity of the Ravensthorpe Shire***

The Ravensthorpe Shire has two major conservation landscapes, two thirds of Fitzgerald River National Park (FRNP) and the Ravensthorpe Range that surrounds the town of Ravensthorpe. In addition, half of the Ravensthorpe Shire is covered by the Fitzgerald Biosphere Reserve, which is internationally and nationally recognised for its extreme biological richness, species endemism and high level of threats, as it is part of the international Southwest Biodiversity Hotspot (Myers et al. 2000) and includes the National Biodiversity Hotspot ‘Fitzgerald River Ravensthorpe’ (DEC 2012).

The Biosphere is particularly significant for its plant diversity with over 2500 described vascular flora species, over 100 of which are endemic to the Biosphere - including 33 endemic to Ravensthorpe Range and nearby alone (Wilkins et al 2011). The FRNP and Ravensthorpe Range are floristic hotspots within this area (DEC 2012). FRNP supports more vertebrate species than any other conservation reserve in south-western Australia with 29 mammals, 51 reptiles, 14 frogs and 209 bird species (DEC 2009). This list includes nine Threatened Fauna species that occur in the Fitzgerald Biosphere (DEC 2012; WA Government 2015). There are a further 18 Priority Fauna species including two that are endemic to the Biosphere: Eula’s planthopper (*Budginmaya eulae*), which is known from only one specimen from Bandalup Hill; and the skink (*Lerista viduata*), which is endemic to the Ravensthorpe Range.

The Ravensthorpe Range acts as a link between FRNP and the Southern Goldfields. The plant communities of the Ravensthorpe Range are significant as in addition to comprising plant species endemic to the range, they represent flora from the Wheatbelt, eastern South Coast, western South Coast, and Goldfields (McQuoid 2004).

## 1.2. Ravensthorpe Shire Biosecurity Management Strategy

This Biosecurity Strategy for the Ravensthorpe Shire is the framework that guides the Southern Biosecurity Group (SBG) to meet its objectives. The SBG plays the key role of assisting land managers to manage and control high risk declared animal, plant and phytophthora dieback species in the Ravensthorpe Shire, its objectives are:

* To manage the impact of declared and other priority pest species so that they have minimal impact on the agricultural industry, landscapes, and biodiversity values within the Ravensthorpe Shire.
* To assist and encourage a consistent, integrated and cooperative approach to the management of declared and other priority pest species across all land types within the Ravensthorpe Shire.

The development of this Biosecurity Management Strategy has been guided by consultation with the Ravensthorpe community and stakeholders to identify and prioritise pest animals, plants and other organisms present and in need of management efforts in the Ravensthorpe Shire.

Phytophthora dieback is a very significant threat to the native vegetation of the Ravensthorpe Shire, as it sits within the Vulnerable Zone as identified by the Department of Parks and Wildlife (DPaW 2015). The vegetation communities of the Shire are among the most diverse on Earth spread across some of the most attractive landforms in Western Australia, a natural phenomenon of very considerable conservation value and economic significance for tourism and lifestyle that characterises Ravensthorpe. Such value and significance brings great responsibility to best conserve the natural resource for the long-term.

Phytophthora dieback does not respect tenure boundaries and its potential to cause damage in the Shire is enormous. As such, respect for its impacts and careful and considered management to ensure its containment is a broad and serious responsibility.

## 1.3. Definitions

The following terms are used in this Strategy and are defined in the various pieces of legislation detailed in the strategy. The definitions vary slightly and are usually specific to each national and state statute. As such, a common use definition is provided here to provide a point of reference and explanation for the terms used throughout the Strategy.

* **Biosecurity**: the management of risks to the economy, the environment and the community of pests and diseases entering, emerging, establishing or spreading in Australia.
* **Disease**: the presence of a pathogenic agent in a host that has the potential to have a negative effect.
* **Established pest or disease**: self-sustaining populations in Australia and is not considered eradicable. It may be distributed widely across Australia or only regionally. A regionally‑distributed established pest or disease may be the subject of containment measures to mitigate further spread.
* **Established pest or disease of national significance**: an established pest or disease that has a significant impact nationally on
* international market access and/or trade
* economic health of the nation
* human health
* natural environment and ecosystems
* infrastructure used by a significant proportion of people over an extensive area
* amenity of resources, such as public lands, and has the potential to affect more than one state/territory, or
* Australian culture, cultural assets, practice or custom, or national image.
* **Exotic pest or disease:** not native to, or established in, Australia and may not have predators or other population control mechanisms.
* **Declared pest**: is a prohibited organism. Declared pests are prevented entry into the State or have control or keeping requirements within the State.
* **Pest**:any animal, plant, invertebrate or pathogen with the potential to have a negative effect on agriculture and food industries and the environment.
* **Weed of national significance (WONS)**: are weeds that are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts. Each WONS has a national strategy and a national coordinator, responsible for implementing the strategy.
* **Wild dog**: are all wild-living dogs including pure-bred dingoes, hybrids, and domestic dogs running wild.

# 2. Biosecurity in the national and state context

This section describes the legislation, agencies, policies and classifications of weeds and pests at a national and state level relevant to the Ravensthorpe Shire. This provides an overview that guides the establishment of frameworks for biosecurity priorities for the Ravensthorpe Shire.

## 2.1. Commonwealth government and national bodies

### Biodiversity conservation legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) recognises invasive species among the threatening processes that can adversely impact Australia’s natural environment.

The Commonwealth Department of Environment website (Commonwealth of Australia 2016c): *An invasive species is a species occurring, as a result of human activities, beyond its accepted normal distribution and which threatens valued environmental, agricultural or other social resources by the damage it causes. Invasive species have a major impact on Australia's environment, threatening the unique biodiversity and reducing overall species abundance and diversity.*

*Invasive species include:*

* *diseases, fungi and parasites*
* *feral animals*
* *insects and other invertebrates*
* *introduced marine pests*
* *weeds*

*Under the EPBC Act, the Commonwealth can, among other things:*

* *List key threatening processes. These processes threaten, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community.*
* *Develop and implement threat abatement plans (TAPs). These plans outline the research, management and other actions necessary to reduce the impacts of a listed key threatening process on affected listed threatened species and ecological communities.*
* *Develop recovery plans in collaboration with state government agencies, eg. The Fitzgerald Biosphere Recovery Plan (DEC 2012)*

*The Australian Government works with the states and territories to develop strategies, undertake research and fund key management activities. Under the EPBC Act, a number of feral animals are recognised as threats to native animals and plants. The impacts of some feral animals have been listed as key threatening processes and a threat abatement plan has or may be developed. Some other animals, such as feral camels, are also the subject of national plans for management as Existing Pest Animal of National Significance under the Australian Pest Animal Strategy (Commonwealth of Australia 2007).*

*The vision for the Australian Pest Animal Strategy is that: Australia’s biodiversity, agricultural assets and social values are secure from the impacts of vertebrate pest animals. The focus of the Strategy is to address the undesirable impacts caused by exotic vertebrate animals (mammals, birds, reptiles, amphibians, and fish) that have become pests in Australia, and to prevent the establishment of new exotic vertebrate pests (Commonwealth of Australia 2016c).*

*The Australian Pest Animal Strategy is based on 12 key principles:*

1. *Pest animal management is an integral part of the sustainable management of natural resources for the benefit of the economy, the environment, human health and amenity.*
2. *Combating pest animal problems is a shared responsibility that requires all parties to have a clear understanding of their roles and responsibilities.*
3. *The development, monitoring and review of integrated pest animal management strategies need to be underpinned by good science.*
4. *Setting priorities for, and investment in, pest animal management must be informed by a risk management approach.*
5. *Prevention and early intervention are the most cost-effective techniques for managing pest animals.*
6. *Pest animal management requires coordination among all levels of government in partnership with industry, land and water managers and the community, regardless of land tenure.*
7. *Effective pest animal management requires capacity-building across government, industry, land and water managers and the community.*
8. *Management of established pests should aim to address actual rather than perceived problems, and to reduce impacts rather than simply pest animal numbers.*
9. *Management should be strategic in terms of determining where management should occur, timing of management, being proactive and using appropriate techniques.*
10. *Where there is a choice of methods, there needs to be a balance between efficacy, humaneness, community perception, feasibility and emergency needs.*
11. *The benefits of management should exceed the costs of implementing control.*
12. *As part of an integrated pest animal management program, commercial harvesting may offset management costs.*

### Biosecurity legislation

According to the Department of Agriculture and Water Resources (Commonwealth of Australia Department of Agriculture and Water Resources 2016b): *The Biosecurity Bill 2014 and supporting legislation received royal assent from the Governor-General on 16 June 2015 and has now become the Biosecurity Act 2015​. The Biosecurity Act will commence on 16 June 2016, replacing the Quarantine Act 1908 (Quarantine Act). As with the Quarantine Act, the Biosecurity Act will be co-administered by the Ministers responsible for Agriculture and Water Resources and Health. Until commencement of the Biosecurity Act, the Quarantine Act remains the primary piece of biosecurity legislation in Australia.*

*The Commonwealth Department of Agriculture and Water Resources (DAWR) will continue to consult with staff, stakeholders and clients to develop delegated legislation and supporting policies and procedures under the Biosecurity Act.*

*The Biosecurity Act modernises Australian biosecurity legislation. It has been developed through consultation with staff across the department as well as with industry, state and territory governments, environment groups, health professionals, trading partners and the general public. The Biosecurity Act has been designed to be flexible and responsive to changes in technology and future challenges.*

*A robust national biosecurity system is important in helping prevent the entry and establishment of exotic pests and diseases likely to harm Australia's agricultural systems, natural environment, community health and economy. Scientific evidence and advice plays an important role in the biosecurity system to support the best decision -making and results.*

*The implementation of the biosecurity legislation is the responsibility of the DAWR and its success is critical to a large number of clients and stakeholders. Client and stakeholder understanding of how the DAWR will implement the new regulatory framework is essential to ensuring effective compliance with the Biosecurity Act.*

### The Commonwealth Department of Agriculture and Water Resources​ (DAWR)

The Commonwealth Department of Agriculture and Water Resources​ (DAWR) has primary responsibility for managing Australia's biosecurity system. At the time of the development of this Biosecurity Strategy for Ravensthorpe, change is occurring in [how biosecurity services are delivered](http://www.agriculture.gov.au/biosecurity/australia/biosecurity-reform) to meet future challenges such as increased global movements of people and goods, and climate change through the new Biosecurity Act (outlined above) (Commonwealth of Australia DAWR 2016a).

The core priorities for DAWR in managing Australian national biosecurity are to:

* Manage Australia’s biosecurity by effectively identifying and targeting the management of risks to focus on the things that matter most;
* Partner with other governments, industry, our clients and our stakeholders to manage Australia's biosecurity;
* Deliver biosecurity services to support access to overseas markets and protect the economy and the environment from the impacts of unwanted pests and diseases; and
* Support Australia's reputation as a competitive exporter of agricultural goods and products.

The DAWR plays a key role in coordinating and managing invasive species including weeds, vertebrate pests and diseases of plants and animals. The department develops policies and holds technical and operational responsibility for pre-border, border, and emergency response to invasive species outbreaks. The department also prioritises and manages investment in invasive species impacting on Australian agriculture. Weed and pest animal management is nationally coordinated within the department (Commonwealth of Australia 2016b).

To combat weeds the Australian Government and all state and territory governments developed the [Australian Weeds Strategy](http://nrmonline.nrm.gov.au/catalog/mql:2307). Under the strategy, 32 of Australia's most significant weed species are listed as [Weeds of National Significance](http://lists.ala.org.au/speciesListItem/list/dr823). After over a decade of national coordination all of these have returned to state and territory management (Commonwealth of Australia 2016a; Australian Weeds Committee 2016).

Animal pest management is primarily the responsibility of the states and territories, although the Australian Government plays a role in coordinating strategic pest animal management, including through membership of the Invasive Plants and Animals Committee, support for rural Research and Development Corporations and funding to the Invasive Animals Cooperative Research Centre Commonwealth of Australia 2016a).

### Weeds of National Significance

According to the Australian Weeds Committee (AWC) (Australian Weeds Committee 2016): *The Weeds of National Significance (WoNS) initiative coordinates national effort against 32 of Australia’s worst invasive plants. Weeds of National Significance are high impact, established weeds for which targeted, strategic and nationally coordinated co-investment has been developed. WoNS are causing major economic, environmental and/or social and cultural impacts in a number of states/territories, and have strong potential for further spread. The WoNS initiative is designed to support collaborative national action to reduce the impacts and prevent further spread of these weeds* (Australian Weeds Committee 2012, 2016).

*In 1999 all Australian States and Territories agreed to 20 inaugural WoNS. The assessment process prioritised these weeds against their invasive characteristics and potential harm. The assessment process and inaugural WoNS were endorsed by Commonwealth, State and Territory Ministers for the environment, primary industries and forestry.*

Weeds of National Significance occurring in the Ravensthorpe Shire are bridal creeper *(Asparagus asparagoides),* African boxthorn *(Lycium ferocissimum),* and opuntioid cacti *(Opuntia spp.).*

### The Australian Pesticides and Veterinary Medicines Authority

The Australian Pesticides and Veterinary Medicines Authority (APVMA) is an Australian government statutory authority. According to the APVMA (APVMA 2016): *The APVMA was established in 1993 to centralise the registration of all agricultural and veterinary chemical products into the Australian marketplace. Previously each State and Territory government had its own system of registration. The APVMA was formerly known as the National Registration Authority (NRA).*

*The APVMA is the Australian Government regulator of agricultural and veterinary (agvet) chemical products. Its principal responsibilities are described in the* Agricultural and Veterinary Chemicals (Administration) Act 1992 *and the* Agricultural and Veterinary Chemicals Code Act 1994.

*For an agvet chemical product to legally be manufactured, imported, supplied, sold or used in Australia, it must be registered by the APVMA - unless exempt by the Agvet Code. The registration process involves scientifically evaluating the safety and effectiveness of a product in order to protect the health and safety of people, animals, plants and the environment.*

*Agvet chemicals, whether used by farmers, pest controllers, veterinarians or other home or professional users, are regulated by the APVMA. This includes:*

* [*agricultural chemicals*](http://apvma.gov.au/node/15931) *such as pesticides, herbicides, biocides, insecticides and seed treatments*
* [*veterinary chemicals*](http://apvma.gov.au/node/15931) *such as medicines, antibiotics, hormonal treatments and some stock feeds and pet foods, and*
* *other chemicals such as insect repellents, garden sprays and pool chemicals.*

*The APVMA* [*regulates*](http://apvma.gov.au/node/15931) *these chemicals and products up to and including the point of retail sale.*

### National Wild Dog Action Plan

The National Wild Dog Action Plan (Wool Producers Australia 2014) is an Australia wide approach, to promote and support community driven action for landscape scale wild dog management. It was prepared to guide the implementation of nationally agreed framework for a strategic and risk based approach to wild dog management; emphasising humane, safe and effective management techniques and appropriate scales for mitigating the impacts of wild dogs. Wild dogs are defined by the Plan as “*all wild living dogs, which includes dingoes, feral dogs and hybrids.*

## 2.3. Cooperative Research Centres

### Plant Biosecurity CRC

The Plant Biosecurity Cooperative Research Centre (PBCRC) was established in recognition of the need to strengthen Australia’s plant biosecurity scientific capacity. The PBCRC website (Cooperative Research Centre for Plant Biosecurity 2016) states that: *its mission is to develop and deploy scientific knowledge, tools, resources and capacity to safeguard Australia, its plant industries and regional communities from the economic, environmental and social consequences of damaging invasive plant pests and diseases.*

*The PBCRC started its six-year term on 1 July 2012, as an extension CRC from the Cooperative Research Centre for National Plant Biosecurity, which began operating in November 2005. It is headquartered in Canberra from where it coordinates plant biosecurity research across all Australian states and territories. The PBCRC has an extensive collaborative network of researchers and educators from 27 participating organisations from Australia and internationally, representing industry, universities, and state and federal government.*

### Invasive Animals CRC

According to the Invasive Animals Cooperative Research Centre (IACRC) website (Cooperative Research Centre for Invasive Animals 2016): *the IACRC is Australia’s largest integrated invasive animal research and management collaboration with* [*27 participating organisations*](http://www.invasiveanimals.com/about-us/participants/)*. The purpose of the IACRC is to counteract the impact of invasive animals through the application of new technologies and by integrating approaches across agencies and jurisdictions*

*The IACRC coordinates research efforts to combat the threat of invasive animals by developing new technologies and integrated strategies that are more humane, target specific and effective to reduce the impact of invasive animals on Australia’s economy, environment, and people.*

*The IACRC focuses on developing smarter tools to prevent and detect new invasions, advanced and tactical tools to strengthen integrated management strategies of carp and other pest fish, and new tools and integrated management strategies for major pests including foxes, wild dogs, feral pigs, rats and mice, cane toads, feral cats and rabbits.*

## 2.4. Western Australian State government

### Biosecurity and Agriculture Management Act

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations were enacted on 1 May 2013. According to DAFWA (DAFWA 2016a): *The BAM Act takes the place of 16 older Acts (including the* Agriculture and Related Resources Protection Act 1976 (ARRP Act), *and 27 sets of regulations with one Act and nine sets of regulations and enhances protection of Western Australia’s agriculture and food sector and the environment. The BAM Act modernises the law and removes inconsistencies between previous legislation to better serve business and the community. It will also enable greater co-operation between government, landholders, industry and the community. The main purposes of the BAM Act and its regulations are to:*

* *Prevent new animal and plant pests (vermin and weeds) and diseases from entering Western Australia.*
* *Manage the impact and spread of those pests already present in the state.*
* *Safely manage the use of agricultural and veterinary chemicals.*
* *Increased control over the sale of agricultural products that contain violative chemical residues.*

*The BAM Act regulates interstate imports and exports by way of quality assurance programs. Penalties can be issued by Quarantine WA, a section within the Department of Agriculture and Food WA (DAFWA) to persons who contravene the regulations regarding importing potentially harmful organisms or carriers of such organisms.*

*In terms of biosecurity risks it is impractical to consider agriculture in isolation, accordingly the BAM Act extends to allow for the protection of industries and assets beyond agriculture such as forestry and* [*aquaculture*](http://www.daff.gov.au/fisheries/aquaculture)*. To enable this, the BAM Act is designed to facilitate cooperation between government agencies other than DAFWA, as well as interested groups ranging from primary producers to the general public. Major stakeholders with interests affected by the BAM Act include:*

* *rural landholders and managers*
* *local and state government authorities*
* *freight carriers*
* *public transport carriers and individual travellers*
* *importers (commercial and private)*
* *stock and grain producers*
* *people who keep and trade declared pests*
* *beekeepers*
* *nursery/garden businesses*
* *pastoralists*
* *stock feeders*
* *fertiliser manufacturers*
* *veterinarians.*

***Industry and community involvement***

The involvement of the whole community has also been facilitated under the BAM Act. In both pastoral and agricultural areas, groups who are managing established declared pests that impact on the public as well as private interests, may be formally acknowledged as a Recognised Biosecurity Group (RBG) by the Minister for Agriculture and Food. The Southern Biosecurity Group (SBG) is looking to become an RBG (see Recognised Biosecurity Groups below, and Biosecurity in Ravensthorpe Shire section).

Agricultural industries are also able to take an active role in the management of biosecurity issues through Industry Funding Schemes, which are already in place for the grains/seed/hay, sheep/goats and cattle industries.

Central to the BAM Act is the Biosecurity Council, established in 2007; this body is an advisory panel comprising specialists from all areas of industry to provide advice to the Minister for Agriculture and the Director General of DAFWA.

***Management plans***

A management plan may be issued under the *Biosecurity and Agriculture Management Act 2007*to provide for the control of a declared pest in an area. A management plan must:

* Identify the area to which the plan relates.
* Set out the purposes of the plan.
* Set out the practices to be followed under the plan.
* Specify any obligations that are imposed on owners, occupiers or other persons for the purposes of the plan.

Current Management Plans involve the management of Stable Fly *(Stomoxys calcitrans)* and Fruit Fly *(Ceratitis capitata*).

### Declared pests

Plants and animals may be ”declared” as pests under Western Australian legislation (Dodd and Loo 2015; DAFWA 2016a). If an animal or plant is declared, landowners/occupiers and other persons are obliged to control that animal or plant on their properties. Declaration specifies a category, or categories, for each plant according to the control strategies or objectives that are considered to be appropriate in a particular area.

Among the factors considered in categorising declared plants are:

* The impact of the plant on individuals, agricultural production and the community in general;
* Whether it is already established in the area; and
* Feasibility and cost of possible control measures.

### Declared plants

Declared plants are usually declared under categories that define the action required. The category may apply to the whole of the State, districts, individual properties or even paddocks. The *Western Australian Organism List (WAOL)* contains information on the area(s) in which a plant is declared and the control categories to which it has been assigned in WA.

***Organism categorisation***

Under the BAM Act, organisms, including plants can be categorised as:

* Permitted organisms under section 11:
  + Organisms that are allowed entry into Western Australia.
* Prohibited organisms under section 12:
  + Organisms that are prohibited from entry into Western Australia.
* Unlisted organisms under section 14:
  + If an organism cannot be categorised as either permitted or prohibited the organism will be unlisted.
* Declared pest under section 22:
  + Pests that may be in the state but are under official containment, control or eradication.

Declared pests can be assigned to a C1, C2 or C3 control category under the *BAM Act Regulations 2013*.  Prohibited organisms can be assigned to a C1 or C2 control category, the control categories are:

* C1 Exclusion:
  + Plants which should be excluded from part or all of Western Australia.
* C2 Eradication:
  + Plants which should be eradicated from part or all of Western Australia.
* C3 Management:
  + Plants that should have some form of management applied that will alleviate the harmful impact of the plant, reduce the numbers or distribution of the plant or prevent or contain the spread of the plant

### Declared pest plant and animal review

During 2016, DAFWA and the Department of Parks and Wildlife are conducting a review of Declared Pest plants (weeds) and vertebrate animals (Dodd and Loo 2015). The review is designed to provide the government and community an up to date, rational, realistic and widely supported suite of declared pests that:

* Reflects the intent of the BAM Act and Regulations;
* Meets community, industry and landholder expectations, and
* Is appropriate to regulatory bodies’ capacity for delivering compliance.

The review will determine whether Western Australia’s declared plants and animals are declared appropriately. It will do this by a fresh look to consider whether the status of pest animals and plants is appropriate in a contemporary context, largely because the declarations were lifted unaltered from the old *Agriculture and Related Resources Protection Act 1977* (ARRP), and placed into the BAM Act 2007 (D. Kessell pers. comm.; Dodd and Loo 2015). This has resulted in a situation of potentially skewed priorities and resource allocation, requiring scrutiny to test appropriateness and priorities.

The (DAFWA) is also responsible for managing the maintenance and construction of the State Barrier Fence (SBF). According to DAFWA: *The State Barrier Fence plays an important role in minimising the impact of invasive species, such as wild dogs and emus and protecting the State’s agricultural industries. The 1,170 km fence extends from the Zuytdorp cliffs north of Kalbarri in the State’s north, through to Jerdacuttup east of Ravensthorpe in the State’s south. From 2010, $13.82 million has been allocated from the State Government’s Royalties for Regions funds to upgrade and extend the fence and support the employment of another eight doggers* (DAFWA 2016b).

The management of the maintenance of the fence may be shifted from DAFWA to industry (K. Tuckett and J. Chambers pers. comm.).

DAFWA is currently investigating a proposal to extend the SBF east from the current southern end at Jerdacuttup known as the Esperance Extension (DAFWA 2016c). The proposal is to extend the SBF eastwards around the agricultural land of the Esperance district, following existing roads and tracks alongside the large areas of unallocated Crown land, running north-east around the Salmon Gums area and southeast to the coast near Cape Arid National Park.

The intent of the Esperance SBF extension as proposed, is to protect the Esperance agriculture area from the impact of wild dogs, emus and kangaroos moving in from the adjacent rangelands and woodlands.

An Esperance Extension Reference Group (EERG) comprising the main stakeholders has been established to advise DAFWA during the SBF extension planning and approvals process. The planning and approvals process includes:

* Environmental investigations to survey for biological values, dieback and weed assessments, and consideration of the Soil and Land Conservation Act.
* Aboriginal cultural heritage surveys involving the Esperance Noongar and Ngadju Traditional Owners.
* Consideration to minimise impacts on cultural and natural values by the fence planning and construction.

The proposal as planned was referred by DAFWA to the WA Environmental Protection Authority (EPA) and the Commonwealth Department of Environment. The EPA has determined that is will be subject to a formal environmental impact assessment.

### Draft WA Wild Dog Action Plan

At the time of the preparation of this strategy, the Draft Western Australian Wild Dog Action Plan 2016 – 2021 (WAWDAP) (WA Wild Dog Action Group 2016) is being developed.

The Draft WAWDAP states in its overview *The Wild Dog Action Plan 2016 - 2021 is an industry driven plan that considers the economic, environmental and social impacts of wild dogs and identifies key issues for managing them throughout Western Australia. The Plan is designed to protect the livestock industries and public safety, and recognises the ecological and cultural values of the dingo.*

*The Action Plan will coordinate the control of wild dogs by developing partnership arrangements between industry, Biosecurity Groups, Government and the community to deliver a sustained, whole-of-industry benefit.*

*The objective is to reduce the impact of wild dogs on agricultural production and biodiversity by 10% per annum, and to target control systems appropriate to the wild dog pressure in a local area and impact on assets in that area.*

*Recognising the need for the agricultural industry to take responsibility for long-term management and with community consent on the need for action, the Action Plan highlights investment in developing the capacity of industry to manage the wild dog impact. Biosecurity Groups will lead integrated management programs to protect agricultural production and biodiversity.*

The WAWDAP proposes that wild dog management will be *lead by a representative group, the WA Wild Dog Alliance, to support Biosecurity Groups to assume leadership of wild dog management.*

The WAWDAP also discusses the SBF as a central focus and valuable infrastructure element critical for the effective management of wild dog impacts on livestock enterprises on agricultural lands west and south of the SBF.

### Recognised Biosecurity Groups

Recognised Biosecurity Groups (RBGs) are formally recognised groups, designed to control pests that impact on public and private interests. The Ravensthorpe Biosecurity Group is an RBG (see Biosecurity management in Ravensthorpe Shire section).

According to DAFWA (DAFWA 2016a) *The Biosecurity and Agriculture Management Act 2007 (BAM Act) enables the Minister of Agriculture and Food to recognise groups as RBGs for the purpose of controlling declared pests at a landscape scale across tenure. RBGs provide a mechanism to enable landholders and managers to develop a coordinated approach to control and manage declared pests in their area.*

*RBGs are the Department of Agriculture and Food WA’s (DAFWA) preferred partnership arrangement for the management and control of declared pests. The work undertaken by RBGs is intended to add value to pest control undertaken by individual landholders and is not intended to replace individual responsibilities.*

*Recognised Biosecurity Groups, with the agreement and support of landholders in their prescribed area, can request the Minister for Agriculture and Food to levy rates on properties in the area to fund declared pest control activities. The work undertaken by an RBG is intended to add value to pest control undertaken by individual landholders rather than to replace individual responsibilities.*

*The WA Office of State Revenue (OSR) is responsible for issuing and collecting the Declared Pest Rates (DPR). In September each year, annual rate assessment notices (invoices) are issued. Collected rate funds are deposited monthly into the Declared Pest Account (DPA), which is administered by DAFWA. Rates are matched dollar-for-dollar by State Government funds and transferred to the DPA. Funds are then disbursed to RBGs to fund approved operations for the control of declared pests.*

*RBGs are incorporated associations managed exclusively by a committee comprised of members. RBGs have full and associate membership. Full membership is open only to ratepayers within the RBG area of operation, and is automatically given to the individual/entity issued with a Declared Pest Rate assessment, provided the assessment is paid in full within 12 months of the issue date. Associate membership is available to any public authority and other corporate body that is responsible for the care, control or management of land within the RBG area of operation, or conducts significant activities on land in the area.*

*DAFWA provides support to RBGs through advice on governance; development of annual operational plans, assisting with community consultation, technical advice and operational support.*

### Aquatic pests and diseases

The WA Department of Fisheries is responsible for the management of aquatic biosecurity in Western Australia, its website (Dept of Fisheries 2016) states: *Aquatic pests and diseases are a significant threat to Western Australia’s precious oceans and rivers. The WA Department of Fisheries is the lead agency responsible for the effort to prevent pests and diseases arriving and establishing in WA waters through its aquatic biosecurity program.*

*The Department’s Aquatic Biosecurity Policy (Department of Fisheries 2014) outlines the agency’s management of aquatic pests and diseases to protect aquatic environments within WA. The policy promotes the following outcomes:*

* *Prevent the establishment of all aquatic pests and diseases in new locations by:* 
  + *Managing the pathways and vectors (using a risk-based approach) that are responsible for their introduction and spread; and*
  + *Eradicating priority pests and diseases in small, localised populations through a focus on early detection, reporting and rapid response.*
* *Minimise the impact of established aquatic pests and diseases by: - Containing priority pests and diseases to limit their spread; and* 
  + *Targeted asset protection.*
* *Develop appropriate partnership arrangements with relevant agencies, industries, and other stakeholders with a view to formalising responsibilities.*
* *Engage the community in the protection of aquatic ecosystems from pests and diseases.*
* *Maintain WA’s favourable reputation for:* 
  + *Being free from priority aquatic pests and diseases;*
  + *Bio-secure business activities; and*
  + *Diverse and sustainable aquatic ecosystems.*
* *Comply with State, national and international aquatic biosecurity obligations.*

*Aquatic pests can be transported by ocean-going vessels, and by escaping or being released into our rivers and dams. Pests and diseases can devastate aquatic ecosystems damaging economies, environments and lifestyles.*

*The Department of Fisheries partners with WA’s industries and the community as essential partners to keep WA waters pest free, it also works* [*at a national level*](http://www.marinepests.gov.au/) *to prevent the spread of pests and diseases in the nation’s waters.*

*The Department of Fisheries* [*Aquatic Biosecurity Charter*](http://www.fish.wa.gov.au/Sustainability-and-Environment/Aquatic-Biosecurity/Pages/Biosecurity-Charter.aspx) *was established in 2011 to promote the protection of Western Australia's oceans and rivers from aquatic pest species. The charter is aimed at all members of the community from industry and community interest groups to individuals.*

### Department of Parks and Wildlife

The Department of Parks and Wildlife (DPaW) is responsible for the management of conservation and recreation lands and waters vested in the WA Conservation Commission, and wildlife conservation for the community of Western Australia. It conducts its activities according to the WA *Wildlife Conservation Act 1950* (WC Act), and the *Conservation and Land Management Act 1984* (CALM Act) as amended.

DPaW has numerous management policies and programs in place to guide and manage the control and where possible, elimination of key invasive pest animals, plants (weeds) and diseases (DPaW 2016). The DPaW website also states: *The majority of the work of these programs occurs on lands the department manages, including national parks and nature reserves. They include:*

Cane toad

*Cane toads first crossed into Western Australia from the Northern Territory in February 2009. To help manage this invasion, the government is working closely with community groups to slow the pest’s progress, while research to find a biological control continues.*

Western Shield - controlling feral cats and foxes

[*Western Shield*](https://www.dpaw.wa.gov.au/management/pests-diseases/westernshield) *is the department's principle animal conservation program, one of the biggest such programs ever undertaken in Australia. The Western Shield program aims to return the balance and mixture of animals in selected areas to levels comparable to pre-European settlement, through 1080 baiting of introduced foxes and feral cats.*

Other feral animals

*Control of feral cattle, goats,* [*camels*](https://www.dpaw.wa.gov.au/management/pests-diseases/202-camels-in-western-australia)*,*[*rabbits*](https://www.dpaw.wa.gov.au/management/pests-diseases/181-rabbits)*, wild dogs and other pest species is carried out to protect areas of key conservation significance.*

Dieback

*The arrival and spread of*[*Phytophthora dieback disease*](https://www.dpaw.wa.gov.au/management/pests-diseases/129-phytophthora-dieback) *in Western Australia has been catastrophic for a number of ecosystems in the southwest. As many as 2,000 of the estimated 9,000 native plant species in the southwest of Australia are susceptible to dieback disease.*

Myrtle rust

[*Myrtle rust*](https://www.dpaw.wa.gov.au/management/pests-diseases/206-myrtle-rust) *is a fungus that causes disease in plants in the Myrtaceae family, which includes the eucalypts. While there are no confirmed reports of myrtle rust in Western Australia, the Department of Parks and Wildlife is on alert since the fungus was first detected in New South Wales in 2010.*

Invasive plants

*Weeds, along with other invasive species, pose one of the most significant threats to biodiversity.* DPaW has an[Invasive Plants Program](https://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds) (DPaW 2013a) to help manage weeds.

# 3. Phytophthora dieback in the national and state context

## 3.1. Commonwealth government

The disease caused by *Phytophthora cinnamomi* is listed as a key threatening process under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EBPC Act). A national Threat Abatement Plan (TAP) for disease in natural ecosystems caused by *Phytophthora cinnamomi* has been in place and reviewed twice since 2001 (Commonwealth of Australia 2014), it has been prepared to provide a national strategy to manage the impact on biodiversity. The latest threat abatement plan came into force on 31 January 2014.

The goal of the TAP is to identify and protect environmental assets such as threatened species and ecological communities listed under the EPBC Act and other matters of national environmental significance, from the impacts of *P. cinnamomi*.

The TAP also integrates:

* strategies to prevent *P. cinnamomi* spreading into areas that are free of disease
* strategies to reduce the impacts in infested areas
* recovery actions for the conservation of biodiversity assets currently being affected.

The TAP should be read in conjunction with the document, *Background: Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (Department of the Environment, 2014). The background document provides information on the scope of the problem; the characteristics, biology and distribution of the pathogen; impacts on the environment and management practices (Commonwealth of Australia 2016b).

The Commonwealth Department of the Environment (DOTE) has in the past commissioned research into natural and induced resistance in Australian native vegetation of *Phytophthora cinnamomi* and innovative methods to contain and/or eradicate within localised incursions in areas of high biodiversity in Australia.

## 3.2. Western Australian State government

The Department of Parks and Wildlife (DPaW) has significant expertise in understanding and managing Phytophthora dieback. Department has well developed policies (CALM 2004; DPaW 2015), from which it designs, delivers and monitors its Phytophthora dieback management.

The Department’s Corporate Policy Statement No. 3 Management of Phytophthora Disease (DPaW 2015) has the objective: *To provide direction and guidance for managing the risk of introducing or spreading Phytophthora disease on Conservation and Land Management Act 1984 land (CALM Act land) managed by the Department of Parks and Wildlife.* It’s scope states:

*This policy applies to activities occurring on CALM Act land, in the south-west of Western Australia (WA) within the ‘vulnerable zone’, which have potential to introduce and/or spread Phytophthora disease.* The Vulnerable zone is: *That part of the South West Land Division and the areas adjoining to the northwest and southeast where susceptible native plants occur in conjunction with environmental factors required for Phytophthora pathogens to establish and persist*.

*The focus of this policy is on Phytophthora cinnamomi, as it currently remains the major disease threat to the State’s unique native flora, ecosystem health and a range of associated values and benefits. However, there are a number of Phytophthora species currently known to occur in southwest WA, some which are thought to be indigenous and others introduced. All these currently recorded Phytophthora species are soil-borne and are potentially plant pathogens; hence this policy provides a basis for the management of all currently known Phytophthora species occurring in southwest WA.*

*This policy is the responsibility of all departmental staff engaged in planning, implementing, supervising, monitoring or reviewing disturbance activities on CALM Act land, including staff employed in specialist branches and divisions, and applies to contractors and other parties undertaking works on CALM Act land in the vulnerable zone.*

Phytophthora dieback management is also at the forefront of all management plans for terrestrial national parks and other reserves in the southwest land division, where susceptible vegetation communities often with endemic and localised flora dominate the landforms. These reserves extend from Kalbarri in the north, to Cape Arid National Park and Nuytsland Nature Reserve in the southeast, and include Fitzgerald River National Park (CALM 1991) and Lake Shaster Nature Reserve (DPaW 2016) in the Ravensthorpe Shire.

## 3.3. Natural Resource Management (NRM) collaborations

Project Dieback and State Phytophthora Dieback Management and Investment Framework (SPDMIF) (SCNRM 2014) has been a very significant mapping and prevention partnership project managed by South Coast Natural Resource Management supported by the WA State Natural Resource Management program with the input of Ravensthorpe Agriculture Initiative Network RAIN and the Shire of Ravensthorpe. Ravensthorpe Range and Fitzgerald River National Park have been identified as Priority Protection Areas by this program. The program’s recommendations include policy and planning mechanisms, partnership and communication, and collaborative investment.

According to the Dieback Working Group (DWG) (DWG 2016): *The DWG was formed in 1996 by local government authorities, community groups and state government land management agencies concerned with the management of Phytophthora Dieback in Western Australia (DWG 2016).*

*The objectives of the DWG as stated in its Rules of Association are:*

* *Increase awareness and management of Phytophthora Dieback by key stakeholders;*
* *Be a source of knowledge and facilitate the development of best management practices for Phytophthora Dieback;*
* *Promote best practice in Phytophthora Dieback management by government, industry, NGO’s, utilities and landholders;*
* *Encourage the adoption of Phytophthora Dieback best practice policy in government, industry, utilities and NGO’s and;*
* *Apply for and coordinate funding applications and facilitate effective partnerships.*

*The DWG seeks to meet their objectives through the Management Committee and staff, general members, strong partnerships with other organisations and projects.  The DWG also provide comment on policy, legislation and management plans in places and situations where Phytophthora dieback is or could be an issue. DWG Project Officers provide expertise to projects that result in the training, education and increased awareness of Phytophthora Dieback by stakeholders. They also support on-ground works to improve and increase management and treatment of the disease.*

*The DWG supports local Dieback Working Groups and encourages the formation of more of these groups. These are an ideal method to network with others in local areas to be involved in managing, treating or researching the disease. Local Dieback Working Groups have started up across the South-west of WA and some have been running for several years. These groups are typically a local network of people concerned about the spread and impact of the disease in their local area.*

*Local Dieback Working groups can seek funding to help protect important local bushland and form a local hub for Phytophthora Dieback information resources, treatment resources and knowledgeable people.*

# 4. Biosecurity management in Ravensthorpe Shire

This section outlines the organisations, systems and process that contribute to biosecurity management in the Ravensthorpe Shire. It includes the roles and responsibilities of relevant agencies, organisations, related strategies and policies and current research and management programs.

## 4.1. Ravensthorpe Shire

The Ravensthorpe Shire landscape is a mixture of approximately 40% agricultural lands and 60% natural lands (GEDC 2016). Some of the landscapes of the Shire contain valuable mineral resources, with a strong history of mining development and economic return (Shire of Ravensthorpe 2014).

Agricultural production is the predominant economic activity, dominated by cereal and oilseed cropping supported by sheep and cattle production. In 2011, Ravensthorpe’s agricultural production was considered to be worth around $107 million (Shire of Ravensthorpe 2014). Sustaining the value and protection of this resource is of great importance to the community.

Natural lands include the eastern half of the large and diverse Fitzgerald River National Park, the most important Mediterranean ecosystem reserve on Earth (B. Von Droste 1989 pers. comm.), Frank Hann National Park, Lake Shaster Nature Reserve, Ravensthorpe Range, the south western parts of the Great Western Woodlands and large areas of unallocated Crown land. The biological richness of the Ravensthorpe Shire is among the most diverse on Earth and of great value to the community for amenity, character and tourism values.

The Shire of Ravensthorpe local authority supports biosecurity management and protection, although it has no specific policy or regulations regarding biosecurity. It provides valuable indirect support through RAIN, the SBG and through the Ravensthorpe Hopetoun Future Fund, which has provided the funding to develop this strategy.

Biosecurity concerns pose threats to agricultural production and the natural landscapes that characterise and form a large part of the economic and identity values of the Ravensthorpe Shire. This Strategy is designed to outline and prioritise the threats, and recommend management and research for effective mitigation.

## 4.2. Agencies and organisations and their roles and responsibilities

### Department of Agriculture and Food

The Department of Agriculture and Food (DAFWA) operations as they relate to Ravensthorpe Shire are mostly based in Esperance, where the Esperance District of DAFWA forms part of the Southern Region office located in Albany. However, wild dog management is conducted in consultation with the Biosecurity Officer in Albany.

The Biosecurity priorities for DAFWAs Esperance district are in line with the agency’s corporate plan and the *Biosecurity and Agriculture Management Act 2007*. The current Declared Plant and Animal review (Dodd and Loo 2015) will inform future priorities.

Current and projected priorities are focussed on pre-established serious pests including the European starling, for which the Esperance district is the primary introduction frontier. *Opuntia* cacti are also a priority as a C3 Declared pest and being recently added as a Weed of National Significance (WoNS) (Table 2) and in a pre-establishment state, small populations of this group are the subject of management attention including the population on the Oldfield River in the Ravensthorpe Shire.

Other priorities are working with Recognised Biosecurity Groups such as the SBG, wild dog management, and on awareness-raising for pest plants and animals that could be better managed as containment or local eradication with some understanding and limited effort, this applies to pests such as boxthorn and localised double-gee.

The Esperance District is served by one dedicated Biosecurity Officer, this role focuses on support for, and managing priorities and liaison with RBGs. The Biosecurity Officer based in Albany provides additional support and liaise to Ravensthorpe. Technology is also assisting with improvements and efficiencies in declared pest management, including automated listening devices that record bird song that can be interpreted by a computer algorithm to identify starling calls indicating presence and numbers (B Nicholas pers. comm.).

### Department of Parks and Wildlife

The Department of Parks and Wildlife (DPaW) is responsible for the management of conservation. DPaW conducts significant predator pest and dieback management programs across conservation and adjacent estate and unallocated Crown land in the Shire.

Ravensthorpe Shire sits within the department’s South Coast region, and straddles the Albany and Esperance Districts, the district divide being Fence Rd and the old vermin fence to the coast at Starvation Bay. A work centre and operations centre is located at Ravensthorpe, adjacent to the RAIN office, and two National Park Rangers operate from Hopetoun and East Mt Barren.

The Western Shield program (DPaW 2016) is a broad-based 1080 baiting program aimed to control feral cats and foxes on conservation and adjacent estate to reduce the predation impact on native animals, many of which are threatened or uncommon. This is particularly important in the Ravensthorpe Shire, which is home to several animals predated by cats and foxes, including tammar wallaby (*Macropus eugenii*), chuditch (*Dasyurus geoffroyii*), quenda (*Isoodon obesulus*), red-tailed wambenger (*Phascogale calura*), heath rat (*Pseudomys shortridgei*), malleefowl (*Leipoa ocellata*) and ground parrot (*Pezoporus wallicus*).

The department’s dieback management program is sophisticated and extensive. However, it relates almost exclusively to lands managed by the department. Notwithstanding, the program and the considerable expertise of the department are of significance to this Strategy for the understanding of the dieback organism and its behaviour and impacts, management techniques, extension materials and by its example. The great significance is that dieback does not respect tenure, and limiting its spread and impacts are priorities for this strategy.

The Fitzgerald River National Park Management Plan (CALM 1991) and the Esperance and Recherche Parks and Reserves Management Plan (Conservation Commission 2016) are also key management instruments of DPaW. The Fitzgerald River National Park Management Plan’s primary principle is to protect the Park from Phytophthora dieback, and it contains a number of prescriptions to implement actions and controls. The Esperance and Recherche Parks and Reserves Plan includes Lake Shaster Nature Reserve in the Ravensthorpe Shire, the Plan contains management actions relating to Phytophthora dieback management as relevant to this Strategy.

Fitzgerald Biosphere is home to 41 threatened species/communities listed by the State of WA, 33 of which are also listed by the Commonwealth Government. DPaW administers the Fitzgerald Biosphere Recovery Plan (DEC 2012). The plan constitutes the formal national regional recovery plan for 11 flora species and provides recovery guidance for the remaining animal and plant species and ecological communities largely endemic to the Fitzgerald Biosphere, which are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The plan presents a landscape approach to identifying the recovery actions and management practices necessary to ensure the long-term viability of the threatened and priority species and ecological communities and the overall biodiversity of the Fitzgerald Biosphere (Commonwealth of Australia 2016a). Phytophthora dieback is one of the primary threats included in the Plan, therefore of relevance to this Strategy.

### Department of Fisheries

Ravensthorpe Shire is in the Department of Fisheries Esperance District administered from offices in Esperance, which is part of the Southern Region headquartered in Albany. Issues of aquatic biosecurity are managed by a specialist branch of the Department of Fisheries located in the metropolitan area, although reporting of potential biosecurity pests and diseases can be provided direct to local offices, in the case of this strategy – to Esperance District Office.

Aquatic biosecurity is a relatively limited issue for Ravensthorpe and this Strategy. However, diligence and a relationship with the WA Department of Fisheries is a priority for this Strategy.

### South Coast Natural Resource Management

South Coast Natural Resource Management (South Coast NRM) coordinates and administers funding provided by the Australian Government and the Government of Western Australia for natural resource management (South Coast NRM 2016).

The South Coast NRM Region stretches from the Denmark Shire in the west, to the Esperance Shire in the east and north to the shires of Broomehill, Tambellup and Gnowangerup. The region is divided into subregions and Ravensthorpe Shire sits predominantly in the Fitzgerald Biosphere Subregion, with eastern overlap into the Esperance Coast and Esperance Mallee Subregions (South Coast NRM 2011).

South Coast NRM’s governance comprises a board of management that oversees committees for NRM functions, audit, business development, and a trust fund. South Coast NRM operates with strong community, industry and government support for on-ground work organised under the themes of Land, Water, Biodiversity, Cultural Heritage and Coastal and Marine. Biosecurity is specifically considered by the Invasive Species Technical Advisory group and the *Invasive Species Management Strategy 2013-2023* (South Coast NRM 2013).

Sub-regional representation is provided by members of an NRM Committee, where sub-regional representatives provide input from catchment groups, production groups and non-government organisations, including RAIN.

The activities and funding of South Coast NRM is directed by *Southern Prospects 2011-2016 - the South Coast Regional Strategy for Natural Resource Management* (South Coast NRM 2011). South Coast NRM processes and partnerships have provided funding for significant NRM activities in Ravensthorpe Shire through RAIN, including biosecurity. It is envisaged that this relationship will continue to provide contributions to ongoing NRM management including biosecurity.

### Department of Health, licensed pest management technicians

Licensed Pest Management Technicians conduct control and management of pests, weeds and phytophthora plant diseases in Western Australia, as licensed by the WA Department of Health (Dept. of Health 2014).

A technician’s licence is granted upon the completion of a provisional licence and the completion of appropriate units at Certificate 3 level of the relevant endorsements for specified treatment and control situations. For weed management, to obtain the endorsement for *Crops and Pastures, Forestry, Pest and Weed Control Non-Cropping Situations and Turf Management*, six units must be completed (Dept. of Health 2014)

To obtain a licence for wild dog management using 1080 and or strychnine baits and trap poison, pest management technicians are required to obtain a Feral Vertebrates Endorsement. This requires the completion of 13 units of competency from the Certificate 3 level Vertebrate Pest Management course (Dept. of Health 2014). PAPP (4-aminopropiophenone) is a new active ingredient used in pest animal bait products that has been registered and approved for the control of foxes and wild dogs. PAPP will be used in a similar way to 1080 baits already registered for fox and wild dog control in Victoria. Like 1080, PAPP is a Schedule 7 poison and can only be purchased and used by authorised persons. All PAPP use must comply with the Directions for the Use of 1080 and PAPP Pest Animal Bait Products in Victoria and the product label (K Tuckett pers. comm.).

For this Strategy and Ravensthorpe Shire, the predominant work undertaken by Licensed Pest Management Technicians is wild dog control, where the technicians operate as contractors to provide this service. Other work that may require technicians with endorsements for competencies include weed management and control and Phytophthora dieback management.

## 4.3. Fitzgerald Biosphere

The Ravensthorpe Shire covers the eastern half of the Fitzgerald Biosphere Reserve as proposed in 2015 (McQuoid 2015). Fitzgerald River National Park was designated a Biosphere Reserve under the United Nations Environment Scientific and Cultural Organisation (UNESCO) Man and the Biosphere Programme in 1978, and is recognised for its relatively pristine state and high biological diversity, especially its flora.

Biosphere Reserves are areas of terrestrial and coastal/marine ecosystems or a combination thereof, which are internationally recognised within the framework of UNESCO's program on Man And the Biosphere (MAB), in accordance with the present Statutory Framework (UNESCO 1996).

The objective of the MAB Program for Biosphere Reserves is to strive to be sites of excellence to explore and demonstrate approaches to conservation and sustainable development at a regional scale through the Three Functions of Biosphere Reserves:

1. ***Conservation***

*Contribute to the conservation of landscapes, ecosystems, species and genetic variation.*

1. ***Development***

*Foster economic and human development, which is socio-culturally and ecologically sustainable.*

1. ***Logistic Support***

*Support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development.*

This Biosecurity Strategy for the Ravensthorpe Shire aligns with and contributes to the MAB Objective and the three functions of Biosphere Reserves.

The governance of Fitzgerald Biosphere is administered by the Biosphere Implementation Group (BIG), which is a stakeholder group consisting of the Department of Parks and Wildlife, the Shires of Jerramungup and Ravensthorpe, Fitzgerald Biosphere Group, Ravensthorpe Agricultural Initiative Network, Friends of Fitzgerald River National Park, South West Aboriginal Land and Sea Council, Great Southern Development Commission, Galaxy Resources and 2 community members.

In 2015, an expanded Fitzgerald Biosphere Reserve renomination was submitted to UNESCO via the State and Australian Governments. This proposed expansion included formal buffer and transition zones, in line with the biosphere reserve criteria adapted in 1996 (UNESCO 1996) and further adjusted in 2003 (UNESCO 2003). Accordingly, the expansion proposal treated Fitzgerald River National Park as the core zone, some surrounding reserves and UCL as buffer zone, and the private lands west of the State Barrier Fence in the Ravensthorpe Shire and State Waters as the transition zone.

UNESCO deferred ratifying the extension proposal as submitted, due to the unsuitability of the buffer zone as proposed. As of April 2016, a redesign of the buffer zone is being undertaken for resubmission to UNESCO.

## 4.4. Ravensthorpe Agricultural Initiative Network (RAIN)

Ravensthorpe Agriculture Initiative Network (RAIN) is a professional natural resource management organisation that provides the means to grow and share knowledge about sustainable land management, and thereby contribute to the prosperity and well being of the Ravensthorpe community (RAIN 2016).

The RAIN Mission is *to promote long-term profitable agricultural systems and responsible natural resource management through proactive community involvement in the Ravensthorpe region*.

RAIN has an excellent track record undertaking activities such as field days and workshops, catchment resource assessment, project planning, soil health activities, revegetation, protection of remnant vegetation, establishment of perennial pastures, control of pest plants and animals, community engagement, and raising awareness of environmental and land management issues.

The success of RAIN can be attributed to its strong community support, the calibre of its committee and staff, strong governance its grass-roots approach to problem solving, and its ability to relate to land managers, agencies, partners and investors.

RAIN has an important role in supporting other catchment and production based groups of the area as sub-groups (including the Southern Biosecurity Group) as well as promoting wider community participation in landcare activities. Each sub-group has its own goals, opportunities and challenges and RAIN is well positioned to develop and/or support activities tailored to meet the needs of each group.

More broadly RAIN raises awareness and involvement in landcare among schools and across the community through a range of communication activities, and at community events. In all of its activities, RAIN endeavours to apply the following principles:

* Respect and value for people;
* Respect for diversity;
* Providing a safe environment for staff, volunteers and visitors;
* Application of best practice to research, trials and on-ground works while encouraging creativity and innovation;
* Integrating conservation practices with productive land management;
* Honesty, fairness, integrity and environmental sustainability in all business;
* Achieving financial sustainability;
* Commitment to community education;
* Fostering community participation;
* Value and actively seeking collaborative partnerships;
* Acknowledging our project partners; and,
* Contributing beyond our boundaries.

## 4.5. Southern Biosecurity Group

The Southern Biosecurity Group (SBG) was transitioned from the Ravensthorpe Declared Species Group in March 2016. The SBG is looking to become a Recognised Biosecurity Group (RBG) under the WA the *Biosecurity and Agriculture Management Act 2007* (BAM Act) (see State government section above). While a coordinated approach to control a pest species can be conducted without being recognised, subject to available funding, recognised status following community consultation and approval by the Minister, allows for declared pest rate to be adopted for a specific species (K. Tuckett pers. comm.).

The SBG is a subgroup of the Ravensthorpe Agricultural Initiative Network (RAIN). This relationship formalises the existence and governance of the RBG within RAIN as the central Natural Resource Management (NRM) organisation in the Ravensthorpe Shire. The SBG, as a subgroup of RAIN, commissioned the development of this Strategy and is responsible for its implementation and review.

The Southern Biosecurity Group is also taking part in the declared pest and weed review (DAFWA 2016a; D. Kessell pers. comm.; Dodd and Loo 2015) by making submissions, and that participation and recommendations are included in this Strategy.

## 4.6. Existing pest animal management programs

### Wild dog management

Wild dog management in the Ravensthorpe Shire is directed by the Ravensthorpe Wild Dog Management Plan 2014 – 2017 (RDSG 2014). The former Ravensthorpe Declared Species Group (RDSG), now the Southern Biosecurity Group (SBG), commissioned this Plan in 2014. The Plan provides an overview of the RDSGs intentions for the management of wild dogs and their impacts, its objectives are:

* To manage the impact of the wild dog population so that wild dog predation has minimal economic impact on the livestock industry and biodiversity values within the Ravensthorpe shire.
* To assist and encourage a consistent, integrated and cooperative approach to the management of wild dogs across all land types within the Ravensthorpe shire.

The Plan also outlines the wider context of wild dog management, risk profiles, appropriate contributions by stakeholders, and the key stakeholders. Specifically, it details the management strategies and methods the SBG sees as critical to achieving the objectives, and describes required future monitoring and review.

The SBG supports the SBF as one part of the Action Plan for Wild Dog Control (WA Wild Dog Action Group 2016).  The SBF acts as a physical barrier for the contractor to work from into the unallocated Crown land (UCL).  The aim is to maintain a 15 km buffer zone (or 1 dog territory width) to the east of the fence, free from wild dogs.  This approach has previously given a reasonable success rate with keeping dogs from entering agricultural land.

The SBG broadly supports the proposed Esperance SBF extension.  Where the current fence finishes is where it appears the largest number of wild dogs enter agricultural land, where stock attacks are now more prevalent on farmland in this vicinity.  Other access into farmland by wild dogs is usually is from washouts, although the lap wire at the bottom of the fence has generally stopped dogs from coming in underneath the wire netting (K Tuckett pers. comm.).

The fence’s role in steering the migration of emus from the north during dry period assists cropping enterprises in agricultural lands.  Notwithstanding, it is accepted and understood by the SBG that there are broader community concerns about the physical barrier of the fence and its impacts on native animals and the local ecology. Fence management experience is that incidences of animals being caught in the fence are minimal (K Tuckett pers. comm.).

Anecdotal evidence suggests an apparent increase in some native animals (Australian bustard, malleefowl, echidna) in the agricultural land matrix of the shire since the proactive control of wild dogs has been in place.  It is also thought that removing wild dogs from the buffer zone may see an increase in foxes and cats, this possibility will be monitored and if considered necessary, control work will be coordinated by the SBG.  The baiting program for wild dogs in the UCL may have also provided some fox control, which will be monitored.

### Red Fox

RAIN coordinates the *Red Card for Red Fox* and Rabbit annual shooting program across the South Coast Region. Although primarily targeting foxes, the event also targets feral cats and rabbits (J. Chambers pers. comm.; RAIN 2016). This event also encourages landholders to follow up with 1080 baiting as older, sly foxes often evade any chance of a spotlight finding them (RAIN 2016).

### Western Shield

The Department of Parks and Wildlife’s fox and cat (feral predator) management program Western Shield is a significant part of the department’s work in the Ravensthorpe Shire, having been in place since the late 1990’s.

Fitzgerald River National Park holds a largely intact assemblage of native animals including many threatened terrestrial birds and mammals (CALM 1991; DEC 2012). Other often-adjacent conservation and natural lands also hold predator vulnerable native animals in their habitats, including Lake Shaster Nature Reserve, which are included in the Western Shield program.

The Eradicat® baiting for feral cats is now being delivered in Fitzgerald River National Park, Lake Shaster Nature Reserve and some adjoining Crown lands, through Western Shield. Work on resolving optimal baiting delivery to increase efficiency and bait uptake is continuing. A five-year Integrated Fauna Recovery Project (IFRP), an adaptive management project is trialling feral cat baits in Fitzgerald River National Park and other reserves. The project will report on its findings in August/September, which will include recommendations for optimal feral cat control through the Western Shield delivery model (S. Comer DPaW pers. comm.).

Western Shield will continue to be DPaW’s primary predator management program for the Shire’s conservation lands, with adjustments and refinements resulting from ongoing research and monitoring.

## 4.7. Existing weed management programs

Existing weed management programs have been implemented as four types:

1. Management of declared weeds through the Department of Agriculture and Food and its predecessor the Agriculture Protection Board;
2. Programs to manage declared weeds developed and run largely as local priorities shift and funding is available through RAIN;
3. Ongoing programs of the Department of Parks and Wildlife; and,
4. Roadside programs of Main Roads WA and the Ravensthorpe Shire.

Declared weed management programs have included:

* The grower levy funded skeleton weed *(Chondrilla juncea)* search and eradication program managed by DAFWA (DAFWA 2016d);
* African Boxthorn *(Lycium ferocissimum)* isa Weed of National Significance (WoNS) and a Declared Plant (AWC 2012). It is common in the Ravensthorpe Shire (Chapman 2015) and has been the subject of management projects and programs over the years predominantly through RAIN (RAIN 2010; K Roy pers. comm.);
* Bridal creeper (*Asparagus asparagoides)* is a WoNS and relatively common in Ravensthorpe Shire along watercourses and in salmon gum and swamp yate woodlands around the town. It has been treated with a rust fungus as part of a control program with varying degrees of success (RAIN 2010);
* A relatively small infestation of droopy prickly pear (*Opuntia monocatha)* on the Oldfield River north east of Munglinup has caught the attention of concerned community members and the Ravensthorpe Shire council as in need of priority attention (K Norman, B Nicholas, K Tuckett pers. comm.). It is the subject of further investigation down river since flooding in 2007, and management activities are planned including support from DAFWA. An infestation at the Ravensthorpe rubbish tip has been eradicated (D Biddulph pers. comm.), although it still occurs in low numbers on the roadside north of the tip (G Webster pers. comm.);
* A localised outbreak of the invasive cottonbush (*Gomphocarpus fruticosus)* is evident at the time of the drafting of this Strategy (August 2016) on land adjacent to Floater Rd just north of Ravensthorpe townsite. Control activities have been undertaken since around 1995 (D Biddulph pers. comm.), and it is the subject of current consideration for priority action to eradicate the population (J Chambers pers. comm.).

Local priority weed management programs have included localised control of pest weeds including Tambookie Grass (*Hyparrhenia hirta*), Golden Wattle (*Acacia pycnantha)* and briar *(Rosa sp.)* (RAIN 2010; D Biddulph pers. comm.; K Roy pers. comm.).

The Parks and Wildlife weed management programs have been active since around 2009 largely aimed at weeds within or likely to affect conservation estate (D Biddulph, P Masters pers. comm.). These have included:

* A succulent weeds (*Agave spp,* *Cotyledon spp, Cressula spp, Opuntia spp*) control project initially funded by the Biodiversity Conservation Initiative of the WA Government and later maintained from district resources that focussed on the river corridors from the Fitzgerald to Oldfield Rivers and around the Kundip townsite. This program included trialling of different control and eradication methods and photo monitoring sites established to measure progress;
* Victorian tea tree (*Leptospermum laevigatum*) eradication around Hopetoun and along Middle Rd for amenity and conservation quality, and to limit fuel biomass hazard around Hopetoun and prevent ingress into Fitzgerald River National Park; an ongoing project that has run for the last 7 years;
* Sydney golden wattle (*Acacia longifolia*) eradication along Fence Rd;
* Golden wattle (*Acacia pycnantha*) eradication on Fence Rd over the last 7 years and ongoing monitoring to hand remove seedlings annually;
* Onion weed (*Asphodelphus fistulosus, Trachyandra divaricata*) eradication at recreation sites Barrens Beach and Quoin Head in Fitzgerald River National Park;
* Saffron thistle (*Carthamus lanatus*) in Jerdacuttup Lakes Nature Reserve and Southern Ocean Drive;
* Boxthorn (*Lycium ferocissimum)* eradication as part of the South Coast NRM funded project, focussed on the Phillips River corridor;
* Some Apple of Sodom (*Solanum linnaeanum)* along Buegge Rd several years ago, now a problem in the Steeredale Estate; and
* Lovegrass (*Eragrostis curvula)* management along Moir Track near the Fitzgerald River National Park entrance.

Roadside weed management is conducted by Main Roads WA through their contractors. The program targets Declared and other weeds along the South Coast Highway. Notably, the small infestation of the very invasive star of Bethlehem *(Ornithogalum umbellatum)* was dug up and removed as part of the heavy haulage route development west of Ravensthorpe townsite. Over several years boxthorn (*Lycium ferocissimum*) has been removed from the Hopetoun-Ravensthorpe Road, although it is spreading in other areas and is in need of control works using the careful and skilled use of effective herbicides and wetting agent in cool conditions. An infestation of briar *(Rosa sp.)* on Stevenson’s Creek where it crosses under South Coast Highway west of Ravensthorpe townsite has been noted and treated with herbicide in recent years. It will require further investigation to ascertain its extent and future management (K Roy pers. comm.).

## 4.8. Existing Phytophthora dieback management programs

Several initiatives, instruments, programs and studies exist in the Ravensthorpe Shire area to manage Phytophthora dieback, principally by DPaW (CALM 1991; DPaW 2015, 2016), South Coast NRM and RAIN (South Coast NRM 2014; Spencer 2014).

Phytophthora dieback is a very serious threat to a range of native plants; the most serious is the introduced cinnamon fungus *(Phytophthora cinnamomi).* This soil-borne pathogen kills a range of native plants, notably the Proteaceae family that dominated many of the vegetation communities of the Shire. Ravensthorpe Shire boasts some of the richest plant communities on Earth, including many susceptible plants, several of which are endemic.

Notable landform features in the Shire include the coastal and subcoastal Barren Ranges in Fitzgerald River National Park, the Ravensthorpe Range, and the western parts of the Esperance Sandplain. These landforms are where the majority of plants threatened by Phytophthora dieback occur; they comprise the most characteristic and valuable natural assets of the Shire.

Phytophthora dieback is known to occur in the Shire along Springdale Road and other roads in the Jerdacuttup and Starvation Bay areas, and in some parts of Fitzgerald River National Park (Project Dieback 2016; DPaW 2013b) (Map 2). It is imperative that these infestations are not spread further and that the community is assisted to understand the severe and irreversible impacts of Phytophthora dieback.

Other Phytophthora sp. have been identified in the Ravensthorpe Shire, including *Phytophthora citricola, P. cryptogea, P. megasperma, P. multivora,* (DPaW 2013b; (Spencer 2014; Project Dieback 2016) and *P. rosacearum* (K. Tuckett pers. comm.). All of these Phytophthora spp. except *P. megasperma* are considered to be introduced and potentially disease causing in susceptible native plants; *Phytophthora megasperma* is considered to be a native organism. The management of these other Phytophthora spp. is in line with that for the invasive and damaging *P. cinnamomi* for the time being, particularly the potentially dangerous *P. cryptogea* (T Massenbauer pers. comm.). If this were to change it would be considered during the review of this Strategy.

The Department of Parks and Wildlife and South Coast NRM have significant Phytophthora dieback management programs (CALM 1991; South Coast NRM 2011; DEC 2012; Spencer 2014; DPaW 2015; DPaW 2016). As stated above in Section 4.2, DPaW programs relate almost exclusively to lands they manage, while South Coast NRM in collaboration with partners including DPaW, the Dieback Working Group and RAIN, share expertise and management support (South Coast NRM 2011, 2016; Spencer 2014; DWG 2016). These programs and partnerships are of prime of significance to this Strategy for supporting a broader understanding and management ability of Phytophthora dieback in the naturally valuable Ravensthorpe Shire.

Map two shows the extent of known problem *Phytophthora spp.* dieback in the Ravensthorpe Shire, the red lines indicate dieback infested roads. However, the map resolution does not fully show the uninfested gaps in the infested sections.

# Ravensthorpe dieback with roads.png

Map 2. Phytophthora dieback in the Ravensthorpe Shire

# 5. Biosecurity Management Strategy for Ravensthorpe

## 5.1 Background

Biosecurity involves the management of introduced (and some native) animals, plants and phytophthora dieback that impact agriculture, biodiversity, amenity and/or land/seascape values of the Ravensthorpe Shire.

In March 2016, the Southern Biosecurity Group commenced the process to transition from the Ravensthorpe Declared Species Group (RDSG) to a Recognised Biosecurity Group (RBG) model. The RBG has consulted with landholders and relevant stakeholders to prioritise pest animals, plants and other organisms for management focus. Leading up the development of this Strategy, the SBG/RDSG has focussed on the management of wild dogs (feral dogs, dingoes and hybrids), which remain a focus of activity as an identified priority.

The Strategy provides context from the Commonwealth and Western Australian State legislation perspectives and this background is provided in previous sections. The Strategy takes its principle guidance from the WA *Biosecurity and Agriculture Management Act 2007* (BAM Act) in dealing with the majority focus of agricultural and environmental pest animals and plants. However, as Phytophthora dieback is considered a priority concern, and to a lesser extent fish pests are of concern, relevant State legislation and the policies of the Departments of Parks and Wildlife and Fisheries also provide guidance.

## 5.2 Community Consultation

The Biosecurity Management Strategy has been guided by consultation with the Ravensthorpe community and stakeholders to identify and prioritise pest animals, plants and other organisms present and in need of management efforts in the Ravensthorpe Shire. The range and perceptions of priorities of pest animals, plants and other organisms was also investigated through a survey conducted during the Ravensthorpe Agricultural Initiative Network (RAIN) Field Day on September 15 2015 and at Paddy’s market day in Hopetoun on January 16 2016.

Community consultation conducted on October 10 2015 was designed to introduce the project, describe why the strategy was being developed, determine the biosecurity priorities and the issues of most concern for the community of the Ravensthorpe Shire.

A community biosecurity survey as a mail out was undertaken in October 2015 to investigate and determine the scale and priority of pest animals, weeds and other biosecurity issues of the residents of Ravensthorpe Shire.

The community and stakeholder consultation process discussed and prioritised pest animals, plants and other organisms for management and research attention. The tables in the following sections list the animals, plants and other organisms, their priority rating and pest status. The results of this consultation are included in the priority biosecurity animals, plants and other organisms in these tables.

The Strategy recognises current published taxonomic treatments in relation to the taxonomic status of organisms. Included, is the recent recognition of the dingo as a distinct species – *Canis dingo* (Crowther et al 2014).

The foundation of this Biosecurity Strategy is the group of priority pest animals, weeds, and diseases listed in Tables 1 and 2 and Phytophthora dieback section following. These priorities present the range of organisms considered by the Ravensthorpe community and agency stakeholders to be those requiring the most pressing attention and for which recommendations for management are outlined. Management recommendations also form the basis of the Implementation and Action Plan section of this Strategy.

## 5.3 Declared animal and plant review

This strategy provides the current animal pest and weed Declared Species (DAFWA 2016e) status as at May 2016. A review of Declared Pest plants and vertebrate animals by DAFWA (Dodd and Loo 2015; D. Kessell pers. comm.) is being conducted concurrently with the development of this Strategy.

The SBG has made submissions to this review process and the results of the status of the review will be included in the Strategy and subsequent Action Plan updates when the Minister for Agriculture has endorsed the review recommendations.

The review presents an ideal opportunity to consider the declaration status of pest animals and weeds in the Ravensthorpe Shire. The Southern Biosecurity Group (SBG) has an important role in providing locally relevant advice and recommendations on the appropriate status of Declared Pests, particularly as they relate to Ravensthorpe Shire.

Of particular relevance is where the organism is a priority for an RBG, the opportunity exists to declare it as an *s22(2) declared pest but not assigned to a control category, to be reviewed after 2 years*. This opportunity allows the organism to be listed for local attention and rated to raise resources for management. The two-year review process monitors management success and accordingly declaration status.

Tables 1 and 2 list the declared plants and vertebrate animals present and considered a priority by the SBG and community in the Ravensthorpe Shire, they provide the current declaration status and that recommended to the review by the SBG.

## 5.4. Priority pest animals and weeds

Priority pest animals and weeds are those considered to have impacts in the Ravensthorpe Shire by the community and stakeholders consulted, as listed in Tables 1 and 2. Most are Commonwealth and State priorities as (EPBC Act 1999; Commonwealth of Australia 2007), Weeds of National Significance (AWC 2012), and Declared Plants and Animals (BAM Act 2007; Dodd and Loo 2015).

Some plants native to other parts of Western Australia have been listed as low priority woody weeds along similar plants from broader continental Australia (Table 2), because they have the potential to become serious weeds due to their strong regeneration abilities. This group includes swamp sheoak (*Casuarina obesa)* that has been recommended for revegetation in the area in the past. However, recent observations have increased the understanding of swamp sheoak distribution patterns and regeneration characteristics, which suggests the need for a review of its use in landscape repair, and to use instead the locally native swamp yate (*Eucalyptus occidentalis*) and paperbarks (*Melaleuca cuticularis and M. preissii*) to perform the same landcare role and maintain local character.

The pests and weeds have been considered and assigned in the table according to their threat related to agriculture and/or the environment, and their degree of invasiveness. The following ranking system was used to prioritise actions presented in Tables 1 and 2:

***High priority*** *–* actions must be undertaken in order to effectively manage the pest or weed problem. If these actions cannot be undertaken, the strategy will be seriously compromised.

***Medium priority*** – actions improve the efficiency or effectiveness of the strategy and are important in terms of implementation; however, they are not critical to the overall strategy.

***Low priority*** – these actions are important for implementation of an ongoing strategy, but provide flexibility in regard to their timing and completion.

**Table 1 Priority animal pests of Ravensthorpe Shire**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Species** | **Ag/Env** | **Invasive** | **WA status April 2016** | **SBG review WA status** | **SBG Priority** |
| Wild dog (*Canis dingo* ***N***, *dingo x familaris, familaris)* | Ag | Low | Declared s.22(2) C3 | Declared s.22(2) C3 | High |
| Starling *(Strurnus vulgaris)* | Ag/Env | High | Declared s.22 (2) C1, C2 | Declared s.22 (2) C1, C2 | High |
| Plague minnow *(Gambusia holbrookii)* | Env | Medium/high | N/A | Awareness and local eradication | High |
| Red fox *(Vulpes vulpes)* | Env/Ag | Medium | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Medium |
| Feral cat *(Felis catus)* | Env | Medium | Non declared | N/A support DPaW | Medium |
| Australian plague locust *(Chortoicetes terminifera)* **N** | Ag | High | Declared s.22 | Declared s.22 | Medium |
| Rabbit *(Oryctolagus cuniculus)* | Ag | Medium/high | Declared s.22(2) C3 | Declared s.22(2) C3 | Medium |
| Emu *(Dromaius novaehollandiae)* **N** | Ag/Env | Low/medium | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Medium |
| House mouse *(Mus musculus)* | Ag/Env | Low/high | Declared s.11 Exempt | Declared s.11 Exempt | Medium |
| White Italian snail *(Theba pisana)* and small pointed conical snail *(Prietocella barbara)* | Ag/Env | High | Permitted s.11 | Permitted s.11 C3 | Medium |
| Primary grain weevils (*Ryzopertha dominica, Sitophilus spp.)* | Ag | Medium | Declared s.22 (2) | Declared s.22 (2) | Low |
| Galah *(Eolophus roseicapilla)* **N** | Ag/Env | Static | Declared s.22 (2) C3 | Non-declared | Low |
| Kookaburra *(Dacelo novaeguineae)* | Env | Static | Non-declared | Non-declared  Management | Low |
| Wedge-tailed eagle *(Aquila audax)* **N** | Ag | Static | Non-declared | Non-declared | Low |

Note: **N** indicates species is native to Western Australia. The dingo is an unprotected native species (WA Wildlife Conservation Act 1950).

**Table 2 Priority weeds of Ravensthorpe Shire**

| **Species** | **Ag/Env** | **Invasive** | **C/wealth**  **status** | **WA Status April 2016** | **SBG review WA status** | **SBG Priority** |
| --- | --- | --- | --- | --- | --- | --- |
| Prickly pear, opuntioid cacti *(Opuntia spp.)* | Ag/Env | High | WoNS | Declared s.22 (2) C3 | Declared s.22 (2) C3  Eradicate locally | High |
| Skeleton weed *(Chondrilla juncea)* | Ag | High |  | Declared s.22 (2) C2 | Declared s.22 (2) C2 | High |
| Cotton bush *(Gomphocarpus fruticosus)* | Ag/Env | High |  | Declared s.22 (2) C3 | Declared s.22 (2) C3  Eradicate locally | High |
| Tambookie grass *(Hyparrhenia hirta)* | Env | High |  | Non-declared | Declared s.22 (2) C3  Eradicate locally | High |
| Star of Bethlehem *(Ornithogalum umbellatum)* | Ag | ? |  | Non-declared | Declared s.22 (2) C3  Eradicate locally | High |
| Briar *(Rosa spp.)* | Env/Ag | High |  | Permitted-s.11 | Declared s.22 (2) C3  Eradicate locally | High |
| Stemless thistle *(Onopordum acoulon)* | Ag | ? |  | Declared s.22 (2) C3 | Declared s.22 (2) C3  Eradicate locally | Medium |
| Horehound *(Marrubium vulgare)* | Ag | High |  | Declared s.22  (2) C3 | Declared s.22 (2) C3  Eradicate locally | Medium |
| Sydney golden wattle *(Acacia longifolia)* | Env/Ag | High |  | Non-declared | Declared s.22 (2) C3  Eradicate locally | Medium |
| Victorian tea tree *(Leptospermum laevigatum)* | Env | High |  | Non-declared | Non-declared  Manage and eradicate locally | Medium |
| Apple of Sodom *(Solanum linnaeanum)* | Ag/Env | High |  | Declared s.22 (2) C3  WoNS | Declared s.22 (2) C3 | Medium |
| Willow *(Salix spp.)* | Env | High | WoNS | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Medium |
| Saffron thistle *(Carthamus lanatus)* | Ag | High |  | Declared s.22  (2) C3 | Declared s.22 (2) C3 | Medium |
| Boxthorn *(Lycium ferocissimum)* | Ag/Env | High | WoNS | Non-declared | Declared s.22 (2) C3 | Medium |
| Double gee *(Emex australis)* | Ag | Med |  | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Low |
| Patersons curse *(Echium plantagenum)* | Ag | Med |  | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Low |
| Victorian golden wattle *(Acacia pycnantha)* | Env | Med |  | Non-declared | Declared s.22 (2) C3  Eradicate locally | Low |
| Bridal creeper *(Asparagus asparagoides)* | Env/Ag | High | WoNS | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Low |
| Caltrop *(Tribulus terrestris)* | Ag/  Domestic | Static |  | Non-declared | Non-declared  Management | Low |
| Cockspur *(Centaurea melitensis)* | Ag | Med |  | Non-declared | Non declared | Low |
| Cape tulip *(Morea miniata)* | Ag/Env | Med |  | Declared s.22 (2) C3 | Declared s.22 (2) C3 | Low |
| Woody Australian weeds  Swamp sheoak *(Casuarina obesa)* **N**  *C. cunninghamiana*  *C. equisetifolia*  *C. glauca*  River gum *(Eucalyptus camaldulensis)* **N** | Env | Med |  | Non-declared | Non declared  *C. obesa* native Pallinup and wheatbelt  Prohibit all locally  Manage all locally | Low |
| Onion weed *(Asphodelus fistulosus)* | Env | Med |  | Non-declared | Non declared | Low |
| Marshmallow *(Malva parviflora)* | Ag/Env | Med |  | Non-declared | Non declared | Low |
| Radish *(Raphanus raphanistrum)* | Ag | Med |  | Non-declared | Non declared | Low |
| African love grass *(Eragrostis curvula)* | Ag/Env | High |  | Non-declared | Non declared | Low |
| Gazania *(Gazania linearis)* | Env | Med |  | Non-declared | Non declared | Low |
| Pine tree *(Pinus spp.)* | Env/Ag | Low |  | Non-declared | Non declared | Low |
| Rye grass *(Lolium rigidum)* | Ag | Low |  | Non-declared | Non declared | Low |
| Wild oats *(Avena fatua)* | Ag/Env | Med |  | Non-declared | Non declared | Low |
| Afghan thistle *(Solanum hoplopetalum)* **N** | Ag | Low |  | Non-declared | Non declared | Low |

Note: **N** indicates species is native to Western Australia.

## 5.5. Phytophthora dieback

Due to the very significant conservation, amenity and economic values of the native vegetation of the Ravensthorpe Shire, Phytophthora dieback is a priority biosecurity risk and a key inclusion in this Strategy. Recommendations for its prevention and management including local awareness, containment and management are priorities.

Inclusion of Phytophthora dieback in this Strategy serves as an example of the Project Dieback and State Phytophthora Dieback Management and Investment Framework (SPDMIF) (SCNRM 2014) recommendations outlined in NRM collaborations in section 3.3 above.

Its inclusion supports the continuance of investment and effort for the localised programs and projects to protect susceptible native vegetation (CALM 1991; Spencer 2014; South Coast NRM 2015; DPaW 2016).

# 6. Implementation and Action Plan

Implementation of this strategy is achieved through a series of management recommendations that form an Action Plan for the three themes of priority pest animals, priority weeds and Phytophthora dieback. Priorities have been determined by stakeholder consultation and to maintain the continuity, investment and momentum of some existing pest animal, weed and Phytophthora dieback management programs.

Implementation objectives:

1. Efficiency, flexibility and integration in designing and implementing approaches to priority animal pest, weed and Phytophthora dieback mitigation;
2. Collaborate with allied agencies and organisations to co-support information, methodology and research for pest animals, weeds and Phytophthora dieback management;
3. Identify and recommend best practice management methods and techniques where possible, and further develop these in the Action Plan;
4. Improve community awareness of pest animals, plants and Phytophthora dieback;
5. Continuous review and improvement of this Strategy and its Action Plan to enable flexibility and effective response to new information and changing priorities.

## 6.1. General and cross-theme recommendations

Some administration and methodologies relate or provide efficiencies as grouped recommendations across the three themes of priority pest animal, priority weeds and Phytophthora dieback management. These recommendations also maintain the continuity of some existing programs and projects where they have been identified as a priority; they are:

1. Review existing and where required develop new Memorandum of Understanding (MOU) agreements between SBG and agencies and organisations involved in pest, weed and Phytophthora dieback management in the Ravensthorpe Shire.
2. Review annually and as the need may arise, pest animal, weed and Phytophthora dieback priorities.
3. Review annually research findings, management methodologies for priority pest animals, plants and Phytophthora dieback.
4. Review annually programs and projects that involve communications and community awareness of priority pest animals, plants and Phytophthora dieback.

## 6.2. Priority pest animal program recommendations

The priority pest management recommendations are derived from Table 1, the continuity of existing programs, and the five implementation objectives. The highest priority animal pest for action is the wild dog. Detailed actions are provided for this priority and a summary of existing knowledge, programs and actions for is presented for all of the priority pests.

### Wild dog management

Wild dogs are considered a pest animal of agriculture in the Shire and management of wild dogs is the highest priority for this Strategy.

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| **WILD DOG MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Review and update the 2014 Ravensthorpe Wild Dog management Plan 2014 – 2017. Focus review on: updating terminology, Section 8 Monitoring and Review, review of objectives, alignment with the WA and Commonwealth Wild Dog Action Plans, current wild dog ecology and management research, the important ecological role that wild dogs play in natural settings, and development of effective monitoring. | SBG/RAIN  Shire of Ravensthorpe |
| * Support for the WA Wild Dog Management Action Plan and State Barrier Fence management, commensurate and cognisant of broader cultural and ecological perspectives, realistic benefit/cost analysis, animal welfare management, current wild dog and dingo management research, and effective monitoring of wild dog management and ecological impacts. | SBG/RAIN  Shire of Ravensthorpe |
| * Support the development of the Esperance extension of the State Barrier Fence, commensurate and cognisant of broader cultural and ecological perspectives, realistic benefit/cost analysis, animal welfare management, current wild dog and dingo management research, and effective monitoring of wild dog management and ecological impacts. | SBG/RAIN  Shire of Ravensthorpe |
| * Support ongoing research into and understanding of wild dog and dingo behaviour and ecology as it relates to management effectiveness. | SBG/RAIN  Shire of Ravensthorpe |
| * Ensure that objective benefit cost analysis is a priority in management program design and review. | SBG/RAIN  Shire of Ravensthorpe |

### Starling suppression

The European or common starling *(Sturnus vulgaris)* is a serious pest of agriculture, the environment, built infrastructure and society. It is the second highest priority for management in this strategy. Ravensthorpe Shire is a primary district for the suppression of this highly invasive pest as it attempts to reach westwards from its stronghold in south-eastern Australia. Starling suppression is the primary responsibility of the Department of Agriculture and Food WA and its program to maintain WA’s starling free status. The threat to WA infrastructure and lifestyle is under-reported and in need of advocacy to inform and develop support from urban communities.

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| **STARLING SUPPRESSION ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness of starlings in the Ravensthorpe community and ensure that people can identify starlings and report sightings to RAIN and DAFWA. | SBG/RAIN |
| * Collaborate with and support DAFWA in the reporting and eradication of local infestations of starlings | SBG/RAIN  Shire of Ravensthorpe  Landholders  Community |
| * Advocate that starlings are a serious economic threat to urban infrastructure and lifestyle quality due to their fouling abilities. | SBG/RAIN  Shire of Ravensthorpe |
| * Advocate that starlings as an immense flocking bird area are a serious disease harbour and vector. | SBG/RAIN  Shire of Ravensthorpe |

### Plague minnow

Aquatic biosecurity is a high priority for this Strategy, as it principally relates to one feral fish species – the plague minnow *(Gambusia holbrookii).* This native of northern Central America is the world’s most invasive inland fish. It is of concern to the Ravensthorpe Shire and this strategy as it is moving east in the Bremer Bay area in neighbouring Jerramungup Shire, observed for the first time in the Bremer River in 2006 and the Hunter River in 2009. It has been observed in a garden pond in Hopetoun having been apparently caught nearby, although the local source is not known and this apparent presence in the Ravensthorpe Shire is of significant concern.

Broader aquatic biosecurity relates to the prevention and management of aquatic pest animals, plants and diseases in marine, estuarine and inland waterways. While aquatic biosecurity is of great significance for other parts of WA, only one issue (the plague minnow) was raised during the development of this strategy. Notwithstanding, issues of aquatic biosecurity may arise as priority for attention, and the review process of this strategy will take account of this need should it arise.

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| **PLAGUE MINNOW ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Apply for the RBG to perform the role of a partner of the WA Department of Fisheries Aquatic Biosecurity Charter. | SBG/RAIN |
| * Raise the awareness of aquatic biosecurity and threats to delicate and valuable natural ecologies and native aquatic species in particular. Use the plague minnow and it invasiveness and impact potential as an example. | SBG/RAIN  Shire of Ravensthorpe |
| * Investigate the presence of plague minnow in the Ravensthorpe Shire. | SBG/RAIN  Shire of Ravensthorpe |
| * Review this Strategy if the need arises to respond to aquatic biosecurity issues should they become a priority. | SBG/RAIN |

### Cat and fox management and Western Shield

The Department of Parks and Wildlife cat and fox control program, Western Shield, is a landscape-scale wildlife protection initiative. It protects and restores native animal populations and ecological interactions principally across conservation estate in southern Western Australia.

There have been reports of an increase in numbers of foxes and cats in the Ravensthorpe area in recent years that are impacting native wildlife. (S. Thompson pers. comm.). Recent studies have shown that cats become more abundant following sustained fox control (Marlow, Thomas, Williams, Macmahon, Lawson, Hitchen and Berry, 2014).

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| **CAT AND FOX MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Support the continuation of the Department of Parks and Wildlife’s Western Shield cat and fox control program. | SBG/RAIN  Shire of Ravensthorpe |
| * Develop complementary (to Western Shield) cat and fox control measures on private and other lands in the Ravensthorpe Shire. | SBG/RAIN  Shire of Ravensthorpe  Landholders |
| * Support research and improved understanding of the ecological interaction between foxes, cats and wild dogs to optimise controls. | SBG/RAIN |
| * Encourage use of cat traps available for community use at RAIN. | SBG/RAIN |

### Australian plague locust

The Australian Plague Locust (APL) is a native insect that has the ability as emerging nymphs and swarming adults to cause severe damage to crops and pastures. Effective management is dependent upon an understanding of its life cycle and the natural events that cause mass hatching and swarming. DAFWA has a program to assist the community with targeted surveillance and information support for control measures.

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| **AUSTRALIAN PLAGUE LOCUST ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Support the continuation of the DAFWA APL support program. | SBG/RAIN  Shire of Ravensthorpe  Landholders |
| * Develop an understanding of the occurrence history, ecological factors that lead to infestation, and successful prevention and control measures in the Ravensthorpe Shire. | SBG/RAIN  Shire of Ravensthorpe |
| * Develop information on locally effective and preferred prevention and control methods including insecticides | SBG/RAIN  Shire of Ravensthorpe |
| * Support research into the ecological cycles and effective prevention and control, and the capture and use of swarming locusts. | SBG/RAIN  Shire of Ravensthorpe  Landholders |

### Rabbit

Rabbits continue to cause significant economic and conservation damage and their control remains an ongoing task. Myxamotosis and rabbit calicivirus biological control is effective in cycles; however, other methods are necessary when these diseases are not active and effective. Rabbits also replace native prey animals for some key native predators including wedge-tailed and little eagle, dingo and carpet python, these ecological regulators rely on rabbits where native prey is extinct or reduced in numbers, and this is a consideration.

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| **RABBIT MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Support the continuation of the calicivirus disease release program. | SBG/RAIN |
| * Develop an objective understanding of rabbit population and distribution fluctuations, impacts on agricultural production, and efficacy of control measures in the Ravensthorpe Shire. | SBG/RAIN  Shire of Ravensthorpe |
| * Establish project areas for pest animal works (particularly rabbit, cat and fox control) and liaise with adjoining public and private landowners to implement an integrated and coordinated program. This would include mail-outs and information sessions with public and private land managers in each project area. | SBG/RAIN  Shire of Ravensthorpe  Landholders |
| * Develop information on locally effective and preferred control methods. | SBG/RAIN  Shire of Ravensthorpe |
| * Support research into the ecological role the rabbit supplies. | SBG/RAIN  Shire of Ravensthorpe |

### Emu

The emu is an infrequent pest of cereal and oilseed crops. It usually occurs in mobs that frequent the interface between larger areas of bush and adjacent paddocks. The emus live in the bush and forage in the paddocks, which can cause impacts on crops and pastures and on fences. Emus also suffer during droughts in the interior where they can flock west and southwards in very large numbers to impact agricultural enterprises near the barrier fence termination. Severe animal welfare issues also manifest when this migration occurs and the emus collect on the barrier fence, which requires considered management.

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| **EMU MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Develop an objective understanding of the emu population and distribution fluctuations, impacts on agricultural production, and efficacy of control measures in the Ravensthorpe Shire. | SBG/RAIN  Shire of Ravensthorpe |
| * Advocate for the continued monitoring of emu populations and climatic conditions in the interior east of the State Barrier fence. | SBG/RAIN |
| * Develop information on humane, locally effective and preferred control methods, including fence design. | SBG/RAIN  Shire of Ravensthorpe |

### House mouse

The house mouse is most often a nuisance pest to agriculture, although it has the capacity to plague when conditions are favourable. Changes to agriculture in the last 30 years including minimum tillage and stubble retention have see an increase in the frequency of mouse plagues (GRDC 2012a). It is also prevalent in natural lands and a major component of the small vertebrate fauna, therefore a key component of the prey fauna for many native predators.

Mouse monitoring is being undertaken as part of a 3-year (2014 -2016) GRDC funded mouse monitoring and modelling project being run in collaboration with Landcare Research (New Zealand) and the Invasive Animals CRC.  The aim of the project is to monitor mouse populations across the grain growing areas of Australia and develop predictive models to forecast outbreaks and disseminate the results of the monitoring and predictions to farmers and industry through GRDC and other means so that everyone is better prepared and aware of mouse activity (J Chambers pers. comm.).

For three years there have been mouse-monitoring sites set up near Geraldton and Ravensthorpe. RAIN received funding to coordinate activities in the Ravensthorpe Shire, which involved:

1. Setting out transects of mouse chew cards (10 x 10 cm paper cards soaked in canola oil, in a line of 10 each separated by 10 m) in fields and along fencelines/edges in at least 3 locations (farms) (maybe up to 10 farms) in each area.
2. Setting up transects to identify active mouse burrows (along a 100 m transect) next to the chew cards.

The monitoring occurs at three key times each year (February, June and September), and similar methods area used in SA, Vic, NSW and Qld. Funding has been approved for monitoring to continue to June 2017 (J. Chambers pers. comm.).

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| **HOUSE MOUSE MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Develop the ability for local monitoring of mouse populations and climatic conditions that favour plaguing. | SBG/RAIN  Shire of Ravensthorpe |
| * Support DAFWA in understanding house mouse plague factors to assist the development of information on locally effective management. | SBG/RAIN |
| * Support DPaW in understanding house mouse ecology in nature. | SBG/RAIN  Shire of Ravensthorpe |
| * Continue to use the MouseAlert program ([www.mousealert.org](http://www.mousealert.org)) to report mouse activity. | Landholders |

### White Italian and Conical Snail

Italian snails have been a serious agricultural pest in South Australia for many years and their impact is now being felt in WA. Small pointed conical snails are an emerging problem on the south coast of WA, although it is believed that their impact could be minimised with effective mitigation strategies. Italian snails are particularly prevalent on alkaline soils, while the small pointed conical snail is found on a range of soil types (McDonald 2016).

Yield losses from snails in crops is estimated to cost growers in the southern agricultural region of WA an estimated $6 million a year (GRDC 2012b). Snails pose a significant biosecurity threat as they are easily transported between paddock, farms and regions. In addition to crop losses, additional costs include baiting, grain cleaning and loss of income with a discount applied to affected grain at receival. The main issue is CBH non-tolerance of snails in grain samples (J. Chambers pers. comm.). It is believed that as infestations are a relatively new and emerging problem on the south coast that the impact can be minimised with good control or mitigation strategies (FBG 2016).

RAIN is a member of the *Albany and Esperance Port Zone Snails Taskforce* established by the Stirlings to Coast Farmers to encourage a collaborative approach across the south coast. A coordinated snail mitigation effort requires funding support from government and research agencies with further investment targeted to locally specific research development and extension across the Albany and Esperance Port Zones. A number of research projects investigating aspects of snail and slug behaviour and mitigation methods have recently been initiated (McDonald 2016).

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| **WHITE ITALIAN AND SMALL CONICAL SNAIL MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Promote workshops and information and other extension activities of the Taskforce to encourage growers to use the most effective snail mitigation strategies on farms in the region. | SBG/RAIN  Shire of Ravensthorpe  Landholders |
| * Encourage local monitoring of snail populations. | SBG/RAIN  Shire of Ravensthorpe |
| * Disseminate results of the research projects to mitigate snail spread. | SBG/RAIN  Shire of Ravensthorpe |

### Primary grain weevils

A significant proportion of the world grain crop is lost and severely reduced in quality by insect damage each year during storage. Many grain pests preferentially eat out grain embryos, thereby reducing the protein content of feed grain and lowering the percentage of seeds that germinate. Some important stored grain pests include the lesser grain borer, rice weevil and rust red flour beetle (DAFWA 2016f). Grain insects are present on most farms in harvesting machinery, stockfeed, grain spills, and old seed. Some of the insects fly between farms and between storages, and others walk or are carried in handling equipment (Bullen 2007).

Grain insect pests may be divided into primary and secondary pests. Primary grain insects have the ability to attack whole, unbroken grains, while secondary pests attack only damaged grain, dust and milled products (DAFWA 2016f). For this reason, the Commonwealth Department of Agriculture and Water Resources has imposed nil tolerance of insects in export grain. Insect pests also increase costs to growers, directly through the expense of control on the farm, and indirectly through the costs incurred by grain handling authorities in controlling weevils in bulk storages (DAFWA 2016f).

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| **PRIMARY GRAIN WEEVILS MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Encourage a regional approach to checking for these pests in grain residues in harvesting and grain-handling equipment, and in storages to minimise spread. | SBG/RAIN  Shire of Ravensthorpe  Landholders |
| * Promote good grain storage insect management including -   + Plan for insect control before storage   + Best stored grain management practice and recommended equipment   + Monthly Inspection of stored grain   + Prior to harvest clean out all machinery and equipment used to handle grain, including headers, augers, field bins, truck bins, silos and other storages   + Treating the surfaces of storages and equipment before they are used may kill insects walking on those surfaces. | SBG/RAIN  Landholders |
| * Using market appropriate chemical treatments. | Landholders |
| * Avoid resistance of grain insects to protectants by using mixtures of different protectants to effectively manage the range of different insect species normally occurring in stored grains. | Landholders |

### Galah

Originally quite restricted in their distribution, galahs especially have taken advantage of the increased amount of arable land to expand their range to most parts of Australia and are now not an uncommon sight in any part of the country. They are notorious among farmers for their attacks upon cereal crops, especially wheat and oats, pasture grasses and oilseeds such as sunflower and safflower (Gerozisis and Hadlington 2004).

Adverse impacts also occur to communities because of unacceptable noise, pollution and destruction of trees in urban surroundings (Tracey, et al. 2007). From an environmental perspective, Galahs damage native trees planted for restoration projects (Tracey, et al. 2007).

The galah is not subject to any control or regulatory activities carried out by the Department of Agriculture and Food (DAFWA). The outcome of DAFWA’s Declared Animals Impact Assessment (Petersen, et al. 2014) scored the galah as low for agricultural impact and environmental impact. It did not rank in the top 15 high priority pest animals for DAFWA (Loo and Reeves 2015).

The approach to managing native pests is similar to that for introduced pest animals but it is usually more complex because of public concern about the balance between conservation and control of native wildlife. The preferred strategy for native pests is to attempt to manage the damage they cause by habitat manipulation or other non-lethal techniques (Olsen 1998).

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| **GALAH MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Liaise with DAFWA and DPAW to monitor population levels to determine if impact levels change. | SBG/RAIN |
| * Identify the key areas of impact and develop management actions (eg. Netting, decoy foods, gas guns) designed to address the specific damage and timing of damage (window). | SBG/RAIN  Landholders |
| * Monitor and evaluate the effectiveness of the management actions | SBG/RAIN  Landholders |

### Kookaburra

The kookaburra has a reputation that it can “adapt to landscape modification by humans better than any other species of bird” (Legge, 2004). Kookaburras are relatively uncommon in the Ravensthorpe Shire, although they are present in woodlands, including around the town of Ravensthorpe.

Kookaburras were introduced to Western Australia as a useful snake killer and have spread and compete with local species for scarce nest hollows in trees (Olsen 1998). These hollows would normally be used by parrots and owls and they prey on small reptiles, mammals and nestlings, placing pressure on these species (Birdlife Australia).

Some native fauna are a possible food choice for the kookaburra; others share similarities in their feeding or breeding ecology. Increased competition for available ecological resources can result in decreased populations. This could present a critical factor for ‘at risk’ species, specifically those that are endemic to the Southwest (Moon 2013).

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| **KOOKABURRA MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness of the impact of Kookaburras as an environmental pest and threat to biodiversity in the Region. | SBG/RAIN |
| * Encourage local monitoring of kookaburra populations that could include (after Moon 2013):   + Interspecific interactions with indigenous birds and mammal species with a focus on ‘at risk’ species;   + Types of prey taken and extent of prey taking;   + Extent of nest predation;   + Nest site preferences; | SBG/RAIN  Landholders |
| * Investigate the removal of kookaburras as a pest control measure | SBG/RAIN |

### Wedge-tailed eagle

Wedge-tailed eagles are no longer considered a threat to agriculture in WA. In December 2000 the Wedge-tailed Eagle was removed from the list of pest species administered by the WA Agriculture Protection Board. It was removed because it was no longer considered in need of population control (Apgar undated).

Until May 1989 in Western Australia, the wedge-tailed eagle was still considered vermin and listed on the open season list on private land. From this date it was listed as ‘protected’ but subject to a damages licence. This licence enables members of the public to apply for a permit to destroy or relocate fauna if they consider it to be causing economic damage (Apgar undated).

Agricultural lands comprise a large percentage of the remaining wedge-tailed eagle habitat. Because of their large size and habits, Wedge-tailed Eagles are easily observed. Eagles in livestock farming areas benefit from dead or dying livestock, mis-mothered lambs and afterbirth (when lambs and calves are being born). In an undisturbed Australian ecology, they would have hunted many of the medium sized mammals, such as wallabies and numbats. Since the ecosystem here has been dramatically modified, the eagles have changed their diet to include feral rabbit, fox and cat (Apgar undated).

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| **WEDGE-TAILED EAGLE MANAGEMENT ACTIONS** |  |
| * Educate farmers on the limited impact as a pest and benefits of wedge-tailed eagles in farming operations. | SBG/RAIN |
| * Promote integrated pest management by encouraging conservation of wedge-tailed eagles and other raptors to assist with management of other pests such as rabbits, galahs, cats and foxes. | SBG/RAIN  Landholders |

## 6.3. Priority weed management recommendations

The priority pest management recommendations are derived from Table 2, consistent with the approach for pest animals in Section 6.2, the continuity of existing programs, and the five implementation objectives. The highest priority plant pest for action is the Opuntia Cactus. Detailed actions are provided for this priority and a summary of existing knowledge, programs and actions for is presented for the high priority pest plants.

### Prickly pear or opuntioid cacti

Prickly pear, opuntioid cacti or cactus (*Opuntia* species, *Cylindropuntia* species and *Austrocylindropuntia* species except *C. californica*) are declared pests in Western Australia (WA) (DAFWA 2016g). They are prioritised at a national level as WONS. According to the Situation Statement on opuntioid cacti in Western Australia (Lloyd and Reeves 2014), seven major risks associated with opuntioid cacti have been identified:

1. The extent of infestations and identity of species present have not been fully determined;

2. Opportunities to eradicate infestations at an early stage of invasion maybe missed;

3. Opuntioid cacti have the potential to invade much larger areas of WA;

4. Biological control agents are not available for most opuntioid cacti;

5. Most opuntioid cacti are not declared;

6. Information on basic biology and ecology of opuntioid cacti is inadequate; and

7. Technical information for control of opuntioid cacti is inadequate.

The opuntioid cacti have proved themselves to be intractable weeds: they are highly invasive and can tolerate a mix of harsh conditions including drought and a wide range of temperatures; they are armed with spines, and are difficult and expensive to kill (Lloyd and Reeves 2014).

Control options include biological, cultural (grubbing) and chemical. Biological control is potentially an effective management tool for large or dense infestations of opuntioid cacti; however, biological control agents are currently not available for most species (Lloyd and Reeves 2014). Herbicides are only effective when cacti are actively growing, that is in warm weather when plants are not under drought stress (DAFWA 2016d). DPAW has undertaken Opuntia control since 2004 and have trialled numerous approaches to control and eradication. They found that the cactus plant is a highly successful target plant for eradication due to its limited root system. Other work has found that so long as all of the vegetative matter from the plant is removed, it will not generate further (pers. comm. D. Biddulph DPAW). Biological control will soon be available for some species in Western Australia (DAFWA 2016d).

RAIN has received funding to conduct weed mapping and community awareness of drooping prickly pear. Aerial surveys using remote drones have proved a useful tool in detecting infestations in remote locations when plants are large for later eradication, although ground truthing is required in the Oldfield River post drone survey to confirm the existence of smaller plants. An infestation near the Ravensthorpe refuse tip has been treated for a number of years with most plants now eradicated save for a few plants to the north that are the subject of ongoing treatment to remove (G. Webster pers. comm.).

As the infestations in Ravensthorpe Shire are relatively localised, and control has been successful, there is a strong possibility that with priority and sustained action, this serious pest can be successfully controlled.

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| **PRICKLY PEAR MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness within the community of Opuntia and eradication successes. | SBG/RAIN  Shire of Ravensthorpe |
| * Apply for expression of interest for involvement in the Opuntia Management Program of DAFWA | SBG |
| * Continue weed mapping and control. | SBG/RAIN  Landholders |
| * Monitor and evaluate the effectiveness of the management actions to eradicate local populations of Opuntia. | SBG/RAIN |
| * Ground-truthing post drone survey of the Oldfield River to confirm the existence and extent of cactus plants | SBG/RAIN |
| * Submit an Expression of Interest to DAFWA for further funding. | SBG/RAIN |

### Skeleton weed

Native to southern Europe, the Mediterranean and south-west Asia. Relatively long-lived perennial with a deep tap root; stems and roots exude white latex when damaged. It is a declared pest in Western Australia (WA) (DAFWA 2016d). Skeleton weed can reduce grain crop yields to due its deep perennial root system, and interfere with harvesting as its wiry stems are still green at harvest time.

Skeleton weed is widely naturalised across much of the southwest of the state, it has been found on many properties across the wheatbelt since first being discovered in Western Australia in 1963 (Dodd and Loo 2015). Potential exists for it to spread to agricultural areas where it is not yet established, including Ravensthorpe.

The aim of managing skeleton weed is to prevent the spread of the weed and to achieve local eradication on each infested farm, which has some impact on farming operations through the associated quarantine, restrictions on some farm operations, annual searches and higher herbicide use rates.

The Grains, Seeds and Hay Industry Funding Scheme funds a program to control Skeleton Weed. The funds to run these programs are collected from producers at a rate of 30 cents for every tonne of grain and seed grown in the agricultural area of Western Australia and sold to a registered receiver. DAFWA has been contracted to administer the two programs and provide the support to ensure proper governance including secretariat, communications, policy and technical support, in addition to financial management (WAAGR 2013).

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| **SKELETON WEED MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Ensure awareness within the community to identify any new infestations, and support control actions. | SBG/RAIN |

### Cotton bush

Narrow leaf cotton bush or swan plant is a declared pest in Western Australia (WA). Cotton bush is not a priority agricultural weed and effective control is based on a community coordinated approach (WAAGR 2013).

It was introduced from South Africa as garden species or for the making of hats before 1802 in Sydney. It was first described as an invasive pest plant in 1817. By 1894 it was present in all mainland states and causing concern in WA where it was spreading rapidly near Dardanup and Burekup.

It is toxic to sheep, cattle and pigs, but unpalatable, so it doesn't usually cause stock problems, although it has caused poultry deaths when chaffed in green feed. It thrives in areas of low fertility and on good soils, especially if it is burnt. Predominantly a weed of roadsides, disturbed areas, pastures, native bush and watercourses, it can also form dense patches in paddocks reducing grazing areas. It is one of the few plants that will invade undisturbed bush (HerbiGuide 2016a).

Major spread is by wind and water transporting the winged tufted seed or the bladdery fruits floating in streams. Seed may contaminate produce or be transported in mud attached to animals and machines. Mechanical removal is effective if most of the root system is also removed. Repeated cultivation provides some control. Mowing or slashing in winter is effective if seedlings are sprayed or slashed as required. Seedlings can be controlled with dicamba and older plants with glyphosate or triclopyr applied in spring to early summer when they are actively growing. The larva of the Lesser Wanderer Butterfly occasionally causes significant damage to cotton bush. Control options include hand pulling, chemical spraying and slashing (HerbiGuide 2016a).

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| **COTTON BUSH MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness within the community of local occurrences, control measures and of local eradication successes. | SBG/RAIN  Shire of Ravensthorpe |
| * Work with landholders to control and eradicate. Follow HerbiGuide eradication strategies including mechanical removal of root systems, follow up cultivation, and recommended herbicide application. | SBG/RAIN  Landholders |
| * Monitor and evaluate the effectiveness of the control actions to eradicate local populations. | SBG/RAIN |

### Tambookie grass

Originally from Africa, then spreading through the Mediterranean to Pakistan. It was initially introduced for erosion control in the Coolatai area in northern NSW during the 1890’s (HerbiGuide 2016b). It was then planted as a pasture grass but generally not very successful unless it is kept short by grazing, mowing or fire. It is similar in appearance to the native kangaroo and taller wallaby grasses.

In the Ravensthorpe Shire, it is known as a single infestation on the Ravensthorpe - Lake King section of Brookton Highway, on the west side of the road just to the south of the Galaxy Mine entrance.

Tambookie grass readily spreads along roadsides. Invades remnant bushland and disturbed areas and is potentially a serious environmental weed that can reduce the cover and species richness of native flora. Importantly it changes fire intensity and frequency. It has the potential to invade most of the WA agricultural area apart from the far southwest (i.e. south of the Bunbury to Albany line) (HerbiGuide 2016b).

Soil movement, mowing and water appear to be the main agents of dispersal. It does not appear to tolerate grazing in the WA environment (HerbiGuide 2016b).

Burning and mowing generally make the infestation worse unless they are combined with herbicides or grazing. Heavy, constant grazing over a few years provides control. Glyphosate applied to actively growing plants usually provides good control but may need a few annual applications in spring to control established infestations. Tussocks can be manually removed but control of seedlings by hand weeding is difficult.

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| **TAMBOOKIE GRASS MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness within the community of the location of the infestation on the Ravensthorpe - Lake King section of Brookton Highway and the potential spread of Tambookie Grass. | SBG/RAIN  Shire of Ravensthorpe  Main Roads WA |
| * Work with Main Roads WA and the Ravensthorpe Shire to eradicate the local infestation. | SBG/RAIN  Main Roads WA  Shire of Ravensthorpe |
| * Educate community to distinguish Tambookie grass from native grasses. | SBG/RAIN  Landholders |

### Star of Bethlehem

The star of Bethlehem poses a risk to barley crops and is toxic to livestock and is an alternate host for the barley leaf rust fungus, which can cause significant crop losses in barley. It can also be toxic to livestock (DAFWA 2016h).

Star of Bethlehem was found on a property near Ravensthorpe townsite in 2013, it was eradicated from this location as part of the Main Roads WA heavy haulage route development (K Roy pers. comm.).

It is a weed of disturbed areas, rotation crops, perennial crops and grassland and spreads by seed, bulbils are spread in water flows and by ants. The main spread is by intentional planting, the dumping of garden refuse, earthworks and tillage (HerbiGuide 2016c).

It acts as an alternative host for the sexual stage of barley leaf rust, and epidemics of barley leaf rust have been associated with star of Bethlehem infestations on the Yorke Peninsula in South Australia. Star of Bethlehem therefore has two important effects on barley leaf rust severity:

* It allow sexual reproduction of the rust to produce resistant strains quickly; and
* It allows the rust to survive over summer with the black spores that infect Star of Bethlehem to produce infectious spores in the following barley crop that subsequently spread across the district causing an epidemic.

Management and control is by spraying or by planting wheat instead of barley on paddocks infested with star of Bethlehem to reduce the risk of barley leaf rust and the production of tolerant strains of the disease (HerbiGuide 2016c). Small local infestations can be dug up and plant and soil material burnt, as was the case with the local Ravensthorpe infestation.

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| **STAR OF BETHLEHEM MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Raise awareness within the community of star of Bethlehem identification and its local eradication. | SBG/RAIN  Shire of Ravensthorpe |
| * Continue vigilance to identify any new occurrences. | SBG/RAIN  Landholders |
| * Monitor and evaluate the effectiveness of the management actions to eradicate local infestations beside the heavy haulage route. | SBG/RAIN  Main Roads WA |

### Briar

Briar, dog rose or rambler rose, are prickly deciduous shrubs to 3 m high, often sprawling or scrambling in habit. It can form dense prickly thickets that can choke out creeklines and other favourable sites (Hussey et al 2007). It is not known which species the infestation near Ravensthorpe represents.

Briar occurs on Stevenson’s or Annabelle Creek where it crosses under South Coast Highway west of Ravensthorpe townsite. It has been of some concern for a few years and limited control works at this site have had some success (K. Roy pers. comm.). It is not known further downstream on Stevenson’s Creek (V Metz pees. Comm.); notwithstanding, a dedicated search from South Coast Highway is recommended to confirm its extent.

It is a perennial weed of old settlements and disturbed areas. It reproduces by seed, and suckering from canes touching the ground and root and stem fragments which can result in dense thickets in 15 to 20 years. Seedling establishment under parent plants is common, and seeds may be spread further afield by birds eating the rose hips. However, seeds rarely establish in dense pasture or healthy native vegetation. Established stands exhibit allelopathy, which can inhibit the germination of other species. (HerbiGuide 2017).

It is not known how far along Stevenson’s Creek or nearby the infestation extends. Investigating and understanding this is the first priority, and it will inform the development of management methods, including eradication if feasible.

Management and control is quite involved due to the reproduction ability of briar. The HerbiGuide website outlines the range of measures required for effective control, including slashing and deep ploughing or ripping in winter to bring the roots to the surface followed by summer cultivation, mechanical removal methods, grazing methods and regimes; and herbicide types, rates and application methods (HerbiGuide 2017). The extent of the infestation will dictate the management approach and the range of methods and liaison with landholders to apply.

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| **BRIAR MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Investigate and map the extent of the infestation on Stevenson’s Creek. | SBG/RAIN Landholders |
| * Identify which species of briar the infestation represents. | SBG/RAIN |
| * Develop a management and/or eradication approach or plan depending on the extent of the infestation, and using the control advice available on the HerbiGuide Website. | SBG/RAIN |
| * Raise awareness within the community of briar identification and its local eradication. | SBG/RAIN  Landholders |
| * Monitor and evaluate the effectiveness of the management actions, the extent of the infestation. | SBG/RAIN  Landholders |

## 6.4. Phytophthora dieback management

Phytophthora management is designed and presented in this Strategy as a cross-tenure, whole-of-community approach. This initiative is in line with the natural, cultural and economic importance of the conservation of the Ravensthorpe Shire area’s world-famous and characterising botanical diversity.

The program recommendations build upon the work already done over many years by the WA Department of Parks and Wildlife and its predecessors, South Coast NRM, the Shire of Ravensthorpe, Main Roads WA, and BHP Billiton, First Quantum Minerals and Galaxy Resources in managing and mitigating the threat of Phytophthora dieback.

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| **PHYTOPHTHORA DIEBACK MANAGEMENT ACTIONS** | **RESPONSIBILITY/ROLE** |
| * Support the Department of Parks and Wildlife’s Phytophthora dieback management programs | SBG/RAIN  Shire of Ravensthorpe |
| * Investigate the benefit of the Southern Biosecurity Group registering as a Local Dieback Working Group. | SBG/RAIN  Landholders |
| * Adapt the Project Dieback *Dieback Management Guidelines* as a standard by which to manage Phytophthora dieback. | SBG/RAIN |
| * Raise awareness in the community to the potential severe threat by Phytophthora dieback to the natural character, economic base and reputation of the Shire of Ravensthorpe and its outstanding natural diversity. | SBG/RAIN  Shire of Ravensthorpe |
| * Develop a community culture of mud-less vehicle use to limit the spread of Phytophthora dieback, and the use of washdown facilities. | SBG/RAIN  Shire of Ravensthorpe |

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## 6.5. Resourcing

The findings of the WA Auditor General in the “Managing the Impact of Plant and Animal Pests: A State-wide Challenge” report (2013), concluded that controlling pests is complex and to be effective requires collaboration between stakeholders. There are several key funding avenues, and these include the principal government agencies as well as a range of industry and community groups and landholders that can fund, co-fund or implement a program to control pests (WAAGR 2013).

Funding is available through:

* Grants to Declared Species Groups in the agricultural region from DAFWA.
* The BAM Act provides for shared and industry funding arrangements through RBGs or Industry Funding Schemes.
* DAFWA operational programs to control some pests – for example on occasions where landholders do not have the capability and capacity to control pests and where controlling established pests is in the public interest.
* Recognised Biosecurity Group collaborations with DAFWA to manage pests with funds raised through compulsory rates levied on landholders in their specified area to carry out pest control programs. The funds raised by rates are matched dollar-for-dollar by the State Government.
* Annual internal funding from the Shire of Ravensthorpe
* Federal funding programs for nationally listed pests and weeds and implementation of threat abatement plans.
* Partnership opportunities with the DPAW for biodiversity objectives
* Partnership with the Department of Fisheries.
* Partnerships with the South Coast NRM Group
* Occasional State funding programs such as Royalties for Regions.

According to the Auditor General (2013), potential exists to make more use of Industry Funding Schemes. The BAM Act provides for the establishment of Industry Funding Schemes to address biosecurity threats relevant to a sector of agricultural activity. The schemes use funding arrangements authorised under the BAM Act to raise industry funds to tackle priority pests and diseases.

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