Wimmera Invasive Plant and Animal Management Strategy

Wimmera CMA

This revised version of the Wimmera Invasive Plant and Animal Management Strategy is based upon the original 2010-2015 Strategy developed by Wimmera Catchment Management Authority in 2010.

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1. Introduction

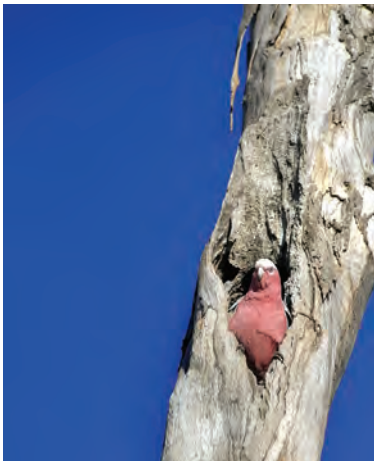
Invasive plants and animals (IPA) are having pronounced environmental and economic impacts in the Wimmera. Australia-wide, invasive animals alone cost more than $700 million a year in lost production and management costs[1]. Costs associated with invasive plants are estimated to be close to $4 billion[2].

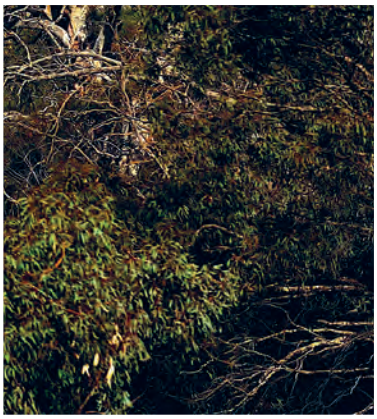
Despite Wimmera IPA control attracting significant investment during the last decade, the problem is much larger than the resources available. To be effective, future investment needs to be more strategic and targeted.

This document represents a significant step forward in articulating priorities for the investment of public funds in Wimmera IPA control. It outlines the principles and logic that government agencies, industry and the community can use to take a strategic and coordinated approach to regional IPA management.

The four regional government agencies with pest management as part of their core business – Agriculture Victoria, the Department of Environment, Land, Water and Planning (DELWP), Parks Victoria (PV) and the Wimmera Catchment Management Authority (WCMA) – jointly developed this strategy and have agreed to implement the pest management priorities within it.

The impacts of invasive plants and animals touches everyone on the land and in regional Australia. In developing this strategy, the agencies recognise and support the fact that landowners, Landcare groups, local governments, and the broader community are controlling pests that are a priority in their local area. This strategy establishes priorities to maximise the public benefit from public funding at a regional scale, while understanding that community work on local priorities are a valid and important contribution to regional pest control.





Aims of the strategy

The breadth and scale of the regional IPA problem is many times larger than the money available to manage the issue. Given this constraint, this strategy recognises a need to coordinate and prioritise efforts between government, industry and the community to make a tangible and measurable difference. Coordination and prioritisation is the primary aim of this strategy.

The strategy also aims to help all land managers and the broader community understand the logical framework underpinning these agreed priorities.

Scope of the strategy

The strategy takes a whole-of-catchment approach, focusing on IPA management where government investment leads to maximum community benefit. The strategy considers invasive plants and animals that are, or can be declared under the Catchment and Land Protection Act (CaLP Act 1994), and that meet the definition of invasive species under the Victorian Invasive Plant and Animal Policy Framework. The definition of an invasive species is:

'mammals, amphibians, reptiles, birds and both terrestrial and freshwater plants, that are not indigenous to Victoria.'

Over-abundant native species are managed under the Wildlife Act 1975 and invasive fish species are dealt with under the Fisheries Act 1995. Both are beyond the scope of this strategy. Refer to page 21 for more information on the management of these species.

This strategy replaces the Wimmera Invasive Plant and Animal Management Strategy 2010-2015. Legislation that relates to IPA management is briefly summarised in Appendix 2.

Strategy context

The purpose of the strategy is to provide an agreed approach to priority setting for Wimmera IPA management. It is an action plan under the Wimmera Regional Catchment Strategy and refers to several key guiding documents. The relationships between this and other State, Federal and local plans are outlined in Figure 1

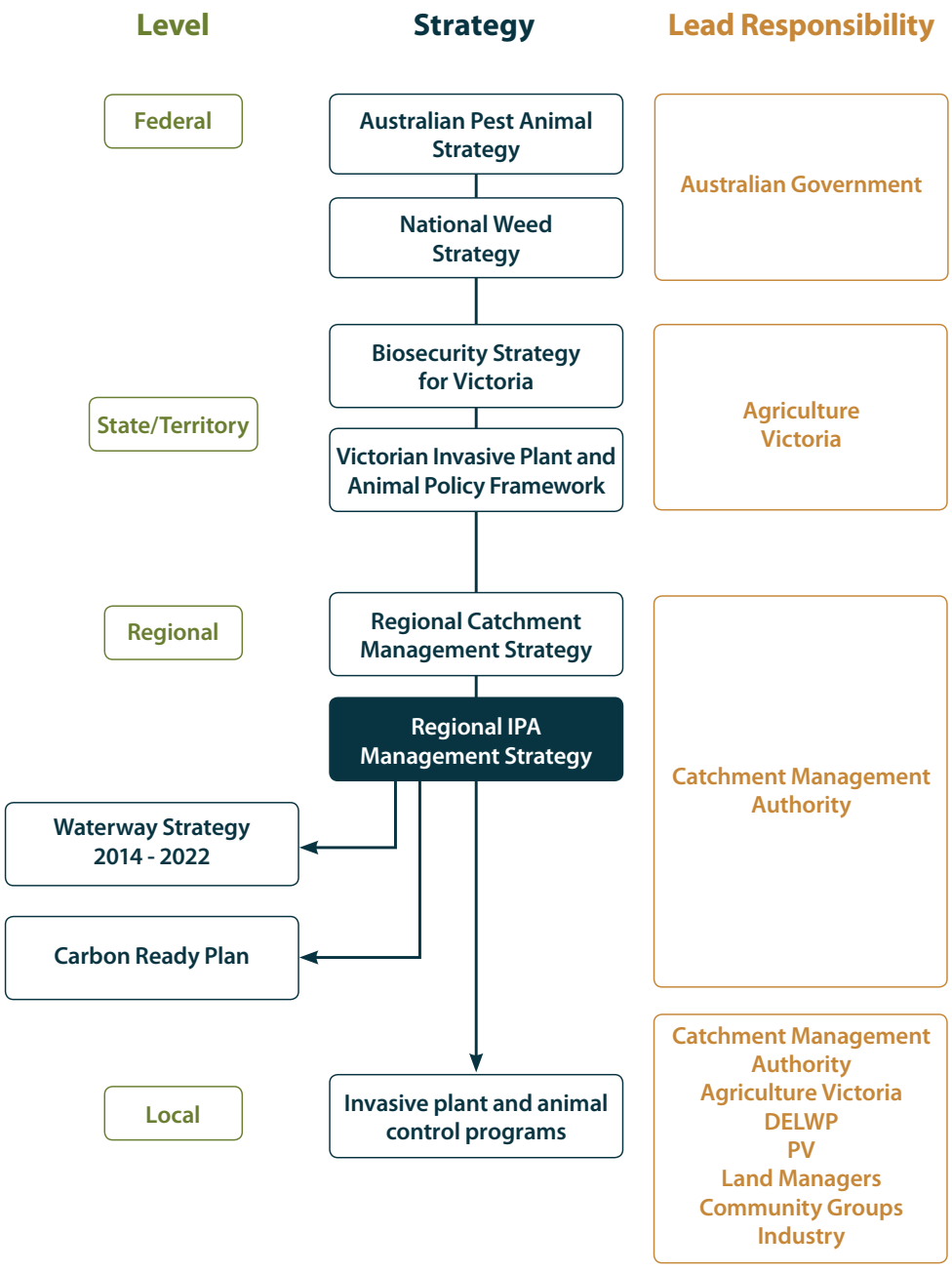


Figure 1: How this strategy relates to State, Federal and other strategies

Strategic principles

A biosecurity approach to IPA management

This strategy applies the biosecurity approach to prioritise IPA management as described in the Biosecurity Strategy for Victoria3. This approach uses a generalised invasion curve to consider the actions and types of interventions appropriate at each stage of pest invasion.

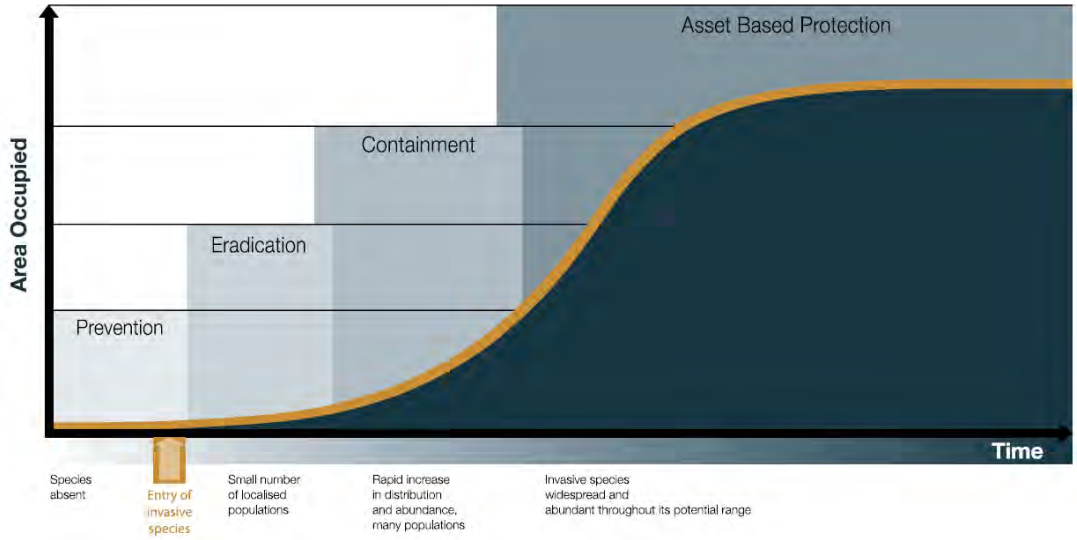


Figure 2: Generalised invasion curve showing actions appropriate to each stage[3].

A key principle of the biosecurity approach is that the cost-benefit ratio for action in the early stages of pest invasion is much greater than after a pest has become widespread and abundant.

Therefore, during the early stages of an invasive plant or animal invasion, **prevention** and **eradication** programs are the most cost-effective and highest priority forms of management. In these cases, a 'species-based' approach is applied. The control of State prohibited weeds and high-risk invasive animals (HRIA) fall into this management approach

If the pest infestation increases it becomes less likely that the species will be eradicated. When this occurs, the best value management option becomes **containment** to limit further spread. The containment of regionally-prohibited weeds using strategies that include the elimination of satellite infestations and the management of pathways of spread fall into this management approach.

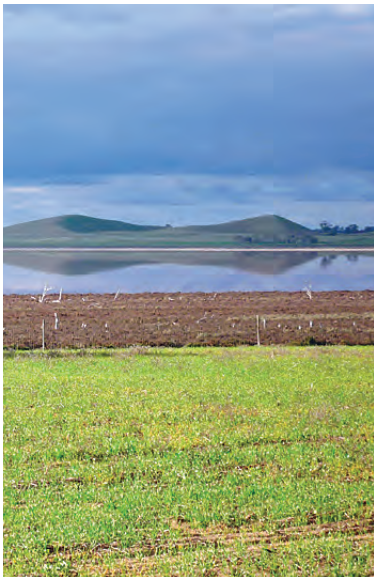
If a pest is widely established and eradication or containment are no longer feasible options, the focus for management turns to reducing the impact of the pest on high-value assets. This is known as **asset-based protection**. This management approach emphasises control work at an asset location to reduce the impact on that asset. Regionally-controlled weeds and environmental weeds fall into this management approach.

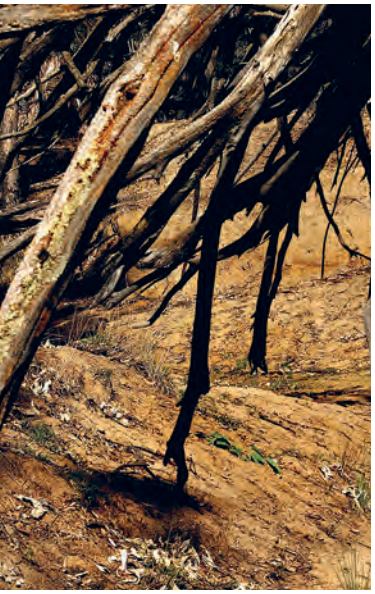
3 DPI, Biosecurity Victoria (2009) Biosecurity Strategy for Victoria. Melbourne.

2. Vision

The vision for IPA management in the Wimmera is:

'To prevent new highly invasive plants or animals becoming established and to protect high-value assets to a standard that allows normal functions and processes to continue.'





3. Objectives

The objectives for IPA management within this strategy are:

Objective 1:
No new high risk pest incursions into the region

Objective 2:
High risk new and emerging IPA species eradicated from the region

Objective 3:
Containment of invasive species with limited distribution and potential to spread further within the region

Objective 4:
High-value assets protected from invasive pests (to the extent that their natural functioning is not impaired)

Objective 5:
Clear pest management targets established. Monitoring and reporting on progress towards those targets leads to continuous improvement

4. Management responsibilities and coordination

4.1 Roles of key regional government agencies in relation to IPA

Wimmera Catchment Management Authority

- Community group (e.g. Landcare, Landcare networks) funding and support for IPA management
- Strategic planning and coordination for natural resource management in the region
- Community awareness raising/education on natural resource management issues
- Overall catchment–wide reporting on the state of the environment
- Overall catchment-wide reporting on the outcomes of IPA management activities
- Providing support through incentives for IPA management that leads to asset-based protection
- Providing advice to the Minister on recommendations for the declaration or revocation of invasive species under the *CaLP Act*

Parks Victoria

- Management of national parks, state parks and conservation reserves
- Delivery of IPA control programs in parks and reserves

Department of Environment, Land, Water and Planning

- Management of Crown land reserves and state forests
- Delivery of IPA control programs on public land
- Administration of *CaLP Act*
- Facilitate IPA control to enhance survival of isolated populations of threatened species and other public land values

DELWP also oversees policy implementation regarding IPA control to protect biodiversity on public land.

Key programs include projects under the Good Neighbour Initiative which aims to control weeds and pests at the boundary between public and private land.

Agriculture Victoria

- Respond to new high-risk invasive pests, diseases and invasive species into Victoria, i.e. Mexican Feather Grass incursion into Victoria in May 2008
- Policy development and implementation with regard to IPA management
- Identification and risk assessment of new high-risk IPA species, i.e. Noxious Weed Review
- Prevention and preparedness to manage new incursions of high-risk IPA incursions, i.e. Incursion Plans and capability to respond to new high-risk pest incursions
- Surveillance programs for early detection of new high-risk IPA species, i.e. Management of Weed Spotters program and targeted industry or Agriculture Victoria surveillance programs
- State Prohibited Weeds and new high-risk invasive animals treated for eradication by Agriculture Victoria on private and public land and sites monitored
- Property inspections and extension/compliance to ensure all known infestations of Regionally Prohibited Weeds are treated for eradication
- Long term monitoring of rabbit abundance and activity (one Wimmera site)
- Monitoring distribution and abundance of Regionally Prohibited Weeds
- Property inspections, extension and compliance for the protection of high-priority assets from established invasive species
- Enforcing provisions of the *CaLP Act 1994* aligned to statewide and regional IPA priorities, i.e. Enforcement activities for the protection of high-priority assets
- Social research, community profiling and stakeholder analysis relating to invasive plants and animals
- Provision of technical and best-practice advice on the prevention and management of IPA declared under the *CaLP Act*
- Assisting the development and function of industry stewardship and quality assurance programs
- Facilitating community empowerment and leadership, i.e. active involvement in the development and review of regional IPA plans and collaboration with Regional Landcare Networks

4.2 Other management responsibilities

All Landowners

Landowners must manage land appropriately and not cause impact to others, and undertake required actions for invasive plants and animals declared under the *CaLP Act*.

Roadside Weeds and Pests

Roadsides provide a means for weeds and pests to spread throughout Victoria. These, in turn, threaten agricultural production and environmental assets.

In accordance with the 2013 amendments to the *Catchment and Land Protection Act 1994*, Municipal Councils are the responsible landowners of roadsides for the purposes of declared weed and pest management within their respective Municipal Districts. This includes responsibility for unmade municipal roads which are not held under licence. Vic Roads are responsible for weed and pest management on Declared roads/roadsides i.e. highways and freeways.

Local Government

Municipal Councils have several responsibilities relating to IPA management. Councils generally have an extensive road infrastructure system to construct and maintain, and are often contracted to maintain main roads and highways on behalf of VicRoads.

As landowners and land managers of large areas and multiple sites, councils have the same duty-of-care responsibilities as other land managers under the *CaLP Act 1994*.

Councils have powers and duties with regard to the overall management of domestic animals under the *Domestic Animals Act 1994*. Under the Act each Council must prepare a domestic animal management plan, and requires registration of cats and dogs. Domestic cats in particular are highly destructive invasive animals when uncontrolled in the natural environment. To mitigate against this councils can apply strict cat controls and promote responsible pet ownership within the community.

As the owners or managers of multiple sites, councils need to ensure that their activities do not result in the introduction or spread of declared pests.

Councils also implement the *Planning and Environment Act 1987* and with other organisations develop and implement planning schemes.

Water Corporations

Water Corporations distribute water to urban and rural landowners and manage groundwater and wastewater. Grampians Wimmera Mallee Water (GWMWater) owns and/or manages land such as drainage basins, channel reserves and water storages. It has the same duty-of-care responsibilities as other land managers under the *CaLP Act 1994*.

As large landowners with multiple sites water corporations need to ensure that activities do not result in the introduction or spread of declared pests.

VicRoads

Maintains and constructs highways and declared main roads including all aspects of managing the road reserve, including IPA control. As large landowners with multiple sites VicRoads need to ensure that activities do not result in the introduction or spread of declared pests.

VicTrack

Victrack is responsible for the state's rural railway reserves including the management of IPAs on those reserves. As large landowners with multiple sites VicTrack need to ensure that activities do not result in the introduction or spread of declared pests.

Industry and Community

Industry and the community have the responsibility to ensure that activities do not result in the introduction or spread of declared pests.

4.3 Effective partnerships for coordinated IPA management

Developing partnerships is critical to the success of IPA management programs. Invasive plants and animals do not respect landowner boundaries and can be introduced and spread via many commercial business activities.

The benefits of partnerships for invasive species management include:

- Sharing of knowledge
- Sharing of resources
- Minimising management costs
- Coordinating operational activities for more effective invasive species management
- Improving business networks and opportunities
- Enhancing the reputation of commercial businesses

It is anticipated that the Key Partners identified in this strategy – Wimmera CMA, PV, DELWP, Agriculture Victoria - will confer at least annually during the life of this strategy to ensure coordinated IPA management continues. The Key Partners will review annually:

- IPA control works undertaken
- Status of IPA species identified under the species-based approach described herein
- Condition and trend of assets with regard to IPA impacts identified under the asset-based protection approach described herein where investment is targeted
- Emerging threats

Wimmera CMA will take the lead in coordinating periodical reviews, and in coordinating the compilation of monitoring data outlined in Section 7. Table 1 provides a standing agenda for the review process.

Other opportunities for the development of effective partnerships for IPA management will be supported and

encouraged by the Wimmera CMA and all partners.

4.4 Community understanding of regional IPA management

Facilitating the regional community's understanding of priorities for IPA management is important in order to:

- Build community support and capacity
- Build partnerships for IPA management with community groups
- Manage community expectations
- Encourage responsibility for IPA management within the community where appropriate

Each agency involved in the development of this strategy recognises the importance of this and is committed to the integration of communication and awareness raising activities as a part of IPA operations. The Wimmera CMA will continue to take the lead role in promoting community understanding of this strategy.

Protocols for dealing with plagues

From time to time favourable seasonal conditions give rise to insect or animal populations that can reach plague proportions. The Wimmera has recorded mouse and locust plagues that have impacts on the economic, environmental and social values social of the region.

Agriculture Victoria take responsibility for monitoring emerging plagues, issuing advice and providing support to the community. More information is available at www.agriculture.vic.gov.au

4.5 Management of introduction and spread pathways

The management of introduction and spread pathways is an essential element of protecting the region and its assets from the impact of pests. The approach is important in the management of new and emerging pests, but also applicable to established pests that threaten the region's assets. By identifying the pathways by which pests expand into new habitat, we are able to target these sources for management. This is especially important in containing the further spread of a pest to ensure efforts in one area are not negated by unchecked spread from other areas.

The changing environment in which we work adds further complexity in responding to the spread of pests. Over recent years, a warmer climate has seen greater incidence and intensity of wildfire and drought. These events can bring greater risk of weed/animal spread through the movement of vehicles and produce such as fodder to assist with emergency response and recovery.

Invasion pathways

Pests are highly competitive plants and animals that have adapted to one or more pathways of spread to colonise new parts of the landscape. While pest animals can move across the landscape without assistance, pest plants hitch a ride. Weed seeds are spread by the wind, in running water, or by attaching to moving animals or machinery. People sometimes unknowingly spread weeds during their everyday work, such as when seeds are mixed up in hay or grain that is transported and deposited, or when seeds are moved along with food for people. Weeds can also be spread by trading weed species and during gardening and horticulture.

A risk assessment of weed spread pathways undertaken by DPI[4] in 2007 found:

Industries with a high risk for weed spread include:

- Seed (includes agricultural crops, pasture, plants, vegetables, bulbs and trees)
- Aquarium/Pet shop
- Landscaping
- Nursery
- Earthmoving
- Forestry
- Bulk Suppliers of landscaping and road making material

Other industries which have potential for weed spread:

- Fodder
- Linear Reserve Management, i.e. railway easements
- Plant research

High risk pathways include:

- Deliberate introductions via commercial and private trade on the internet
- Deliberate introductions via business
- Contaminated goods/produce
- Contaminated vehicles
- Contaminated equipment
- Deliberate introduction via community
- Recreation

Invasive animals may also be introduced into the region via some of the pathways of spread detailed above, and also via specific pathways for invasive animals, for example, when feral pigs have been spread by hunters for sport.

Preventing the spread of pests is everyone's responsibility. Strategic IPA management programs must consider mitigation strategies to manage pest pathways of spread so that high risk pests are not introduced to the Wimmera and high value assets are protected from invasion. This is often achieved by collaboration and the development of partnerships between those organisations/industries involved in potential IPA spread practices and those organisations seeking to prevent invasive plant or animal spread.

Species-based approach:

Action 4.5.1	Invasive plant and animal prevention/ surveillance, eradication and containment programs to include pathway management where appropriate.
Lead Organisation	Agriculture Victoria; DELWP; PV; Local Government.
Key Partners	WCMA/Industry/Community/Landowners
Target	Pathway management undertaken for highest priority pests

Asset-based protection approach:

Action 4.5.2	Invasive plant and animal asset protection programs to include pathway management where appropriate.
Lead Organisation	WCMA
Key Partners	Agriculture Victoria; PV; Local Government; Community; Linear Reserve Managers; Landowners.
Target	The community is alerted to increased risks of pest spread after significant events such as major wildfire.

4 King C, Thomas N, Steel J, Hunt T, Weiss J, (2007) Weed Spread Pathway Risk Assessment – Stage 2 June 2007, Department of Primary Industries, Tackling Weeds on Private Land, Melbourne.

Treatment of the State Prohibited weed Mesquite *(Prosopis* spp.*)* by local contractor. Chemical treatment above, and burning debris and promoting seed germination for subsequent knock-down below. Photos: Michael Moerkerk

5. Species-based approach

Using biosecurity principles, the IPA management action has been divided into either a species-based approach or an asset-based protection approach. The highest priority activities are those listed under the species-based approach.

5.1 Prevention and Eradication – priority action

Aim: To prevent high-risk invasive plants and animals entering the region, and to eradicate high-risk new and emerging invasive plants and animals from the region.

Action 5.1.1	Implementation of High Risk Invasive Plant program (HRIP), High Risk Invasive Animal program (HRIA).
Lead Organisation	Agriculture Victoria.
Key Partners	DELWP, WCMA, PV, community Weed Spotter, network industry sector.
Target	Surveillance programs implemented to reduce the chance of high risk invasive species incursions becoming established.

High Risk Invasive Plant Program

The Agriculture Victoria High Risk Invasive Plant Program is designed to prevent future incursions of high-risk invasive plants and eradicate current and new incursions of high-risk invasive plants.

The High Risk Invasive Plant Program focuses on State Prohibited Weeds and Victorian Alert Weeds (collectively called Weed Alert Species). The program deals with detection and response for the whole of Victoria on both public and private land.

The program strategically recruits 'Weed Spotters' from partner organisations and relevant community sectors, and trains these people on how to identify and report new high-risk weeds.

The monitoring of social medial "buy/swap/sell" sites by Weed Spotters has proved to be an effective method of detecting high risk invasive plants. (Pers. comm. Mark Farrer, Agriculture Victoria)

High Risk Invasive Animal Program

High risk invasive animals are non-native (introduced) species that are, or have the potential to become, established in the wild through escape from captivity and domestication, deliberate or accidental release and accidental or illegal importation. These species have the potential to impact on agricultural production, threaten biodiversity, contribute to human health problems and can potentially damage the state's diminishing water resources.

Prevention and early intervention provides the most cost-effective means of dealing with new high risk invasive animals and also allows for the greatest chance of successful eradication.

The project seeks to achieve the following outcomes:

- New high risk invasive animals prevented from establishing in Victoria.
- New high risk invasive animals actively managed towards eradication in Victoria.

The project has the following objectives:

- **Surveillance and Detection:**
  Implement effective surveillance and detection for new high risk invasive animals.
- **Compliance through Extension:**
  Ensure compliance with the Catchment and *Land Protection Act 1994* for keeping and managing regulated and established pest animals.
- **Coordination, Capacity and Capability:**
  Improve Agriculture Victoria capacity and capability to respond to and manage new high risk invasive animals.
- Agriculture Victoria manages the response to incursions of new high risk invasive animals.

For further information on the control over the possession, trade and movement of declared pest animals go to: *www.agriculture.vic.gov.au > Information Notes > Animals & Livestock>Pest Animals > Regulation, A guide for the control over the possession, trade and movement of declared pest animals.*

Action 5.1.2	Implement programs to eradicate HRIA and state prohibited weeds (see Table 1) when detected in the region.
Lead Organisation	Agriculture Victoria.
Key Partners	WCMA; DELWP; Agriculture Victoria.
Target	All state prohibited weed infestations treated for eradication. All HRIA treated when/if they occur in Victoria.

Action 5.1.3	Undertake risk assessments of potential new high risk invasive plants and animals and their potential pathways of spread. Use this information to develop and implement strategies to reduce the risk of introduction of pests from outside the region.
Lead Organisation	Agriculture Victoria.
Key Partners	Agriculture Victoria; Nursery and Garden Industry; WCMA; DELWP; other industry sectors.
Target	Timely review of risk assessments

Table 1: State Prohibited weeds

Plants in the State Prohibited weed category either do not occur in Victoria, or are present and can reasonably be expected to be eradicated. Only mesquite and water hyacinth occurred in the Wimmera at the time of writing. These lists are updated periodically and can be found at www.agriculture.vic.gov.au.

State Prohibited weeds	
Alligator Weed *Alternanthera philoxeroides*	**Mesquite** *Prosopis* All spp.
Branched Broomrape *Orobanche ramosa*	**Mexican Feather Grass** *Nassella tenuissima*
Camel Thorn *Alhagi maurorum*	**Parthenium Weed** *Parthenium hysterophorus*
Giraffe Thorn *Acacia erioloba*	**Poverty Weed** *Iva axillaris*
Hawkweed *Hieracium* All spp.	**Ragwort** *Senecio jacobaea*
Horsetail *Equisetum* All spp.	**Salvinia** *Salvinia molesta*
Karoo Thorn *Acacia karroo*	**Tangled Hypericum** *Hypericum triquetrifolium*
Knotweed spp *Fallopia x bohemica, F.japonica, F sachalinensis*	**Water Hyacinth** *Eichhornia crassipes*
Lagarosiphon *Lagarosiphon major*	

5.2 Containment – priority action

Aim: To contain, and ideally eliminate, existing IPA not widespread in the region by eliminating satellite infestations and managing pathways of spread.

Action 5.2.1	Implement inspection and extension / compliance programs to contain, and ideally eradicate, regionally prohibited weeds (see Table 2).
Lead Organisation	Agriculture Victoria.
Key Partners	WCMA; DELWP; Agriculture Victoria; GWMWater; Local Governments; Linear Reserve Managers; Landowners; PV; Industry
Target	Regionally prohibited weeds don't spread beyond their 2010 extent.

Table 2: Wimmera Regionally Prohibited Weeds

Plants in the Regionally Prohibited Weeds category are not widely distributed in the region but are capable of spreading further. It is reasonable to expect that they can be eradicated from the region and must be managed with that goal. These lists are updated periodically and can be found at www.agriculture.vic.gov.au

Wimmera Regionally Prohibited weeds	
African Daisy *Senecio pterophorus*	**English Broom** *Cytisus scoparius*
African Feather-grass *Pennisetum macrourum*	**Noogoora Burr/ Californian Burr** *Xanthium strumarium*
Arrowhead *Sagittaria L. spp.*	**Prairie Ground Cherry** *Physalis viscosa*
Buffalo Burr *Solanum rostratum*	**Serrated Tussock** *Nassella trichotoma*
Cape Tulip (Two-leaf) *Moraea miniata*	**Spiny Emex** *Emex australis Steinh*
Dodder *Cuscuta All spp.*	**Tiger pear** *Opuntia aurantiaca Lindl.*
Dodder *Cuscuta* All spp.	**Spiny Emex** *Emex australis*

Action 5.2.2	Through community engagement and liaison, maintain awareness of weeds that are of community concern, and take a pro-active approach in the nomination of new weeds on the state Noxious Weeds List
Lead Organisation	WCMA
Key Partners	Agriculture Victoria
Target	Emerging weeds that are of concern to the community are risk assessed in a timely manner

The management of over-abundant native species and protected introduced species

From time to time native species that are well adapted to living in modified agricultural landscapes become over-abundant and can have adverse effects on property, industry, or the environment. For example, kangaroos maintain reasonable population levels even in drought periods because of their use of farm dams, and are able to increase numbers quickly in good seasons. High numbers can adversely affect agricultural production, and can also adversely affect some of the rarer environmental values we are trying to conserve in our parks and reserves.

This strategy outlines how we cooperatively manage introduced (non-native) invasive plants and animals. While outside the scope of this strategy, it is recognised that the control of over abundant native species is sometimes required to limit adverse impacts.

Over-abundant native species are primarily managed under the Wildlife Act 1975. Under the Act, permits for the control of wildlife can be granted on a case by case basis. Factors considered before the issue of a permit include the population health of the species in question and the nature and severity of the damage. DELWP is the first point of contact in this process.

Conversely, there are also introduced species (such as deer, quail, partridges and pheasants) which are included under Victoria's Wildlife Act. These species have been afforded this particular status under legislation due to their recreational value. The management of introduced species protected by the Wildlife Act is also outside the scope of this strategy. Issues relating to these species should also be referred to DELWP.

6. Asset-based protection approach

Biosecurity principles state that when a pest has become widespread then attention turns to the protection of assets. Assets are features in the landscape that should be protected from pests and their condition improved or protected for the public good. In the Wimmera these assets include waterways, wetlands, and areas of native vegetation.

It is acknowledged that sufficient resources are not available to protect everything from every pest. Therefore, the identification of highest value areas and the direction of resources to those areas first will ensure the assets most important to the community are managed as effectively as possible.

6.1 Established, widespread pests of concern

There are many and widespread invasive plants and animals that have a negative impact on the region's environmental assets (see Appendices 4 and 5). Interviews with land managers and IPA experts were used to determine which widespread invasive species are having the greatest impact on the region's identified assets. A selection of the most important of these is discussed here.

Invasive Plants

Invasive plants impact on the region's assets primarily by out-competing and displacing more desirable species. They can also negatively affect the hydrology and amenity of the region's waterways through infestations along the riparian zone and in watercourses. Some of the most disruptive weeds identified in the region are listed below.

Bridal Creeper *(Asparagus asparagoides)*

Bridal creeper is a climbing vine native to South Africa. It has spread widely through Victoria since its introduction in the 1870s. It is not an agricultural weed, and is grazed by sheep and cattle. Bridal creeper is a Weed of National Significance and is the environmental weed with the greatest impact on native vegetation in the Wimmera.

Bridal creeper seeds are readily dispersed by birds and invade intact native vegetation. Bridal creeper dominates the understory and smothers herbs, shrubs and small trees, reducing the diversity and therefore quality of the underlying native vegetation. It produces a large tuberous root mat that fills space in the top-soil and excludes other plants. Bridal creeper can also transform native plant communities by increasing the availability of soil phosphorus through changes to nutrient cycling. The changes to soil nutrients contribute to the establishment of bridal creeper monocultures in the Wimmera. Areas invaded by bridal creeper can lose more than half their native plant species.

Bridal creeper is difficult to eradicate from an area because it is so easily re-invades. While complete eradication is obviously ideal, ecologists have sought to determine an acceptable threshold density if this were not possible. While it has been difficult for ecologists to determine an acceptable threshold density for bridal creeper (*P. Turner pers. comm.*), there is anecdotal evidence that the diversity of native species may be maintained when the density of bridal creeper remains below 10 percent cover. Therefore, a sensible target density for bridal creeper in priority areas would be below this 10 percent threshold. There is some evidence that controlled areas previously infested with bridal creeper are susceptible to invasion by other weeds[5] so care needs to be exercised in this regard and control sites revisited with follow-up weed control.

5 Turner P, Scott J, Spafford H (2008) The ecological barriers to the recovery of bridal creeper (Asparagus asparagoides (L.) Druce) infested sites: Impacts on vegetation and the potential increase in other exotic species. Austral Ecology 33, 713–722.),

Blackberry *(Rubus fruticosus)*

Blackberry is a Weed of National Significance prevalent in the upper Wimmera catchment. Blackberry favours gullies and waterways and can infest these riparian zones, reducing amenity value, out-competing natives and altering hydrology. Thickets of blackberry quickly become impenetrable, are resistant to grazing by stock and provide harbour for rabbits.

Boneseed *(Chrysanthemoides monilifera)*

Boneseed is a Weed of National Significance and an environmental weed that out-competes and replaces native vegetation. It is widespread throughout the region.

Boxthorn *(Lyceum ferocissimum)*

A woody shrub found throughout the region. Birds and foxes spread seeds. Forms dense stands and out-competes native vegetation.

Broom

Another group of woody weeds that infests areas, out-competes natives and provides harbour for rabbits. Prevalent in the upper catchment. Includes the regionally-prohibited english broom (*Cystitus scoparius*) as well as regionally controlled cape broom (*Genista monspessulana*) and flax-leaved broom (*Genista linifolia*).

Gorse *(Ulex europaeus)*

Gorse is a Weed of National Significance. Dense stands of gorse are highly flammable and provide harbour for rabbits. Although seedlings are not spiny and can be grazed by stock, gorse can infest areas to the extent that they can become impenetrable to stock. Gorse infestations have been widespread in the upper Wimmera catchment but extensive control efforts in recent years have resulted in this weed becoming less prevalent.

Invasive Animals

European Rabbit *(Oryctolagus cuniculus)*

Rabbits are by far the most destructive invasive animal in the Wimmera. Rabbits are the major threat to agriculture, native vegetation and habitat conservation. They threaten waterway assets by starting erosion in hill country leading to the sedimentation of waterways. They dig into stream banks causing destabilisation and further erosion.

The overall cost caused by rabbits to agriculture and horticulture in Australia was recently estimated to be about $206 million per year

Rabbits can stop the regeneration of slow growing native flora such as bulokes and native pines. In pine-buloke woodlands rabbits browse and kill emerging trees, and are gradually turning these nationally threatened vegetation communities from woodlands to grasslands. Regeneration has only occasionally occurred in this vegetation community since rabbits appeared in the mid-1800s. Rabbit grazing is highly selective and rabbits can have greater impact on the regeneration of woody perennials than most other grazers including domestic stock, goats and kangaroos. It takes less than on rabbit per hectare to prevent the successful generation of many native trees and shrubs

Under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, competition and land degradation by rabbits is listed as a key threatening process. Rabbits impact over 300 EPBC Act listed threatened species and nine ecological communities[6].

Evidence shows rabbit densities need to be kept low to allow the regeneration of these woodlands.

Rabbit densities have been defined in this context as:

High if spotlight counts exceed six per km, and/or warren counts >3 active entrances per ha, and/or faecal pellet counts >15 per quadrat (0.25 m2).

Moderate if spotlight counts range between three and six per km, and/or warren counts in 1–3 active entrances per ha, and/or faecal pellet counts 10–15 per quadrat (0.25 m2).

Low if spotlight counts <3 per km, and/or warren counts <1 active entrance per ha, and/or faecal pellet counts <10 per quadrat (0.25 m2).

Rabbit numbers have varied over the years since their introduction. The introduction of Myxomatosis in the 1940s was highly successful in reducing numbers. However, as immunity to Myxomatosis developed after the 1950s, control depended on advances in technology including the integrated use of 1080 baiting, ripping and pressure fumigation.

In March 2017, a new strain of the Calicivirus RHDV1 K5 was released at 150 sites across Victoria with 14 of those sites in the Wimmera. It is unlikely that RHDV1 K5 will achieve population reductions that the 1996 calicivirus release initially did, as it is not being released into a naïve population. Knockdowns are expected to be on average around 10 – 15% (ranging from between 0 – 40%). It is important that RHDV1 K5 is used as part of an ongoing integrated multi-technique rabbit management program. (Source: Agriculture Victoria)

6 Williams K, Parer I, Coman B, Burley J and Braysher M (1995) Managing Vertebrate Pests: Rabbits. Bureau of Resource Sciences and CSIRO Division of Wildlife and Ecology. Australian Government Publishing Service, Canberra.

Feral Pig *(Sus scrofa)*

Feral pigs are considered an environmental pest due to their selective feeding, trampling and rooting for underground parts of plants and invertebrates, as well as predation on, competition with, or disturbance of a range of native animal species.

Feral pig activity also has a dramatic effect on watercourses and swamps. By wallowing and rooting around the waterline, they destroy the riparian vegetation which provides food and nesting sites for native wildlife and helps to prevent soil erosion. Water quality is also affected and their diggings may spread undesirable plant and animal species, and plant diseases in these areas.

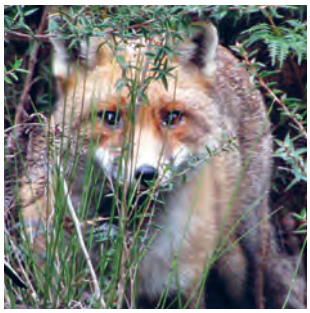
'Since the publishing of the Wimmera Invasive Plant and Animal Management strategy in 2010, the number of Feral Pig reports has increased in the upper Wimmera catchment on the interface of the Pyrenees Range public and private land interface. Feral Pigs are known carriers of a number of endemic diseases in Australia. Of more concern is if ever there was an outbreak of exotic diseases such as foot and mouth or classical swine fever in Australia, feral pigs are a high biosecurity risk for the spread of these diseases. The illegal release of feral pigs for recreational hunting is an ongoing concern.' (*Source: Agriculture Victoria*)

Wild Dog *(Canis lupus familiaris; Canis lupus dingo x Canis lupus familiaris)*

Wild dogs are generalist predators and will eat wildlife and livestock if available. They will also scavenge on carrion and attack domestic pets from time to time. Wild dogs can kill more animals than they need for food, which is referred to as surplus killing.

'Wild Dogs in the north-west Wimmera have been subject to varying degrees of control to mitigate predation on stock since well into last century. Predation mainly on sheep occurs to varying degrees at varying intervals at the interface of the Big Desert and Wyperfield National Parks and State Forest.

This area is part of the North West Wild Dog Management Zone which is managed by DELWP Mildura in collaboration with the local community and Parks Victoria. A Strategic Work Plan guides annual Wild Dog management which includes an integrated approach of, baiting, trapping, shooting, guard animals and animal husbandry. During the 2016 – 17 financial year, 30 livestock were confirmed as killed by Wild Dogs and 8 Wild Dogs trapped on the southern boundary of the Big Desert-Wyperfield complex. An increase in Wild Dog activity in eastern Wyperfield has increased since the 2014 bushfires.' *(Source: Agriculture Victoria)*



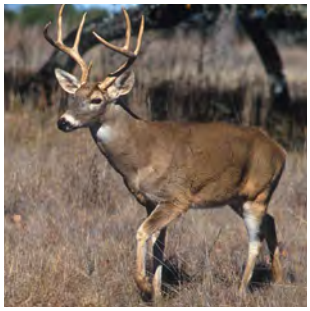
Red Fox *(Vulpes vulpes)*

Foxes are widespread throughout the Wimmera. They predate heavily on native animals and are one of the leading causes of extinction of native species7. Foxes are highly mobile and will disperse over large distances. Sub-adult foxes can disperse at the end of summer across tens of kilometres108. They will actively fill territory vacated by other foxes removed through control programs. Therefore, fox control of small areas will be rapidly negated by reinvasion. Fox control must happen over large areas to protect a core population of a threatened species.

There is currently not a good understanding of the fox density/damage relationship with regard to the conservation of threatened animals9. Given this lack of understanding, it is not possible to quantify an acceptable threshold for fox density. Therefore, any fox control programs should aim instead for a reduction in density of foxes in the target area.

Foxes are generally secretive animals that are often present at low densities, and obtaining accurate measures of abundance is difficult. For this reason, an indicator of fox abundance, such as sand-plot monitoring10 , should be used to measure the impact of control programs.

Fox control programs in other parts of Australia have had mixed success11. Some have recorded reductions in density of >70 percent, while other programs have been unable to show any reduction. Recent unpublished work suggests a reduction in fox activity in target areas in the order of 20 to 30 percent (M. Stevens pers. comm.) might be achievable in the Wimmera.



Deer species *(Fallow; Red; Samba)*

Deer species are known to occur in the Grampians National Park and the Little Desert National Park.

Fallow Deer have been detected in the Little Desert NP, and although numbers are low, present an additional challenge for Park Management.

Fallow Deer are also present in the Grampians NP, and have a greater presence on the peripherals of the park at the public land/private land interface.

Red Deer are well established in the Grampians NP and there is anecdotal evidence to suggest that illegal releases of Sambar Deer have also occurred in the park.

The draft Grampians Landscape Conservation Plan (GLCP) recognises the threat that deer species (as well as other pest grazers) can have on the natural values of the park.

A priority strategy of the GLCP is to undertake integrated herbivore control using Adaptive Experimental Management to inform decision making before delivery of a large-scale program.

7 Saunders G, Coman B, Kinnear J, Braysher M (1995) Managing Vertebrate Pests: Foxes. Bureau of Resource Sciences, Australian Government Publishing Service, Canberra.
8 Trewhella WJ, Harris S (1988) A simulation model of the pattern of dispersal in urban fox (Vulpes vulpes) populations and its application for rabies control. Journal of Applied Ecology 25, 435–450
9 Saunders G, McLeod L (2007) Improving Fox Management Strategies in Australia. Bureau of Rural Sciences, Canberra.
10 Robley A, Wright J, Gormley A, Evans I (2008) Adaptive Experimental Management of Foxes Final Report. Parks Victoria Technical Series.
11 Summarised in Saunders G, McLeod L (2007) Improving Fox Management Strategies in Australia. Bureau of Rural Sciences, Canberra.

Feral cats *(Felis catus)*

Australia-wide feral cats cause environmental damage that is similar in scale to that caused by foxes[12]. Predation by cats is listed nationally as a key threatening process and also as a threatening process under the Victorian FFG Act. Feral cats are known to have contributed to declining populations or extinctions of ground nesting birds and small mammals.

While control of domestic cats is important, there is good evidence that feral cat populations are self-sustaining and domestic cats play little or no role in maintaining the feral population.

A key drawback for cat control is that the available techniques have significant limitations. Trapping is very labour intensive and feral cats quickly become trap-shy. Shooting is relatively ineffective for management over large areas because cats are wary, sparsely distributed, and readily recolonise an area.

The lack of an effective control method has meant that in the past cats have been overlooked for control work in favour of other invasive animals, such as foxes, for which good control methods exist. This has, over time, resulted in a lack of regional information and awareness on the extent of the feral cat problem.

There is ongoing research into new techniques for feral cat control, including into new humane toxins, that may improve broad-scale control prospects in the future.

This strategy recognises that feral cats are a problem in the Wimmera, and that cat control in asset-based protection areas is warranted. However, the strategy also recognises that there are substantial information gaps, and that control is unlikely to be cost-effective until improved techniques become available.

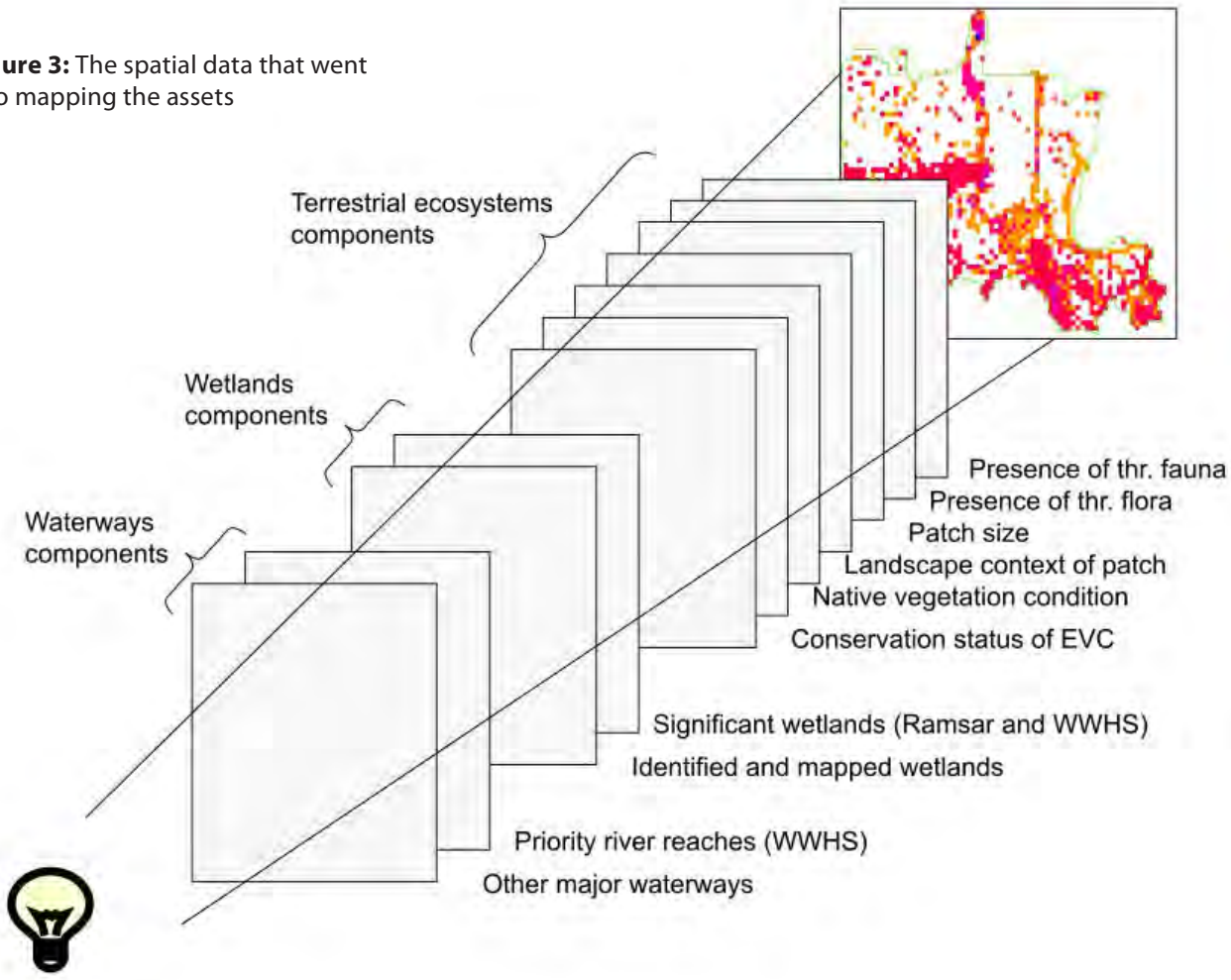
At the time of writing this strategy, the use of humane chemical control methods for feral cat control were still being evaluated.

12 McLeod R (2004) Counting the Cost: Impact of Invasive Animals in Australia 2004. Cooperative Research Centre for Pest Animal Control. Canberra.

6.2 Priority assets in the Wimmera

Datasets developed by Wimmera CMA, DELWP and the Arthur Rylah Institute were used to map each asset type (waterway, wetland, terrestrial ecosystem). Several spatial data sets were used to establish a complete picture of all the components that make up each asset type (Figure 3).

Figure 3: The spatial data that went into mapping the assets



To enable data to be visualised together, a standardised 9 km2 grid was built and each cell in the grid scored with values from each data layer. Using this standardised grid, values from multiple assets were analysed separately or combined as required. Certain areas were examined more closely if they had value for more than one asset type. As an example, a map of the region with combined waterway, wetland and terrestrial ecosystem asset values on the standardised grid is presented in Figure 4.

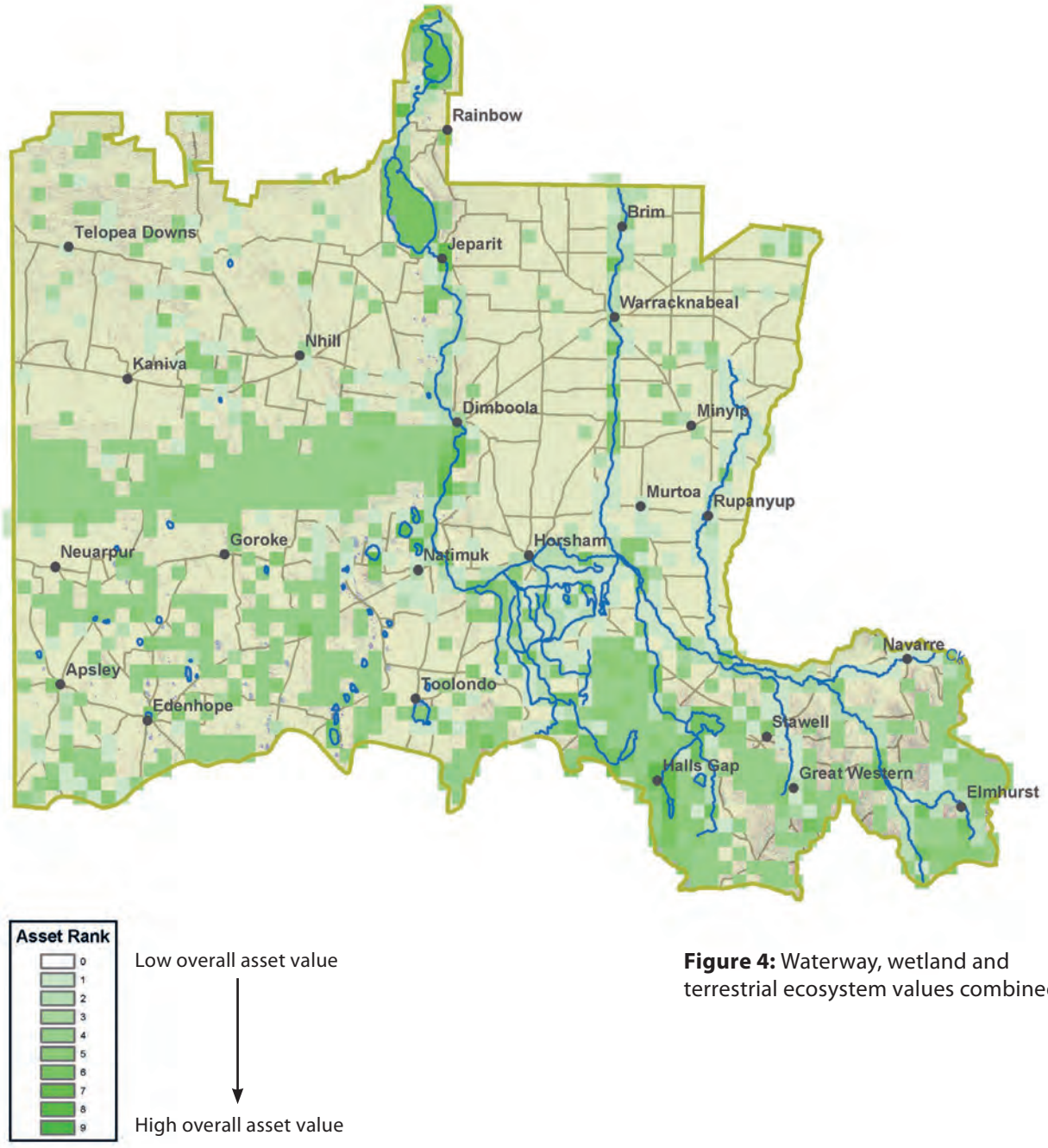


Figure 4: Waterway, wetland and terrestrial ecosystem values combined

6.3 Asset-based protection - priority action

The criteria used to prioritise action within the asset-based protection approach were:

1. **The overall value of the environmental asset using wetland, waterway and terrestrial ecosystem scores; and**
2. **The impact of pests on those values**

The highest value asset areas were considered first, and data available in 2009 on the distribution and severity of pests (both from on-ground surveys and interviews) were considered for each of these areas. The RWG, through discussion and consensus, then prioritised areas for asset-based protection. The RWG selected seven priorities that are listed here. The asset is described and one or two key IPA species highlighted with ecological targets specified. Asset protection against other IPAs in these areas is also supported. In some cases, this may be a native species (such as the case with coastal wattle in the Grampians). The list is not designed to be exhaustive, but to provide guidance on areas to work on first. In 2017 partners reviewed this information and were asked to what extent changes were required. There have been some moderate amendments as a result of this process. The high priority areas listed have been chosen with the practical implementation of IPA control activities, costs and funding in mind. In the future, if more resources for IPA management become available then the list could be expanded.

Progress against these priorities will be assessed by Wimmera CMA periodically in collaboration with partners. The high priority areas for IPA control (listed below) have been kept small enough to allow reasonable progress to be made and measured over the course of this plan. Refer to section 7 for details on how progress against targets will be assessed and reported. A re-assessment of these high priority areas for IPA control will occur before the development of an updated plan.

Photo: David Fletcher

Highest priority areas for IPA control

Albacutya-Wyperfeld Pine-Buloke woodlands

Promotion of sustainable woodland regeneration through protection against rabbit browsing.

Wimmera Heritage River corridor

Improvement of water quality, amenity value, the quality of riparian vegetation, wetland values, and the quality of the corridor for movement of native species by controlling bridal creeper and other weeds.

Grampians-Pyrenees Arc

Improvement of water quality in tributary streams for the Wimmera River through the reduction in rabbit numbers on steep hill sides and in stream banks, and through the removal of weeds that harbour rabbits such as gorse, blackberry, broom and boneseed. Associated improvement in the quality of remnant native vegetation through the removal of these weeds. Improvement of quality of riparian vegetation through the removal of blackberry from streams.

Grampians National Park and surrounds

Protection of critical weight range mammals including threatened species through fox control. Protection of important vegetation communities through control of bridal creeper and other weeds.

MacKenzie River area

Protection of riparian vegetation, and protection against stream-bank erosion through rabbit control. Improvement in quality of native vegetation through control of bridal creeper and other weeds.

Threatened EVCs in the south-west Wimmera

Improvement in the quality of remnant-threatened vegetation communities through control of bridal creeper, rabbits and other weeds.

Dispersed assets

Protection of isolated populations of threatened species and threatened vegetation communities through pest control on a case-by-case basis.

Little Desert

The Little Desert National Park (LDNP) is a high value environmental asset (refer to Figure 4). Diverse vegetation ranging from woodlands of yellow gum, river red gum and black box through open woodlands of desert stringybark to expansive desert banksia and sheoak heathlands.

The vegetation supports a range of fauna assemblages including a number of threatened species. The eastern part is already included under the highest priority areas for pest control in the Wimmera Heritage River corridor.

Pest plant invasion is limited by low fertility of sandy soils which dominate much of the park, and low rainfall. However, small areas of clay soils within the park have a higher potential for pest plant invasion, and pest plants are widely established on more fertile and moister clay soils along the Wimmera River within the Wimmera Heritage River corridor.

Rabbits occur throughout the park with higher concentrations occurring within the Wimmera Heritage River corridor. Rabbit grazing threatens regeneration of a number of vegetation types. Rabbit control has been undertaken for many years focusing on the Wimmera River and along the boundary with private land.

Foxes are widespread in the park predating on critical weight range fauna. An extensive fox control program has been undertaken since 1994.

IPA control measures should continue in LDNP. At this point in time the overall threat of IPAs on the high value environmental assets in LDNP (excluding the Wimmera Heritage River corridor) however is of less concern than the high priority areas identified in this strategy. There should be ongoing assessment of IPA threats to the high value environmental assets in LDNP.





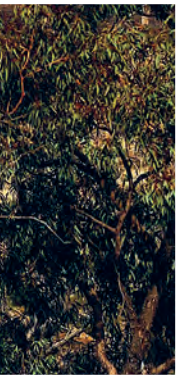




Photo: David Fletcher

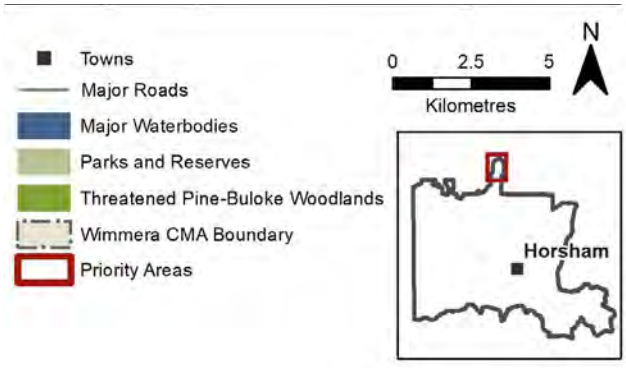
Action detail for priority areas

6.3.1 Albacutya-Wyperfeld Pine-Buloke Woodlands

Rabbits heavily impact on the regeneration of these slow-growing, nationally threatened woodlands. Rabbits favour eating pine-buloke seedlings, and as these trees grow slowly, even moderate rabbit densities result in the loss of all regrowth of these trees. A reduction in rabbit numbers is required for buloke and understory regrowth.

The majority of the pine-buloke woodland vegetation that remains in the region is around Lake Albacutya and within Wyperfeld National Park, both areas managed by Parks Victoria. Approximately 800 hectares of this threatened vegetation community stands to benefit from rabbit control. Rabbit control in these vegetation communities is the highest priority, but supplementary control in adjacent areas will help keep rabbit densities below critical threshold levels.

Actions and Monitoring	Protect this threatened vegetation community through strategic rabbit control. Rabbit density across the target area will be surveyed annually by PV. This data will be used to direct control works to areas most in need, and will also be used to measure progress against the target across the priority area.
Lead Organisation	PV
Key Partners	WCMA, DELWP, Agriculture Victoria , Landowners
Ecological Target	Maintain rabbit densities at <3 per spotlight kilometre (or <1 active warren entrance per hectare) to allow regeneration of key native plant species



6.3.2 Wimmera Heritage River Corridor

The Wimmera Heritage River corridor from Polkemmet north to the Wirrengren Plain has many outstanding natural values including unique and threatened riparian vegetation, amenity value, wetlands, and is a vital wildlife corridor in an otherwise cleared landscape. Bridal creeper is the pest plant presenting the greatest environmental harm to this asset. Other weeds also have an impact, depending on the season, and capeweed has also been a problem. Weed-control activities should focus on bridal creeper, while acknowledging that it is practical and sensible to control all weeds if working in a particular area. A lesser priority, rabbit control is also important where rabbits are damaging riparian vegetation and causing stream-bank erosion.

While the whole corridor is important, it features specific areas that require special attention.

These areas are:

Priority 1	Southern end of Lake Albacutya
Lead Organisation	PV
Key Partners	WCMA, DELWP, Agriculture Victoria, Landowners, Landcare groups, Project Hindmarsh
Target	Protect the high value Ramsar site and riparian values along Outlet Creek through the control of rabbits, bridal creeper and any other IPs.

Priority Area 1 - During the past decade, bridal creeper has gradually travelled north up the Wimmera River corridor reaching the southern end of Lake Albacutya. Keeping this high-value Ramsar[13] site free of bridal creeper is a priority.

Priority 2	Wimmera River between Polkemmet and Wail
Lead Organisation	PV
Key Partners	WCMA, DELWP, Agriculture Victoria, Landowners, Landcare groups, Project Hindmarsh
Actions	Protect the waterway, riparian and terrestrial ecosystem values through the control of rabbits, bridal creeper and other invasive plants.

Priority Area 2 - This area has multiple asset values. These include waterway and high riparian vegetation values. It is where the significant tract of Little Desert native vegetation joins the corridor of native vegetation forming the Wimmera River's riparian zone. There are opportunities for native plants and animals to move between vegetation and landscapes in this area in response to creeper and, where practical, the concurrent control of other invasive plants is required to maintain these high asset values

The monitoring and ecological targets for all priorities are:

Monitoring	*With current levels of funding:* All who undertake control works to measure pest density before and after treatment using an appropriate method. This is to enable monitoring of progress toward targets at control sites *If funding is increased:* Survey IP and rabbit density across target area annually. This data used to direct control works to areas most in need, and also to measure progress against the target across the whole priority area (Agriculture Victoria/ WCMA)
Ecological Targets	1) reduce bridal creeper density to <10 percent cover to maintain diversity of native species 2) eliminate other IPs from priority area 3) maintain rabbit densities at <3 per spotlight kilometre (or <1 active warren entrance per hectare) to allow regeneration of key native plant species

13 International Ramsar Convention on Wetlands

Priority 3	Wimmera Heritage River Corridor between Wail and Lake Albacutya
Lead Organisation	WCMA
Key Partners	DELWP, Agriculture Victoria, PV, Landowners, Landcare groups, Project Hindmarsh
Actions	Protect native vegetation in this significant north-south biolink through the control of bridal creeper, other invasive plants, and rabbits along the length of the Wimmera Heritage River Corridor north of Wail.

Priority Area 3 - This is by far the most significant continuous tract of native vegetation in the northern half of the Wimmera catchment, and links the Little Desert with the broad sweep of native vegetation in the Albacutya/Wyperfeld/Big Desert region. This corridor has high riparian vegetation values that contribute to water quality in the Wimmera River, enhance the region's biodiversity values and provide capacity for native species to migrate along a north-south axis. Again, bridal creeper is the pest plant with the greatest potential for environmental damage. The control of rabbits, bridal creeper, and the concurrent control of other weeds causing environmental damage, is required to maintain these high value assets.

Priority 4	South-eastern shore of Lake Hindmarsh and surrounds
Lead Organisation	PV/WCMA
Key Partners	DELWP, Agriculture Victoria, Landowners, Landcare groups, Project Hindmarsh
Actions	Protect wetland and native vegetation values on the south-eastern shore of Lake Hindmarsh and HFR through the control of boneseed, boxthorn, bridal creeper, other IPs, and rabbits.

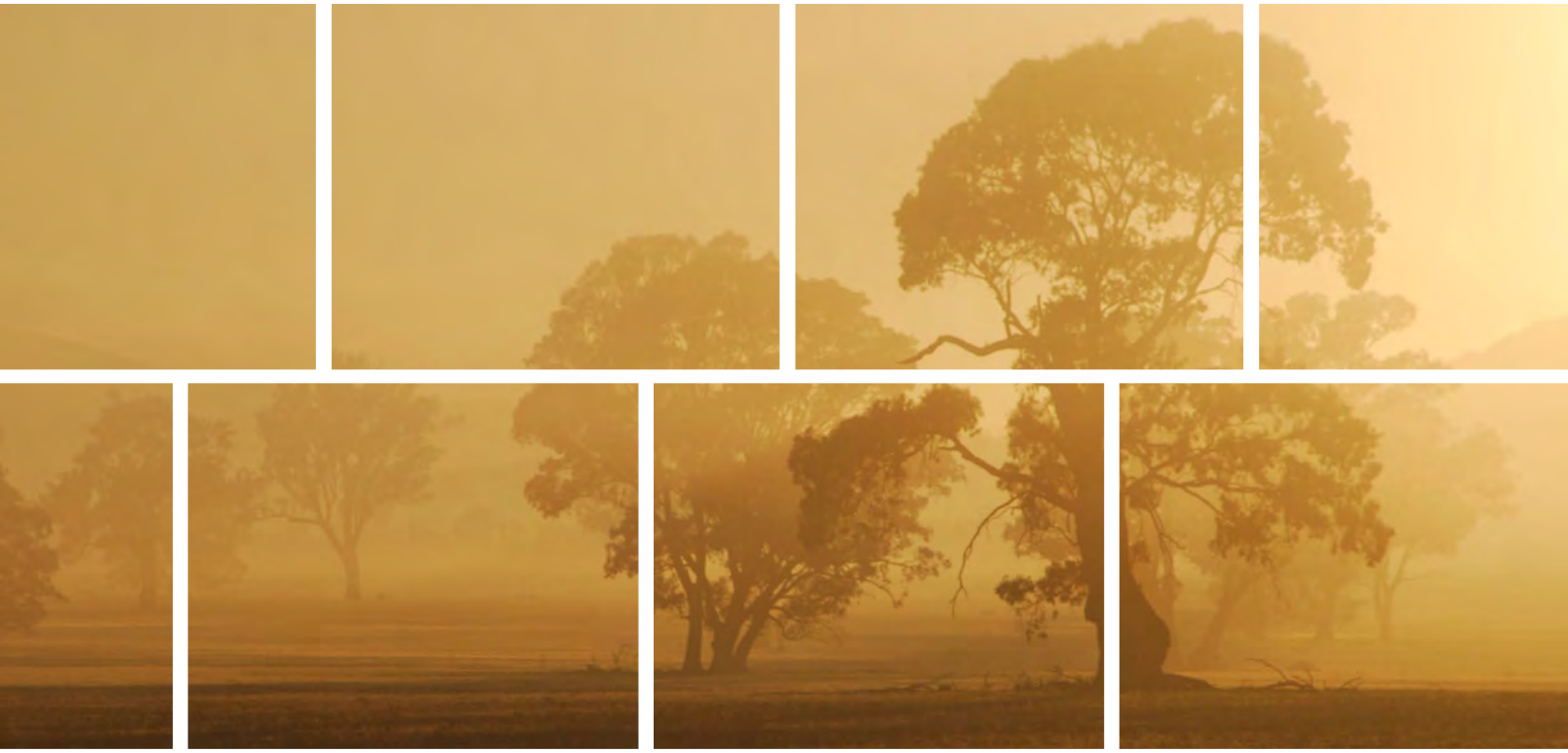
Priority Area 4 - The area around the south-eastern shore of Lake Hindmarsh, including the Hindmarsh Flora Reserve (HFR), has high wetland and native vegetation values. Infestations of rabbits, boneseed, boxthorn and bridal creeper impact on these values. Woody weeds and rabbits impact on the diversity of native vegetation and replace native shrubs such as sweet bursaria.

6.3.3 Grampians Pyrenees Arc

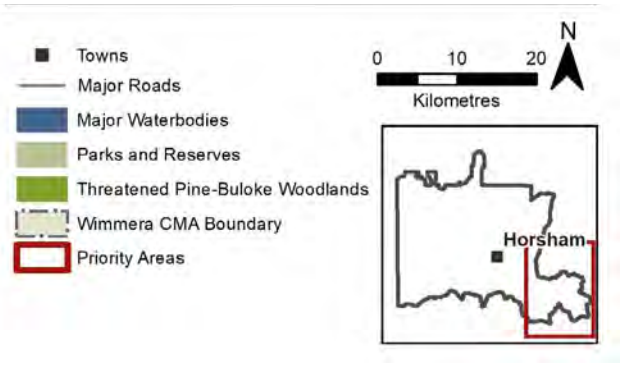
This area features several important tributaries that greatly influence Wimmera River water quality. The area also has high riparian and terrestrial ecosystem values because there are substantial areas of remnant vegetation along stream-sides, on private land and in several large reserves such as the Grampians, Black Range and Pyrenees Ranges. Vegetation communities in this area include the EPBC listed grey-box woodlands and state-listed box-ironbark woodlands.

High rabbit densities cause erosion on hill sides and stream banks, leading to low water quality. Infestations of blackberry harbour rabbits and out-compete native vegetation, particularly in the riparian zone. Other weeds, such as gorse, broom and boneseed also harbour rabbits and, along with bridal creeper, replace native species in areas of native vegetation.

There has been significant effort to control gorse in this area during the last decade, with considerable success. Sustaining that effort for the next five years could well see it removed from the region.



Lead Organisation	WCMA
Key Partners	DELWP, Agriculture Victoria, Landowners, Landcare groups, Project Platypus
Actions	Protect water quality, riparian values and threatened ecological communities through the control of rabbits. Protect riparian values through the control of blackberry and gorse from high value influencing streams. Protect threatened or high value terrestrial ecosystem areas through the control of broom, boneseed, bridal creeper and other IPs.
Monitoring	*With current levels of funding:* All who undertake control works to measure pest density before and after treatment using an appropriate method. This is to enable monitoring of progress toward targets at control sites *If funding is increased:* Sample rabbit density across target area annually (Agriculture Victoria or community monitoring program WCMA). Sample weed density across target area annually (WCMA). Data used to direct control works to areas most in need, and to measure progress against the target across the whole priority area.
Ecological Targets	1) Maintain rabbit densities at <3 per spotlight kilometre (or <1 active warren entrance per hectare) to reduce erosion and allow regeneration of key native plant species. 2) Eliminate gorse and blackberry from high value influencing streams. 3) Reduce bridal creeper density to <10 percent cover where directly threatening high value assets. 4) Remove broom, boneseed and other IPs where directly threatening high value assets.



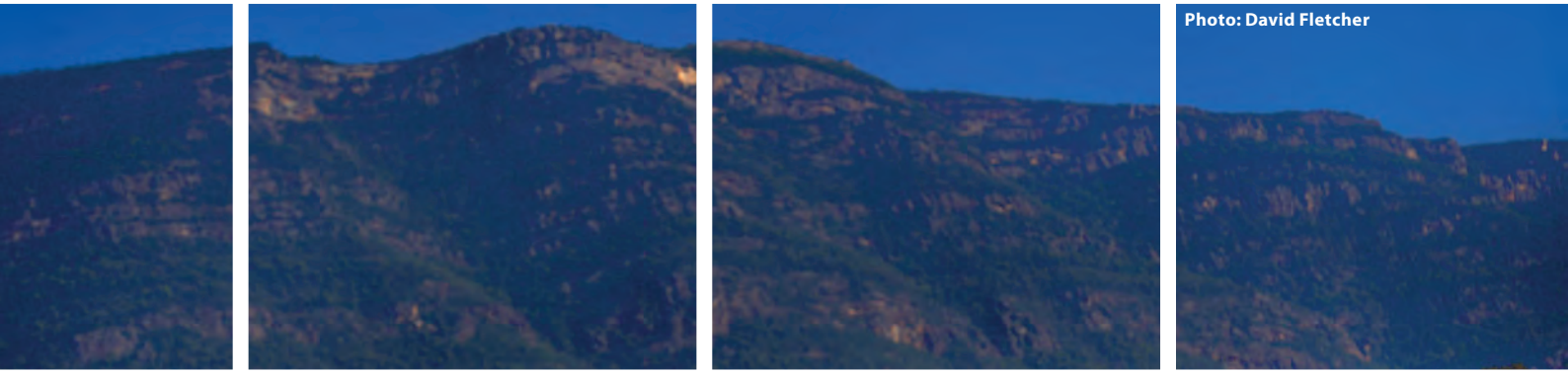
6.3.4 Grampians National Park and surrounds

The Grampians National Park is a large complex park managed for a suite of environmental and cultural values and is identified as a biodiversity hotspot area for the state. A primary objective for IPA management is to protect the large, continuous area of native vegetation that supports a diverse fauna assemblage including threatened flora and fauna species.

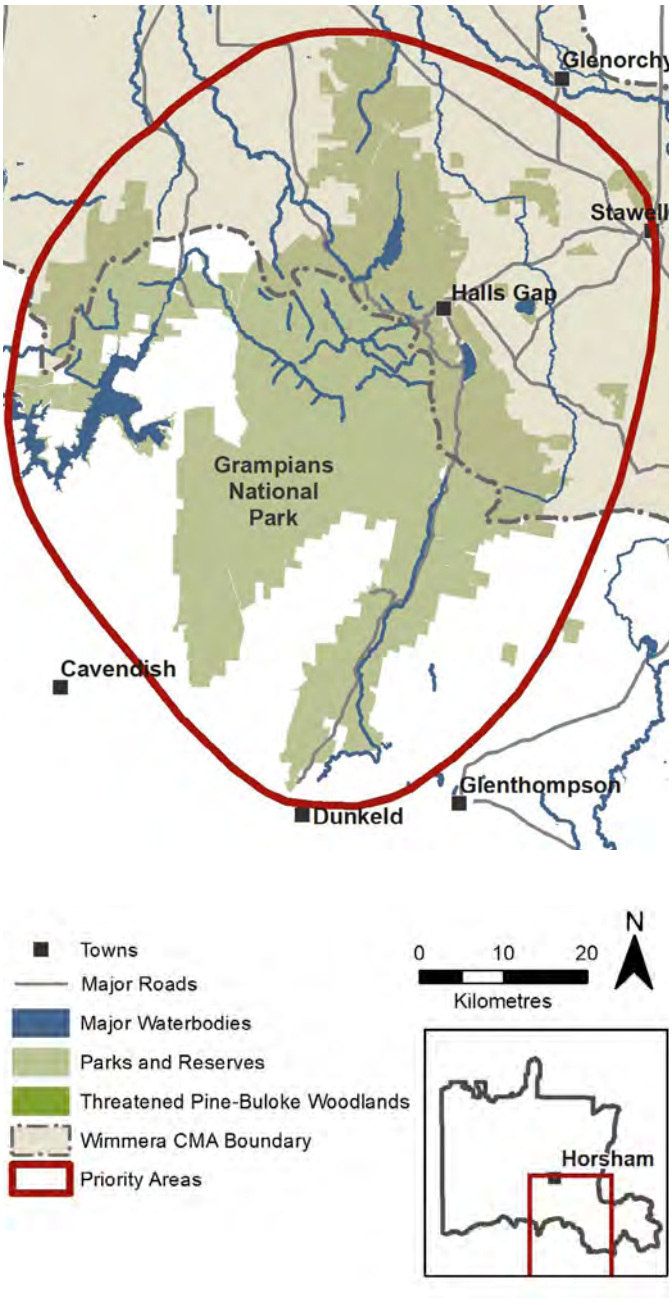
The invasive animal with the greatest impact is the fox. Fox control is aimed at increasing the distribution and abundance of critical weight range animals including threatened fauna such as the brush-tailed rock wallaby, long-nosed potoroo, southern brown bandicoot, silky mouse and smokey mouse.

The diversity and structure of the native vegetation in the Grampians is negatively impacted by invasive plants. Bridal creeper is an invasive plant that impacts on a range of vegetation communities. Coastal wattle is an environmental weed that is significantly impacting on the important Hills Herb-rich Woodland EVC.

Feral goats, feral cats and deer numbers are increasing and will require substantial funding for control and monitoring programs.



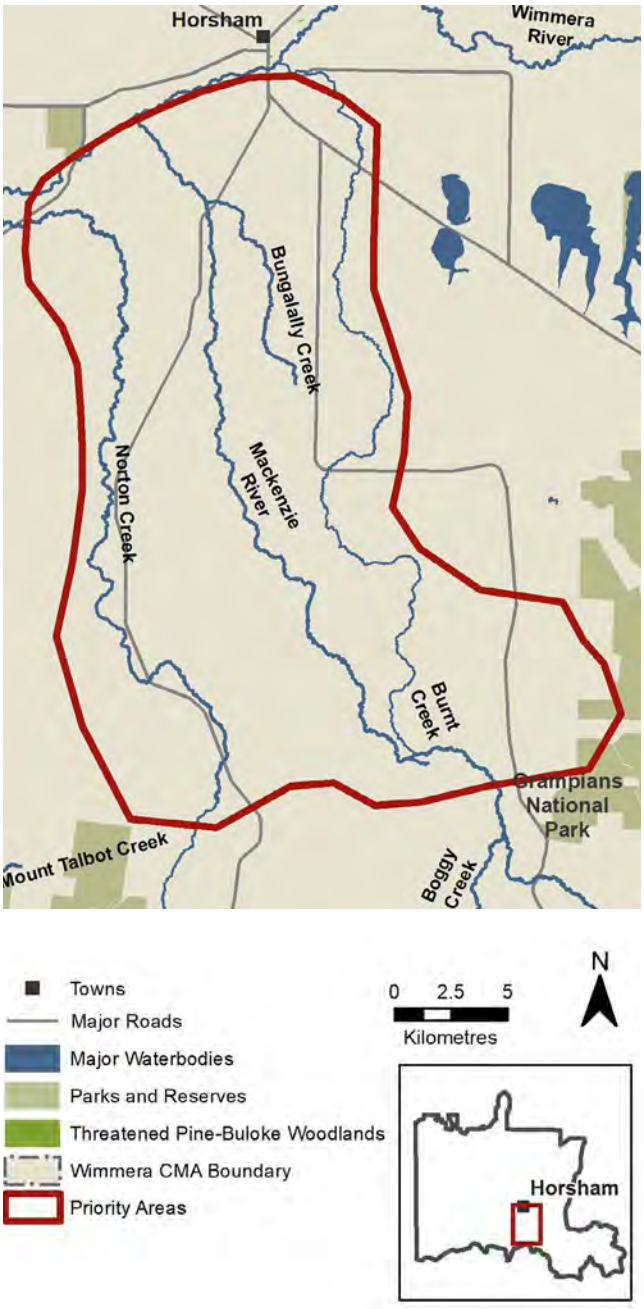
Lead Organisation	PV
Key Partners	DELWP, Agriculture Victoria, WCMA, Landowners, GHCMA, Landcare groups, Project Platypus
Actions	Protect populations of critical weight range fauna through fox control. Protect high value native vegetation communities through control of environmental weed including bridal creeper and coastal wattle.
Monitoring	*With current levels of funding:* PV to monitor fox abundance in core area to measure effectiveness of control methods. All who undertake fox control works to record and report on size of control effort. All who undertake IP control works to measure IP density before and after treatment using an appropriate method. This is to enable monitoring of progress toward targets at control sites. *If funding is increased:* Survey weed density across target area annually. Data used to direct control works to areas most in need, and also to measure progress against the target across the whole priority area (PV/WCMA/Agriculture Victoria)
Ecological Targets	1) Reduce fox density in core protected area of the central Grampians to benefit critical weight range animals including threatened species. Undertake fox control over an area large enough to buffer and inhibit fox dispersal into this core protected area (minimum area approx. 100,000 ha). 2) Remove bridal creeper, coastal wattle and other environmental weeds where they significantly impact the diversity and structure of native vegetation.



6.3.5 MacKenzie River area

This area has high riparian vegetation and waterway values. Rabbits, which easily dig into stream banks, are a problem. They impact negatively on both riparian vegetation and water-quality values. Weeds such as capeweed and bridal creeper impact on high-value riparian vegetation. Target area is about 40,000 ha.

Lead Organisation	DELWP
Key Partners	Agriculture Victoria, WCMA, PV, Landowners, GHCMA, Landcare groups
Actions	Protect water quality and riparian vegetation through rabbit and IP control
Monitoring	*With current levels of funding:* All who undertake control works to measure pest density before and after treatment using an appropriate method. This is to enable monitoring of progress toward targets at control sites *If funding is increased:* Survey IP and rabbit density across target area annually. Data used to direct control works to areas most in need, and to measure progress against the target across the whole priority area (DELWP/Agriculture Victoria or community monitoring program WCMA)
Ecological Targets	1) Maintain rabbit densities at <3 per spotlight kilometre (or <1 active warren entrance per hectare) to reduce stream-side erosion and allow regeneration of key native plant species 2) Remove capeweed, bridal creeper and other weeds where they significantly impact native vegetation in the riparian zone.



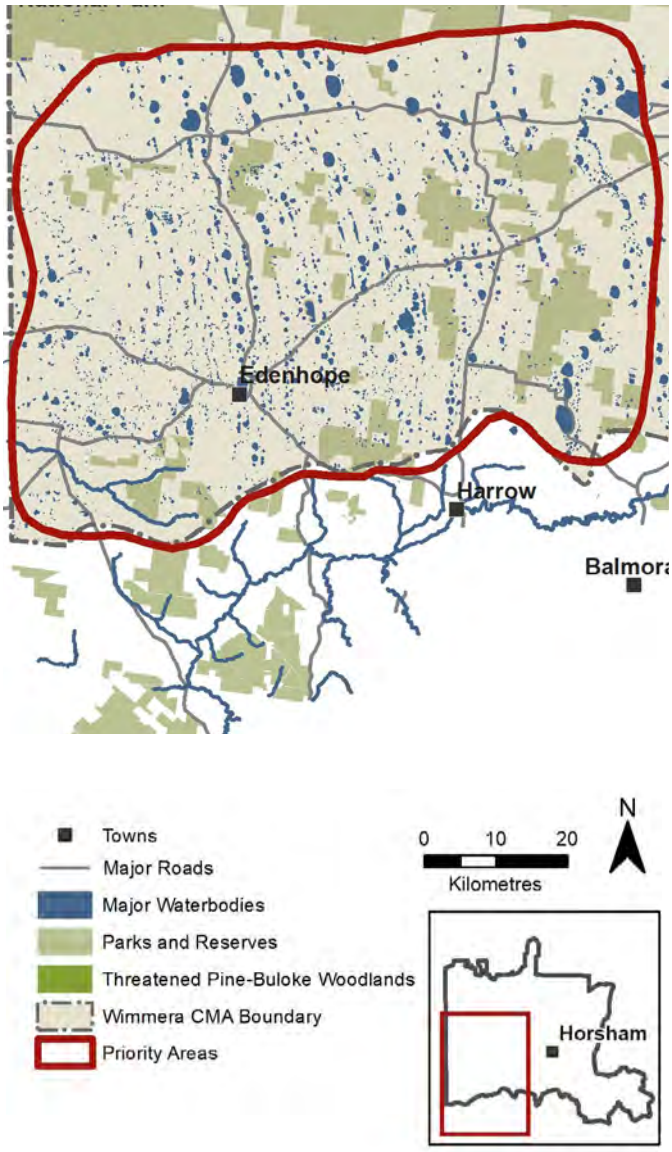
6.3.6 Threatened Ecological Vegetation Communities (EVCs) in the south-west Wimmera

The south-west Wimmera contains a valuable mosaic of wetlands, native woodlands and agricultural land. There are more than 2500 wetlands in the area, and threatened vegetation communities are represented in a number of the remaining native woodland patches.

Threatened remnant vegetation communities occur in many small parks and reserves in the region, and also on private land. These communities are vulnerable to invasion by bridal creeper that infests and readily degrades the quality of the vegetation community, and regeneration is also impacted by rabbits.

The south-west Wimmera has about 10,000 ha of high-value threatened native vegetation communities on public land, and another 5000 ha on private land.

Lead Organisation	DELWP
Key Partners	Agriculture Victoria, WCMA, PV, Landowners, GHCMA, Landcare groups
Actions	Protect threatened vegetation communities, particularly those associated with wetlands, through IP and rabbit control
Monitoring	*With current levels of funding:* All who undertake control works need to measure IPA density before and after treatment using an appropriate method. This enables monitoring of progress toward targets at control sites. *If funding is increased:* Survey IP and rabbit density across target area annually. Data used to direct control works to areas most in need, and to measure progress against the target across the whole priority area (DELWP/Agriculture Victoria or community monitoring program WCMA)
Ecological Targets	1) Maintain rabbit densities at <3 per spotlight kilometre (or <1 active warren entrance per hectare) to allow regeneration of key native plant species 2) Reduce bridal creeper density to <10 percent cover where directly threatening high value assets 3) Remove other IPs where directly threatening high value assets



6.3.7 Dispersed assets

It is important to protect the Wimmera's isolated populations of threatened species and vegetation communities from IPAs. The protection of these populations from pest threats can at times be achieved quite simply. For example, protection of orchid species from rabbits by erecting a rabbit-proof fence or tree guards at reestablishment sites. , or controlling bridal creeper at sites where it is threatening to out-compete jumping jack wattle and Wimmera spider orchid, which are both endangered species. The application of pest-control measures to protect dispersed assets must be assessed on a case-by-case basis.

Large scale weed control program have also occurred along the Yarriambiack Creek designed to protect significant native vegetation.

Lead Organisation	DELWP, PV
Key Partners	WCMA, Agriculture Victoria, Landowners, Community groups, Landcare groups, Landcare networks.
Actions	Protect isolated populations of threatened species and communities through IPA control measures at the site where these threatened populations occur. The application of pest-control measures to protect dispersed assets must be assessed on a case-by-case basis and applied as needs arise
Monitoring	*With current levels of funding:* All who undertake control works need to measure IPA density before and after treatment using an appropriate method. This enables monitoring of progress toward targets in control areas. *If funding is increased:* Survey IP and rabbit density across target area annually. Data used to direct control works to areas most in need, and to measure progress against the target across the whole priority area (DELWP/Agriculture Victoria/WCMA)
Ecological Target	1) Improve population size and security of isolated populations of threatened species by reducing the impact of IPAs





Photo: David Fletcher




6.4 IPA management with regard to land tenure in priority areas

High-priority areas were selected irrespective of land tenure, using a 'tenure blind' approach. However, consideration of land tenure is important for the practical implementation of pest control in these areas.

On public land, Parks Victoria will control pests in national parks, state parks and conservation reserves to ecological thresholds or other specified targets as described in this strategy. DELWP will control pests on unlicensed Crown Land and state forests to ecological threshold levels or other specified targets as described in this strategy.

Agriculture Victoria takes responsibility for the treatment of State prohibited weeds on all land tenures. Treatment of regionally-prohibited weeds is the responsibility of landowners and is enforced by Agriculture Victoria. Agriculture Victoria will focus around priority asset-based protection areas when enforcing the control of established pest animals and regionally controlled weeds.

Public land that is part of or adjacent to high priority asset-based protection areas may require pest control to a level above and beyond that required under the CaLP Act. Private land managed in this way would act as a 'buffer zone' to restrict pest invasion into the core of priority areas (Figure 5). Wimmera CMA will develop programs to provide financial incentives for landowners to control pests above and beyond duty of care requirements in these buffer zones.

Wimmera CMA supports Landcare groups to control listed IPAs across the whole catchment

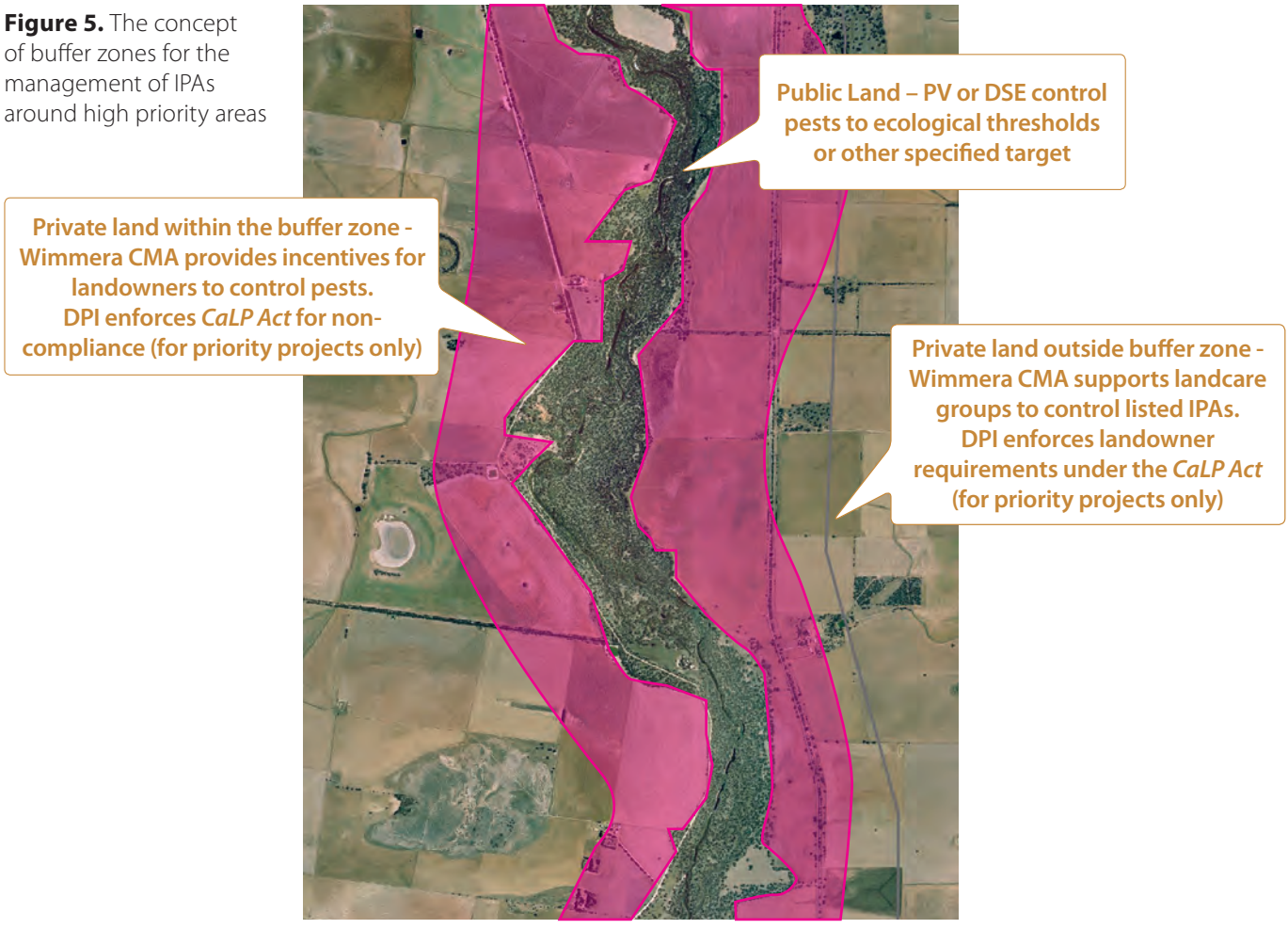


Figure 5. The concept of buffer zones for the management of IPAs around high priority areas

6.5 Pest management strategy for land outside priority areas

It is recognised that the remainder of the region, outside the priority asset-based protection areas identified in this strategy, also have values that are impacted upon by IPAs and that these impacts are important.

Outside priority areas there are some established species-based IPA control programs to deal with specific issues; for example, wild dog management around the Big Desert to minimise predation on livestock, and feral goat control on the fringes of the Little Desert and Grampians National Parks.

However, these are the exception and in general these areas are managed at a minimum to the standard 'general duties of landowners' required under the *CaLP Act 1994*.

Broadly the *CaLP Act* requires that all landowners, including public land managers, manage their land and the pests on the land in such a way that the impact on adjacent landowners is minimised. More specifically landowners must take all reasonable steps to eradicate regionally prohibited weeds and to prevent the growth and spread of regionally controlled weeds. Appendix 4 lists the weeds in each of these categories. Landowners are also required to take all reasonable steps to prevent the spread of, and as far as possible eradicate, established pest animals (i.e. rabbits, foxes and wild dogs – refer to Appendix 2) from their land. All members of the community have a responsibility not to spread invasive plants and animals declared under the *CaLP Act*.

Agriculture Victoria is responsible for enforcing the *CaLP Act* and general duties of landowners under species-based and asset-based protection approaches. These specifically include enforcement around:

- regionally prohibited weeds
- rabbits (in asset-based protection priority areas)

Wimmera CMA will provide support to landowners to achieve pest management beyond duty of care standards via Landcare group funding. This contestable funding will be made available to Landcare groups on an annual basis.

The entire region has values that are impacted upon by invasive plants and animals and is managed at a minimum to the standard of duty of care required under the *CaLP Act 1994*




PRAIRIE
ADVANCE




7. Monitoring, evaluation and reporting (MER)

MER costs are generally incorporated into each IPA control program budget. Program managers in each agency need to optimise resources when deciding between funding on-ground control and funding monitoring. To facilitate optimal resource use, program managers should have a clear understanding of the purpose of each monitoring task before it is resourced.

Table 3 describes the suite of MER activities that should be undertaken to report on the implementation of this strategy.

Wimmera CMA intends to periodically evaluate the implementation of this strategy with the key partners. As per Table 3, annual IPA program data from all four government organisations will be delivered to WCMA and collated by WCMA for consideration by the key partners.

In Table 3 MER activities have been divided into two classes:

1. Management Trigger

Monitoring linked to an immediate change in management. For example, if active rabbit warren density is below 'x' then our management strategy will be 'a', if active rabbit warren density is above 'x' then our management strategy will be 'b'.

2. Measure Progress

Monitoring to measure progress in order to then deliver a message to the public and investors. This type of monitoring is not linked directly and immediately to a change in management. For example, active rabbit warren density may be recorded periodically to measure progress against targets. This progress can then deliver a message about the effectiveness and success of the program for a variety of audiences including the public and investors.

Table 3: MER activities to evaluate the implementation of this strategy.

Strategy Objective	Action	Monitoring	Purpose of Monitoring		Reporting Schedule	Evaluation Schedule
			Management Trigger	Measure Progress		
Prevention	HRIP and HRIA surveillance (Agriculture Victoria)	# of reports through passive surveillance # of reports through active surveillance	None	Deliver message about trends in # of reports, to inform public and investors, and to inform development of next strategy.	Agriculture Victoria to provide an annual report on program to Key Partners. WCMA compile data	Agriculture Victoria to periodically evaluate state-wide program.
Eradication	On-ground programs to eradicate state prohibited weeds and HRIA (Agriculture Victoria)	# of incursions detected and treated for eradication All treated sites monitored to assess the effectiveness of treatment	None	Deliver message on program to public and investors and to inform development of next strategy	As above	Agriculture Victoria to periodically evaluate state- wide program. Agriculture Victoria to periodically assesses effectiveness of treatment methods.
Containment	On-ground inspection, extension and compliance programs to contain and eradicate all occurrences of regionally prohibited weeds (Agriculture Victoria)	# of incursions detected and treated for eradication # and description of extension activities # and description of compliance activities	None	Deliver message on program to public and investors and to inform development of next strategy	As above	Agriculture Victoria to periodically evaluate state-wide program.
	Take a pro-active approach to risk assessment of emerging weeds of community concern (WCMA)	# of nominations from public for noxious weeds risk assessment (WCMA)	Management trigger: if # of nominations <3 seek reasons and review program	Deliver message to inform development of next strategy	WCMA provide annual report on program to Key Partners. WCMA to compile data	WCMA to periodically review efficacy of approach
Asset-based protection	Specific actions described for each priority area in section 6 (Key Partners: DELWP/ Agriculture Victoria/ PV/WCMA)	Specific monitoring described for each priority area in Section 6	Management trigger: Key Partners to periodically assess progress against targets for each priority area and consider allocation of funding to each priority area for coming year.	Deliver message on progress against ecological targets to public and investors Key Partners to periodically update Figure 6. To inform development of next strategy.	Report for each priority area by each organisation provided annually to WCMA. WCMA to compile this data.	Periodic review by Key Partners
MER	Effective MER program	% of total monitoring data (as specified in this table) compiled % of evaluation actions (as specified in this table) completed	None	Deliver message on effectiveness of this MER approach to inform development of next strategy.	WCMA completes analysis and provides periodic reports to Key Partners.	WCMA reviews report in 2015.

7.1 Regional IPA monitoring

Further clarification is provided on the two distinct requirements of MER with regard to the protection of assets from established and widespread IPAs. The two requirements are:

a) that progress against targets where control works are undertaken are measured, and

b) that region-wide trends in established and widespread IPAs are assessed.

Measure progress where control works undertaken

The implementation of MER to measure progress against targets where control works are undertaken is straightforward. When and where a program of pest control is undertaken the severity of the pest problem can be recorded before and after control work. This data can be used to report on progress towards targets and update the annual report card shown in Figure 6.

Measure region-wide trends

The implementation of MER to measure region-wide trends in established and widespread IPAs is prohibitively expensive (based on current funding levels). The Wimmera is a large region (23,500 km2) with many IPA species; IPA management has historically struggled to attract funding commensurate with the scale of the problem that pests present.

If funding for IPA management was substantially increased this problem could be readily solved. Regular surveys to monitor IPA trends could be conducted within each of the high priority asset-based protection areas first and, if funds allowed, could be expanded to cover the entire region. Monitoring protocols described in section 6 have been tagged 'With current levels of funding 'or 'If funding is increased'to reflect this.

If increased funding for monitoring region-wide trends cannot be found for the duration of this strategy, a pragmatic alternative is to repeat the cost-effective solution that was used in the development of this strategy (details in Appendix 1). This two-stage process started by collating invasive plant and animal data held independently by regional government agencies. Pest experts and public and private land managers were then interviewed for their views on trends and pest impacts.

Alternatives to this approach might also be feasible. For example, community-based monitoring programs could be pursued. These need to be rigorous and well-designed for findings to be translated into management planning. Community-based programs have advantages in that they involve and engage the community and can produce a strong survey effort with little financial outlay. Disadvantages can be that they are resource intensive to start, require a commitment of resources to collate and evaluate data, and the potential for data inconsistencies to compromise the strength of findings.

The following maps and tables are designed to show progress against targets by providing an annual snapshot of IPA density and trends for each asset-based protection priority area.

It must be read with these points in mind:

- Traffic lights and trends are based on the best available information, but this information is incomplete. More robust data is required for a more complete understanding of IPA issues in the Wimmera.
- Traffic lights and trends shown here give a 'first cut' indication of 2010 IPA issues for priority areas, and are based in quantitative and qualitative data collected during the drafting of this strategy.
- Target densities for rabbits and bridal creeper have been defined in this strategy. Target densities for other IPAs are yet to be established.
- If an IPA species is below the target density ongoing control work may be required to maintain those levels.
- There are several factors (e.g. rainfall or disease) that contribute to changes to IPA numbers, and our control efforts are but one of these factors. Therefore, the cause and effect relationship between control work and IPA density is not perfect and at times need to be investigated further.

A gradual rebound of rabbit populations has occurred since 1996 due to the growing resistance to the rabbit calicivirus (RHDV), particularly in areas where effective rabbit management has not occurred and where soil types are most suited to rabbit warren construction.

Agriculture Victoria's Long-Term Rabbit Monitoring sites at Telopea Downs and Ararat have recorded since 1998. An 87% reduction in rabbit populations and 75% reduction in active warren entrances per hectare at ripped sites. In 2016, over both sites where warren ripping had previously occurred, an average of 11.25 warren entrances per hectare was recorded. Where effective warren ripping programs have not occurred, data from 3 Victorian Long-Term Monitoring sites (Non-ripped) showed that average rabbit densities were higher than in ripped sites and were near the lower end of the range of rabbit densities observed prior to the arrival of RHDV. *(Source: Agriculture Victoria)*

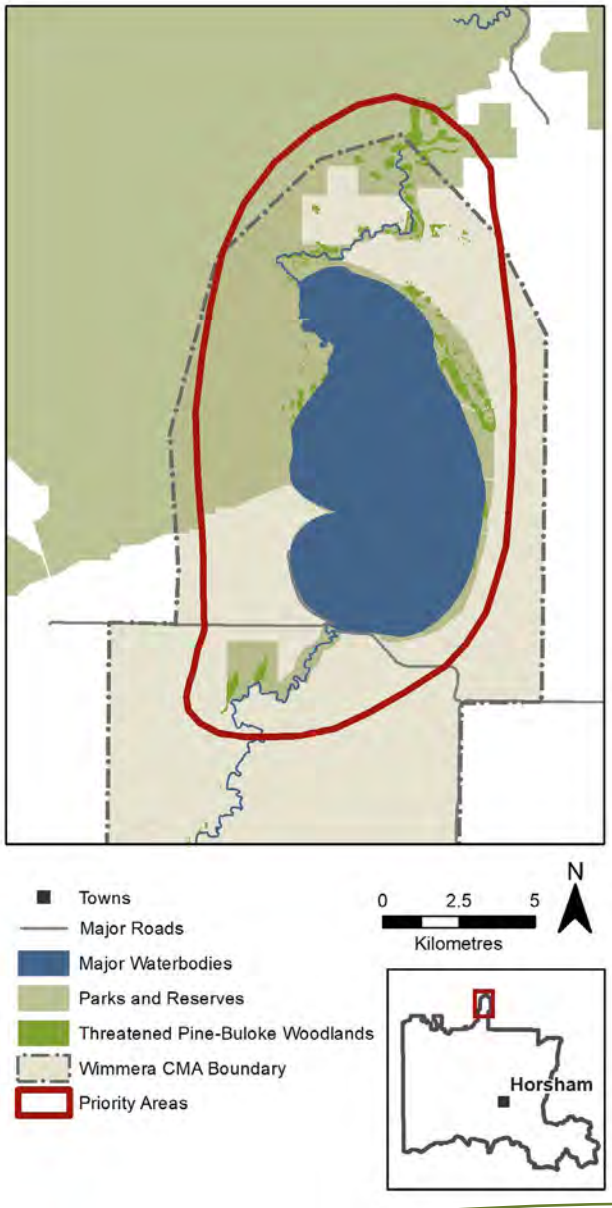
LEGEND

	High	Greater than 25% above target density
	Medium	Between target and 25% above target density
	Low	Below target density
▲	Increasing	
--	Steady	
▼	Decreasing	
?	Insufficient Data	

Albacutya-Wyperfield Pine-Buloke Woodlands

Rabbit density 2010	
Rabbit density 2016	
Trend	--
Weed Density	?
Weed Trend	?

Ongoing control works required to mitigate rabbit population increase and rabbit impacts.

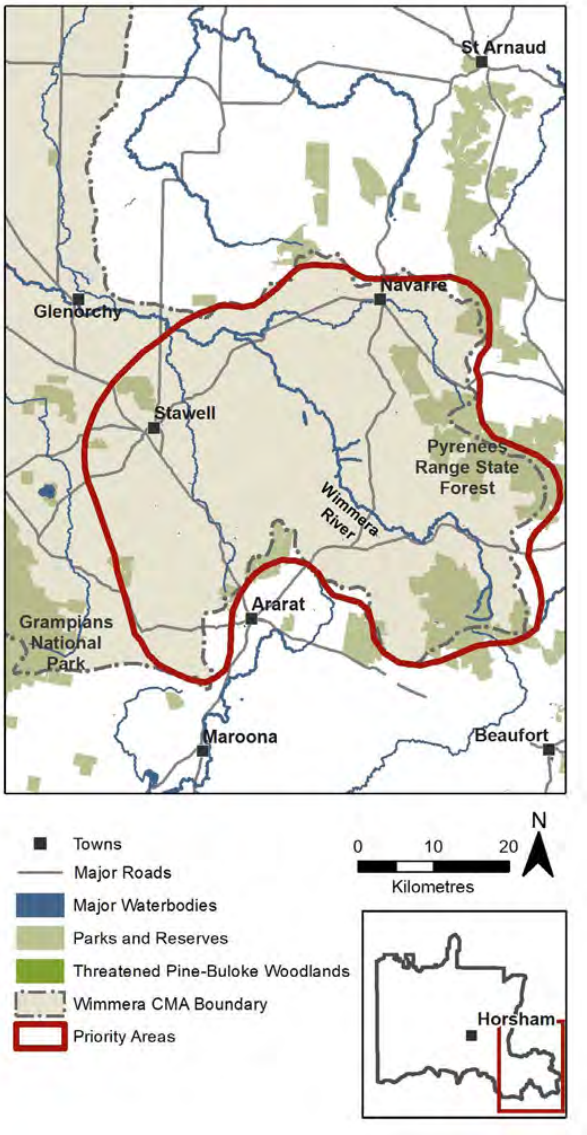


Wimmera River Heritage Corridor

Rabbit density 2010	
Rabbit density 2016	
Trend	▼
Ongoing control works required to mitigate rabbit population increase and rabbit impacts.	
Weed density 2010	
Weed density 2016	
Trend	– –
Bridal creeper responding to good seasonal growing conditions. Ongoing control works required to capitalise on gains and reduce impact.	

Grampians-Pyrenees Arc

Rabbit density 2010	
Rabbit density 2016	
Trend	– –
Requires increased control effort to mitigate rabbit population increase and impact.	
Weed density 2010	
Weed density 2016	
Trend	– –
Ongoing control works required to capitalise on gains and reduce impact.	



Grampians National Park and surrounds

Rabbit density 2010	
Rabbit density 2016	
Trend	– –

Although there is a low density, the rabbits are having a medium to high impact. Monitoring data from the Grampians suggests that although rabbits are in lower densities without large warren complexes, they are preferentially browsing tree seedlings and leading to poor woodland species recruitment across the landscape.

Grampians National Park and surrounds

Fox density 2010	
Fox density 2016	
Trend	▼

Increased baiting for foxes has driven the fox density down. Camera recording data shows an increase in feral cats.

Grampians National Park and surrounds

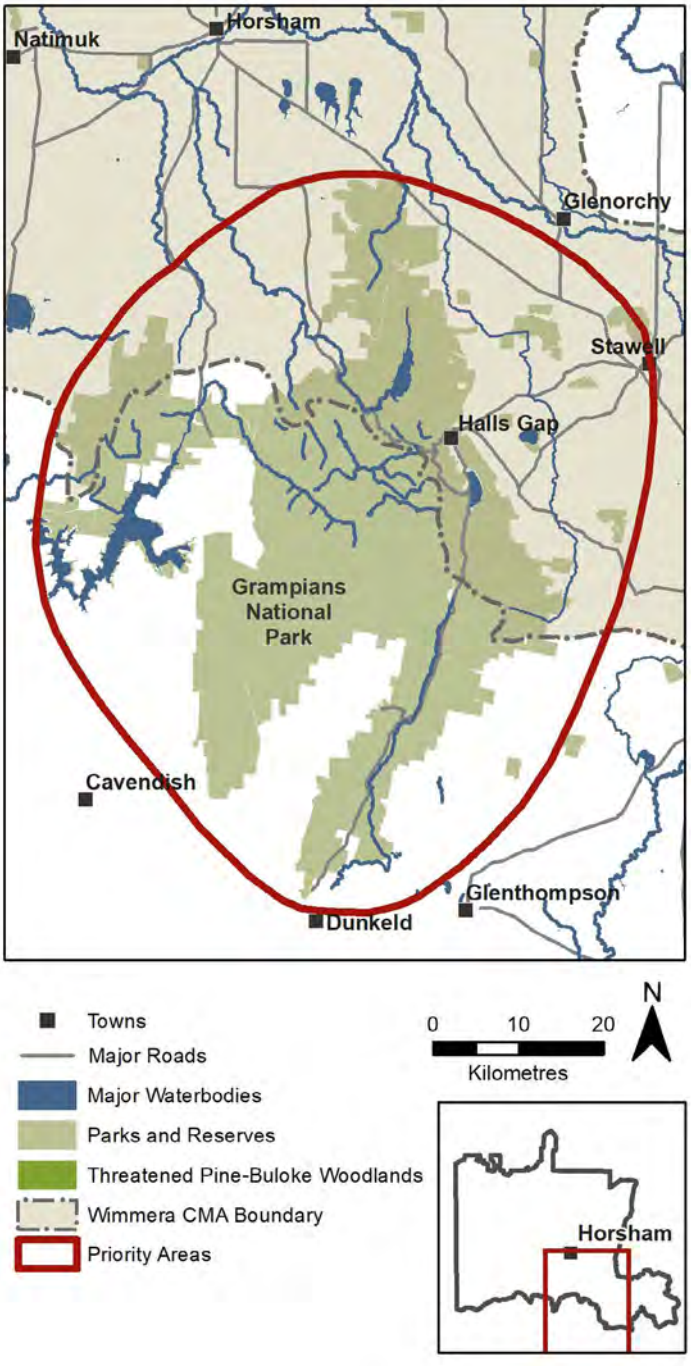
Deer density 2010	
Deer density 2016	
Trend	▲

Parks Victoria mentions anecdotal reports of Samba Deer in the park, and that Fallow Deer are an emerging problem as they are being seen in more places.

Grampians National Park and surrounds

Weed density (Sallow wattle) 2010	
Weed density (Sallow Wattle) 2016	
Trend	▲

Post 2014 aerial photo mapping is indicating sallow wattle has spread to new areas following the 2014 bushfires in the northern Grampians.



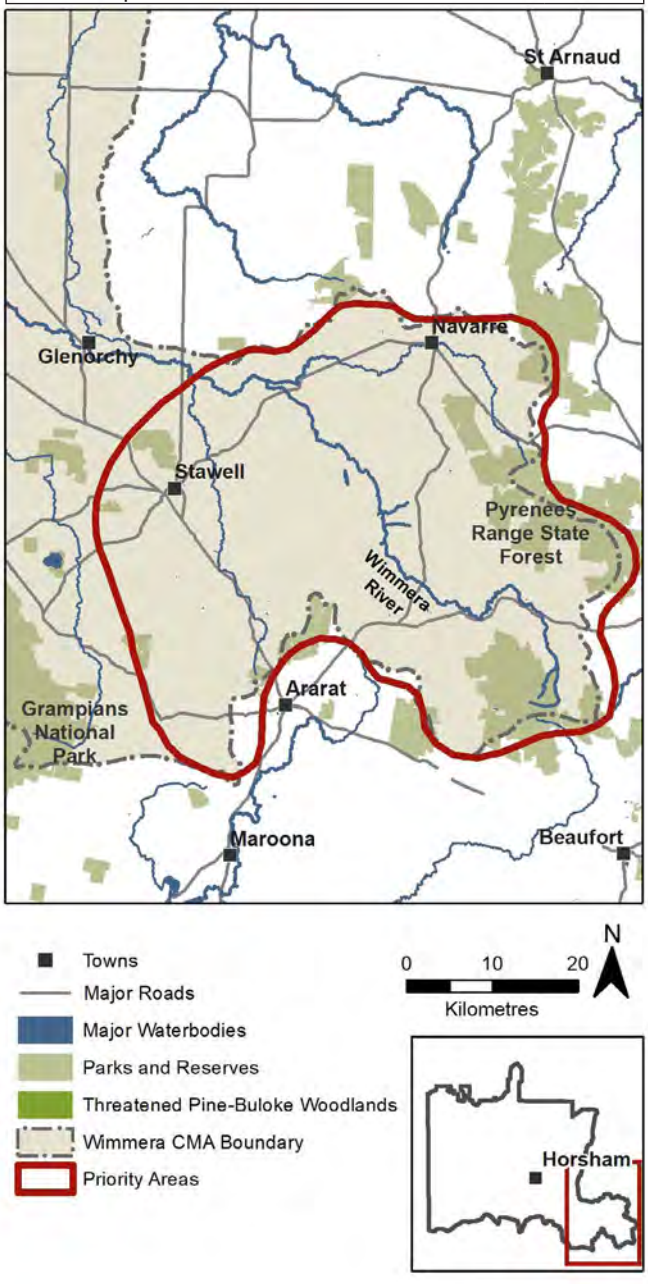
Grampians National Park and surrounds

Goat density 2010	
Goat density 2016	
Trend	▲

Data from 21 Parks Victoria vantage monitoring points is showing more goats in more places

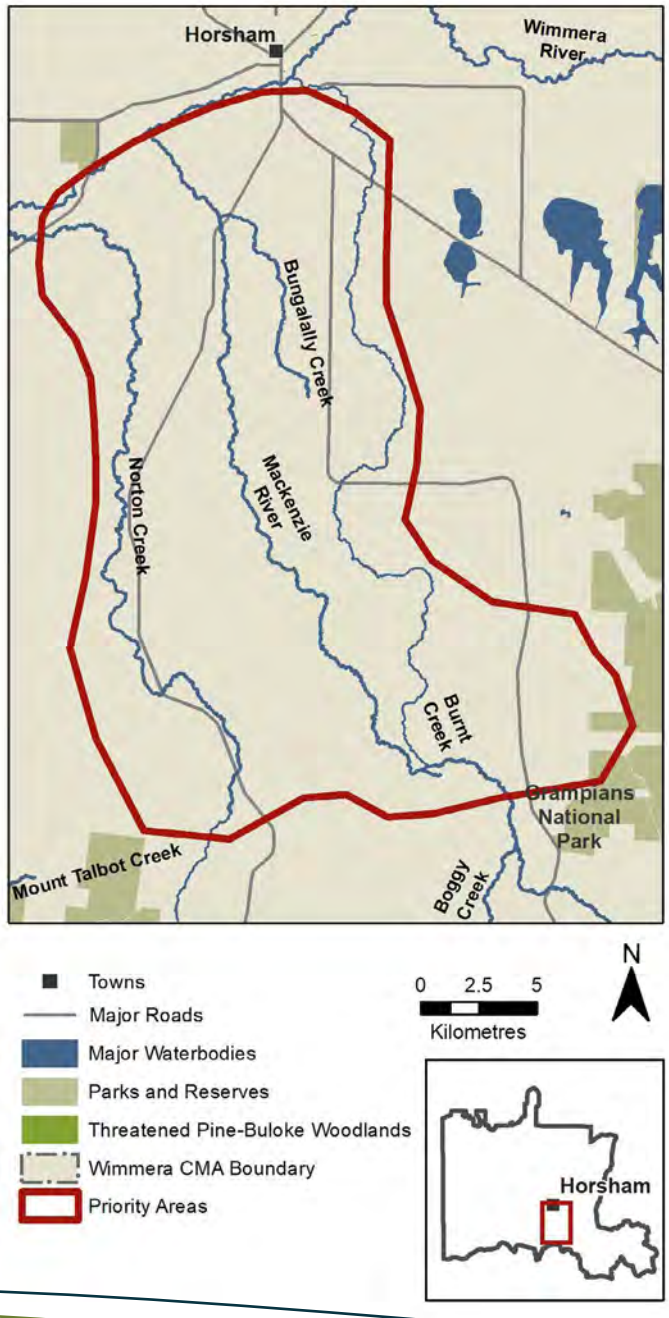
Grampians-Pyrenees Arc

Rabbit density 2010	
Rabbit density 2016	
Trend	– –
Requires increased control effort to mitigate rabbit population increase and impact.	
Weed density 2010	
Weed density 2016	
Trend	– –
Ongoing control works required to capitalise on gains and reduce impact.	



MacKenzie River and Burnt Creek areas

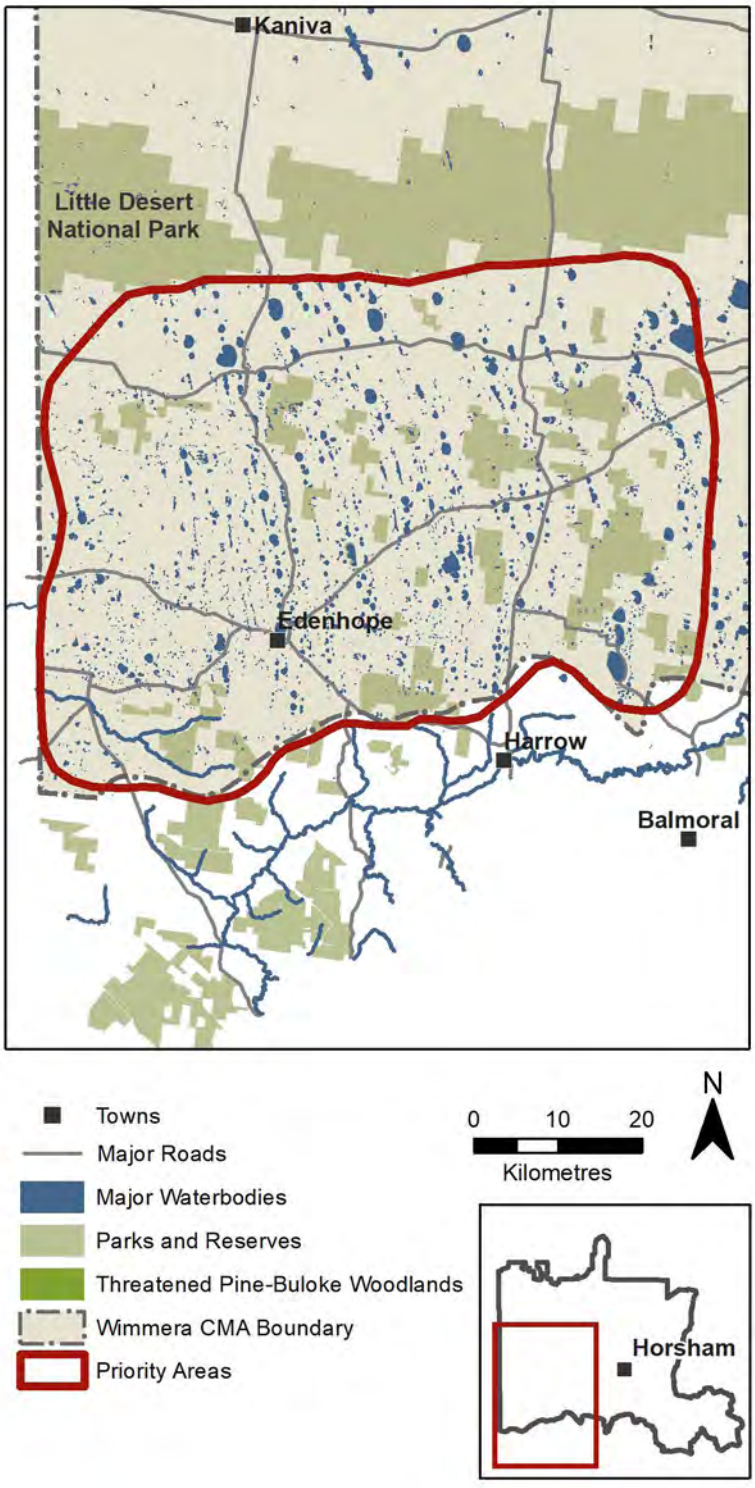
Rabbit density 2010	
Rabbit density 2016	
Trend	
Weed density 2010	
Weed density 2016	
Trend	– –
Ongoing control works required to capitalise on gains and reduce impact.	



Threatened Ecological Vegetation Communities (EVCs) in the south-west Wimmera.

Rabbit density 2010	
Rabbit density 2016	
Trend	– –
Fox density 2010	?
Fox density 2016	
Trend	▲
Weed density 2010	
Weed density 2016	
Trend	– –

New weeds species have been reported since 2010 and have the potential to influence future trends.



7.2 Emerging Issues for Invasive Species Management

The WIPAMS review process with the key partners has identified some factors that highlight the new and emerging issues for IPA management. For example, changes in climate, on-line trading of plants and changes to demographics are a dynamic that is having, and will continue to have, an impact on IPA management across the region.

Some of the main points to consider when developing strategies and actions for controlling IPA are captured below:

- The frequency of incursions of exotic invasive species is increasing.
- Due to increased use of information technology, there is an increase in the deliberate/accidental introduction of new high risk invasive species via commercial and private trade on the internet.
- Changing demographics in rural, peri urban areas can bring increased biosecurity risks through less experienced land owners or less landowners where farm numbers are in decline.
- The introduction of new biological control agents (ie: RHDV K5) must be used as part of an integrated approach to achieve effective pest management.
- Increased use of contractors may increase the risk of invasive species introduction and spread.
- Larger and corporate farms may impact on social networking and capacity for community action.
- Effectively engaging new generation land owners/ managers will require ongoing review of 'fit for purpose' communication strategy, tactics and tools.
- Increased international and interstate trade and movement of goods and people may increase the risk of exotic species incursions.
- The increase in frequency, intensity and size of environmental events such as wildfire, flood and drought bring a higher risk of introducing new/existing invasive species to and within the region. The impact of these events on the resilience of natural ecosystems can allow the introduction, spread and impact of invasive plants and animals.
- As climate changes some invasive species may increase abundance and distribution in range, and some may decrease their current range.
- Agricultural and horticultural adaptation to a changing climate may see the potential introduction of new invasive plant species considered.
- Aging regional infrastructure (ie: transport, water) and changes/increased development of regional energy infrastructure increases the risk of movement and spread of invasive species on plant, products and materials.
- Increasing consumer interest in how food and fibre is produced requires ongoing consideration on ensuring food/ fibre safety and ethics. Pest management programs must address these community/consumer concerns.
- To have a social licence to operate in pest management, animal welfare is a critical community requirement.

8. References

Gong W, Sinden J, Braysher M and Jones R (2009) *The economic impacts of vertebrate pests in Australia. Invasive Animals Cooperative Research Centre*, Canberra.

Sinden J, Jones R, Hester S, Odom D, Kalisch C, James R, Cacho O (2004) *The economic impact of weeds in Australia. CRC for Australian Weed Management, Technical Series No8*, Adelaide.

DPI, Biosecurity Victoria (2009) B*iosecurity Strategy for Victoria*. Melbourne.

King C, Thomas N, Steel J, Hunt T, Weiss J, (2007) *Weed Spread Pathway Risk Assessment – Stage 2 June 2007, Department of Primary Industries, Tackling Weeds on Private Land*, Melbourne.

Turner P, Scott J, Spafford H (2008) *The ecological barriers to the recovery of bridal creeper (Asparagus asparagoides (L.) Druce) infested sites: Impacts on vegetation and the potential increase in other exotic species*. Austral Ecology 33, 713–722.),

Williams K, Parer I, Coman B, Burley J and Braysher M (1995). *Managing Vertebrate Pests: Rabbits. Bureau of Resource Sciences and CSIRO Division of Wildlife and Ecology. Australian Government Publishing Service,* Canberra.

Department of the Environment 2015b, *Species Profile and Threats Database. Commonwealth of Australia*, Available at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Murdoch FA, McPhee S, Cooke B (in prep 2010) *How many rabbits are too many? – Monitoring grazing pressure and regeneration of semi-arid woodlands*.

Saunders G, Coman B, Kinnear J, Braysher M (1995) *Managing Vertebrate Pests: Foxes. Bureau of Resource Sciences, Australian Government Publish-ing Service*, Canberra.

Trewhella WJ, Harris S (1988) *A simulation model of the pattern of dispersal in urban fox (Vulpes vulpes) populations and its application for rabies control*. Journal of Applied Ecology 25, 435–450

Saunders G, McLeod L (2007) *Improving Fox Management Strategies in Australia. Bureau of Rural Sciences*, Canberra.

Robley A, Wright J, Gormley A, Evans I (2008) *Adaptive Experimental Management of Foxes Final Report. Parks Victoria Technical Series*.

Summarised in Saunders G, McLeod L (2007) *Improving Fox Management Strategies in Australia. Bureau of Rural Sciences*, Canberra.

McLeod R (2004) *Counting the Cost: Impact of Invasive Animals in Australia 2004. Cooperative Research Centre for Pest Animal Control.* Canberra.

International Ramsar Convention on Wetlands

9. Acronyms

CaLP Act	Catchment and Land Protection Act 1994
DELWP	Department of Environment, Land, Water and Planning
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act 1988
Grampians NP	Grampians National Park
GWM Water	Grampians Wimmera Mallee Water
HRIA	High Risk Invasive Animal
IPA	Invasive Plants and Animals
LDNP	Little Desert National Park
MER	Monitoring, Evaluation & Reporting
NRM	Natural Resource Management
PTP	Potentially Threatening Processes
PV	Parks Victoria
Ramsar	Ramsar Convention on Wetlands
WIPAMS	Wimmera Invasive Plant and Animal Management Strategy
Wimmera CMA	Wimmera Catchment Management Authority
WoNS	Weeds of National Significance

10. Appendices

Appendix 1: Process followed to build this strategy

A Regional Working Group, comprising representatives from each of the agencies, used an evidence-based process to make key decisions during the development of the strategy (Figure 7).

Other stakeholders, including land managers, local government, pest contractors, pest management experts, landowners and community groups were consulted both in the information gathering phase early in the process, and later when commenting on the draft. Appendix 3 lists those consulted in the preparation of this plan.

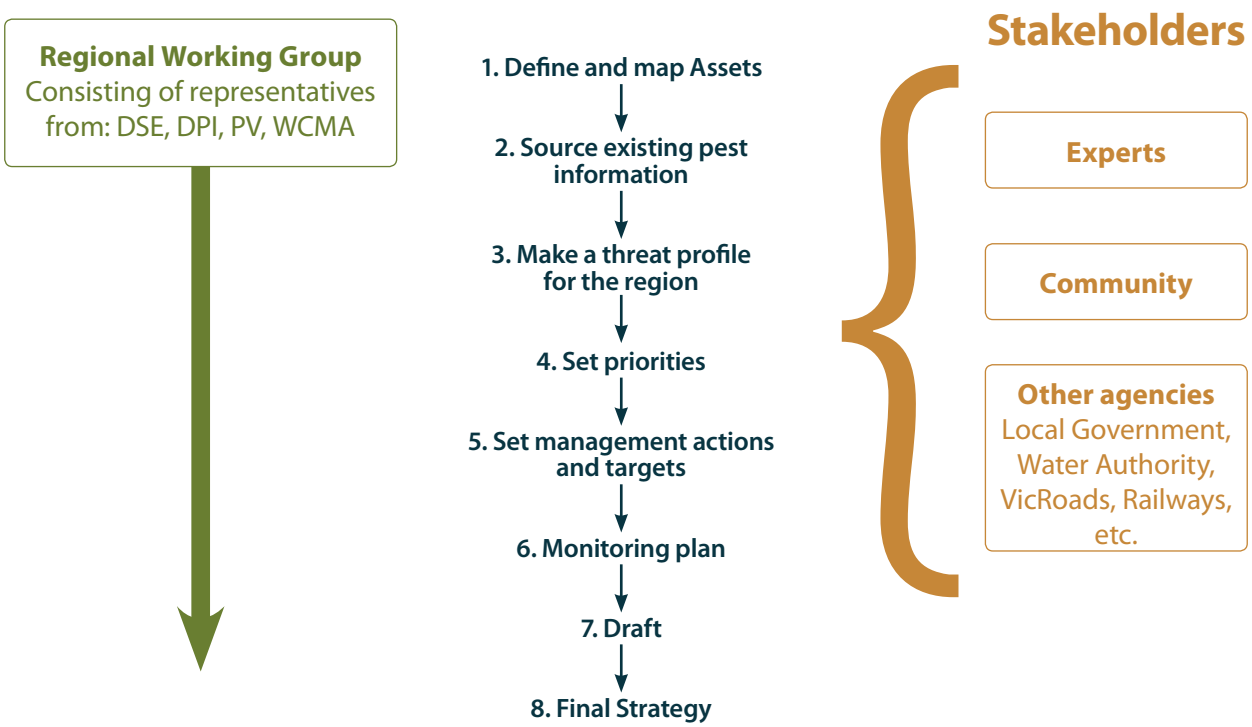


Figure 7: Process followed to build this strategy

The first step in the process was to define and map regional assets. Assets were defined as features in the landscape that should be protected from IPAs and their condition improved and protected for the public good. These assets are places in the landscape of high value because they have one or more of the following attributes:

- they support rare or threatened vegetation communities
- they hold wetlands or waterways with ecological, social or economic significance
- they provide large, continuous areas of native vegetation that support a diverse fauna assemblage and allow the movement of plants and animals in response to change
- they support native vegetation, wetlands or waterways in relatively good condition
- they support nationally threatened plants or animals
- they are important to the community for social value, and the aesthetic or recreational opportunities they provide
- their functioning provides essential ecosystem services that underpin a thriving regional economy

Asset mapping and pest data were then combined to establish a regional threat profile. The RWG used biosecurity principles to prioritise actions between pest species (species-based approach) and environmental assets (asset-based protection approach).

Under the species-based approach, established noxious-weed lists were used to prioritise action. Under the asset-based protection approach the criteria used for prioritisation were:

1. The overall value of the asset using wetland, waterway and terrestrial ecosystem scores

2. The threat of pest impact on those values

When priorities were set, management action and targets were defined that were designed to be practical and measurable. The organisation responsible for the implementation of each action was also defined. Finally, the RWG agreed on a monitoring, evaluation and reporting plan that would provide a way to track progress on the plan's implementation from 2010–2015.

The second step in the process was to collate existing information on the distribution and severity of IPAs in the region. The RWG used combined data held by the four agencies, and explored the applicability of this data for the preparation of this five-year strategy. While useful, the existing data had shortcomings due to variances in collection methods over the years. The RWG decided further work was needed to gather local knowledge of people working daily on pest issues that might not have previously made it into databases. This knowledge was collected through a series of interviews with regional pest management experts and land managers (listed in Appendix 3).

Appendix 2: Legislation that relates to IPA management

There is a range of legislation relating to IPA management. An overview of the legislation is provided below.

Catchment and Land Protection Act 1994

The Catchment and Land Protection Act 1994 provides a legislative framework for land management including the control of declared noxious weeds. This Act sets out the responsibilities of private and public land managers for weed and pest animal management. The Act provides the power to declare plants as 'noxious' if the Minister is satisfied that it is, has, or may have the potential to become, a serious threat to primary production, Crown land, the environment or community health in Victoria. Noxious weeds are weeds declared to be state prohibited, regionally prohibited, regionally controlled or restricted, requiring action by the landowner, including the Secretary [DELWP] as a landowner.

Section 20 specifies general duties of landowners (defined to include public authorities, occupiers of Crown land under a lease or license, Roads Corporation, Director of National Parks) in relation to land management:

"Section 20. General duties of landowners —

(1) In relation to his or her land a landowner must take all reasonable steps to —

(d) Eradicate regionally prohibited weeds; and

(e) Prevent the growth and spread of Regionally Controlled Weeds; and

(f) Prevent the spread of, and as far as possible eradicate, established pest animals

Current status of responsibility for pest management on roadsides

In accordance with the 2013 amendments to the Catchment and *Land Protection Act 1994*, Municipal Councils and VicRoads are the responsible landowners of roadsides for the purposes of declared weed and pest management within their respective Municipality or District. This includes responsibility for unmade municipal roads which are not held under licence.

National Parks Act 1975

Section 17 2 (a) of the Act requires the Secretary to ensure that each national park and State park is controlled and managed, in accordance with the objectives of this Act, in a manner that will—

(i) Preserve and protect the park in its natural condition for the use, enjoyment and education of the public;

(ii) Preserve and protect indigenous flora and fauna in the park;

(iv) Eradicate or control exotic flora in the park; [also Other parks, Section 18(2)(iv)]

(aa) Have regard to all classes of management actions that may be implemented for the purposes of maintaining and improving the ecological function of the park;

Section 17 2 (d) requires the preparation of a plan of management in respect of each national park and state park, which may include pest management plans.

Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* aims to guarantee that all Victoria's taxa of flora and fauna survive, flourish and retain their potential for evolutionary development in the wild.

Public land managers should particularly note those Potentially Threatening Processes (PTPs) listed under the Act Section 49 of the Act relates to environmental weeds and states that 'A person must not, except as prescribed, without the permit of the Secretary, abandon or release any prescribed flora into the wild.'

Other PTPs listed in the act include the impact of foxes, rabbits and feral cats.

Crown Land (Reserves) Act 1978

The *Crown Land Reserves Act 1978* provides for the permanent or temporary reservation and management of Crown Lands.

Land may be reserved for a range of public purposes including preservation of areas of ecological significance, preservation of species of native plants, for wildlife, public gardens, archaeological and coastal protection.

Committees of Management [Section 15(1) (a)] appointed under the Act 'shall manage improve maintain and control the land for the purposes for which it is reserved…'

***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

The *EPBC Act* is administered by the Commonwealth Department of Environment, Water, Heritage and the Arts and in relation to IPA:

- Lists Key Threatening Processes that threaten the survival, abundance or evolutionary development of a native species or ecological community. Examples of invasive species listed as key threatening processes are 'competition and land degradation by rabbits' and 'loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants'.
- Develops and implements Threat Abatement Plans. These plans outline the research and management necessary to reduce the impacts of Key Threatening Processes on listed threatened species and communities.

These elements underpin Australian Government funding to a range of activities to reduce the threat of invasive species, including the Caring for our Country program and national WONS program.

Appendix 3: People who contributed to the development of this strategy

Name	Affiliation
Mike Stevens	PV
Zoe Wilkinson	PV
Mark Farrer	Agriculture Victoria
Anthony Salter	DELWP
Glenn Rudolph	DELWP

Appendix 4: Wimmera invasive plants of concern

This list outlines the pest plants of concern in the Wimmera and categorises them with regard to the type of action required. Noxious-weed listings for the Wimmera developed through the Noxious Weed Review process are given in brackets following each species' common name.

The codes for these categories are as follows:

SP = State prohibited
RP = Regionally prohibited
RC = Regionally controlled
R = Restricted
E = Environmental
F = Fisheries noxious species

The national WoNS listing is denoted with a W.

Prevent and Eradicate	
Alligator Weed (SP) (W) *Alternanthera philoxeroides*	**Mesquite (SP) (W)** *Prosopis All spp.*
Branched Broomrape (SP) *Orobanche ramosa*	**Mexican Feather Grass (SP)** *Nassella tenuissima*
Camel Thorn (SP) *Alhagi maurorum*	**Parthenium Weed (SP) (W)** *Parthenium hysterophorus*
Giraffe Thorn (SP) *Acacia erioloba*	**Poverty Weed (SP)** *Iva axillaris*
Hawkweed (SP) *Hieracium All spp.*	**Ragwort (SP)** *Senecio jacobaea*
Horsetails (SP) *Equisetum All spp*	**Salvinia (SP) (W)** *Salvinia molesta*
Karoo Thorn (SP) *Acacia karroo*	**Tangled Hypericum (SP)** *Hypericum triquetrifolium*
Knotweed spp (SP) *Fallopia x bohemica, F. japonica, F. sachalinensis*	**Water Hyacinth (SP) (W)** *Eichhornia cras*
Lagarosiphon (SP) *Lagarosiphon major*	

Contain (and Eradicate where practical)
African Daisy (RP) *Senecio pterophorus*
African Feather-grass (RP) *Pennisetum macrourum*
Arrowhead (RP) (W) *Sagittaria spp*
Buffalo Burr (RP) *Solanum rostratum*
Cape Tulip (Two-leaf) (RP) *Moraea miniata*
Dodder (RP) *Cuscuta All spp.*
English Broom (RP) (W) *Cytisus scoparius*
Noogoora Burr/Californian Burr (RP) *Xanthium strumarium*
Prairie Ground Cherry (RP) *Physalis viscosa*
Serrated Tussock (RP) *Nassella trichotoma*
Spiny Emex (RP) (W) *Emex australis*
Tiger pear (RP) (W) *Opuntia aurantiaca*

Asset Protection	**Devil's claw (purple-flower) (R)** *Proboscidea louisianica*	**Ox-eye daisy (R)** *Leucanthemum vulgare*	**St. Peter's wort (R)** *Hypericum tetrapterum*
African boxthorn (C) (W) *Lycium ferocissimum*	**Devil's claw (yellow-flower) (R)** *Proboscidea lutea*	**Pampas lily-of-the-valley (R)** *Salpichroa origanifolia*	**Star thistle (R)** *Centaurea calcitrapa*
African love grass (R) Eragrostis *curvula*	**Fennel (R)** *Foeniculum vulgare*	**Parkinsonia/ Jerusalem-thorn (R) (W)** *Parkinsonia aculeata*	**Stemless thistle (R)** *Onopordum acaulon*
Amsinckia (R) *Amsinckia spp.*	**Fireweed (R) (W)** *Senecio madagascariensis*	**Paterson's curse (C)** *Echium plantagineum*	**Stinkwort (R)** *Dittrichia graveolens*
Angled onion (R) *Allium triquetrum*	**Flax-leaved broom (C) (W)** *Genista linifolia*	**Pond apple (R) (W)** *Annona glabra*	**Sweet briar (C)** *Rosa rubiginosa*
Apple of Sodom (R) *Solanum linnaeanum*	**Gamba grass (R) (W)** *Andropogon gayanus*	**Prickly acacia (R)** *Acacia nilotica*	**Thorn apple (common) (R)** *Datura stramonium*
Artichoke thistle (R) *Cynara cardunculus*	**Golden thistle (R)** *Scolymus hispanicus*	**Prickly pear (drooping) (C)** *Opuntia monacantha*	**Thorn apple (long-spine) (R)** *Datura ferox*
Asparagus fern (R) (W) *Asparagus scandens*	**Gorse/ Furze (C) (W)** *Ulex europaeus*	**Prickly pear (erect) (C)** *Opuntia stricta*	**Thorn apple (recurved) (R)** *Datura inoxia*
Athel pine/ tamarisk (R) (W) *Tamarix aphylla*	**Hardheads/ Russian knapweed (C)** *Rhaponticum repens*	**Ragwort (R)** *Senecio jacobaea*	**Topped lavender (R)** *Lavandula stoechas*
Bathurst burr (C) *Xanthium spinosum*	**Hawthorn (C)** *Crataegus monogyna*	**Rubber vine (R) (W)** *Cryptostegia grandiflora*	**Tree of heaven (R)** *Ailanthus altissima*
Bellyache bush (C) (W) *Jatropha gossypiifolia*	**Hemlock (R)** *Conium maculatum*	**Saffron thistle (C)** *Carthamus lanatus*	**Tufted honeyflower (R)** *Melianthus comosus*
Bindweed (C) *Convolvulus arvensis*	**Hoary cress (R)** *Lepidium draba*	**Sand rocket/ Sand mustard (R)** *Diplotaxis tenuifolia*	**Tutsan (R)** *Hypericum androsaemum*
Blackberry (C) (W) *Rubus fruticosus*	**Horehound (C)** *Marrubium vulgare*	**Scotch/ Heraldic thistle (R)** *Onopordum acanthium*	**Variegated thistle (R)** *Silybum marianum*
Bridal creeper (R) (W) *Asparagus asparagoides*	**Hymenachne,** *Olive hymenachne (R) (W)* *Hymenachne amplexicaulis*	**Silverleaf nightshade (C) (W)** *Solanum elaeagnifolium*	**Viper's bugloss (C)** *Echium vulgare*
Bridal veil creeper (R) (W) *Asparagus declinatus*	**Illyrian thistle (R) Onopordum** *illyricum*	**Skeleton weed (R)** *Chondrilla juncea*	**Wheel cactus (C)** *Opuntia robusta*
Californian/ Perennial thistle (C) *Cirsium arvense*	**Khaki weed (C)** *Alternanthera pungens*	**Slender/ Shore thistle (R)** *Carduus tenuiflorus/pycnocephalus*	**Wild garlic (C)** *Allium vineale*

Caltrop (C) *Tribulus* *terrestris*	**Lantana (R) (W)** *Lantana* *camara*	**Soldier thistle (R)** *Picnomon* *acarna*	**Wild mignonette (R)** *Reseda* *luteola*
Cape broom (C) (W) *Genista* *monspessulana*	**Madeira vine (R)** *Anredera* *cordifolia*	**Soursob (R)** *Oxalis* *pes-caprae*	**Wild teasel (R)** *Dipsacus* *fullonum subsp. fullonum*
Cape tulip (one-leaf) (C) *Moraea* *flaccida*	**Mimosa, giant sensitive plant (R) (W)** *Mimosa pigra*	**Spear thistle (R)** *Cirsium* *vulgare*	**Wild watsonia (R)** *Watsonia* *meriana*
Cat's claw creeper (R) (W) *Dolichandra* *unguis-cati*	**Opuntioid cacti (R)** *Austrocylindropuntia Backeb. spp.*	**Spiny broom (C)** *Calicotome* *spinosa*	**Willows (R) (W*)** *Salix spp.* *(except Salix alba var. caerulea, Salix alba x matsudana, Salix babylonica, Salix X calodendron Wimm., Salix caprea L. 'Pendula', Salix matsudana Koidz 'Aurea', Salix matsudana Koidz 'Tortuosa'., Salix myrsinifolia Salisb., and Salix X reichardtii)*
Chilean cestrum (C) *Cestrum* *parqui*	**Opuntioid cacti (R)** *Cylindropuntia*	**Spiny rush (C)** *Juncus* *acutus*	***W except for** *Salix babylonica, Salix X calodendron, Salix X reichardtii*
Chilean needle grass (R) (W) *Nassella* *neesiana*	**Opuntioid cacti (R)** *Opuntia spp. (except* *O..aurantiaca,* *O. monacantha,* *O. robusta,* *O. stricta,* *O. ficus-indica)*	**St Barnaby's thistle (C)** *Centaurea* *solstitialis*	
Climbing asparagus (R) (W) *Asparagus* *plumosus*	**Ornamental asparagus (R) (W)** *Asparagus* *africanus*	**St. John's wort (C)** *Hypericum* *perforatum*	

Appendix 5: Wimmera invasive animals of concern

This list outlines the invasive animals of concern in the Wimmera. Animals listed here are already established in the region and an asset-protection approach to their management is required. As outlined in the scope of this strategy, it does not include aquatic pests or native animals. There are many high-risk invasive animals that have the potential to enter the region, and would receive the highest priority for eradication if any incursions were to take place. For further information and a list of these high-risk invasive animals that includes declared and non-declared species, refer to the Agriculture Victoria website:

www.agriculture.vic.gov.au/agriculture/pests-diseases-and-weeds/pest-animals/a-z-of-pest-animals

Pest animals of concern where an asset-protection approach is required	
European Rabbit	*Oryctolagus cuniculus*
European Hare	*Lepus europaeus*
Feral Cat	*Felis catus*
Feral Dog	*Canis familiaris*
Feral Goat	*Capra hircus*
Feral Pig	*Sus scrofa*
Red Fox	*Vulpes vulpes*