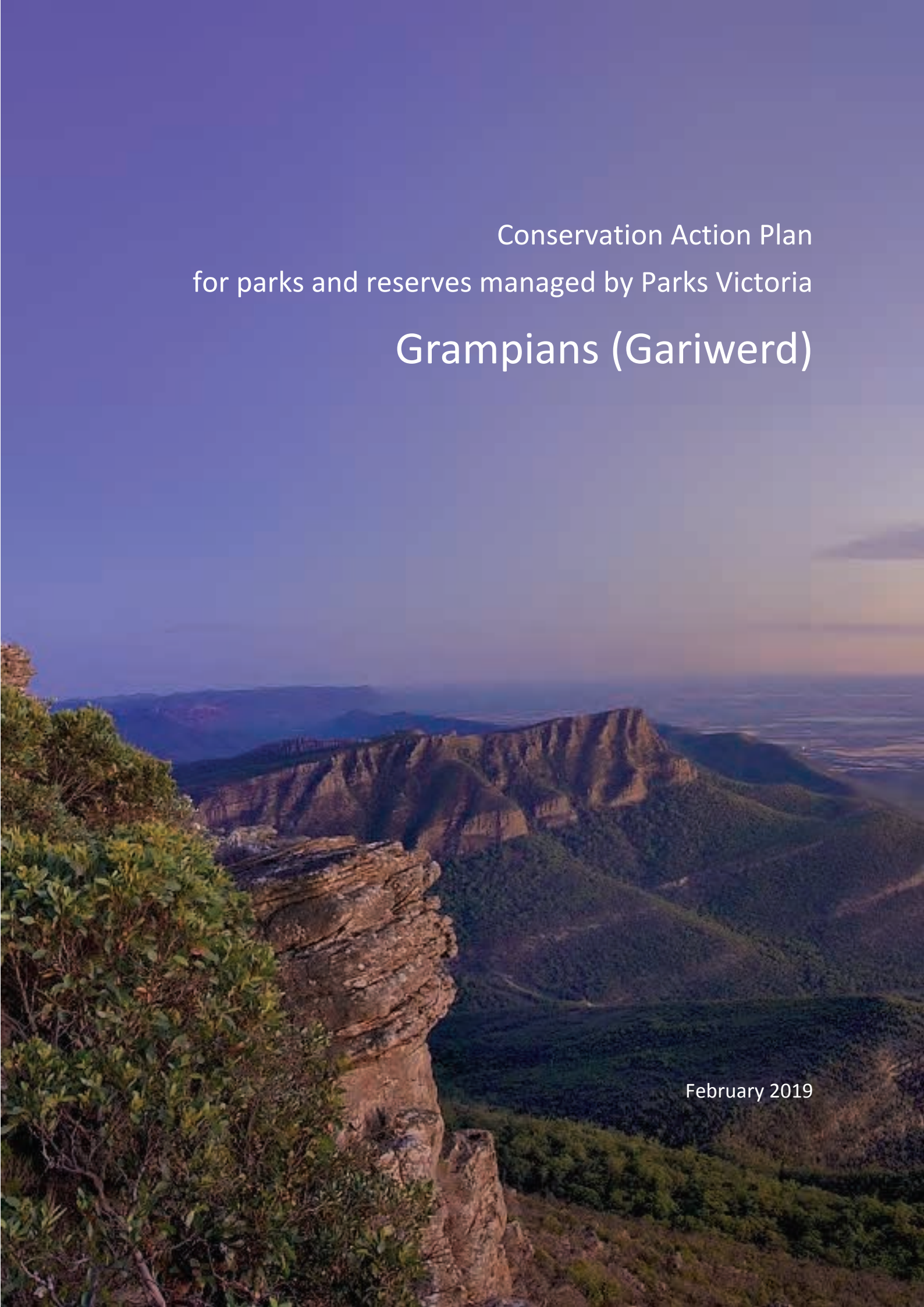

Conservation Action Plan

for parks and reserves managed by Parks Victoria

Grampians (Gariwerd)

February 2019

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Disclaimer
This plan is prepared without prejudice to any negotiated or litigated outcome of any native title determination applications covering land or waters within the plan's area. It is acknowledged that any future outcomes of native title determination applications may necessitate amendment of this plan; and the implementation of this plan may require further notifications under the procedures in Division 3 of Part 2 of the *Native Title Act 1993* (Cwlth).
The plan is also prepared without prejudice to any future negotiated outcomes between the Government/s and Traditional Owner Communities. It is acknowledged that such negotiated outcomes may necessitate amendment of this plan.
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Acknowledgements: Participants in the Grampians (Gariwerd) Park Landscape Conservation Action Planning process (Table 2.1) are thanked for their technical input and sharing their local knowledge.

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Foreword

To realise its vision — a world-class park service ensuring healthy parks for healthy people — Parks Victoria is committed to delivering works on the ground across Victoria's park network to protect, conserve and enhance park values. It is our primary responsibility to ensure parks are healthy and resilient for current and future generations.

Parks Victoria acknowledges, respects and works closely with Traditional Owners and other Aboriginal communities and organisations across Victoria. We pay our respects to Elders past and present, and to emerging Aboriginal leaders.

Parks Victoria recognises the diversity of cultures, deep connections, rights and responsibilities that Traditional Owners have over the lands and waters covered by the Grampians Conservation Action Plan. We recognise that the ancient landscape we see today has been modified over many thousands of years of occupation and influenced by the skills, knowledge and activities of generations of Aboriginal land managers. We also acknowledge the impacts of more recent land use and the impacts that introduced threats have had on this unique cultural landscape. The plan presented here is offered as a starting place for conversations with Traditional Owners on the importance of the nature and wildlife of this Country.

The plan focuses primarily on the first of Parks Victoria's three strategic themes:

- Conserving Victoria's special places
- Connecting people and parks
- Providing benefits beyond park boundaries.

The plan is guided by *Protecting Victoria's Environment – Biodiversity 2037*, Victoria's plan to stop the decline of our native plants and animals. It is also guided by the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) and the *Flora and Fauna Guarantee Act 1988* (Vic.), which are the key pieces of Commonwealth and State legislation for the conservation of significant places, species and communities, and for the management of ecologically threatening processes.

The plan outlines Parks Victoria's understanding of the major threats to nature and wildlife in this ancient and unique cultural landscape, and the potential actions that we can take together with Traditional Owners and other partners in caring for and improving the health of the Grampians landscape.

Matthew Jackson

Chief Executive Officer

Parks Victoria

Summary

The Grampians (Gariwerd) Park Landscape encompasses an area with a stunning and diverse array of natural and cultural values. Although it is one of the smallest park landscapes in Victoria, it hosts over a third of the state's indigenous flora, iconic geological formations, and the largest collection of Aboriginal rock art in the state. It is an important cultural landscape that is at the centre of creation stories for many Traditional Owners in south-western Victoria. The Park Landscape is predominantly the Grampians National Park, one of the best-known parks in Victoria, and is an important habitat stronghold for a number of rare or endangered species.

The catchments within the Landscape provide important water resources for communities and agriculture beyond the Landscape boundaries. A range of visitor activities, including the Grampians Peaks Trail, benefit local communities through tourism opportunities and rely heavily on the significant conservation values articulated in this plan.

This Conservation Action Plan defines and prioritises conservation strategies for the Grampians (Gariwerd) Park Landscape until July 2023, and broadly describes the expected outcomes of these strategies. The plan outlines what can be realistically achieved to tackle the threats that pose the most risk to conservation assets. The Conservation Action Plan will support Parks Victoria in achieving our landscape conservation vision that:

The resilience of natural assets in the Grampians (Gariwerd) Park Landscape is increased and ecosystem services are maintained in the face of climate change and other stressors.

Parks Victoria's Conservation Action Plans generally define and prioritise conservation strategies for five-year periods. However, Conservation Action Plans are also designed to evolve and adapt according to changes in circumstance and evidence. This particular version of the Grampians Conservation Action Plan may be revised before its scheduled review period to integrate traditional ecological knowledge and input from Gariwerd Traditional Owners, and to capture their role in managing this highly biodiverse and culturally significant landscape in future conservation strategies. This Conservation Action Plan may assist in informing a future Joint Management Plan.

The development, implementation and review of the plan follows Parks Victoria's cyclical ten-step conservation action planning process, which is based on an internationally recognised process developed by The Nature Conservancy. The plan covers the first seven steps in this process:

1 Scope planning, people and resources.
2 Identify conservation assets.
3 Assess the viability of conservation assets and set conservation outcomes,
4 Identify and assess threats to conservation outcomes.
5 Develop action options from situational analysis.
6 Assess and select preferred strategies and actions.
7 Set performance measures.

Nine conservation assets have been identified in the Grampians (Gariwerd) Park Landscape: Riparian, Wetland, Heathland (treeless), Heathy Forest and Woodland, Herb Forest and Woodland, Mixed Forest, Rocky Knoll, Montane, and Wet Forest. Within each of these assets a range of nested assets, such as threatened species and important ecological assemblages, have also been identified.

The plan also identifies a range of key ecological attributes (components that are believed to best reflect the health of the asset). The plan describes their current condition (very good, good, fair, poor) and the trend in condition (improving, stable, declining), and sets the anticipated future condition of each key ecological attribute. These measures then allow the overall condition of each asset to be assessed:

- Wetlands are largely in good condition.
- Riparian, Heathland, Heathy Forest and Woodland, Rocky Knoll, Montane, and Wet Forest assets are in fair condition.
- Herb Forest and Woodland and Mixed Forest are in poor condition.

The trends in condition are stable or in decline without management intervention. The desired future status of the majority of assets is good, but dependent on the implementation of all the listed strategies.

Six key threats to the conservation assets in the Park Landscape are described in the plan. They are:

- predation by foxes and cats
- fire regimes and management
- alteration to natural hydrology
- over-grazing/ over-browsing
- invasion by terrestrial weeds
- diseases.

The following conservation strategies will be undertaken to tackle these threats. They have been selected for their impact, feasibility and cost in achieving the desired conservation outcomes.

- **Fire management for healthy ecosystems** — Use fire as a tool to maintain fire dependent habitat or species, exclude planned fire from fire sensitive habitats and apply fire peripheral to priority species and habitats to provide protection.
- **Water management for conservation outcomes** — Support partnerships to improve water dependent conservation assets by maintaining and improving the hydrological regimes that support them in the Landscape.
- **Manage predation pressure at a landscape scape** — Implement landscape-scale poison baiting combined with targeted control (i.e. trapping) for foxes and cats in priority fauna refugia.
- **Environmental weed program** — Surveillance and rapid management intervention to prevent the establishment of new and emerging weeds, and contain Sallow Wattle to its current extent and density.
- **Herbivore management** — Reduce the distribution and abundance of herbivores (goat, rabbit, red deer and fallow deer) in priority areas across the Landscape.
- **Collaborative partnerships to address key knowledge gaps** — Develop research partnerships and integrate applied research to help inform and improve management efficacy.

For each strategy a results chain has been developed to help guide implementation and monitoring indicators. These chains test the ability of Parks Victoria's management to achieve the conservation outcomes defined for each of the assets.

Contents

Mackenzie Falls

1 Background

1.1 Adaptive management

Conservation action planning is an important component of Parks Victoria's approach to adaptive management and evidence-based decision making. It involves identifying conservation priorities and then developing and implementing strategies to address those priorities to achieve defined conservation outcomes.

Through conservation action planning, Parks Victoria identifies and focuses on strategies that target clearly defined elements of the natural environment (conservation assets) for which threats have been identified and where success can be measured. Understanding how to best use the resources available for conservation to achieve the greatest improvement in the overall health of ecosystems is a complex challenge for land managers.

Conservation experience, scientific understanding, local environmental knowledge, traditional ecological knowledge, and strategic thinking are all key components of successful conservation action planning.

In this conservation action plan, clearly defined conservation strategies have been developed and prioritised. These strategies are based on the best available knowledge and will enable specific operational activities to be implemented, monitored for success, and further refined. The plan complements the existing park management plans. Conservation strategies detailed in the park management plans have been reviewed during the conservation action planning process, and updated for inclusion where relevant.

1.2 Park Landscapes

Park Landscapes are classified according to a combination of ecological attributes, land forms and administrative boundaries. They form a logical unit for conservation action planning and the delivery of specific operational activities in groups of parks and reserves. Parks Victoria has identified 16 park landscapes across Victoria (Figure 1.1).

1.3 Planning method

Parks Victoria has applied the conservation action planning methodology developed by The Nature Conservancy. This methodology is based on the Open Standards for the Practice of Conservation developed by Conservation Measures Partnership, an international partnership of conservation organisations.

Parks Victoria's approach to conservation action planning is suitable for planning conservation projects with joint management partners, in partnership with all stakeholders, for land managed by Parks Victoria. It is consistent with the approach used by numerous other agencies in Victoria managing conservation lands. The plan is intended to provide guidance to Parks Victoria staff for the management of conservation values, and also to articulate our conservation priorities and strategies to stakeholders, land management partners and the public.

The emphasis is on identifying strategies that tackle threats that pose the greatest risk to priority conservation assets and key ecological attributes and that will contribute most to meeting the expected conservation outcomes.

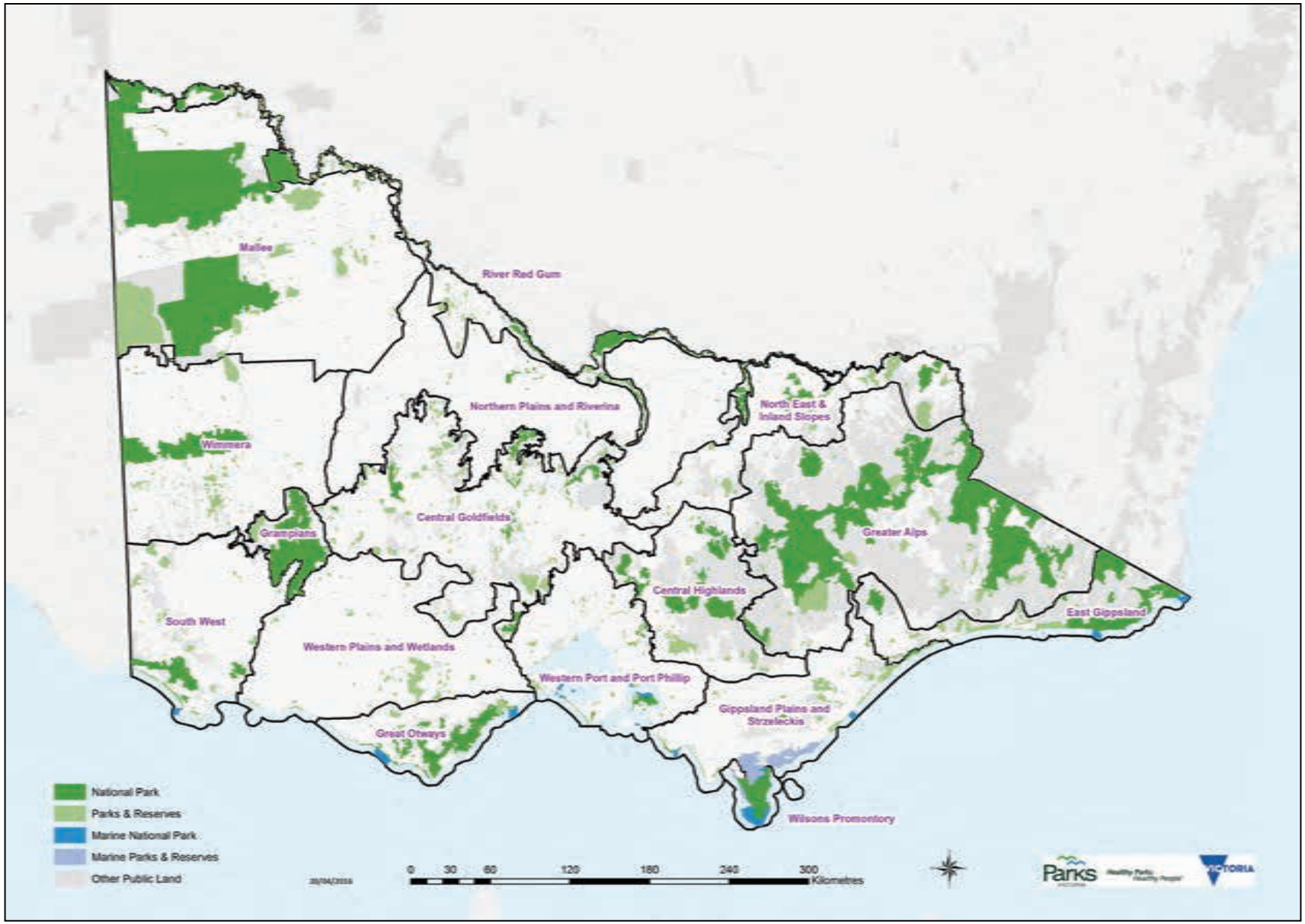


Figure 1.1 Parks Victoria's Park Landscapes.

Parks Victoria's conservation action planning process involves a series of conservation action planning workshops, with participants from Parks Victoria and other organisations, and follows 10 sequential steps (Figure 1.2):

1 Scope planning, people and resources.
2 Identify conservation assets.
3 Assess the viability of conservation assets and set conservation outcomes.
4 Identify and assess threats to conservation outcomes.
5 Develop action options from situational analysis.
6 Prioritise conservation strategies.
7 Set performance measures.
8 Plan work.
9 Implement operational plans.
10 Adapt the conservation action plan and operational activities.

This Conservation Action Plan is an output of steps 1 to 7, and will provide directions for environmental conservation management for the next 15 years. The implementation of the conservation strategies (steps 8 and 9) will be undertaken by regional staff at the operational level. After five years the plan will be reviewed (step 10), and progress will be evaluated against outcomes identified for the conservation assets, threat mitigation objectives and implementation of identified priority actions, in order to revise the plan.

Figure 1.2 Parks Victoria's Conservation Action Planning: the 10-step process.

Post-fire recovery, February 2006

2 Scope

2.1 Geographic scope

The Grampians (Gariwerd) Park Landscape takes in a large and mountainous area, including many ecosystems, outstanding geological formations and spectacular landscapes. The Grampians National Park covers most of this Park Landscapes area. It is an iconic, National Heritage-listed reserve known for its diverse and endemic flora and is the fourth largest national park in Victoria.

The Grampians (Gariwerd) Park Landscape encompasses 184 412 ha of land managed by Parks Victoria, including the Grampians National Park (Figure 1.3). Table 2.1 lists the parks and reserves within the Landscape, their priority for biodiversity conservation (Level of Protection) (Appendix A) and the Protected Areas Category assigned to each area according to IUCN guidelines (Appendix A).

The natural values of significance identified in the Grampians National Park Management Plan (Parks Victoria 2003) are:

- spectacular landforms identified as being of high geological significance at the national level by the Australian Heritage Commission
- seven broad vegetation types (BVTs), including areas of weed-free, diverse and intact vegetation of high conservation value
- two occurrences of Red Gum Swamp Community No. 1, which is listed as threatened under the *Flora and Fauna Guarantee Act 1988* (Vic.)
- high floral diversity (975 vascular species, representing about one-third of the state's flora), and high faunal diversity (312 vertebrate species, including a diverse macropod fauna)
- 148 species that are threatened in Victoria (26 endemic to the Park Landscape), including 40 that are also nationally threatened and 30 that are listed under the Flora and Fauna Guarantee Act.
- proclaimed special water supply catchment areas; almost three-quarters of the park is protected catchment area under the schedules of the *Catchment and Land Protection Act 1994* (Vic.).

Over one-third of Victoria's indigenous flora species and 44 Ecological Vegetation Classes (EVCs) are represented in the Grampians (Gariwerd) Park Landscape. These range from montane EVCs adapted to occasional snow cover to Plains Woodland EVCs on the Park Landscape's fringes baked dry in the summer. Most of the Grampians National Park is a designated water catchment area, servicing many communities in western Victoria. The Park Landscape is very important habitat for the Heath Mouse, Brush-tailed Rock-wallaby, Smoky Mouse and Grampians Pincushion-lily.

2.2 Cultural significance

With responsibility for managing over four million hectares of Victoria's most intact landscapes, Parks Victoria recognises the critical importance of working with Australia's First Peoples to manage parks and reserves in a culturally sensitive and ecologically sympathetic way.

Parks Victoria recognises the importance of long-term, respectful and meaningful partnerships with Traditional Owners; the opportunity to understand, share and celebrate Aboriginal cultural values; and need for greater accountability and responsibility for managing risks to Aboriginal cultural heritage. It is developing a robust agency-wide approach that provides a strong foundation for partnerships to grow and evolve, and become embedded in the way Parks Victoria works.

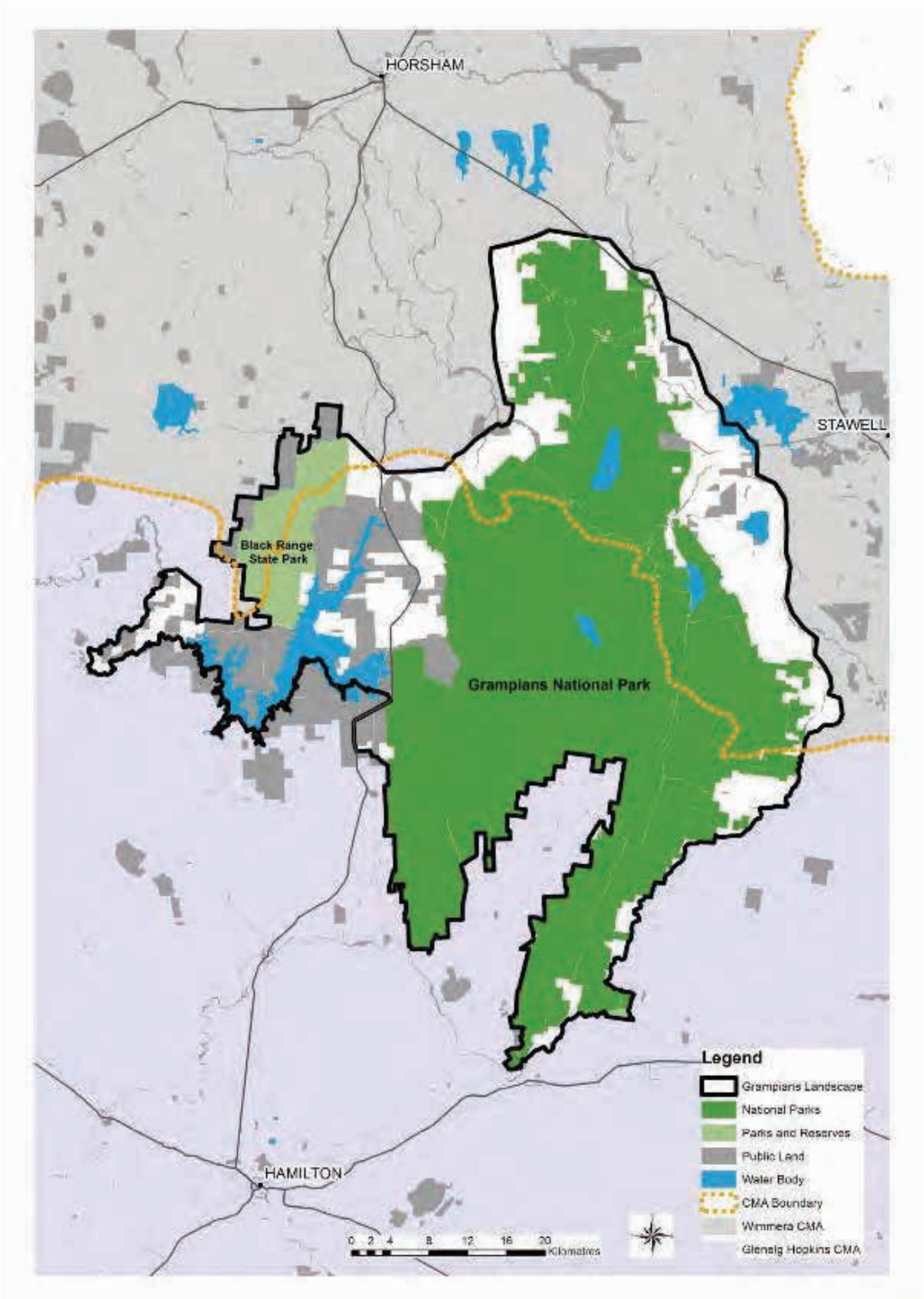


Figure 1.3 Geographic scope of conservation planning for the Grampians (Gariwerd) Park Landscape.

Table 2.1 Levels of protection and Protected Areas Categories for parks and reserves comprising the Grampians (Gariwerd) Park Landscape.

Site name	Area (ha)	Level of protection	Protected Areas Category (IUCN)
Grampians National Park	168241.4	A1	2 — National Park
Black Range State Park	11727.5	A1	2 — National Park
Brady Swamp Wildlife Reserve	223.8	B	4 – Habitat/species management area
Mount William Creek Streamside Reserve	38.7	C	3 – Natural monument or feature
Rowes Bushland Reserve	6.3	C	4 — Habitat/species management area
Cherrypool Highway Park	20.6	D	not a protected area
Mount Difficult Plantation	12.5	—	not a protected area
Brambuk Cultural Centre	1.7	—	not a protected area
Lady Somers Bridge Streamside Reserve	16.2	E1	3 – Natural monument or feature
Moyston West Bushland Reserve	7.3	E1	4 — Habitat/species management area
Millers Creek Bushland Reserve	4.6	E1	4 — Habitat/species management area
Fyans Creek Bushland Reserve	68	E1	4 — Habitat/species management area

The Grampians, known to Traditional Owners as Gariwerd, is an ancient Aboriginal cultural landscape. The creation stories, cultural heritage values, natural resources and traditional management practices of the area are valued by Traditional Owners of the Wotjobaluk, Gunditjmara, and Eastern Maar nations, who maintain strong associations with the area.

The Grampians (Gariwerd) Landscape has had intensive Aboriginal occupation for tens of thousands of years. It is a place where food, water and shelter have always been abundant and is the origin of many dreaming stories. The landscape contains over 90% of Victoria's known rock-art sites and has been subject to substantial archaeological research. The Landscape also contains an array of culturally significant elements, including isolated artefacts, shelters, quarries, mounds, surface scatters, grinding grooves, ceremonial rock arrangements and scarred trees.

The Grampians National Park (Gariwerd) was inscribed in the National Heritage List in 2006. The listing noted that two cultural sites at Billimina and Drual are important evidence of early occupation in the semi-arid zone and later temperate environments over the past 20 000 years (Bird et al. 1998, cited in Commonwealth of Australia 2006).

Traditional Owners are partners in conservation planning. At present, discussions are underway to confirm the status of the Grampians National Park and surrounding reserves in a native title or Traditional Owner settlement context. In the meantime, proposed management actions will be communicated with all relevant parties. It is anticipated that in the future, Traditional Owners will have increasing involvement in setting conservation management directions in the Grampians (Gariwerd) Park Landscape, which should be a consideration in future iterations of this Conservation Action Plan at review. Barengi Gadjin Land Council is the Registered Aboriginal Party for the Black Range State Park, with responsibilities related to Aboriginal cultural heritage management.

2.3 Legislative and planning context

The majority of the Grampians (Gariwerd) Park Landscape is reserved and managed under the provisions of the *National Parks Act 1975*. The Grampians National Park was declared in 1984, having been formerly designated State forest in 1872. The park's national significance for its natural, cultural and geological values was recognised by its inscription on the National Heritage List in 2006.

The Grampians National Park includes reference areas at Moora Valley, The Sisters, and Grasstree Creek, which are managed under the *Reference Areas Act 1978* (Vic.). The Catchment and Land Protection Act provides legal protection for water supply catchment areas covering a large proportion of the Grampians National Park. Other small reserves are managed under the Crown Land (Reserves) Act.

This plan builds on the existing Grampians National Park Environmental Action Plan (2002) and the Grampians Biodiversity Action Plan (2006), which includes the Black Range State Park. These plans have addressed past climatic events, such as prolonged drought, landscape-scale bushfire and La Niña floods.

2.4 Alignment with Regional Catchment Strategies

This plan addresses a number of key assets, objectives and actions from the Wimmera and Glenelg Hopkins Regional Catchment Strategy (RCS), in particular the following assets:

- rivers
- wetlands
- native vegetation
- terrestrial habitat
- threatened species and communities.

The plan will support these RCS objectives:

- maintaining or improving the condition of rivers and streams
- protecting wetlands with recognised conservation significance
- improving the condition of wetlands, and maintaining the diversity of wetland types
- improving the management of existing native vegetation
- maintaining extent and improving condition of terrestrial habitat
- improving connectivity of habitat for species populations and communities
- managing public land as the core of resilient ecosystems
- improving the health of key populations of threatened species and communities.

2.5 Other sources of information

Information sources that have directly assisted and informed the preparation of this plan include the *Victorian Biodiversity Strategy* (1997), *Grampians National Park Management Plan* (2003), *Glenelg Hopkins Catchment Management Authority Regional Catchment Strategy* (2013) and *Wimmera Catchment Management Authority Regional Catchment Strategy* (2013).

The Strategic Management Prospects (SMP) tool, which is a component of the Department of Environment, Land, Water and Planning's NatureKit, can also be used as a decision support tool and to augment ground-truthed data where available, to assist in identifying the relative priority of threats and actions. SMP outputs are biodiversity focused and may need to be balanced with organisational and community priorities when implementing conservation strategies.

2.6 Participation

A series of conservation action planning workshops were held between 2011 and 2016 to support the planning process for the Grampians (Gariwerd) Park Landscape plan.

The success of the workshops drew from the breadth of experience and depth of knowledge of participants, including from Parks Victoria, Department of Environment, Land and Water, Wimmera and Glenelg Hopkins Catchment Management Authorities, Deakin University and community stakeholders.

Because of the length of time between workshops for identifying assets, assessing threats and prioritising strategies, follow-up discussions with local staff have occurred to ensure the currency of information.

Table 2.2 List of participants in the conservation action planning workshops.

Participant	Organisation	Participant	Organisation
Graham Parkes	Parks Victoria	Rod Bird	Community representative
Jill Read	Parks Victoria	Barry Clugston	Community representative
Ryan Duffy	Parks Victoria	Ray Draper	Community representative
Jacinta Williamson	Parks Victoria	Keiran Lawton	Community representative
Dave Roberts	Parks Victoria	Ty Matthews	Community representative
John Wright	Parks Victoria	Cecilia Myers	Community representative
Ben Holmes	Parks Victoria	Daryl Panther	Community representative
Mark Antos	Parks Victoria	Steve Wickson	Community representative
Tamara Boyd	Parks Victoria	Richard Hill	DELWP
Evan McDowell	Parks Victoria	Geoff Miller	DELWP
Phil Pegler	Parks Victoria	Pauline Rudolph	DELWP
Tony Varcoe	Parks Victoria	Derek Petersen	Parks Canada
Mike Stevens	Parks Victoria		

Eastern Pygmy-possum

3 Conservation assets

3.1 Methodology for Identifying conservation assets

For planning and managing the terrestrial environment, Parks Victoria has classified conservation assets in its Park Landscapes according to similarities in biodiversity and natural values, and management drivers. The classification is based on the eight natural ecosystem groups described in Victoria's Biodiversity Strategy (1997):

- Alps
- Coastal
- Dry Forest and Woodland
- Grassland
- Heathland
- Inland Waters and Wetlands
- Mallee
- Wet Forest and Rainforest.

Within each of these ecosystem groups, a number of sub-ecosystems have also been identified, defined by groupings of Ecological Vegetation Classes and Divisions (EVCs and EVDs) (White 2012). Conservation assets within the Park Landscapes have been identified by assigning ecosystems, sub-ecosystems and habitats from Parks Victoria's classification system, on the basis that they have similar ecological processes and threats.

Finer-scale assets that are an important focus of conservation efforts have also been identified, to help define each conservation asset more completely. These finer-scale or 'nested' assets are mostly species assemblages and communities, but may also include habitat features and ecosystem services.

Individual species are aggregated with others if they co-occur across the landscape and have similar attributes that are important in determining their persistence in the landscape. Keystone species and rare, threatened or endemic species are also included as nested assets if they have unique conservation requirements.

3.2 Conservation assets of the Park Landscape

Nine ecosystems (conservation assets) were identified for the Grampians (Gariwerd) Park Landscape. Each conservation asset was also associated with numerous iconic species, threatened species, and flora and fauna assemblages. The extents and distributions of these nine Conservation Assets are presented in Figure 3.1 and Table 3.1. The component EVCs and EVDs are listed in Appendix B.

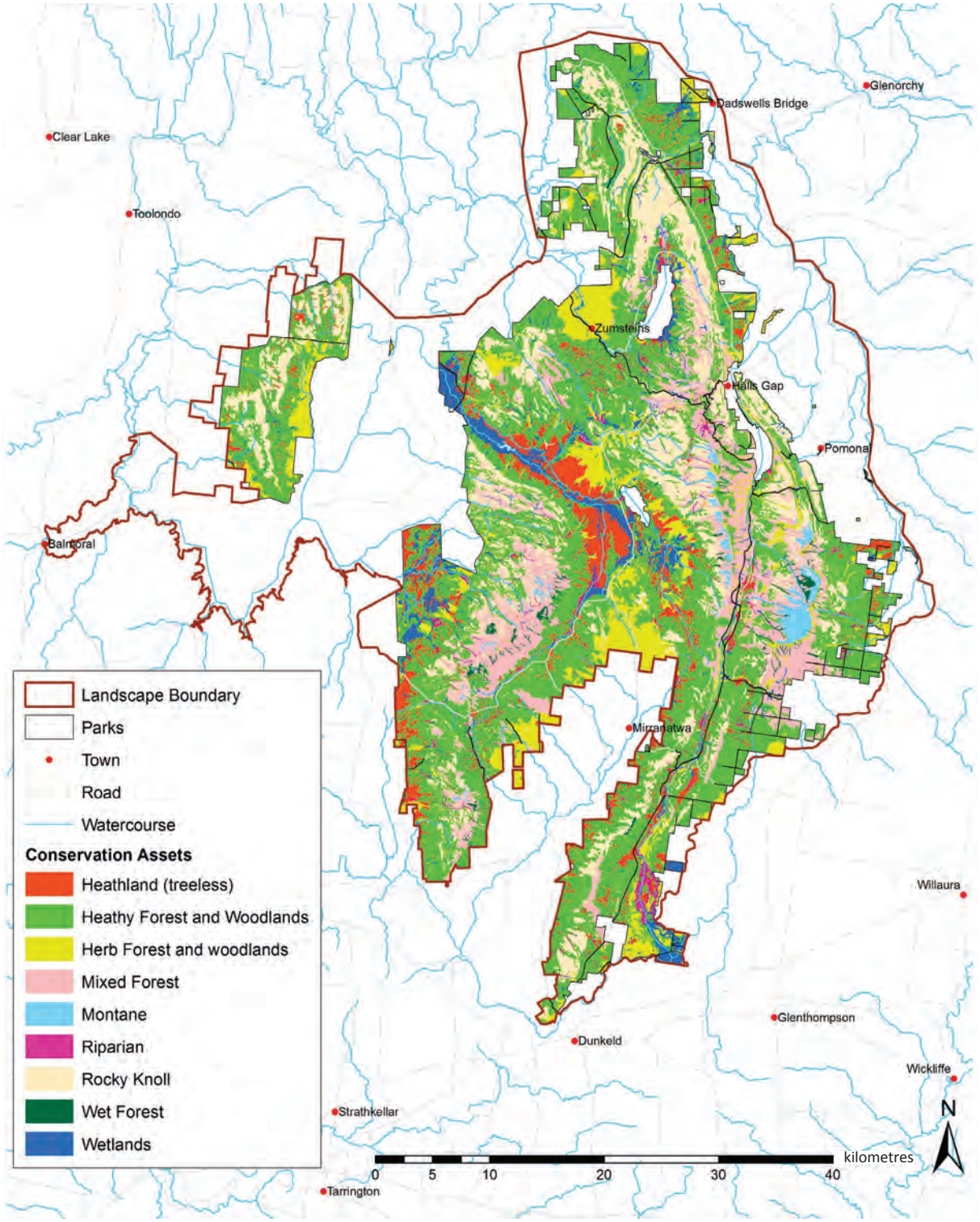


Figure 3.1 Ecosystems in the Grampians (Gariwerd) Park Landscape. Crown land not managed by Parks Victoria is shown in grey.

Table 3.1 Conservation asset (ecosystem) areas in the Grampians (Gariwerd) Park Landscape.

Conservation asset	Area (ha)
Riparian	2879
Wetlands	8910
Heathland (treeless)	13640
Heathy Forest and Woodland	86845
Herb Forest and Woodland	21012
Mixed Forest	19382
Rocky Knoll	28540
Montane	1930
Wet Forest	1107

Resurrection Plant, *Borya mirabilis*

4 Conservation outcomes

Setting conservation outcomes involves defining a conservation vision and conservation outcomes for each asset. The conservation vision is based on Parks Victoria's broader vision for conserving its special places, and is an aspirational statement that describes what the Park Landscape should be like in the future. Conservation outcomes are derived from a comparison of the current and desired condition of the conservation asset overall (Where are we now? Where do we want to be?) and are articulated as SMART goals[1].

4.1 Viability

Assessing the overall health of a conservation asset involves identifying the critical factors required for its long-term viability, which are called the *key ecological attributes*. These include attributes of structure, composition and process related to the assets. An important characteristic of a key ecological attribute is that it must be readily measurable using one or more indicators. The current and desired condition of the attribute can then be assessed, and the overall viability of the asset can be assigned to a defined category.

The assessment of the viability (or overall health) of a conservation asset is a five-step process utilising key ecological attributes:

1 Identify a small number of key ecological attributes (typically 3–5) for each conservation asset.
Some common key ecological attributes are structure (e.g. remnant size or population abundance, distribution of communities, and configuration of patches or age class), composition (e.g. species diversity), and interactions and biotic and abiotic processes (e.g. hydrological regime or water quality).

2 Identify appropriate indicators for each key ecological attribute.
An indicator is a readily measurable parameter that can be used to assess the condition of the key ecological attributes. For example, the presence or absence of a particular habitat-sensitive species may be an appropriate indicator for species diversity or habitat condition.

3 Develop criteria for rating the current value of each indicator.
The development of criteria for rating the value of each indicator is an iterative process. It typically starts with a simplified qualitative assessment (e.g. many, some, few) and is progressively developed into more refined and measurable numeric values (e.g. 1000 megalitres of water for 3 months during late spring). A value range for the indicator is defined to correspond with a ranking for poor, fair, good, and very good.

4 Rank the current and desired condition of each indicator to determine the overall viability of the conservation assets.
The final step in assessing the viability of the conservation assets is to rank the current condition of each indicator. The rankings used are poor, fair, good, and very good. Desired condition should be assessed over a 15-year period and should consider the role, if any, of management intervention to maintain long-term viability.

5 Determine the overall viability of conservation assets.
The overall current and desired condition is determined for each conservation asset, using the condition rankings for key ecological attributes and their associated indicators. Each conservation asset is rated for the current and desired condition of its key ecological attributes and overall condition.

[1] Specific, Measurable, Achievable, Relevant, Time-bound

These key ecological attributes for each asset, including conservation outcomes and asset descriptions, are presented in the following pages, along with assessments of the current and desired status of each asset and its key ecological attributes. These attributes and outcomes have been used to guide the development and prioritisation of conservation strategies.

4.2 Landscape conservation vision

The vision below describes the intended outcome of management and the future state of the Grampians (Gariwerd) Park Landscape.

The resilience of natural assets in the Grampians (Gariwerd) Park Landscape is increased and ecosystem services are maintained in the face of climate change and other stressors.

The Park Landscape is largely intact but the current condition of its assets ranges from poor to good. The terrestrial assets have been heavily impacted by recent landscape-scale bushfires which have resulted in a reduction in the structural complexity of these ecosystems, subsequent weed invasion and reductions of key faunal groups. Modifications to hydrological regimes have similarly resulted in a reduction in the condition of water-dependent conservation assets and impacts to aquatic fauna assemblages. Implementing this plan will directly address these threats to improve the condition of conservation assets within the Grampians (Gariwerd) Park Landscape.

Dusky Antechinus, *Antechinus swainsonii*

5 Conservation asset descriptions

The following pages provide a description of the conservation assets within the landscape, along with the outcomes sought through management. The descriptions are set out in the following format, and definitions for the terms used are provided below.

Conservation asset name

Ecosystem or habitat type that is seen as the overarching value that is to be managed, including a description of the ecosystem or habitat type, its condition, predominant drivers of condition, and their effect on component nested assets.

Nested assets

Nested assets are a series of values that are present within the asset, or that rely on the asset for their health. These are often iconic species for the system, threatened species, ecological (fauna) assemblage and species of particular note. Comprehensive lists of species held on national and Victorian databases are used to inform the selection of nested assets.

Condition

This sets out the key ecological attributes, indicators for those attributes, the current condition and trends in condition of the attribute, and the anticipated future status. An example is shown below.

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Ground-dwelling mammals: diversity and extent	Species richness and occupancy of suitable habitat	Fair	↘	Good
Vegetation structure and composition	Percentage shrub cover and distribution	Fair	→	Good

Conservation outcome

This statement reflects the goals for the key ecological attributes of the asset that will achieve the desired overall condition of the asset. An example is shown below.

Coastal Grassy Woodland	Current condition	Desired trend	Future status
In the 15 years to 2033, maintain critical habitat features (e.g. vegetation structure), functions (e.g. hydrology, water quality and quantity) and connectivity of riparian and in-stream ecosystems to provide habitat and refugia.	Poor	↗	Good

Trends are indicated as follows: Improving ↗ Stable → Declining ↘

The assessment of current condition and desired future status is represented by the following categories. Measures to assess this classification are documented in the Monitoring, Evaluation and Reporting Plan.

VERY GOOD (optimal integrity) — The attribute is functioning at an ecologically desirable status, and requires little human intervention to maintain or improve health.
GOOD (minimum integrity) — The attribute is functioning within its range of acceptable variation; it may require some human intervention.
FAIR (vulnerable) — The attribute is outside its range of acceptable variation and requires human intervention to recover or be restored. If unchecked, the target will be vulnerable to serious degradation.
POOR (imminent loss) — Allowing the attribute to remain in this condition for an extended period of time will make restoration or preventing extinction practically impossible.

Riparian

The Riparian conservation asset in the Grampians (Gariwerd) Park Landscape is characterised by tall eucalypt forests along river banks and associated alluvial terraces. It is also found occasionally in the heads of gullies leading into creeks and rivers. The soil is fertile alluvium, regularly inundated with water and permanently moist. The forests are dominated by eucalypts to 30 m tall, with an open to sparse secondary tree layer of wattles and scattered dense patches of shrubs, ferns, grasses and herbs. This ecosystem can also grow as dense shrubland where the ground is rocky, or as scrub along creeks and minor streams in floodplains at lower elevations. The EVCs that make up this asset include Floodplain Thicket/Wet Heathland Complex, Riparian Scrub, Riparian Forest, Riparian Shrubland, Floodplain Riparian Woodland and Riparian Woodland.

The rivers and river banks support a vast range of invertebrates, providing a food source for other native fauna species, including Platypus, Water Rat, kingfisher, swallows, frogs, fish and water skinks. The Riparian asset and the wetlands it supports are also critical drought refuges in the Grampians (Gariwerd) Park Landscape.

The quality of the Riparian asset affects the health of assets downstream, including swamps, creeks, perennial pools and woodlands that grow on river fans. The main driver of condition is the water flow regime, which has been altered by water harvesting and the increasing severity of drought. Water harvesting changes the timing, duration, frequency and volume of water flows, which is known to reduce the presence and diversity of aquatic species. In-stream water harvesting infrastructure and drought also modifies the habitat of the stream, affecting water flows and degrading the ecosystem and downstream waterbodies (e.g. the insufficient filling of Gooseneck Swamp and surrounding wetlands during a dry period).

The condition of this asset varies across the Park Landscape. Higher-quality examples are associated with unmodified hydrological regimes (e.g. the upper catchments of the Glenelg River and Wartook Basin), and lower-quality examples are in areas with highly modified regimes (e.g. the reaches of the Wannon River immediately downstream of the Wannon Headworks).

Nested assets

Four nested assets have been identified in this asset (see the table below). Diverse streamside vegetation provides drought refugia for a range of species. These species require high quality water and depend on the intactness of aquatic and semi-aquatic systems.

Nested asset	Examples of components
Aquatic and riparian fauna, including iconic or threatened fauna	Platypus, Southern Water Skink, Water Rat, Swamp Rat, turtles, crakes, rails, snakes, rare in-stream macro-invertebrate assemblages in wet gullies of eastern aspects of Victoria Range, including Sawmill Creek
Glenelg Spiny Crayfish	
Grampians Bertya	
Drought refugia	Permanent pools along the Wannon River, Glenelg River MacKenzie Creek, Mt William Creek and tributaries flowing from the Victoria Range

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Watershed functioning and connectivity	Hydrology and water quality (Index of Stream Condition)	Fair	→	Good
Riparian habitat features	Streamside vegetation structure, instream habitat (Index of Stream Condition)	Good	→	Good
Aquatic fauna diversity	Number and type of macroinvertebrates (Index of Stream Condition — Aquatic Life)	Fair	→	Good

Conservation outcome

Riparian	Current condition	Desired trend	Future status
By 2033, improve the condition of critical habitat features (e.g. vegetation structure, refugia), functions (e.g. hydrology, water quality) and connectivity of riparian and in-stream ecosystems to provide habitat and refugia across the landscape.	Fair	↗	Good

Wetlands

Diverse ephemeral and permanent wetlands are found throughout the Grampians (Gariwerd) Park Landscape. Ephemeral freshwater wetlands occur on fertile, silty, peaty or heavy clay soils in depressions that are seasonally inundated. These wetlands support herbaceous or sedgy vegetation and sometimes scattered or fringing eucalypts. In areas of higher rainfall, tea-tree and paperbark shrubs can occur. Permanent or semi-permanent freshwater wetlands include aquatic herblands dominated by sedges or aquatic herbs, or open River Red Gum woodlands with a sedgy or grassy-herbaceous ground layer. In these woodland systems a diversity of aquatic and amphibious herbs and grasses occupy depressions or shallow drainage lines on alluvial plains, or along the banks and wet flats of smaller, intermittent creeks. The EVCs in this asset include Plains Sedgy Wetland, Aquatic Herbland/Plains Sedgy Wetland Mosaic, Red Gum Swamp, Sedge Wetland, Shallow Freshwater Marsh, Creekline Grassy Woodland, Creekline Sedgy Woodland, Floodplain Thicket, Plains Sedgy Woodland, Seasonally Inundated Shrubby Woodland and Sedgy Riparian Woodland. The timing, duration and frequency of flood events determines the composition and characteristics of wetland systems.

The condition of Wetlands is driven by drought, recent bushfires and changed water flows, and varies wetland areas varies across the Park Landscape. The Wannon River floodplain system is the last remaining long-unburnt wetland system in the Grampians (Gariwerd) Park Landscape. It provides important wetland habitat for the Western Swamp Crayfish, breeding grounds for ibises, and feeding grounds for Brolgas at Gooseneck Swamp and the surrounding wetlands. The swamp also supports the largest known population of the endangered Wimmera Bottlebrush. Water flow has been reduced because of water harvesting from the Wannon River headwaters, however artificial drainage of the swamp has recently ceased with permanent restoration works reinstating more natural wetland levels following successful trials to demonstrate the potential for wetland restoration outcomes.

The Glenelg River system is intact along its course through the Grampians. However, significant changes to the water flow regime have altered wetlands along its course, such as Moora Moora Reservoir and Scrubby Creek. The Ming Ming Swamp wetland system in the Western Grampians also remains intact, but has reduced inflow of water because of diversion weirs along the Victoria Range.

In 2017 The Glenelg Hopkins CMA trialled an environmental water release from the Moora Moora Reservoir, using gauges to monitor how far downstream the water reached. This provided water to the temporary freshwater swamps of the Victoria Valley and habitat for species such as the Glenelg Spiny Crayfish and Yarra Pygmy-perch.

Nested assets

Five nested assets have been identified for this asset (see the table below). A diversity of riparian and wetland vegetation types provide drought refuge for a range of species. All these species depend on the intactness of aquatic and semi-aquatic systems.

Nested asset	Examples of components
Aquatic fauna, including iconic or threatened fauna	Southern Water Skink, Platypus, Water Rat, Swamp Rat, crakes, rails, platypus, snakes, turtles, Little Galaxias
Freshwater Crayfish	Glenelg Spiny Crayfish, Western Swamp Crayfish
Riparian EVCs and communities	Red Gum Swamp Community (FFG-listed), Plains Sedgy Wetland EVC (endangered), Reed Swamp (endangered), Shallow Freshwater Marsh (endangered)
Threatened flora	Wimmera Bottlebrush and Southern Pipewort
Drought refugia	Permanent pools and groundwater fed wetlands

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Habitat features	Index of Wetland Condition (plant biota)	Good	→	Good
Wetland functioning and connectivity	Index of Wetland Condition (area, hydrology, water properties)	Good	→	Good
Aquatic species extent	Species presence, occupancy	Good	→	Very Good

Conservation outcome

Wetlands	Current condition	Desired trend	Future status
By 2033, maintain or improve the condition of critical habitat features (e.g. vegetation structure), functions (e.g. hydrology and water quality) and connectivity of priority wetland ecosystems across the landscape to support wetland-dependant flora and fauna.	Good	→	Good

Heathland (treeless)

The Heathland asset is characterised by dense, low, tough-leaved shrubs and occasional small trees over a ground layer of sedges, lilies, rope-rushes, prostrate shrubs and herbs. Heathland occurs on low-nutrient soils, including deep infertile sands. Where water drainage is poor and soils are subject to waterlogging (on lower slopes, flats or depressions), a dense ground layer of rushes and sedges may grow. These sites are important refuge areas for fauna. The EVCs that make up this asset include Damp Heath Scrub, Damp Heathland, Heathland Thicket, Sand Heathland and Wet Heathland.

Heathland generally has very high species richness, supporting a wide range of fauna including a diverse heathland bird assemblage and several critical weight range mammal species. The two primary drivers of the vegetation structure and composition of Heathland ecosystems are fire and rainfall. The system is also particularly susceptible to the effect of the pathogen *Phytophthora cinnamomi*.

The 2006 Grampians bushfire created a single, young age class of plants throughout large areas of the Heathland conservation asset. This was exacerbated by additional planned burning and the 2010 (Dadswell Bridge), 2013 (Victoria Range) and 2015 (Black Range) bushfires. On the other hand, the exclusion of fire in this asset can reduce the health of this ecosystem, which requires less than 30 years between fires to maintain flora and fauna diversity.

The health of ground-dwelling native mammal populations is driven by heathland productivity (which is influenced by fire and rainfall) and the presence and abundance of foxes and cats. The recovery of native small mammals after the 2006 bushfire was associated with the 2011 floods and drought-breaking rains.

Climate change is a threat to small mammals that live in heathlands because of predicted lower rainfall and increased fire frequency. These conditions are expected to create heathland with more open vegetation, leaving small mammals more vulnerable to predators. For example, recent surveys have detected Southern Brown Bandicoot and Long-nosed Potoroo only within wetter heathland and scrub habitats, which are denser than recently burnt, drier heathland.

Nested assets

Five nested assets have been identified in this asset (see the table below). All species in these nested assets depend on the structure, composition and productivity of vegetation, which are driven by appropriate fire regimes and rainfall.

Nested asset	Examples of components
Small mammals	Heath Mouse, Common Dunnart, Southern Brown Bandicoot, Long-nosed Potoroo
Heathland-dependent birds	Tawny-crowned Honeyeater, Chestnut-rumped Heathwren, Hooded Robin, King Quail
Drought refugia	Sites with higher productivity (Wet Heathland)
Reptiles and amphibians	Southern Toadlet, Growling Grass Frog, Brown Toadlet
Freshwater crayfish	Burrowing Crayfish

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Heathland habitat structure and connectivity	Growth stage distribution (time) Spatial arrangement of growth stages Habitat complexity	Fair	↘	Good
Floristic diversity	Species richness	Fair	↘	Good
Small mammal and bird abundance and diversity	Species diversity	Fair	↘	Good

Conservation outcome

Heathland (treeless)	Current condition	Desired trend	Future status
By 2033, improve the connectivity, structural complexity and species diversity of heathland habitat.	Fair	↗	Good

Heathy Forest and Woodland

Heathy Forest and Woodland usually consists of an open forest of Messmate and Brown Stringybark of low to medium height with an open crown cover. Smaller trees such as wattles are also sometimes present. Tough-leaved shrubs such as heaths and peas dominate the ground layer, often growing with graminoids and grasses, except where frequent fire has reduced the understorey to a dense cover of bracken. Like heathlands, the great diversity of plants supports rich assemblages of woodland birds and tree and ground-dwelling mammals.

This asset is found on a range of geologies, but generally grows on low-nutrient soils, including shallow rocky soils, deep uniform sands (aeolian or outwash) and Tertiary sand/clay (altered to form quartzite gravel). It occurs on a range of landforms at various elevations, from gently undulating hills to exposed areas on ridge tops and steep slopes. The EVCs in this asset include Heathy Woodland/Plains Grassy Woodland Complex, Dry Creekline Woodland, Grassy Dry Forest, Heathy Dry Forest, Lateritic Woodland, Sand Forest, Shrubby Woodland and Heathy Woodland.

Fire, rainfall, introduced predators and *Phytophthora cinnamomi* are the primary drivers of condition in this ecosystem. Most of the woodlands affected by the 2006, 2013 and 2014 bushfires were severely burnt, resulting in complete loss of the tree canopy and understorey and in some instances complete loss of trees. These areas became unsuitable habitat for small mammals, which were not recorded in fire-affected woodlands for a number of years afterwards. A decline in bird populations was also recorded. Areas of long-unburnt woodlands act as source populations from which animals recolonise areas that have been burnt. Populations of small woodland mammals such as the Southern Brown Bandicoot periodically recovered in response to periods of high rainfall, but declined rapidly shortly after. The Long-nosed Potoroo has not recovered, and is now only known to occur at three long-unburnt sites in the Grampians Landscape and is at risk of local extinction. The loss of these small, digging mammals is thought to affect the ability of ecosystems to regenerate. Long-term studies of *Phytophthora cinnamomi* from the Grampians indicate gradual shifting of heath-dominated woodlands to graminoid-dominated systems, with up to 50% loss of root mass in affected plants. The impact has an ecosystem knock-on effect to fauna species because of a loss of rich floral resources, with affected heath species less resilient to the effects of drought, fire, frost through loss of root system condition.

Nested assets

Four nested assets have been identified in this asset (see the table below). All species in these nested assets depend on the structure, composition and productivity of vegetation, which are maintained by appropriate fire regimes and rainfall.

Nested asset	Examples of components
Small mammals	Southern Brown Bandicoot, Long-nosed Potoroo and Heath Mouse.
Arboreal mammals	Eastern Pygmy-possum, Sugar Glider and microbats
Woodland birds	FFG-listed Temperate woodland bird community
Large forest owls	Powerful Owl, Barking Owl and Barn Owl

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Woodland habitat connectivity and structure	Spatial arrangement of growth stages Habitat Complexity	Fair	↘	Very Good
Vegetation growth stage	Growth stage distribution and extent of mature growth stage.	Fair	↘	Very Good
Floristic diversity	Species richness	Fair	↘	Very Good
Small mammal diversity and extent	Species richness and occupancy of suitable habitat	Fair	↘	Very Good
Woodland bird diversity and extent	Species richness and occupancy of suitable habitat	Fair	↘	Very Good
Arboreal mammal diversity and extent	Species richness and occupancy of suitable habitat	Fair	↘	Very Good

Conservation outcome

Heathy Forest and Woodland	Current condition	Desired trend	Future status
By 2033, improve the age class, structural and floristic diversity of woodlands and increase the diversity and occupancy of woodland fauna.	Fair	↗	Very Good

Herb Forest and Woodland

Herb Forest and Woodland occurs as dry, open eucalypt woodlands of Messmate and Yellow Box trees with a sparse shrub layer. The understorey is rich in herbs, grasses, and orchids. Soils are generally shallow but fertile, and rocky outcrops may be present. This seasonally dry environment is favourable for annual herbs, and the fertile nature of the various geologies also supports perennial herbs. Herb Forest and Woodland can grow on relatively flat or undulating ground or on sedimentary sandstone ridge tops. Woodlands growing on lateritic soils are the most species-rich in the park. Plains Woodland is an open River Red Gum woodland and occupies poorly drained, fertile soils on flat or gently undulating plains at low elevations. A high diversity of grasses and herbs grow under a sparse layer of shrubs. This asset covers a large number of EVCs, including Damp Sands Herb-rich Woodland, Grassy Woodland, Herb-rich Foothill Forest, Hills Herb-rich Woodland, Alluvial Terraces Herb-rich Woodland, Plains Grassy Woodland and Plains Woodland,

Woodlands are in fair to poor condition across the Grampians (Gariwerd) Park Landscape. Condition is driven by the amount of herbivory (grazing and browsing) by native and introduced mammals, particularly rabbits, kangaroos, wallabies and deer. Research and monitoring in the Grampians National Park indicates that there are complex herbivory interactions between different fauna species, but overall herbivory is leading to poor seedling recruitment as well as a shift from palatable grasses and wildflowers to a system dominated by less palatable species such as spiky heaths. In the long-term the system is shifting away from deep-rooted perennial native grasses, which are important for maintaining nutrients and habitat in woodlands, to a less productive heath-dominated system.

Drought, pathogens, fire and past timber harvesting also affect the health of Herb Forest and Woodland. Historical sheep grazing, the introduction of rabbits, and predation by foxes and cats have led to the local extinction of some woodland small mammal species (e.g. Southern Bettong, Eastern Quoll and Eastern Barred Bandicoot) and a significant reduction in the abundance of species such as the Southern Brown Bandicoot and Long-nosed Potoroo and a retraction of their distribution into complex heathland habitats.

Recent fires have resulted in an increase in the level of invasion of Sallow Wattle in Herb-rich Woodland. When Sallow Wattle cover increases to above 30% it has significant impacts on the diversity and

functioning of these systems. Without intervention, Sallow Wattle invasion is likely to continue to modify the structure, condition and function of this conservation asset.

Nested assets

Six nested assets have been identified for this asset (see the table below). All species in these nested assets depend on a mixed canopy age with appropriate understory strata, including open patches. This vegetation structure is driven by herbivory and fire.

Nested asset	Examples of components
Orchids	Grampians Duck Orchid, Ornate Pink Fingers, Elegant Spider Orchid, Greencomb Spider Orchid, Candy Spider Orchid, Spiral Sun-orchid
Arboreal mammals and bats	Yellow-Bellied Glider, Squirrel Glider, Brush-tailed Phascogale
Reptiles	Striped Worm Lizard, monitor lizards
Woodland birds	including FFG listed Temperate Woodland Bird community Bush-stone-curlew, Diamond Firetails, pardalotes, robins
Large forest owls	Powerful Owl, Barking Owl, Barn Owl
Ant-blue Butterfly	

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Woodland (open) structure and composition	Intactness (Sallow Wattle extent) Shrub/groundcover distribution	Poor	↘	Fair
Ground layer composition and diversity	Grass distribution/cover and floristic richness	Poor	↘	Fair
Arboreal mammal diversity and extent	Species richness and occupancy of suitable habitat	Poor	↘	Fair
Reptile diversity and extent	Species richness and occupancy of suitable habitat	Poor	↘	Fair
Woodland bird diversity and extent	Species richness and occupancy of suitable habitat	Poor	↘	Fair
Habitat features	Presence/abundance of: hollows, coarse woody debris	Poor	↘	Fair

Conservation outcome

Herb Forest and Woodland	Current condition	Desired trend	Future status
By 2033, improve open woodland structure, floristically rich ground layer and critical habitat features (hollow-bearing trees, coarse woody debris, complex native grass layer).	Poor	↗	Fair

Mixed Forest

Mixed Forest in the Grampians (Gariwerd) Park Landscape includes two EVDs: Foothill Forest and Tall Mixed Forest.

Foothill Forest occurs in areas of moderate rainfall on fertile soils. They grow on gently undulating lower slopes, valley floors and on ridges. The forests are made up of eucalypt species that prefer moister or more fertile conditions, including Messmate, Grampians Grey Gum, Mountain Grey Gum and Brown Stringybark. A rich array of herbs, lilies, grasses and sedges dominate the ground layer.

Tall Mixed Forest (Eastern) grows on relatively fertile, moderately well-drained soils in areas of higher rainfall. It is characterised by the diversity of species and types of plants in the understorey, including many shrubs, grasses and herbs.

The EVCs that comprise the majority of this asset are Shrubby Foothill Forest, Valley Grassy Forest and Lowland Forest.

Heavy historical timber harvesting continues to drive the condition and composition of these ecosystems in the Park Landscape. Remnant large old trees are very rare in the forests. Fire frequency and amount of rainfall are significant ecological drivers of Mixed Forest condition, and recent fires have killed a number of remnant large old trees. Only one area of Mixed Forest in the Grampians (Gariwerd) Park Landscape, at the southern end of the Victoria Range, is considered to be long unburnt.

Nested assets

Four nested assets have been identified for this asset (see the table below). The nested assets depend on a mixed canopy age with appropriate understory strata, including open patches. This vegetation structure is driven by historical timber harvesting and current fire regimes.

Nested asset	Examples of components
Small mammals	Smoky Mouse, Dusky Antechinus, Long-nosed Potoroo, and missing species: Eastern Quoll, Spot-tailed Quoll, Southern Bettong
Large forest owls and other birds	Gang-gang Cockatoo, Yellow-tailed Black-Cockatoo, Southern Boobook, Powerful Owl, Barking Owl
Floristic diversity	Grampians Grey Gum, Grampians Rice-flower, tree-ferns, club-mosses, Fairy Aprons
Arboreal mammals and bats	Sugar Glider, Feathertail Glider, bats

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Forest growth stage	Growth stage distribution; extent of mature growth stage	Poor	→	Fair
Forest structure and composition	Consistency with EVC benchmark conditions	Fair	→	Fair
Faunal diversity and extent (arboreal mammals, bats, small mammals, large forest owls and birds)	Species richness and occupancy of suitable habitat	Unknown		Unknown

Conservation outcome

Mixed Forest	Current condition	Desired trend	Future status
By 2033, allow the development of mature vegetation growth stages and complex vegetation structure of Mixed Forests, including habitat for important fauna.	Poor	↗	Fair

Rocky Knoll

The Rocky Knoll asset occurs on exposed rocky outcrops at higher elevations, where rock is a dominant landform feature, soils are shallow or almost absent, and effective rainfall is low. Rocky Knolls are typically damp to wet in winter and dry in summer. Scattered, often stunted trees are occasionally present. Rock-adapted shrub species and herblands of grasses, herbs and geophytes can be found growing on rocky terraces. A diverse shrub layer to four metres tall characterises this vegetation type, including a number of rock-adapted species. The ground layer of plants is usually sparse and has few species, except where it occurs in a mosaic with Rocky Outcrop Herbland.

The EVCs that comprise the Rocky Knoll asset are Montane Rocky Shrubland/Shrubby Foothill Forest Complex, Rocky Outcrop Herbland and Rocky Outcrop Shrubland. The habitats found amongst Rocky Knolls support a unique set of flora and fauna. Basking rocks, cracks and hollows are used by reptiles, springs, seepages, small pools, nesting and roosting sites for small birds, and rocky areas provide a substrate for many mosses and lichens. Caves and terraces are habitat and refuge for the Brush-tailed Rock-wallaby, Grampians Mountain Dragon and the critically endangered Grampians Pincushion-lily, which is endemic to the Grampians (Gariwerd) Park Landscape.

Previous practices such as sport hunting and the fur trade have had a catastrophic impact on the Brush-tailed Rock-wallaby, which became extinct in the Park Landscape. A small number have since been reintroduced.

Rocky Knoll areas are also very significant cultural sites for Traditional Owners, and are the location of the largest concentration of rock art sites in Victoria. These sites, along with Rocky Knoll habitats, are vulnerable to damage by goats.

Our understanding of how this asset functions and responds to disturbance is poorly understood. It probably provides refuge from fire as well as an array of basking sites often favoured by reptiles and some invertebrates.

Nested assets

Five nested assets have been identified for this asset (see the table below). Our understanding of the role of key ecological attributes in supporting the persistence of these nested assets is limited and will be developed through the implementation of this plan.

Nested asset	Examples of components
Rocky substrates and bryophytes	Basking rocks, cracks and hollows, springs, seepages, small pools, nesting and roosting sites, landscape aesthetic, moss, lichen
Reptiles	Grampians Mountain Dragon, Cunningham's Skink
Raptors	Peregrine Falcon, Wedge-tailed Eagle
Brush-tailed Rock-wallaby	
Grampians Pincushion-lily	

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Brush-tailed rock-wallaby abundance and recruitment	Population number, juvenile number	Poor	↘	Fair
Grampians Pincushion-lily extent and abundance	Number of plants, number of sites	Poor	↘	Fair
Habitat features	Presence of moss beds, rock pools, shade trees, tussock grass stands	Fair	↘	Good

Conservation outcome

Rocky Knoll	Current condition	Desired trend	Future status
By 2033, protect Rocky Knoll substrate and habitat features at key locations to maintain attributes of key species.	Fair	↗	Fair – Good

Montane

The majority of the Montane asset occurs as a treeless or sparsely treed shrubland (Montane Rocky Shrubland EVC) on well-drained, very shallow sandy loams of rocky high-altitude peaks in the Mt William, Serra and Victoria Ranges. The shrubland consists of a diversity of tough-leaved shrubs over a variable ground layer of sedges, herbs and rush-like species. Less commonly it is an open and sparse eucalypt mallee woodland (Montane Grassy Woodland EVC) dominated by Grampians Sally.

High Altitude Wetland (represented by the Montane Wet Heathland EVC) occurs in wet soak depressions, narrow gullies and headwaters of creeks in the high-rainfall montane areas of the Major Mitchell Plateau. It grows as dense, heathy shrubs over sedges and rushes. Occasional stunted eucalypts are present. It is likely that the high organic content of these soils improves water retention capacity, and regulates and stabilises run-off to benefit base flows in creeks and sub-surface flows.

Montane ecosystems provide habitat for threatened fauna such as Smoky Mouse, Southern Brown Bandicoot and Grampians Mountain Dragon. All populations of these species are thought to be in continued decline due to severe, large-scale bushfires.

Fire is an important driver in Montane ecosystems, much of this conservation asset has been burnt in recent fires. The extent and severity of recent fires in this system and the slow maturation cycle means that, for the lifetime of this plan, planned fire is very unlikely to improve the condition of the key ecological attributes.

Nested assets

Four nested assets have been identified for this asset (see the table below). All rely on old growth stages, which have been greatly reduced by recent bushfires.

Nested asset	Examples of components
Montane endemic EVCs	Montane Wet Heathland
Small mammals	Smoky Mouse, Southern Brown Bandicoot.
Small reptiles	Grampians Mountain Dragon
Invertebrates	Grampians Isopods (*Gariwerdeus beehivensis, Gariwerdeus ingletonensis, Gariwerdeus turretensis, Naiopegia xiphagrostis, Phreatoicopsis raffae, Phreatoicopsis terricola, Synamphisopus ambiguous, Synamphisopus doegi*), moths and butterflies

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Small mammal extent and abundance	Smoky Mouse occupancy of suitable habitat	Fair	↘	Very Good
Montane growth stage	Growth stage distribution; Extent of mature growth stage	Fair to Poor	↘	Fair to Good
Faunal diversity and extent (arboreal mammals, small mammals, large forest owls and birds)	Species richness and occupancy of suitable habitat	Unknown		Unknown

Conservation outcome

Montane	Current condition	Desired trend	Future status
By 2033, allow the development of mature vegetation growth stages within the Montane asset to benefit fauna (especially Smoky Mouse) and regulate hydrological processes.	Fair	↗	Very Good

Wet Forest

In the Grampians (Gariwerd) Park Landscape, Wet Forest is an aggregate of the Moist Forest and Tall Mist Forest EVDs. Moist Forest (EVC Damp Forest) is dominated by eucalypts up to 30 m high, with a dense, medium to tall shrub layer consisting of mixed species from both wet and dry forest types. The ground layer includes herbs and grasses as well as a variety of moisture-dependent ferns. Wet forest generally occurs on well-developed colluvial soils at a variety of aspects and elevations.

Tall Mist Forest is also dominated by a eucalypt overstorey to 30 m but is restricted to south-facing steep, narrow gullies. These gullies are sometimes spring-fed and are supplemented by relatively high annual rainfall. A scattering of understorey trees and shrubs occur over a moist, shaded and fern-rich ground layer. The high organic content of the soils in these communities improves water retention capacity and also regulates and stabilises run-off, which benefits base flows in creeks and subsurface flows.

Tall Mist Forest (Wet Forest EVC) is important habitat for the Smoky Mouse, large forest owls, and assemblages of invertebrates of relict Gondwanan origin. These rare in-stream macro-invertebrate fauna assemblages inhabit wet gullies on the eastern aspects of Victoria Range, including Sawmill Creek. These moist environments function as drought refugia for flora and fauna throughout the landscape. Most of the areas of Damp and Wet Forest EVCs in the Mt William Range, Victoria Range, Mt Difficult Range and Serra Range were severely burnt in the 2006 and 2014 bushfires.

Nested assets

Three nested assets are associated with this asset (see the table below). Many of these depend on the exclusion of fire for the establishment of mature Wet Forest.

Nested asset	Examples of components
Smoky Mouse	
Large forest owls	Powerful Owl, Barking Owl
Macro-invertebrate assemblages	Grampians Isopods (*Gariwerdeus beehivensis, G. ingletonensis, G. turretensis, Naiopegia xiphagrostis, Phreatoicopsis raffae, Phreatoicopsis terricola, Synamphisopus ambiguous, S. doegi*).

Condition

Key ecological attribute	Indicator	Current condition	Current trend	Condition goal
Watershed functioning and connectivity	Hydrology, water quality (Index of Stream Condition)	Fair	→	Good
Wet Forest structure and composition	Consistency with EVC benchmark conditions	Fair	→	Good
Growth stage	Growth stage distribution; extent of mature growth stage	Fair	→	Fair
Macro-invertebrate diversity and extent	Species richness and occupancy of suitable habitat	Fair	→	Good

Conservation outcome

Wet Forest	**Current condition**	**Desired trend**	**Future status**
In the 15 years to 2033, maintain areas of mature Wet Forest and allow areas to reach growth stage maturity to provide fauna refuge and high water quality and yield.	Fair	↗	Good

Sallow Wattle monitoring

6 Threats to conservation outcomes

6.1 Methodology for assessing threats

Parks Victoria's method for assessing threats broadly follows the process outlined in the current standard for risk management (AS/NZS ISO 31000: 2009). Threats to conservation assets are assessed against their impact on achieving the defined conservation outcome for each asset and their direct impact on key ecological attributes. The assessment is a three-step process.

1 **Identify threats to conservation outcomes.**

   Threats to conservation assets are identified by assessing the threat agents as well as the impact of the threatening process on key ecological attributes. For example, the effect of foxes (agent) is predation (process), which reduces the abundance and diversity of small ground-dwelling fauna (impact).

2 **Classify threats.**

   Threats are classified according to a risk assessment matrix that defines both the likelihood and ecological consequence of the identified threats impacting on key ecological attributes (Carey et al. 2007). Threats are ranked as extreme, high, moderate or low risk. Priority areas for the risk abatement of threats are mapped.

3 **Develop threat management objectives.**

   Threat management objectives are developed to mitigate the impact of the threats that are the greatest risk to conservation assets. Threat management objectives specify the change in high risk threats required to achieve a particular conservation outcome for a conservation asset.

6.2 Threats to conservation assets

A broad range of key threats to the conservation assets of the Grampians (Gariwerd) Park Landscape were identified by participants in the conservation action planning workshops. These threats have been assessed and ranked using the methodology described above (Table 6.1). The highest-ranked (extreme) threats are discussed in the following sections. These are the high-priority threats that will be addressed directly through this plan.

The key threats to the terrestrial conservation assets relate to impacts on the key ecological attributes, and are generally considered to be those with the greatest impact on the regeneration, recruitment and restoration of species and ecological communities. This focuses management on the need to ensure that species and ecological communities are functioning within acceptable bounds to maintain key species and threatened flora and fauna populations (e.g. small mammals, heathland birds, Grampians Pincushion-lily).

Table 6.1 Key threats to the key ecological attributes of the Grampians (Gariwerd) Park Landscape.

Threatening process	Threat agent and impact	Key ecological attributes				
		Ground-dwelling mammals	Vegetation structural complexity	Floristic diversity	Watershed & wetland functioning & connectivity	Arboreal mammals, woodland birds & large forest owls
Predation	Decline in populations and abundance of native mammals due to fox and cat predation.	Extreme	—	—	—	Extreme
Fire — regimes and management	Too frequent, infrequent, wrong season / severity / scale, causing the degradation of habitat, landscape functioning and connectivity. Reduced capacity for landscape to support biodiversity.	Extreme	Extreme	Extreme	Extreme	Extreme
Alteration to natural hydrology	Increased severity of extreme events (flood and drought) reduces water quality and impacting species habitat and life cycles	Extreme	Extreme	Extreme	Extreme	—
Alteration to natural hydrology	Harvesting or diversion and barriers to water movement hinder flows needed to support ecosystem processes.	—	—	—	Extreme	—
Over-grazing /over-browsing	Rabbits, goats and deer apply grazing pressure to vegetation, and selectively browse flora resulting in simplification of vegetation structure and reduced floral diversity.	High	High	High	High	—
Invasion by terrestrial weeds	Weeds outcompete native species, alter vegetation structure and impact fire and hydrological regimes	—	Extreme	Extreme	High	Extreme
Over-grazing /over-browsing	Overabundant kangaroos and wallabies impact on the regeneration and recruitment of native species.	High	High	Extreme	Moderate	Extreme
Diseases	Direct decline in vegetation and amphibian diversity caused by Phytophthora and Chytrid Fungus.	High	Extreme	Extreme	Extreme	—

Predation by foxes and cats

Threat description

The threat of predation is influenced largely by introduced predators (Red Foxes and Feral Cats) and poses an extreme risk to a range of assets across the Grampians (Gariwerd) Park Landscape. This threat affects ecosystems primarily by reducing the abundance of prey species, including species that support ecological processes (e.g. small mammals that dig). Predation by foxes and cats occurs throughout the Park Landscape and has contributed to the decline in the health of a range of conservation assets. Predation also compounds the impacts of drought and bushfire on native animal populations.

Little is known about the abundance of cats in the Grampians and their response to long-term landscape-scale poison baiting of foxes. Programs elsewhere that focused on controlling a single predator species have resulted in an increase of other predator species. The integrated control of predator species is important for effectively managing the threat while supporting the recovery of populations of native mesopredators such as Spot-tailed Quolls that have been lost from the Grampians (Gariwerd) Park Landscape. The role of native predators and how they can be supported to recover is a gap in our current understanding of these systems. Building this knowledge will support the ongoing effective management of predation pressure by both introduced and native predators.

Threat objective

By 2023, reduce fox and feral cat predation pressure at the landscape scale to support populations of ground-dwelling mammals, including the Brush-tailed Rock-wallaby, Long-nosed Potoroo, Southern Brown Bandicoot, Smoky Mouse and Spot-tailed Quoll.

Fire regimes and management

Threat description

Fire is a threat that poses an extreme risk to a range of assets throughout the Grampians (Gariwerd) Park Landscape. The primary threat is frequent large-scale and high intensity bushfires, which have impacted 85% of the Grampians National Park over the last decade. Landscape-scale bushfires create large areas of single-age vegetation and reduce the variability of vegetation and habitats, affecting the ability of species to survive and recolonise after fire. Old-growth vegetation, and the fauna it supports, is particularly vulnerable to frequent fire. Large fires may reduce the size of animal populations as well as the food availability for surviving animals, which can have a severe impact on threatened species.

Managing fire in the landscape to decrease the likelihood of the intensity and extent of fires that have occurred recently is essential to reducing this threat. Increasing the diversity of burn histories in fire-dependent sub-ecosystems (Heathland, Heathy Forest and Woodland and Herb Forest and Woodland) as well as excluding fire from those that are fire sensitive (Riparian, Wet Forest and Montane) will help to increase the variability of vegetation growth stages and habitats.

To increase the variability of vegetation growth stages and habitats, fire must be managed to ensure that conservation assets are not burnt more frequently than their tolerable fire intervals, and that fire occurs at the appropriate intensity, timing and season for the vegetation type. The spatial arrangement of vegetation growth stages is also important to support suitable habitat for species with specific requirements, and for species to be able to recolonise areas in the years following fire when the habitat becomes suitable for their needs.

Fire management can have an impact on conservation assets through activities such as track and control line establishment for bushfire suppression and planned burning. Fire management vehicles can also spread pathogens and weeds. In the Grampians (Gariwerd) Park Landscape, fire should be managed through existing roads and tracks where possible to limit the physical impact of fire management, as well as the spread of pathogens and weeds.

Threat objective

By 2023, reduce the average size and intensity of bushfire from 2011–2016 averages, reducing the likelihood of ecosystems having large, connected areas of a single vegetation age.

Alteration to natural hydrology

Threat description

Riparian and wetland systems are sensitive to changes in water quality and quantity which can compromise their character, health and function. The primary threat to wetlands in the Park Landscape is the alteration of hydrology caused by water harvesting, diversion and associated infrastructure. Historical infrastructure continues to supply water to the region in the present day. This is prevalent in the upper reaches of the Glenelg River where the Moora Moora Reservoir and weirs in the upper Wannon River are used to divert water to the Wimmera system, via a channel system, referred to as the Wimmera-Glenelg Headworks System.

Water diversion and retention infrastructure has cut off some floodplains and wetlands from natural flooding and caused more permanent inundation in others. These changes alter the characteristics of wetland habitat, particularly affecting species confined zones between high and low water levels. Water diversion and retention infrastructure also obstructs species movement and alters the flow and presence of water.

Wetland function and the existence of drought refugia depends on structural intactness, which is vulnerable to degradation from trampling by exotic species such as deer. Introduced exotic vegetation can also impact wetland characteristics and alter water consumption, as well as altering vegetation structure and hindering flows.

Deeper marshes provide important drought refugia in dry conditions when shallow ephemeral systems have dried out. The relative permanence of deeper marshes makes them more likely to be subject to water harvesting. Groundwater harvesting also has the potential to compromise the filling and permanence of groundwater-fed wetlands that provide critical drought refugia in the absence of riverine-fed systems.

Wetland and riparian health is also impacted by natural disturbance such as bushfires and floods. The frequency and intensity of these events are exacerbated by climate change, resulting in excessive erosion, increased sediment transport and high nutrient loads.

Altered water temperatures and reduced water quality (e.g. eutrophication or decreased dissolved oxygen) can affect the metabolism, growth and reproduction of aquatic species.

Collaboration with Catchment Management Authorities, water corporations, non-government organisations, waterholders and other stakeholders is required to restore wetlands and flow regimes.

Threat objective

By 2023, reduce the impact of water harvesting activities and water diversion infrastructure to restore more natural flows to priority wetlands and mitigate the impacts of floods and droughts on waterway function and ecological services.

Over-grazing / over-browsing

Threat description

Over-grazing and over-browsing pose a high risk to a range of assets across the Park Landscape and are largely driven by introduced rabbits, goats and deer, although native herbivores (e.g. wallabies and kangaroos) also have an effect. This threat particularly impacts the floristic diversity and structural complexity of Heathy Forest and Woodland, Herb Forest and Woodland and Rocky Knoll ecosystems, and the habitat values of Riparian and Wetlands conservation assets. Managing the threat is essential for the successful regeneration of key canopy species, increasing species diversity in the shrub layer, and improving overall vegetation cover, complexity and floristic richness.

The impacts of this threat vary between species and locations. Feral Goats inhabit Rocky Knoll areas and impact the endangered Grampians Pincushion-lily and montane vegetation communities. Red Deer browse on small trees (e.g. Silver Banksia) and woody shrubs (e.g. Slaty Sheoak and Oyster Bay Pine) and graze on the ground layer, mainly in Herb Forest and Woodland, reducing the diversity and regeneration of the shrub layer and altering the nature of the ground layer. Fallow Deer were once restricted to the eastern Grampians, but their distribution and abundance has been increasing in recent years.

Native herbivores, including kangaroos and wallabies, are also likely to impact regeneration and recruitment of native species. Browsing by native herbivores tends to have a higher impact on Herb Forest and Woodland rather than Heathland and Heathy Forest and Woodland. Kangaroo populations are often largest in areas adjacent to private land where there is abundant food and shelter. Although rabbits are not highly visible in the Grampians landscape, rabbit population densities are sufficiently high to have impacts in Herb Forest and Woodland, particularly in sandier soil profiles.

The effective management of grazing and browsing pressure involves the integrated reduction of introduced herbivores and the management of native herbivores to support the regeneration and health of the identified conservation assets.

Threat objective

By 2023, reduce deer, rabbit, and goat impacts and monitor overabundant native herbivore populations**.**

Invasion by terrestrial weeds

Threat description

The primary threat of weed invasion is the spread of the native woody perennial Sallow Wattle, but this may change over time with shifting climates, the introduction of new weeds and the spread of other established weed species. It is essential to have an appropriate monitoring program coupled with the resources required to treat and eradicate new populations of weeds that are likely to affect conservation assets (such as woody weeds creating a dense mid-story in woodland areas).

A number of established high-risk weeds are already having a direct impact on assets and limiting the recovery and restoration of important areas. Sallow Wattle invasion is a critical problem because it undergoes mass germination after fire, supressing the regeneration of indigenous plants and modifying the habitat for fauna. Wattles and other plants within the family Fabaceae fix atmospheric nitrogen in the soil, which can support other introduced vegetation able to readily exploit high nutrient availability and deter the reproduction and persistence of native species adapted to nutrient-poor soils.

New and emerging weeds also present a potential threat to the Grampians (Gariwerd) Park Landscape. Because of the largely unknown nature of these weeds, the level of threat will vary between species and locations. Prevention and readiness strategies to reduce the potential for invasion and enable timely responses will reduce the likelihood that new and emerging weeds become problematic in the future.

Threat objective

By 2023, eradicate all identified new and emerging weeds and contain the spread of Sallow Wattle, ensuring it does not spread beyond its 2018 distribution.

Diseases

Threat description

The threat of diseases was assessed as high to extreme in the Grampians (Gariwerd) Park Landscape, mainly because of the presence and extent of phytophthora dieback and amphibian chytridiomycosis. Dieback caused by the plant pathogen *Phytophthora cinnamomi* poses a high to extreme risk to many assets in the Park Landscape. It affects the roots of susceptible plant species, causing dieback and eventual death. Heathy ecosystems are particularly affected. The pathogen is spread by walkers and vehicles, and has been detected along tracks and roads throughout much of the Park Landscape. Animals moving through the landscape also spread the disease.

The only technique known to prevent the spread of *Phytophthora cinnamomi* in bushland areas is to restrict management activities and off-track access to remote areas or implement stringent vehicle and equipment protocols. Careful planning of the construction of new tracks to avoid sensitive, disease free areas is a way to prevent the spread of the fungus into ecosystems that are known to be very susceptible.

Chytridiomycosis is an infectious disease that affects amphibians caused by the fungus *Batrachochytrium dendrobatidis*. The fungus lives in water or soil and is thought to infect frogs when their skin comes into contact with water and soil that contains fungal spores. The fungus has contributed to the decline and extinction of a number of Australian frog species, including the Growling Grass Frog. As with *Phytophthora cinnamomi*, the only effective technique to prevent spread is to restrict management activities and off-track access to remote areas.

There is no strategy to directly address this threat in this conservation action plan. However, all aspects of management in the Park Landscape will consider the threat of disease and minimise the spread of pathogens by implementing a threat reduction approach to activities such as fire management and roadworks.

Threat objective

By 2023, contain the spread of *Phytophthora cinnamomi* and *Batrachochytrium dendrobatidis* to currently infected areas.

Rosy Hyacinth Orchid, *Dipodium roseum*

7 Conservation strategies

7.1 Prioritising conservation strategies

A broad range of conservation strategies and actions have been considered, including those in existing park management plans and regional catchment strategies as well as additional strategies identified by regional staff and conservation partners. These strategies have been assessed for their impact, feasibility and cost in relation to achieving the conservation outcomes identified in this plan. Through this process, strategies have been ranked as low, medium or high priority. High-priority strategies have been further ranked through a structured decision-making process to establish the greatest overall impact and feasibility within a given resource allocation.

A full list of strategies and their prioritisation is presented in Appendix B. Each strategy may be suitable for further refinement or development with conservation partners and stakeholders who wish to further support conservation outcomes in the Grampians (Gariwerd) Park Landscape.

Strategies prioritised through this process are as follows:

- Fire management for healthy ecosystems
- Support partnerships to improve water regimes
- Manage predation pressure at a landscape scale
- Environmental weed program
  - Sallow Wattle containment
- Herbivore management
- Collaborative partnerships to address key knowledge gaps.

7.2 Priority strategies

Priority strategies have been further developed to establish guiding statements around the key implementation components of each strategy. These were tested through the development of results chains, which test the logic of the strategy in a stepwise manner for delivering the desired outcomes. These results chains were used to develop key implementation milestones for each strategy, which include measurable outputs and outcomes that help managers to understand the impacts of management on improving the viability of conservation assets and managing threats.

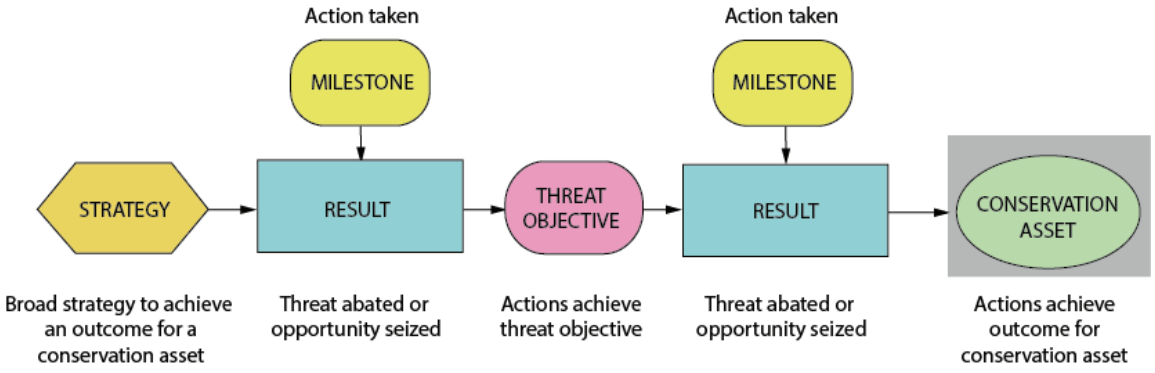
Conservation strategy

Conservation strategy development has focused on either addressing key threats or improving the health of key conservation assets or both. The development of these priority strategies has been undertaken using results chains to ensure that the actions that are defined within the strategy are those that will lead directly to addressing the objectives and conservation outcomes of this plan. Each strategy is captured in a statement which defines:

- the impacts of the strategy on key threats
- the approaches to be applied
- the measures of success
- the impact of the strategy on conservation outcomes.

Results chain

Results chains have been developed for all conservation strategies. They express the relationship between the conservation strategy, identified threats and an improvement in the desired state of conservation assets, as well as the assumptions that underpin how we think a conservation strategy will contribute to maintaining one or more conservation assets. The results chain helps visualise and identify some initial monitoring indicators and milestones. Below is a simple example of a results chain.



Implementation milestones

Result	Activities
Output from the results chain	Corresponding actions taken

Fire management for healthy ecosystems

This strategy involves working in partnership with other fire management agencies, particularly DELWP, to improve the ecological and cultural health of the Grampians (Gariwerd) Park Landscape through appropriate fire management.

As the lead agency for fire management on public land in Victoria, DELWP works with Parks Victoria to develop and deliver fire management programs that are based on risk mitigation. DELWP sets objectives for bushfire management on public land and develops strategies and actions for prevention, preparedness, fuel management (including planned burning and non-burning fuel treatments), response and recovery programs (DEWLP 2012). Parks Victoria works to ensure our landscapes are managed in the most effective and respectful way to ensure the persistence of high-quality habitat supporting healthy populations of flora and fauna, particularly threatened species.

Appropriate fire management recognises that assets have differing fire needs, including the scale, severity, intensity, frequency, and seasonal timing of fire events (both bushfire and planned burning). The impacts of such events on the health of assets may occur immediately after in the loss of faunal habitat and decreases in populations, but may also be evident over the longer term through impacts on the ability of species to recolonise burnt areas, or through increased predation or competition for resources that may last decades after large bushfires.

Fire management is a high priority management program in the Heathland, Heathy Forest and Woodland, Mixed Forest, and Herb Forest and Woodland. Over the last 10 years Parks Victoria has established a biophysical unit approach to managing this landscape. The biophysical unit boundaries recognise that the movement of fauna through the landscape can be limited by physical landscape features, or by the physiological or habitat preferences of species, thus effectively creating independent units and metapopulations of species. The units delineated for the Grampians landscape (Figure 7.1) are used by land and fire managers as the base scale for setting desired medium and long-term outcomes for specific ecological values that are potentially most impacted by fire (Palmer & Munawer, 2009).

Bushfire events over the last 10–15 years have created large areas of similarly aged and currently young vegetation and habitat through the Grampians National Park. Planned burning programs in these systems will be undertaken with cautious consideration of habitat connectivity, maintaining habitat complexity

and the effect on growth stage composition across the Park Landscape. The aim is to increase the percentage of the landscape that is considered 'long unburnt' over time and use targeted fuel management approaches to reduce the extent of high-severity bushfires that impact the tree canopy. Mosaic burns will be achieved through the diverse application of fire, working with the landscape vegetation types (e.g. burning up to escarpments) or burning during wetter seasons (e.g. winter burning).

Fire in Grassy Forest and Woodland needs to be applied to reduce heath intrusion and improve the condition of the ground layer in terms of floristic diversity and native grass structure. Care must be taken not to encourage spread of Sallow Wattle. Controlling grazing by herbivores (macropods, rabbits and deer) will also be an essential complement to the burning program, to reduce the potential for overgrazing following planned burns.

This strategy supports a risk mitigation and cross tenure approach to fire management, aiming to retain appropriate fire in the landscape and reduce the impacts of planned burning and large bushfires. In particular, it supports:

- applying ecologically sensitive fire to fire-dependent ecosystems, based on our knowledge of tolerable fire intervals, vegetation growth stage distributions and geometric mean abundance
- targeting fuel management to protect ecological, cultural and infrastructure assets, based on identified risk mitigation needs
- undertaking fire preparedness and suppression activities in accordance with environmental and fire management guidelines, including local planning documents
- actively excluding fire from fire-sensitive ecosystems and other high-priority areas.

It is important that the appropriate growth stage structure for each vegetation type is considered and used to guide the planning process for planned burns across the Park Landscape. Particularly critical is retaining critical habitats provided in long-unburnt vegetation. The location of planned is also recognised as important to support habitat connectivity and facilitate recolonisation of burnt areas.

The strategy also aims to increase knowledge and valuing of traditional burning practices. Parks Victoria will support local Traditional Owners in incorporating cultural and ecological knowledge into fire plans and strategies developed by DELWP. Parks Victoria will also support the training and mentoring of Indigenous rangers as forest fire-fighters, implementing traditional burning practices that have a positive ecological benefit and can help to engage the community in cultural understanding.

Parks Victoria also has a key role in supporting the rehabilitation and ecological recovery of ecosystems after fire. In the early stages of recovery after fire, populations of threatened species can be more at risk from predation and overgrazing or overbrowsing, or degradation from the unauthorised use of fire-affected areas by park visitors.

Conservation outcomes

Habitat degradation and impacts to cultural assets from fire management operations are reduced.

Strategy summary

Use fire as a tool to maintain fire-dependent habitat or species, exclude planned fire from fire-sensitive habitats, and apply fire to the periphery of priority habitats and species to provide protection.

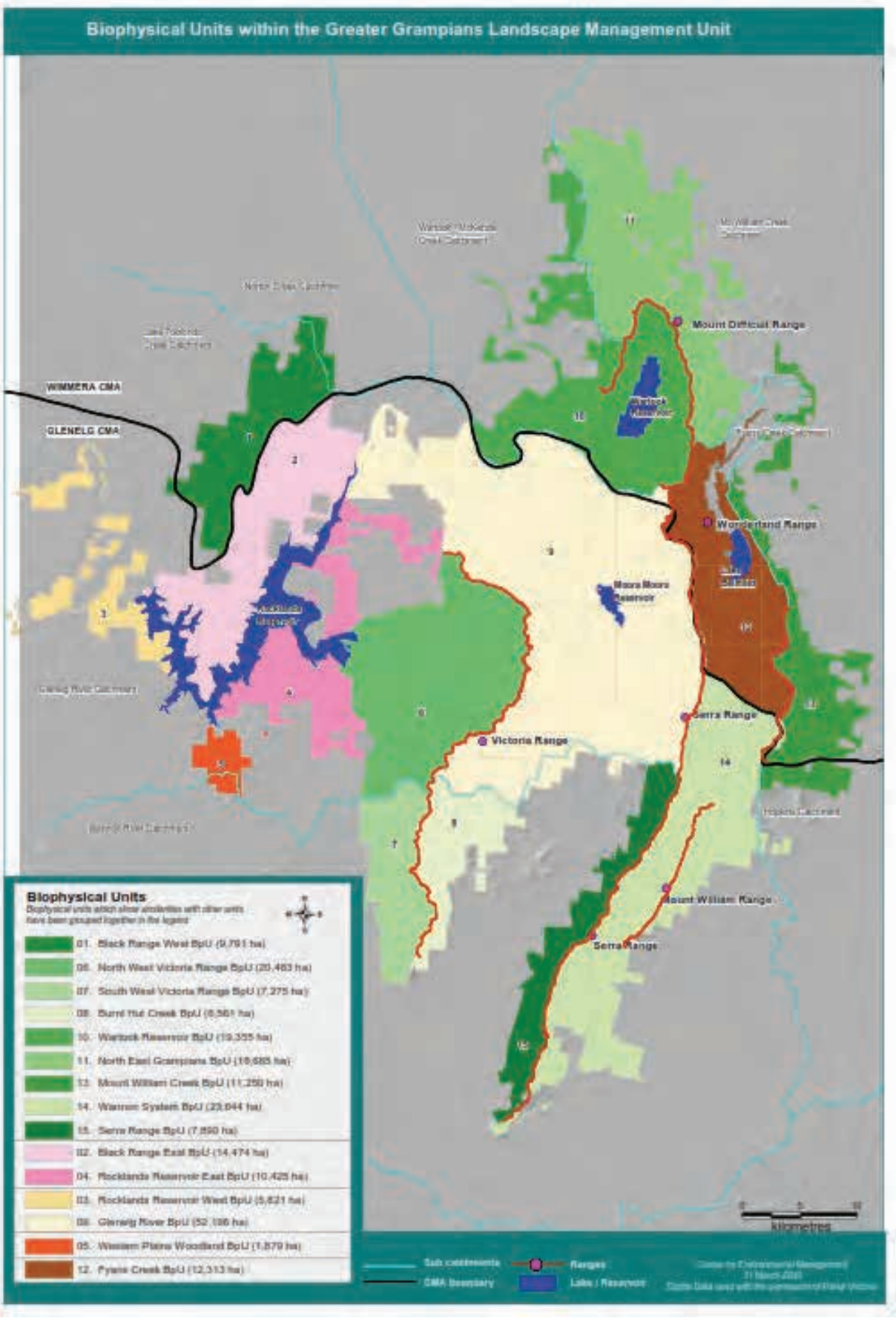
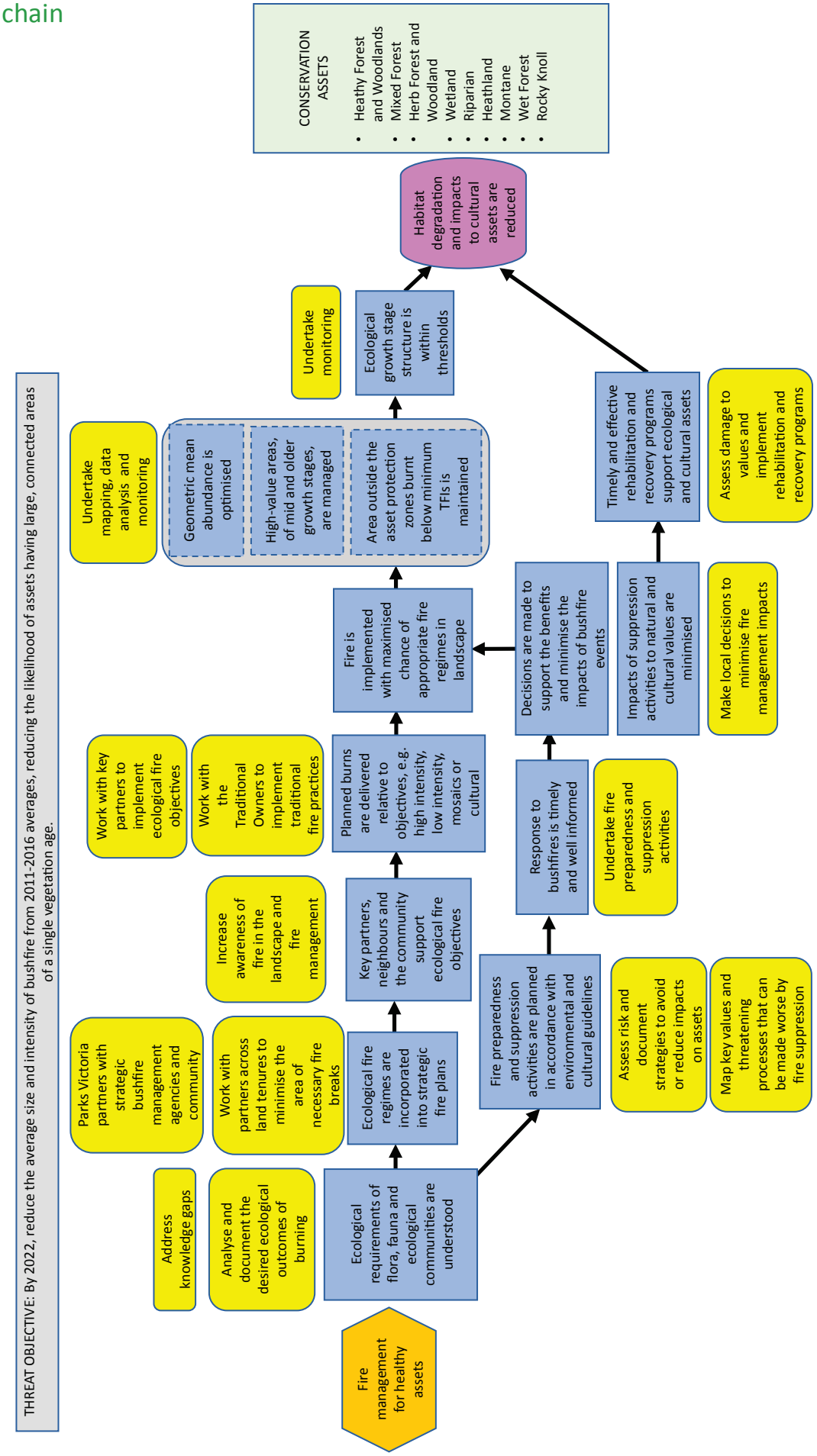


Figure 7.1 Biophysical units of the Grampians (Gariwerd) Park Landscape.

Results chain



Implementation milestones

Result	Activities
Ecological requirements of flora, fauna and vegetation communities are understood.	Address knowledge gaps. Analyse and document desired ecological growth stage. structure (spatial and temporal), geometric mean abundance and Tolerable Fire Intervals (TFIs).
Ecological fire objectives are incorporated into strategic fire plans.	Partner with strategic bushfire management agencies (DELWP) and the community. Where possible, work with partners across land tenures to minimise the area of necessary fire breaks.
Key partners, neighbours and the community support ecological fire objectives.	Use the Fire Operations Plan as a public communication tool to increase awareness of fire in the landscape, considerations of management, and the use of non-burn fuel treatments.
Planned burns are delivered relative to objectives, e.g. high intensity, low intensity, mosaics or cultural.	Work with DELWP to implement ecological fire objectives. Utilise the fire round-table meetings as a forum for liaison. Work with Traditional Owners to implement traditional fire practices where practical. Undertake peripheral burning to protect priority species and priority habitats.
Fire is implemented with maximised chance of appropriate fire regimes in the landscape.	
Geometric mean abundance of species (a measure of biodiversity) is optimised. High value areas if mid and older growth stages are managed. Area outside of the asset protection zones burnt below minimum TFIs is minimised.	Undertake mapping, data analysis and monitoring.
Fire preparedness and suppression activities are planned in accordance with environmental and cultural guidelines.	Assess risk and document strategies to avoid or reduce. impacts on assets. Identify opportunities where bushfire will benefit ecosystems. Map key values (natural and cultural) and threatening processes (weeds, pests and pathogens) that can be made worse by fire suppression.
Response to bushfires is timely and well-informed.	Undertake fire preparedness and suppression activities in accordance with strategies, guidelines & legislation.
Decisions are made to support the benefits and minimise the impacts of bushfire events. Impacts of suppression activities to natural and cultural values are minimised.	Make local decisions to minimise fire management impacts, such as the placement of dozer breaks.
Timely and effective rehabilitation and recovery programs support ecological and cultural assets.	Assess damage to assets and implement rehabilitation and recovery programs in a timely manner.
Ecological growth stage structure is within thresholds.	Carry out monitoring.
Habitat degradation and impacts to cultural assets are reduced.	

Support partnerships to improve water regimes

Managing environmental flows involves managing the timing, frequency, duration, depth and extent of water inundation where feasible, to improve the health of wetlands and other water-dependent ecosystems in the Grampians (Gariwerd) Park Landscape. Key activities include working in partnership with Catchment Management Authorities to prepare environmental watering plans, and with other key partners including Nature Glenelg Trust, Deakin University and water authorities to improve or rationalise water infrastructure and restore associated aquatic and riparian habitat. These plans and activities will improve the ability to provide appropriate water regimes to the Park Landscape. Because water, infrastructure, catchments and the park and reserves are managed by various agencies, collaboration and partnerships with stakeholders are required to deliver improved waterway outcomes and rationalise existing infrastructure while balancing social and economic demands in the region. Partnering with flood and emergency services agencies to build capacity in timely flood response is also a priority to ensure visitor safety and achieve good ecological outcomes for water-dependent ecosystems.

Priority water-dependent assets for restoration include swamps in the Victoria Range, the upper Wannon River, upper Glenelg River, upper MacKenzie River, Moora Moora Dam and Gooseneck Swamp. Priority species that depend on drought refugia include the Platypus, galaxiids and crayfish.

The strategy is divided across four broad objectives:

- Ensure the annual delivery of environmental water, supported by the development and renewal of plans such as annual watering plans and waterway strategies.
- Identify opportunities for assets that do not currently receive environmental water to have more natural water regimes reinstated.
- Update or remove legacy infrastructure and redundant water channels in the landscape and restore flow regimes.
- Prepare appropriately for floods, ensuring visitor safety and ecological outcomes in flood-prone areas.

Water infrastructure

The water infrastructure includes water regulation and diversion as well as a number of groundwater bores in and close to the Park Landscape.

Unlicensed, disowned and legacy utilities are an ongoing issue in the Grampians (Gariwerd) Park Landscape. Although this was mentioned in the 2003 management plan, clarifying the ownership of assets has been difficult and remains largely unresolved. Cataloguing assets and working with stakeholders to ascertain ownership is the first step in rationalising infrastructure in the Park Landscape.

The Grampians Wimmera Mallee Water Corporation administers bore water and associated licensing and monitors water use. Water harvesting data for both surface and groundwater is provided to DELWP, which manages records. Collaboration between agencies is important for understanding water and wetland relationships and ensuring sustainable water use.

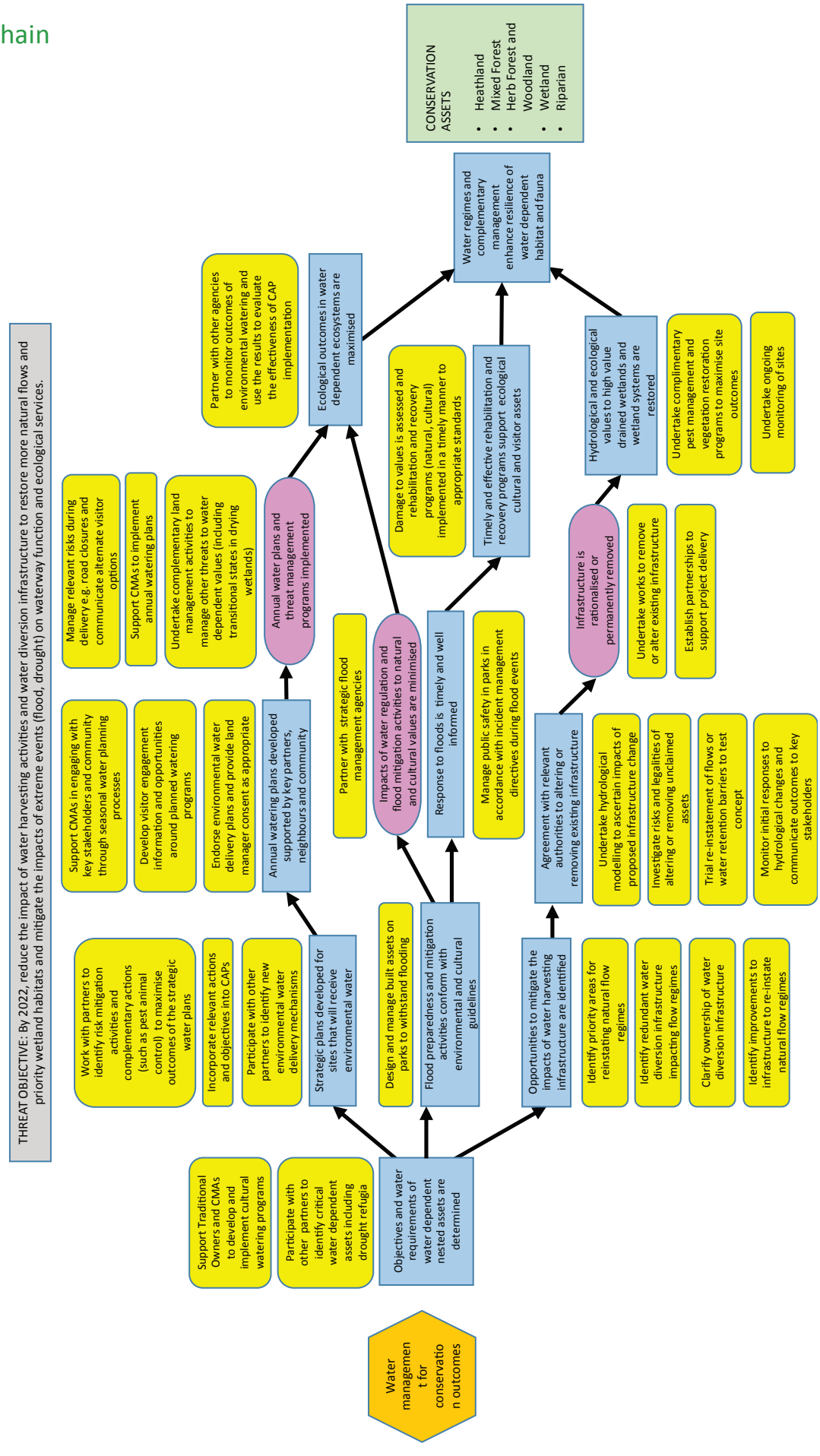
Conservation outcomes

Water regimes and complementary management activities enhance the resilience of water-dependent habitat and fauna.

Strategy summary

Support partnerships to improve water-dependent conservation assets by maintaining and improving the hydrological regimes that support them in the landscape.

Results chain



Implementation milestones

Result	Activities
Objectives and water requirements of water-dependent nested assets are determined.	Support Traditional Owners and CMAs to develop and implement cultural watering programs. Participate with partners to identify critical water dependent assets, including drought refugia and threatened species.
Strategic plans are developed for sites that will receive environmental water.	Work with partners to identify risk mitigation activities and complementary actions (such as pest animal control) to maximise outcomes of the strategic plans. Incorporate relevant actions and objectives from the strategic plans into the CAPs at the five-year review. Work with other partners to identify new environmental water delivery mechanisms (e.g. pumps, pipelines, levies and removal of existing water infrastructure).
Annual watering plans developed supported by key partners, neighbours and community.	Support CMAs in engaging with key stakeholders and community through seasonal water planning processes. Develop visitor engagement information and opportunities around planned watering programs. Endorse environmental water delivery plans and provide land manager input and consent as appropriate.
Annual water plans and threat management programs are implemented.	Support CMAs in implementing annual watering plans. Undertake complementary land management activities such as pest management and restoration works to manage other threats to water-dependent values, including transitional states in drying wetlands.
Ecological outcomes in water dependent systems are maximised.	Work with other agencies to monitor the outcomes of environmental watering and use the results to evaluate the effectiveness of implementation.
Flood preparedness and mitigation activities conform with environmental and cultural guidelines.	Design and manage built assets on parks to better withstand flooding Protect cultural assets from future flood events Position built assets in areas less at risk from flood events
Impacts of water regulation and flood mitigation activities on natural and cultural values are minimised. Response to floods is timely and well-informed.	Work with strategic flood management agencies to improve Parks Victoria's capacity to respond to flood events and protect natural and cultural values. Implement recommendations from the CMAs Regional Floodplain strategy where applicable to the Park Landscape. Manage public safety in the parks during floods in accordance with incident management directives.
Timely and effective rehabilitation and recovery programs support ecological, cultural and visitor assets	Damage to values is assessed and rehabilitation, and recovery programs for natural and cultural assets is implemented in a timely manner and to appropriate standards.
Opportunities to mitigate the impacts of water harvesting infrastructure are identified.	Identify priority areas for reinstating natural flow regimes Identify redundant or legacy water diversion infrastructure impacting flow regimes in priority areas.

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Result	Activities
	Clarify ownership of water diversion infrastructure, and where possible issue retrospective S27 consents under the National Parks Act, in accordance with management plan recommendations. Identify improvements to infrastructure to re-instate natural flow regimes in priority areas.
Relevant authorities agree to alter or remove existing infrastructure.	Undertake hydrological modelling to ascertain impacts of proposed infrastructure change to determine risks and benefits. Investigate risks and legalities of altering or removing unclaimed assets (i.e. public liability risks). Trial re-instatement of flows or water retention barriers to test environmental watering concept. Monitor initial responses to hydrological changes and communicate outcomes to key stakeholders.
Infrastructure is rationalised or permanently removed.	Establish partnerships to support project delivery. Undertake works to remove or alter existing infrastructure.
Hydrological and ecological values to high value drained wetlands and wetland systems are restored.	Undertake complementary pest management and vegetation restoration programs to maximise site outcomes. Undertake ongoing monitoring of sites.
Water regimes and complementary management activities enhance the resilience of water dependent habitat.	

Manage predation pressure at a landscape scale

The management of predation pressure at a landscape scale aims to support an increase in populations of species that are vulnerable to predation, such as potoroos, rock-wallabies, bandicoots and the Smoky Mouse. At the same time it must consider the populations of species that are likely to become overabundant following a decrease in predation pressure (e.g. rabbits, wallabies and kangaroos). To meet both objectives, effective landscape-scale control techniques for introduced predators are needed, as well as strategies to increase populations of native predators such as Spot-tailed Quolls and Eastern Quolls.

Techniques currently available for fox control (baiting, soft jaw trapping, shooting and den fumigation) enable landscape-scale population control. New and emerging techniques such as aerial baiting and canid pest ejectors may help to increase the effectiveness of existing approaches. Aerial baiting is not suitable for areas where susceptible non-target fauna such as quolls are present. Cat control is currently limited to cage trapping, which may be effective locally but not at a landscape scale. Control is targeted at high-value areas with populations of potoroos, rock-wallabies, bandicoots and Smoky Mouse (Figure 7.2). The emergence of new feral cat control technologies, such as poison bait and grooming products, could be used to achieve landscape-scale population control, pending regulatory reform.

Controlling introduced mesopredators may increase numbers of small exotic herbivores such as rabbits. However, native mesopredators such as quolls are thought to have an impact on feral species, so that an increase in quoll numbers could prevent an increase in small exotic herbivores after implementing feral predator controls. However, quolls are cryptic and their historical abundance and the reasons for their current rarity in the Park Landscape are unknown. Investigating the causes of low quoll density and establishing population numbers may help in planning a long-term strategy to re-introduce or re-establish quoll numbers.

Conservation outcomes

Predation-sensitive species have the opportunity to recover, and exist in the landscape at viable levels.

Strategy summary

Implement landscape-scale poison baiting, combined with targeted control (i.e. trapping) for foxes and cats in priority fauna refugia.

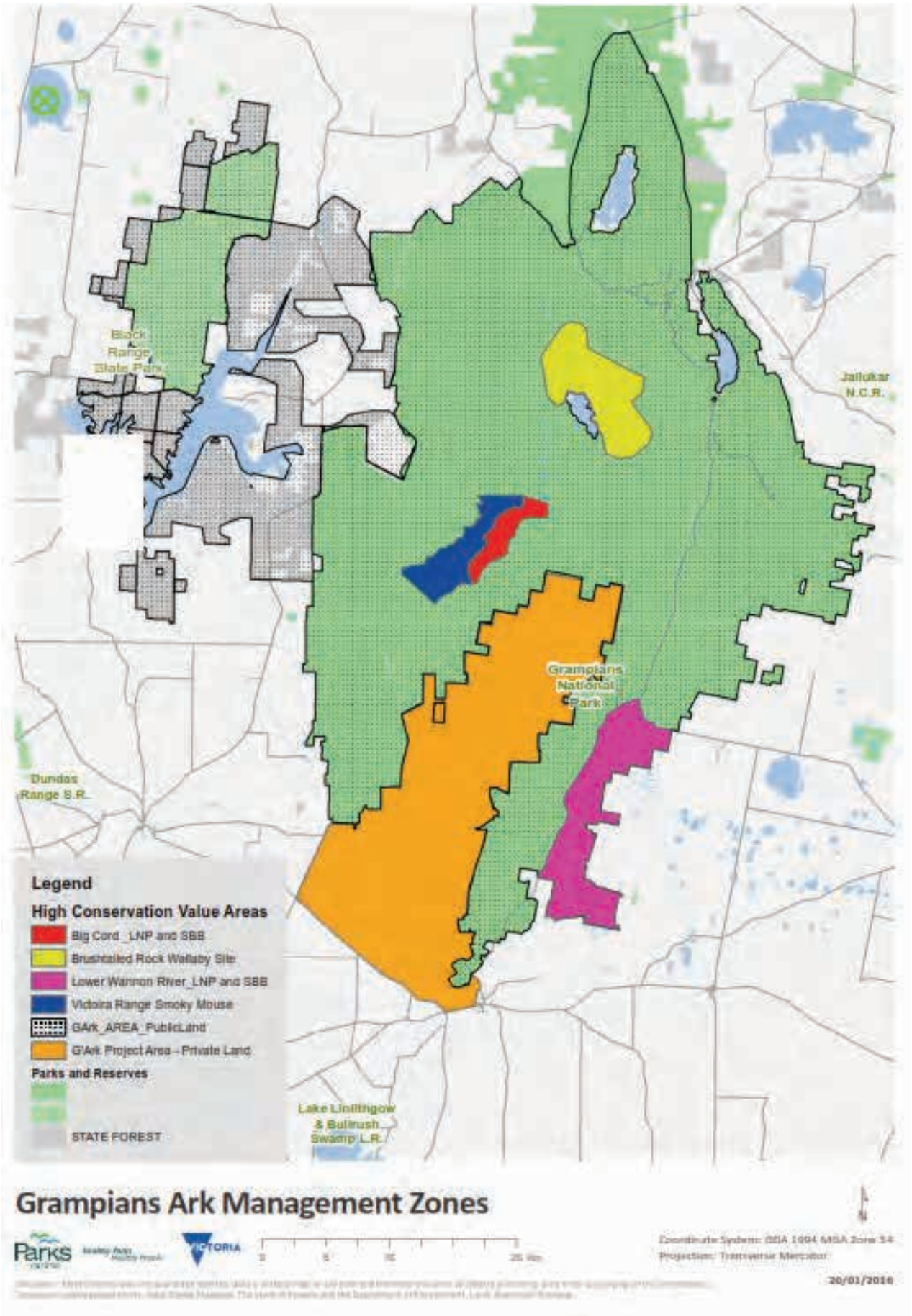
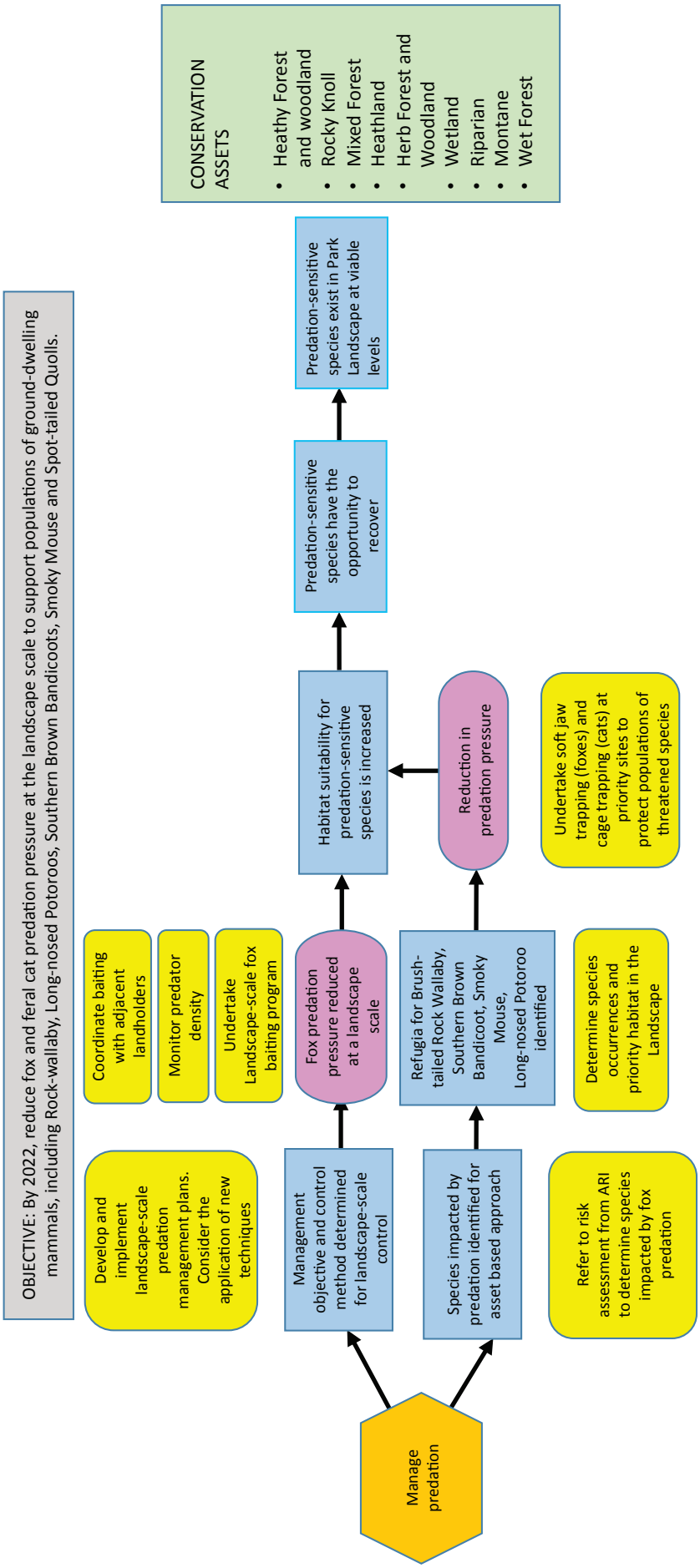


Figure 7.2 Management zones for Grampians Ark fox control.

Results chain



Implementation milestones

Result	Activities
The management objective and control method is determined.	Develop and implement landscape-scale predation management plans. Consider the application of new techniques that would not deliver adverse outcomes (e.g. aerial baiting impact on native predators).
Fox predation pressure is reduced at the landscape scale.	Undertake landscape scale fox baiting program. Monitor predator density. Coordinate baiting program with adjacent landholders and Landcare groups.
Habitat suitability for predation-sensitive species is increased.	
Predation-sensitive species have the opportunity to recover. Predation-sensitive species exist in landscape at viable levels.	
Species impacted by predation are identified.	Refer to risk assessment from ARI to determine species impacted by fox predation.
Refugia for Brush-tailed Rock-wallaby, Southern Brown Bandicoot, Smoky Mouse and Long-nosed Potoroo are identified.	Determine species occurrences, undertake species monitoring in the Park Landscape (Deakin University).
Predation pressure is reduced.	Undertake soft jaw trapping (foxes) and cage trapping (cats) to protect populations of priority species (Brush-tailed Rock-wallaby.
Habitat suitability for predation-sensitive species is increased.	
Predation-sensitive species have the opportunity to recover. Predation-sensitive species exist in landscape at viable levels.	

Environmental weed program

This strategy involves a range of actions for reducing the spread, establishment and impacts of non-native plant species. The strategy focuses on species that have, or are likely to have, significant impacts on the health of conservation assets and ecological processes within the Grampians (Gariwerd) Park Landscape.

A biosecurity approach to pest plant management is a Victorian Government standard for identifying the threat of an invasive species and undertaking an assessment of is relative risk to determine an appropriate intervention. There are four general management responses to the threat of environmental weeds: prevention, eradication, containment and asset protection (Appendix E). The management responses to weeds in this strategy are based on their current extent and the level of risk they present to the Park Landscape. Described below are the management responses to weeds, the control objective of each response, and the predominant examples of species in the landscape subject to control types.

New and emerging weeds

The prevention and eradication responses require that resources are available to reduce the potential for new and emerging weeds to establish. This can be achieved by identifying the most likely invasion points and pathways, which are often vehicle access sites, parking areas, and places where animals are likely to act as vectors. Locations where incursions have been observed previously are likely to be key invasion points. Any new weed species identified within the Park Landscape needs to be controlled rapidly to prevent its establishment and spread. Preventing the spread of species into new areas includes ensuring that vehicle and equipment hygiene is maintained to ensure that plant propagules aren't transported to new areas. The same hygiene principles are used to reduce the risk of spreading pathogens.

Established weeds

Another key component of this strategy is to focus on significantly reducing or eradicating weed species that are already established. A focus on species that alter ecological processes is more likely to result in significant gains in the health of assets. Working with local landowners to control regulated weeds on private land will increase the effectiveness of the program.

Bushfires and planned burns can result in significant weed invasion. Working with authorities, government departments and contractors involved in fire management to build weed management into fire management planning will be an important step in integrated weed control throughout the Park Landscape. Standards will be developed and adopted for best practice hygiene procedures, techniques and equipment for Parks Victoria fire management staff and contractors.

Biological control

A range of biological control agents have been applied in the Park Landscape in the past. These programs generally had initial positive impacts but were less effective as a long-term solution. The persistence of biological control agents is often limited, with reintroduction required for ongoing results.

Biological controls are effective in reducing the density and rate of spread of a species, but the persistence of the control agent can depend on the abundance of the target species to sustain the control. The introduction of a biological control agent will require the target species to be above the minimum extent of occupancy and density than would enable the control agent to breed and disperse. The control agents for consideration in the Park Landscape are fungal rusts or invertebrates that feeds exclusively on the target species.

Biological control agents are not a 'set and forget' method of managing pests. Without ongoing resource availability, monitoring and re-introductions where required, a target species can recover following control efforts. Biological controls are currently available for the following species: English Broom, Bridal Creeper, Paterson's Curse, prickly pears, Horehound, Dock, Boneseed and Blackberry. Biological control is a method of containment and asset protection, but it will not eradicate weeds from the Park Landscape.

Management approaches to control weeds in the Grampians (Gariwerd) Park Landscape depend on the type of weed, its impact and stage of invasion. A shortlist of known infestations is tabled below with specific management objectives for species in each area.

Conservation outcomes

The vegetation structure and quality of habitat in priority locations is maintained or restored. The condition of priority populations of indigenous flora species is maintained or improving.

Strategy summary

Control environmental weeds through surveillance and rapid management intervention to prevent the establishment of new and emerging weeds, and by containing Sallow Wattle to its current extent.

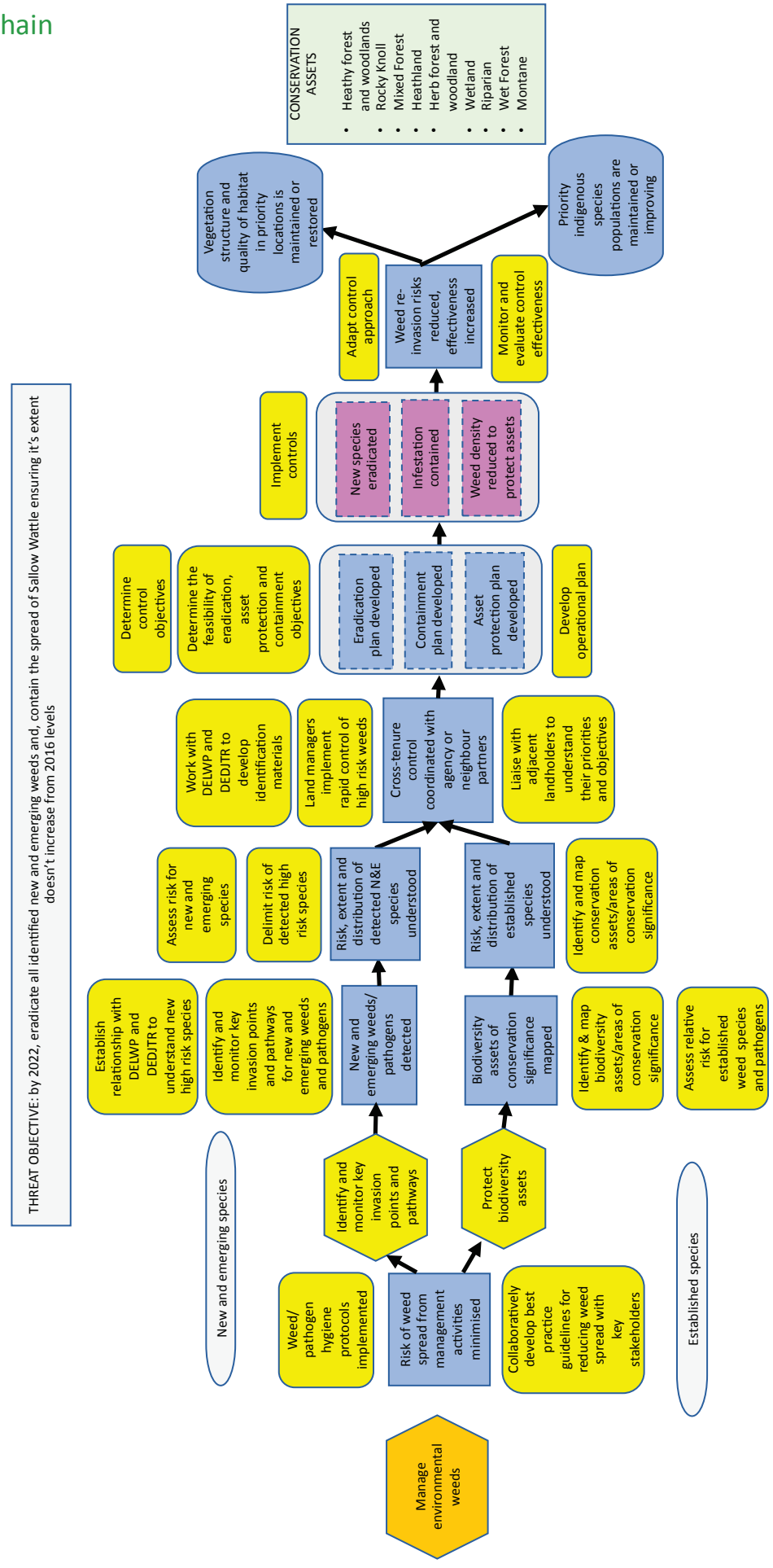
Table 7.1 Location for control of priority weed species.

Location	Control objective	Examples
Grampians NP	Eradication	New and emerging species
	Containment	Blue Periwinkle, One-leaf Cape-tulip, St John's Wort, White Arum-lily
	Biological control	Bridal Creeper
	Asset protection	South African Orchid, Sallow Wattle, English Ivy
Halls Gap	Eradication	New and emerging species and localised populations of Blackberry
	Containment	Blue Periwinkle, One-leaf Cape-tulip, St John's Wort, White Arum-lily
	Biological control	Bridal Creeper
	Asset Protection	South African Orchid, Sallow Wattle, English Ivy
Zumsteins	Eradication	New and emerging species
	Containment	One-leaf Cape-tulip, White Arum-lily
	Biological control options	Bridal Creeper
	Asset protection	Radiata Pine, Sallow Wattle
Park boundaries	Eradication	All new and emerging species
	Containment	One-leaf Cape-tulip
	Biological control options	Bridal Creeper
	Asset protection	Sallow Wattle, South African Orchid, Veldt Grass (at native orchid sites)
Wartook catchment	Eradication	New and emerging species, localised eradication of Sallow Wattle
	Containment	
	Biological control options	
	Asset protection	

Management priorities for sites and species should be based on the risk rankings in the *Advisory list of environmental weeds in Victoria* (White et al. 2018). For species not listed in White et al. (2018), the *Managing weeds: Assess the risk guide* (Blood et al., 2016) can be used. Following bushfire, prioritised species-based management responses should be guided by the *Post-fire weeds triage manual* (Zimmer et al., 2012).

Collaboration with other agencies that have responsibility for weed management (DELWP, DEDJTR, CMAs) and Landcare groups is essential for the successful implementation of this strategy.

Results chain



Implementation milestones

Result	Activities
Contain or eradicate new and emerging weeds and pathogens	
The risk of weeds spreading from management activities is minimised.	Implement weed and pathogen hygiene protocols. Work with DEDTJR and DELWP to develop best practice guidelines for reducing the spread of weeds.
New and emerging weeds and pathogens are detected when they enter the Park Landscape.	Identify and monitor key invasion points and pathways for new and emerging weeds and pathogens. Landcare groups can assist with locations and monitoring. Establish relationship with DELWP and DEDJTR to understand new high-risk species.
Risk, extent & distribution of detected species understood	Assess risk for new & emerging species using biosecurity approach Delimit the extent of detected high risk species within parks
Cross-tenure control is coordinated with agency or neighbour partners	Develop partnerships with CMAs, Traditional Owners, Landcare groups & neighbouring landholders Work with DELWP & DEDJTR to develop identification materials, especially to help landholders identify young plants Neighbouring land managers implement rapid control of new and emerging and established high-risk weeds.
Eradication plan is developed. Containment plan is developed. Asset protection plan is developed.	Develop eradication plans for new and emerging species. Assess the feasibility of eradication and containment objectives.
New species are eradicated. Infestations are contained. Weed density is reduced to protect assets.	Implement coordinated, cross-tenure responses to eradicable and containable infestations.
Weed reinvasion risk is reduced, and the effectiveness of weed control is increased.	Monitor and evaluate the effectiveness of weed control. Adapt the control approach.
Vegetation structure and quality of habitat in priority locations is maintained or restored.	
Priority indigenous species populations are maintained or improving.	
Protect high-value assets from high-risk weeds and pathogens	
The risk of weeds spreading from management activities is minimised.	Work with DEDTJR and DELWP to develop best practice guidelines for reducing the spread of weeds.
Biodiversity assets of conservation significance are mapped.	Identify and map conservation assets and areas of conservation significance.
The risk, extent and distribution of detected species are understood.	Assess the relative risks for established weed species and pathogens. Collate, verify and map weed species distribution in relation to the assets

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Result	Activities
Cross-tenure control is coordinated with agency or neighbour partners.	Develop partnerships with CMAs, Traditional Owners, Landcare groups and neighbouring landholders.
Eradication plan is developed. Containment plan is developed. Asset protection plan is developed.	Scope the biosecurity objectives and locations for priority species. Work with park neighbours to develop containment plans for Blue Periwinkle, One-leaf Cape-tulip, St John's Wort and White Arum Lily. Develop asset protection plans for priority established weeds, including Bridal Creeper, South African Orchid, Sallow Wattle, English Ivy and Radiata Pine. Determine the feasibility of local eradication, containment or asset protection for species.
New species are eradicated. Infestations are contained. Weed density is reduced to protect assets.	Prioritise and implement the removal of satellite weed populations. Control weeds at high-value and high-risk locations.
Weed reinvasion risk is reduced, and the effectiveness of weed control is increased.	Monitor and evaluate the effectiveness of weed control. Adapt the approach to control.
Vegetation structure and quality of habitat in priority locations is maintained or restored. Priority indigenous species populations are maintained or improving.	

Sallow Wattle containment

The distribution of Sallow Wattle was well understood prior to 2011, but since then several large bushfires have led to the establishment of new populations. Priority areas for Sallow Wattle control have been identified in the Sallow Wattle Action Plan. The action plan is an asset protection approach to supporting EVCs (e.g. Herb-rich Woodland) and species impacted by Sallow Wattle invasion (e.g. Grampians Duck Orchid). Because of the widespread occurrence of Sallow Wattle and its ability to rapidly expand its range, out-compete other species and change the ecology of susceptible native systems, control is aimed at ensuring the containment of this species within its existing range.

Within the containment area, Sallow Wattle density is to be maintained below 30% cover to reduce its competitive influence. This control is to be targeted at systems that naturally lack a mid-storey component (e.g. Herb-rich Woodland and Heathy Woodland) and systems where the impacts of homogenisation of the system are greatest (e.g. Riparian and other wet EVCs). The containment area is to the south of the Mount Difficult escarpment and north of Golton Gorge. Sallow Wattles found in the Wartook catchment will be removed.

Sallow Wattle control will involve an adaptive experimental management program, aimed at:

- improving our understanding of the present and future distribution of Sallow Wattle and its potential distribution under a climate changed future
- increasing the understanding of the return on investment of control methods, including chemical control, mechanical control (brushcutting, mulching and manual removal) and biological control.

To increase the effectiveness of Sallow Wattle control there needs to be a better understanding of the factors that should trigger intervention. The current understanding is that negative ecological outcomes occur when Sallow Wattle cover exceeds 30%. However, the cover at which control is most effective is yet to be determined.

Implementation milestones

Result	Activities
High-value sites where Sallow Wattle is currently absent are identified.	Identify and map biodiversity assets and areas of conservation significance.
The spatial extent of Sallow Wattle is identified.	Collate, verify and map weed species distribution/ delimit the invasion. Map invasion before and after disturbance to compare levels of infestation.
The potential extent of Sallow Wattle in future is understood.	Assess the relative risk of Sallow Wattle through distribution modelling that takes into account climate change predictions.
The ecology and potential controls of Sallow wattle are understood	Establish and continue research partnerships to fill knowledge gaps.
Assets most vulnerable to Sallow Wattle infestation are identified	Research partnerships to ascertain the most likely EVCs invaded. Use outcomes of research to prioritise areas for control.
Partnerships with key agencies, organisations and neighbouring landholders are strengthened	Develop and strengthen partnerships with other agencies, including DELWP, DEDJTR, Wimmera CMA, Glenelg Hopkins CMA, Traditional Owners, Project Platypus and Laharum Landcare, to ensure there is a coordinated approach to controlling Sallow Wattle.
Sallow Wattle incursions are identified.	Prioritise and implement the removal of satellite populations, or control at high-value and high-risk locations.
Control methods are monitored and evaluated to determine their effectiveness.	Monitor and evaluate control effectiveness to assess cost effectiveness of currently available control methods using adaptive management principles. Determine the feasibility of local eradication, containment or asset protection. Determine the level of cover at which control action is most effective.
Control methods are adapted based on program evaluation.	Adapt control approach to reflect learning from the monitoring and evaluation of control effectiveness.

Herbivore management

This strategy will continue an adaptive experimental management (AEM) program to manage total grazing and browsing pressure across the Grampians (Gariwerd) Park Landscape. Introduced grazers to be managed in this landscape include rabbits, goats and deer. Macropods will be monitored to understand responses to predator and competitor removal, allowing for landscape-scale management of total grazing pressure. This strategy lists species with their management objective, control methods and priority locations.

Red Deer and Fallow Deer are game species. Hunting is not permitted in the Park Landscape, but there are social benefits in using volunteer shooters to reduce deer numbers. An integrated approach, including building community awareness of the impact of deer, engaging volunteer hunters, using specialist contractors and targeting control efforts at areas of high conservation value is required to effectively manage deer in the Park Landscape. Priority areas (Table 7.2) have been identified, and eight operational sectors encompassing high-value conservation assets have been defined (Figure 7.3). Restrictions on visitor access will be imposed during control operations.

Goats inhabit the Black Range, Victoria Range, Mount Cassell and Mount Difficult Range areas of the Park Landscape. Unlike deer, goats are not a game species in Victoria so their control does not require a consideration of game impact. However, an integrated approach, including building community awareness of impacts, engaging volunteer shooters, using specialist contractors and targeting control efforts at areas of high conservation value will be applied. Priority areas and control methods have been identified, and 11 operational sectors encompassing high conservation value areas have been defined (see Figure 7.3). Restrictions to visitor access will be imposed during control operations.

Rabbits in the Grampians are largely supressed, with low-density populations throughout the Park Landscape. Traditional control efforts to protect cultural sites and support Good Neighbour programs are the management focus. The 2017 release of the RHDV1 K5 strain of rabbit calicivirus may assist in the continued suppression of rabbit numbers in the Park Landscape. An integrated approach is recommended for the control of rabbits, with continued monitoring to ascertain responses to predator (cat and fox) control actions.

Sambar Deer, Elk and Feral Pigs in the Mount Cole and Moyston districts could expand into the Park Landscape. The management objective is to control incursions before they can become established. If these species or other introduced herbivores are detected within the Park Landscape, herbivore management resources will be redirected to their eradication as a management priority.

The management of total grazing pressure also includes the monitoring of impacts from native herbivores, including Eastern and Western Grey Kangaroos and Red-necked and Black Wallabies. The management objective for native herbivores is to gain a better understanding of their impact on high-value conservation assets, and to measure changes in population size in response to changes in predation pressure. Key actions include monitoring of populations and monitoring of impacts. Priority locations include the interface with agricultural land (Eastern and Western Grey Kangaroos), Woodland (Red-necked Wallaby) and Heathy Woodland (Black Wallaby).

Conservation outcomes

Vegetation structure and quality of habitat in priority locations is maintained or restored. Priority populations of indigenous flora species are maintained or improving.

Strategy summary

Control introduced herbivores (goats, rabbits, Red Deer and Fallow Deer) to improve the structure and composition of native vegetation across the Park Landscape.

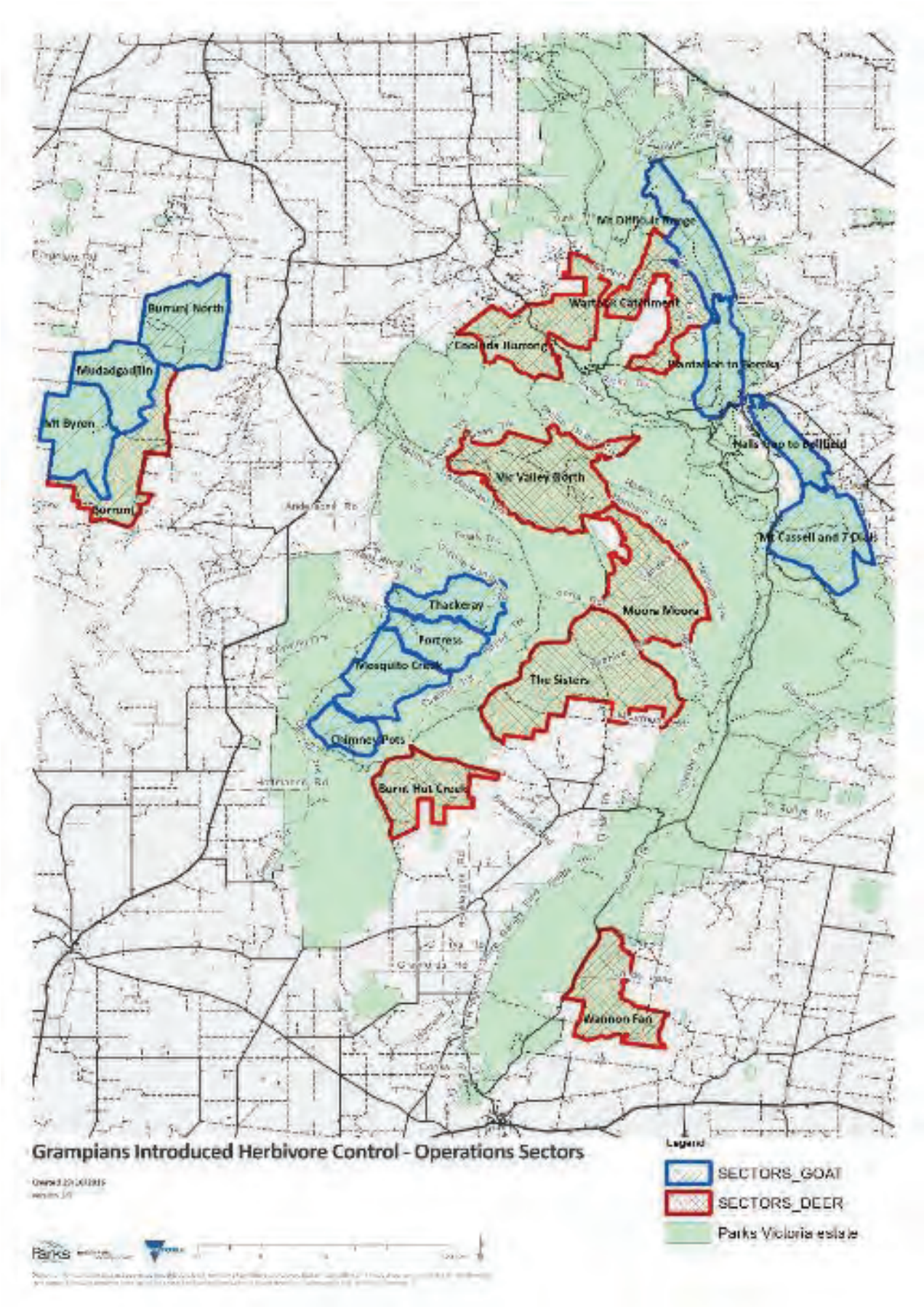
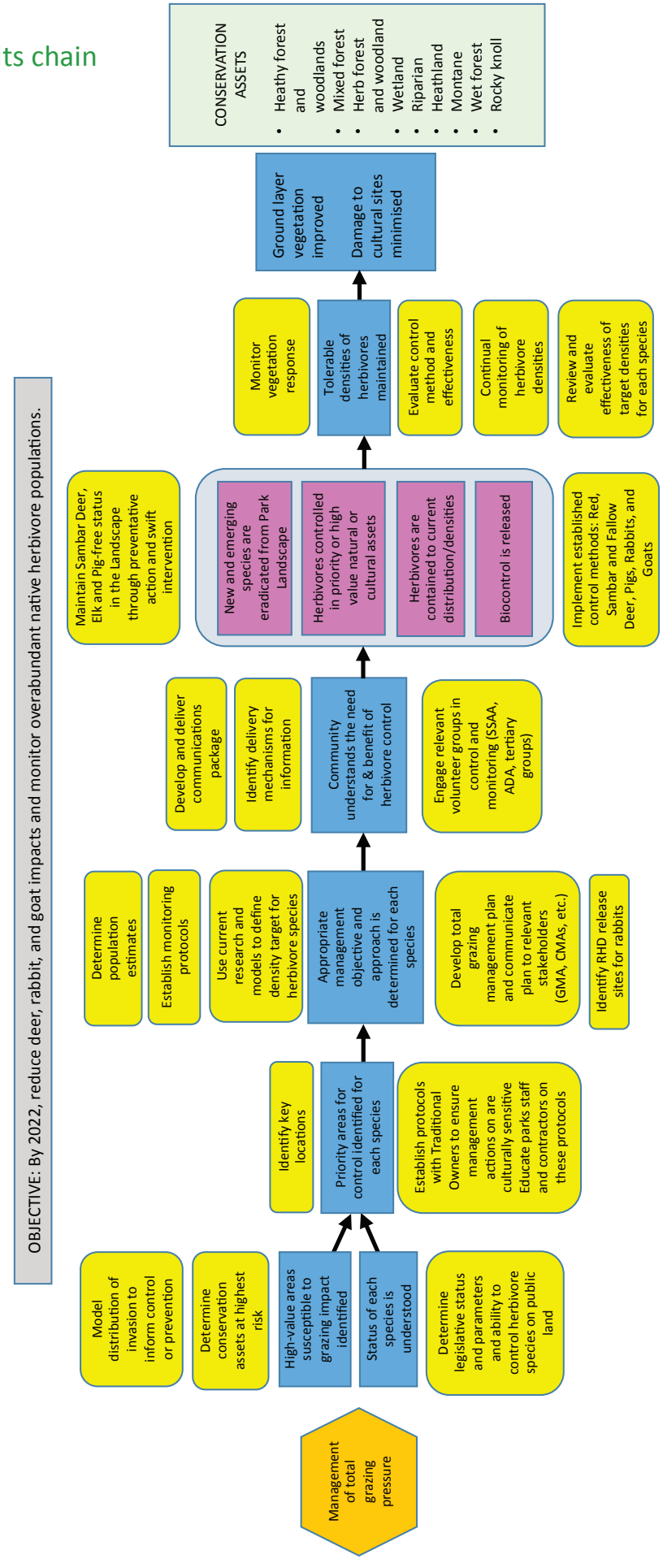


Figure 7.3 Operational sectors for herbivore control.

Results chain



Implementation milestones

Result	Location	Activity	Objective
All grazers			
High-value areas susceptible to grazing impacts are identified.	Landscape	Determine conservation values with the highest risk. Model the distribution of invasion to inform control or prevention.	N/A
The status of each species is understood.	Landscape	Determine legislative parameters and ability to control herbivore species on public land (Wildlife Act 1975, Catchment and Land Protection Act 1994, Prevention of Cruelty to Animals Act 1986).	
Priority areas for control are identified.	Across Landscape	Identify key locations for control and/or monitoring activities.	
An appropriate management approach is developed for each species.	Location specific approach	Establish monitoring protocols. Determine population sizes. Use current research and models to define a density target for each species. Develop a total grazing management plan with research partners, and distribute the plan to relevant stakeholders (ie. GMA, CMAs, DEDJTR, DELWP).	
The community understands the need and benefits of herbivore control.	Landscape	Develop and deliver communications package. Examples include briefing, talking points and media releases. Identify mechanisms for information. Engage relevant volunteer groups in control and monitoring (Sporting Shooters Association of Australia, Australian Deer Association, universities, citizen scientist groups).	
Acceptable densities of herbivores are maintained.	Landscape	Monitor vegetation response. Evaluate control method and effectiveness. Continual monitoring of herbivore densities. Review and evaluate target densities for each species.	
Ground layer vegetation is improved. Ecosystem integrity and water quality in riparian areas are improved.			
Rabbits			
An appropriate management approach is developed.	Landscape	Undertake annual rabbit warren monitoring in autumn. Establish and maintain rabbit target densities of less than 0.35 active warren entrances per hectare.	Asset protection

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Result	Location	Activity	Objective
		Release new RHD virus strains, and determine potential release sites when virus becomes available.	
	Cultural sites	Work with Traditional Owners to employ culturally appropriate control methods.	Asset protection
Goats			
Goats are controlled in priority areas and contained to target densities	Landscape	1. Establish a monitoring program.	Containment
	Goat sectors	Trial the use of GPS collars.	Containment
		Develop safety and operations plan.	
		Establish partnership with volunteer hunting associations.	
		Conduct shooting using contractors and volunteers.	
		Utilise professional shooting to boost volunteer efforts as required.	
		Maintain target density of less than 8 goats per km^2.	
Fallow and Red Deer			
Goats are controlled in priority areas and contained to target densities	Landscape	Maintain a detection rate of less than 2 per km^2	Containment
	Fire-affected area near Lake Wartook	Remove 100 Red Deer and any Fallow Deer detected.	Containment
		Contract shooters to make up any shortfall in target numbers.	
	Herb Forest and Woodland	Use volunteer shooters to cull 400 deer over an initial two years (2018–2019).	Local Eradication
		Contract shooters to make up any shortfall of target numbers.	
		Maintain a negligible detection rate of less than 0.1 per km^2 in priority woodland areas.	
	Black Range SP & Victoria Valley	Undertake an aerial shooting trial (1 day in each location).	Containment
Sambar Deer, Elk and Pigs			
Sambar Deer, Elk, and Pigs are not established in the Park Landscape.	Landscape	Eradicate any Sambar Deer, Elk and Pigs detected in the Park Landscape.	Eradication
Eastern Grey Kangaroo, Western Grey Kangaroo, Red-necked Wallaby and Black Wallaby			
The impacts of macropods are monitored and controlled if necessary.	Landscape	Monitor the impact of macropod herbivory on vegetation.	Monitor
		Determine culling targets to reduce herbivory impacts if required.	
		Develop and implement control actions (if required).	

Collaborative partnerships to address key knowledge gaps

This strategy involves increasing levels of collaboration and partnerships with Traditional Owners, researchers and other land managers in applying adaptive management approaches. The strategy will also support and facilitate the establishment and coordination of a Technical Advisory Group, whose function will be to provide advice to support potential partnership projects in the Grampians (Gariwerd) Park Landscape. The primary focus of this strategy is to address knowledge gaps to improve management effectiveness through research on causal factors relating to asset condition, or by identifying appropriate methods for measuring conservation outcomes or the impacts of threat management. This will be achieved by:

- integrating specialist knowledge into on-ground activities
- providing support to researchers to undertake formal research to inform park management
- identifying opportunities to incorporate citizen science activities
- sharing findings and research outputs with relevant stakeholders, other land managers and the broader community.

The integration of research and land management activities will influence conservation management direction and provide the rationale for project resourcing. At an organisational level, this strategy will contribute to organisational and stakeholder confidence in Parks Victoria's evidence-based decision making.

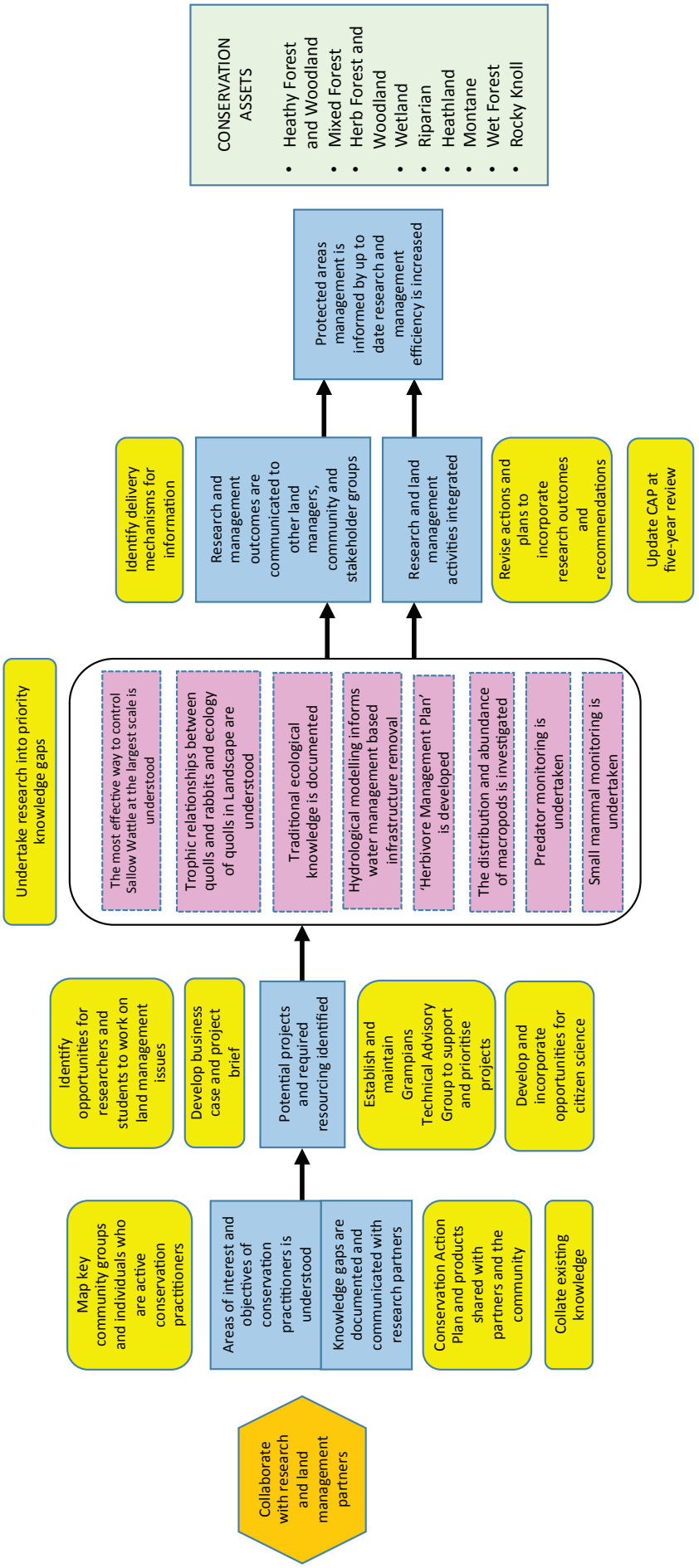
Conservation outcomes

Protected areas management is informed by up-to-date research and management efficiency is increased.

Strategy summary

Integrate research and management activities to improve management effectiveness.

Results chain



Implementation milestones

Result	Activities
Areas of interest and objectives of conservation practitioners are understood.	Share Conservation Action Plan and products with partners and the community.
Knowledge gaps are documented and communicated to research partners.	Collate existing knowledge. Map key community groups and individuals who are active conservation practitioners.
Potential projects and resources are identified.	Identify opportunities for researchers and students to work on land management focused issues. Develop business case and project brief. Establish and maintain Grampians Technical Advisory Group to support and prioritise projects. Develop and incorporate opportunities for citizen science activities.
Restoration partnerships achieve the following results: • The most effective way to control Sallow Wattle at the largest scale is understood. • Trophic relationships between quolls and rabbits, and the ecology of quolls in the Park Landscape is investigated. • Traditional ecological knowledge is documented. • Hydrological modelling informs water management and infrastructure removal • A herbivore management plan is developed. • The distribution and the abundance of macropods is investigated. • Predator monitoring is undertaken. • Small mammal monitoring is undertaken.	Undertake research into priority knowledge gaps.
Research and management outcomes are communicated to other land managers, community and stakeholder groups.	Identify delivery mechanisms for information.
Research and land management activities integrated.	Revise actions and plans to incorporate research outcomes and recommendations. Update the Conservation Action Plan at the five year review.
Protected areas management is informed by up-to-date research, and management efficiency is increased.	

Brush-tailed Rock-wallaby with tracking collar

8 Measuring performance

Monitoring, evaluation and reporting allows Parks Victoria to quantify the effectiveness of implementing the prioritised conservation strategies, and supports continuous improvement through value-based and evidence-informed decision-making.

Measuring performance in conservation action planning involves the assessment of the effects of management actions in relation to the desired state of key ecological attributes and conservation assets. In developing an effective Conservation Action Plan, agreeing on what will be measured and how measurement will be made before works are implemented is a critical step. Performance measures enable an integrated assessment of:

- the quantity and quality of management actions (activity measures)
- the impacts of an activity on threats (threat measures)
- the results of management on the conservation asset (outcome measures).

The following performance measures, developed in collaboration with experts in this field, provide a useful starting point for developing a Monitoring, Evaluation and Reporting Plan for the Grampians (Gariwerd) Park Landscape. This can be used to guide interim assessments of performance until a detailed plan is established.

Fire management for healthy ecosystems

Use fire as a tool to maintain fire dependent habitat or species, exclude planned fire from fire-sensitive habitats and apply fire to the periphery of priority habitats and species to provide protection.

Activity measures:

- a map of asset protection, strategic bushfire moderation zones and landscape management zones prepared
- liaison undertaken with DELWP on fire operations plans
- area of ecological burns undertaken in fire-tolerable and fire-dependent conservation assets according to the geometric mean abundance of species.

The key threat managed under this strategy is *Fire — regimes and management*. It will be measured using the following threat indicators:

- extent and timing of planned burns
- percentage of the Park Landscape maintained in tolerable fire intervals
- deviation from ideal growth-stage distributions.

Conservation outcomes resulting from the implementation of the strategy:

- improved structural diversity and distribution of vegetation growth stages in fire-sensitive and fire-dependent vegetation communities
- protected values in ecosystems that are sensitive to inappropriate fire management.

Water management for conservation outcomes

Support partnerships to improve water-dependent conservation assets by providing hydrological regimes that support them in the Landscape.

Activity measures:

- number of water regulation structures within the catchment areas identified and catalogued
- number of water regulation structures licensed or under permit and rationalised or removed
- timely approval or endorsement of watering strategies and plans
- area of drought refugia identified.
- number of community members reached through engagement and participation programs

The key threat managed under this strategy is *Alteration to natural hydrology*. It may be measured using the following threat indicators:

- amount of water harvested
- number of unclaimed water diversion channels or infrastructure impacting priority assets
- area of conservation assets where the impact of artificial structures has been reduced.

Conservation outcomes resulting from the implementation of the strategy may be measured by:

- condition and diversity of wetlands
- area of wetland restored or rehabilitated
- persistence of drought refugia in the landscape (extent)
- time taken to respond to floods and undertake rehabilitation and recovery.

Manage predation pressure at a landscape scale

Implement landscape-scale poison baiting combined with targeted trapping for foxes and cats in priority fauna refugia.

Activity measures:

- extent, frequency and method of fox control (number of fox baits laid)
- extent, frequency and method of cat control (number of cat trap-nights).

The key threat managed under this strategy is *Predation*. It may be measured using the following threat indicators:

- cat activity (as measured by camera)
- fox activity (as measured by bait take)
- area of the Park Landscape where predation pressure is actively managed.

Conservation outcomes resulting from the implementation of the strategy may be measured by:

- population extent of predation-sensitive species
- population size of predation-sensitive species
- number of predation-sensitive species with increasing populations.

Environmental weed program

Conduct surveillance and rapid management intervention to prevent the establishment of new and emerging weeds, and contain Sallow Wattle to its current extent.

Activity measures:

- number of environmental weeds with impacts, control methods and priority locations identified
- extent, frequency and method of control (number and type of environmental weed removed)
- percentage of priority locations where control activities have been undertaken
- Sallow wattle
  - population extent
  - site-scale cover of Sallow Wattle
  - method and extent of control.

The key threat managed under this strategy is *Invasion by terrestrial weeds*. It may be measured using the following threat indicators:

- extent and cover of environmental weeds
- number of new and emerging weed species identified within the Park Landscape
- Sallow Wattle
  - number of new populations in the Wartook catchment.

Conservation outcomes resulting from the implementation of the strategy:

- health of conservation assets where environmental weeds are or were present
- health of conservation assets impacted by Sallow Wattle.

Herbivore management

Control herbivores (goats, rabbits, Red Deer and Fallow Deer) in priority Herb-rich Woodland and Montane ecosystems to improve the structure and composition of native vegetation.

Activity measures:

- number of pest animals with impacts, control methods, control level and high-priority locations identified
- extent, frequency and method of control (number and type of pest animal removed)
- percentage of priority locations with control activities undertaken.

The key threat managed under this strategy is *Over-grazing/ Over-browsing*. It may be measured using the following threat indicators:

- Herbivore density

Conservation outcomes resulting from the implementation of the strategy:

- Improved structure and composition of native vegetation.

Collaborative partnerships to address key knowledge gaps

Integrate research and management activities to improve management effectiveness.

Activity measures:

- number of Technical Advisory Group meetings
- effort of citizen scientists (e.g. number of records provided).

The key threats managed under this strategy are all of the threats. They may be measured using the following threat indicators:

- total effort to manage each threat
- total cost to manage a unit of threat.

Conservation outcomes resulting from the implementation of the strategy:

- Parks Victoria staff's confidence in management actions
- stakeholders' confidence in management of Grampians (Gariwerd) Park Landscape
- improved management effectiveness and efficiency.

Table 8.1 Activity measures selected for the Grampians (Gariwerd) Park Landscape based on delivery of conservation strategies.

		Activity measures		
	Indicators	**Target Zone (Very Good/Good Condition)**	**Cautionary Zone (Fair Condition)**	**Unacceptable zone (Poor Condition)**
Strategy 1 – Manage predation pressure at a landscape scale (foxes)	Number of baits, and, Hectares baited at 1 bait per track km.	≥ 95% of bait stations baited (1200 bait stations) and 4 pulses per annum	81–94% of bait stations baited and, or 3 pulses delivered	≤ 80% of bait stations and, or only 2 pulses delivered
Strategy 2 – Environmental weed program — Sallow Wattle containment	• Area of sallow wattle control within containment areas • Area of Sallow Wattle infestation breaching containment area	Knowledge gap Density of > 30% Sallow wattle cover maintained within containment areas. Reduction in previous year's extent and area of infestation	Knowledge gap	Knowledge gap
Strategy 3 – Fire Management for healthy ecosystems	Area of ecological burns implemented in fire-tolerable and fire-dependent EVDs according to the geometric mean abundance of species for the Park Landscape	Area burnt within < 25% deviation of GMA recommendations for Landscape Management Zone.	Area burnt ≥ 25% deviation above GMA recommendations for Landscape Management Zone.	Area burnt ≥ 40% deviation above GMA recommendations for Landscape Management Zone.
Strategy 4 – Herbivore management	Target species (goat, red deer, fallow deer, macropod spp.) shot per unit effort	Knowledge gap	Knowledge gap	Knowledge gap
Strategy 5 – Support partnerships to improve water regimes	Number of practical restoration projects delivered on-ground	≥ 3 hydrological improvements achieved (i.e. in stream barriers improved, environmental flow restored to a wetland, etc.)	1 or 2 improvements implemented after 3 years effort in partnerships with CMA's and water authorities.	0 improvements achieved after 3 years effort in partnerships with CMAs and water authorities.

Table 8.2 Threat (intermediate) measures selected for the Grampians (Gariwerd) Park Landscape based on the delivery of priority strategies for the main threat.

		Threat measures		
Categories of performance measures	**Indicators**	**Target Zone (Very Good/Good Condition)**	**Cautionary Zone (Fair Condition)**	**Unacceptable zone (Poor Condition)**
Main threat objective: predation	1 Fox bait take 2 Fox and cat activity index	1 Bait take <10%, 2. Fox remote camera activity index < 25% patch occupancy, and cat activity index <16% (based on 2012–13 ARI data)	1 Bait take 11–14%, 2. Fox activity index 25–29%, cat activity index 16–19%	1 Bait take ≥ 15% 2 Fox activity index ≥ 30%, Cat activity index ≥ 20%
Main threat objectives: inappropriate fire regime severe landscape-scale bushfire	Area of EVD (or scale up to Ecosystems for simplicity or interpretation at the landscape scale) burnt whilst below Tolerable Fire Interval	1 The area (Ha) of EVD's burnt whilst below minimum Tolerable Fire Interval is < 25% of the EVDs proportional area across the landscape. 2 5-year moving average for total proportional area <25% of each EVD below minimum or above maximum TFI (DELWP 2015)	1 area of EVDs burnt whilst below minimum Tolerable Fire Interval is ≥ 25% of the EVDs proportional area across the landscape. 2 5 year moving average for total proportional area ≥ 25% of each EVD below minimum or above maximum TFI	1 EVDs burnt when below minimum Tolerable Fire Interval is ≥ 40% of the EVDs proportional area across the landscape. 2 5-year moving average for total proportional area ≥ 40% of each EVD below minimum or above maximum TFI (DELWP 2015)*
Main threat objectives: inappropriate fire regime, severe landscape-scale bushfire	Area of EVD (or scale up to Ecosystems for simplicity or interpretation at the landscape scale) within Growth Stage distribution	< ±25% deviation from goal growth stage for each EVD (or sub-ecosystem) across the landscape (DELWP 2015).	> ±25% of modelled growth stage for each EVD (or sub-ecosystem) across the landscape (DELWP 2015)	> ±40% of modelled growth stage for each EVD (or sub-ecosystem) across the landscape (DELWP 2015)
Main threat objective: severe landscape-scale bushfire	Area of bushfire forest severity class 1 or 2	< ±25% of mapped high priority watershed areas across the landscape having a Bushfire forest severity class 1 (crown burn) or class 2 (crown scorch). Knowledge Gap — mapping of priority riparian zones, priority watersheds, high erodibility areas and drought refuges.	> ±25% of mapped high priority watershed areas across the landscape having a Bushfire forest severity class 1 (crown burn) and class 2 (crown scorch)	> ±40% of mapped high priority watershed areas across the landscape having a Bushfire forest severity class 1 (crown burn) and class 2 (crown scorch)
Main threat objective: overabundant herbivores	Herbivore population abundance / site occupancy	Knowledge gap	Knowledge gap	Knowledge gap
Main threat objective: Sallow Wattle invasion	1 Sallow Wattle population-scale extent 2 Sallow Wattle site-scale %CA	1 Sallow wattle population extent is within the red line 'containment area' as per the control plan. 2 < 25% cover abundance of Sallow Wattle in the buffer zones around key biodiversity asset sites	1 Sallow Wattle population is within 1–9% of the containment area 2 25–29% cover abundance of Sallow Wattle in the buffer zones around key biodiversity asset sites	1 Sallow Wattle has expanded ≥ 10% outside the 'containment area' 2 ≥ 30% cover abundance of Sallow Wattle in the buffer zones around key biodiversity asset sites

Objectives with Interim Target, Cautionary and Unacceptable zones of performance.

* Biophysical unit (BpU) scale analysis is required once this performance zone is reached.

Table 8.3 Outcome (long-term) measures selected for the Grampians (Gariwerd) Park Landscape based on achieving the key ecological attribute goals with interim target, cautionary and unacceptable zones of performance.

Categories of Performance Measures	Indicators	Target Zone (Very Good/Good Condition)	Cautionary Zone (Fair Condition)	Unacceptable zone (Poor Condition)
Ground-dwelling Mammal KEA Goal	1 Common ground-dwelling small mammal species richness and population viability (heath mouse, antechinus) 2 Population viability of rarer species (southern brown bandicoot, long nosed potoroo, smoky mouse, Brush-tailed Rock-wallaby).	1 Common ground-wwelling mammal species are present and have viable populations in each BpU across the landscape. 2 No loss of any remaining rare species populations. knowledge gap — what is the methodology to measure population viability?	1 Loss of a common ground-dwelling small mammal species from 1–2 BpUs. Knowledge Gap — are the numbers of BpU correct? 2 Extinction of a local metapopulation of a rarer species across the landscape (e.g. loss of Smoky Mouse from Mt William) or, significant population collapse with lack of population viability (see knowledge gap).	1 Common ground-dwelling mammal species is lost from 3 or more BpUs. Knowledge gap — are the numbers of BpU correct? 2 Local extinction of a ground-dwelling mammal species from the landscape
Floristic Diversity KEA Goal	1 Common Key Fire Response fire sensitive flora species 2 Endemic flora species richness	1a ≥ 60% of all vegetation across the landscape is within the range between minimum and maximum tolerable fire interval (TFI) 1b all common Key Fire Response fire sensitive species present in each BpU 2 No loss of endemic flora spp.	1 A Key Fire Response fire sensitive flora species is lost from 1–2 BpUs. Knowledge Gap — are the numbers of BpU correct? 2 Loss of an endemic flora species site / population (e.g. loss of Grampians Duck Orchid from Mirranatwa gap leaving Roses Gap colony).	1 A Key Fire Response fire sensitive flora species is lost from 3 or more BpUs. Knowledge gap — are the numbers of BpU correct? 2 Local extinction of an endemic flora species from the landscape
Intact Watershed and Aquatic Values KEA Goal	1 Index of wetland and Stream condition 2 Freshwater crayfish spp. richness, distribution and abundance	1 Index of wetland and stream in good or better condition for ≥ 75% of landscape 2 Freshwater Crayfish spp. richness all present and in viable populations	1 Index of wetland and stream in good or better condition for 61–74% of landscape	1 Index of wetland and stream in good or better condition for < 60% of landscape
Vegetation Structural Complexity KEA Goal	Abundance of Habitat attributes (i.e. %CA of coarse woody debris / logs / heath spp. / grass, and, or vegetation structural complexity <1m)	Knowledge gap: Requires a review of Deakin Fire and Fauna habitat data. Indices such as vegetation complexity below 1 m height are identified in Stevens et al. (2012). (Data exists from 2008 to 2018 for Heathy Woodland.)	See knowledge gap	See knowledge gap
Arboreal mammals, woodland birds and large forest owls KEA goal	Knowledge gap	Knowledge gap: Are woodland microbats a good surrogate indicator?	Knowledge gap	Knowledge gap

Cutting post-fire Sallow Wattle regrowth

9 Plan implementation

A Monitoring, Evaluation and Reporting Plan will be developed from the interim performance indicators in this Conservation Action Plan. It will include key evaluation questions, more specific monitoring questions, and appropriate metrics, measures and reporting standards. It will be a key component of adaptive management and a more outcomes-focused approach to managing for conservation in parks and reserves. Specifically, the Monitoring, Evaluation and Reporting Plan is essential for:

- determining whether the conservation strategies and specific operational activities are achieving the desired conservation outcomes
- showing trends in the condition of conservation assets and the levels of threat
- demonstrating the effectiveness and efficiency of resources invested in the Conservation Action Plan.

The plan will address the collection, storage and collation of data as well as its analysis and interpretation. The analysis and interpretation of data is the cornerstone of applying a 'learning by doing' approach, in which knowledge gaps are identified and addressed through targeted scientific research. The evaluation of the Conservation Action Plan is an important step in documenting lessons learnt and communicating ideas around the improvement of policy, planning and management within Parks Victoria and to external audiences.

Steps 8, 9 and 10 of the 10-step process for conservation planning follow on from implementing the strategies outlined here, and are beyond the scope of this Conservation Action Plan. Steps 8 and 9 will be carried out at an operational level within the Parks Victoria Region that has responsibility for the Grampians (Gariwerd) Park Landscape. Step 10 will involve a review of the Conservation Action Plan in the light of what is learnt during implementation.

Step 8: Plan work

In planning the work program, prioritised conservation strategies will be converted into operational conservation projects in specific locations. Quality maps generated by Parks Victoria in the conservation action planning process are critical for planning on-ground conservation activities, targeting key threats to conservation assets. They provide a greater understanding of the potential spread or overlap of operational conservation activities physically and in terms of their geographic impact. They also support the detailed consideration of logistic issues including access, cultural heritage and areas of high visitation. Engaging with Traditional owners and investigating opportunities for collaboration will be investigated during this phase. During the organisation of work, local and organisation-wide resource allocation processes should be followed. Detailed project planning within the Parks Victoria District and Region, including the refinement of resource requirements, will be undertaken using standard procedures.

Step 9: Implement plan

The Conservation Action Plan will be implemented by a regional team, often in collaboration with other agencies, Friends groups and volunteers. Operational conservation activities will be implemented in accordance with relevant Parks Victoria policies and procedures and legislative obligations.

Step 10: Adapt the Conservation Action Plan and operational activities

In the context of adaptive management, the evaluation of the Conservation Action Plan is important in determining and communicating whether or not the conservation strategies and specific on- ground activities have abated threats and achieved the desired conservation outcomes.

The Conservation Action Plan is not a static document. It will be reiterated in response to the outcomes of the Monitoring, Evaluation and Reporting Plan and in response to emerging issues. This reiteration may lead to a restructure of conservation strategies, including the amendment of results chains and their underlying assumptions and a refinement of specific on-ground activities. The review and reiteration of the plan is likely to be undertaken in part through a small workshop process involving a similar representation of people involved in the development of the original plan.

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Lace Monitor, *Varanus varanus*

Appendices

Appendix A — Parks and reserves in the Grampians (Gariwerd) Park Landscape

Levels of Protection (LoP) for natural values management

Levels of Protection is a tool to aid planning and resource allocation by placing individual parks in a statewide context. Parks have been classified (or grouped) according to composition and representation of attributes classified at the EVC and species scale (Table A.1). A key principle of the framework is that protected area planning is conducted in a bioregional context. The bioregional value, and hence management priority, of biodiversity attributes in parks and reserves has been assessed on the basis of:

- conserving the range of ecosystems and existing biotic diversity
- the occurrence of attributes that depend on a particular park for their security.

The Protected Areas Category System

The protected area management categories of the International Union for Conservation of Nature and Natural Resources (IUCN) classify protected areas according to their management objectives. The categories are recognised by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas, and as such are increasingly being incorporated into government legislation. For further information, see the IUCN website: http://www.iucn.org/theme/protected-areas/about/categories

Category Ia Strict Nature Reserve — strictly protected area set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited.

Category Ib Wilderness Area — usually large unmodified or slightly modified area, retaining its natural character and influence without permanent or significant human habitation.

Category II National Park — large natural or near natural area set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area.

Category III Natural Monument or Feature — set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove.

Category IV Habitat/Species Management Area — aims to protect particular species or habitats and management reflects this priority.

Category V Protected Landscape/ Seascape — protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value.

Category VI Protected area with sustainable use of natural resources — conserves ecosystems and habitats together with associated cultural values and traditional natural resource management systems.

Table A.1 Park groups and their attributes.

Park group	General description of park group attributes
A1	All parks represent at least 2 bioregions. Parks generally greater than 10000 ha (up to 660 000 ha), all scheduled under the *National Parks Act*. Most parks very large or have contiguity with state forest areas (or both), and have very high area to boundary ratios. All have very high diversity in terms of both vegetation communities and species, & represent a high proportion of the bioregions species diversity (about 40–60%). Very large number of threatened species present and important for protecting a relatively high proportion of those species. Internal fragmentation is highly variable across the scale of these parks as is areas of highly disturbing previous land use.
A2	With Park Group A1, captures representation of all bioregions. Park size generally greater than 1000 ha (up to 21 600 ha), mostly parks scheduled under the *National Parks Act* but also includes high value nature conservation reserves. All have relatively high diversity in terms of both vegetation communities and species, and represent a high proportion of the bioregions species diversity (about 40–60%). Large number of threatened species present and important for protecting a relatively high proportion of those species. A greater degree of exposure to threatening processes at their edge (than A1), as well as from previous disturbing land uses.
A – Marine	Marine National Parks scheduled under the *National Parks Act*.
B	Represents full range of bioregions, except for 3 bioregions completely conserved within parks in A1 and A2. Park size ranges from 50 ha to 40 000 ha, majority of nature conservation reserves. Parks are protecting vegetation communities largely of moderate significance and well represented in the parks system. Parks have relatively lower species diversity, representing a moderate proportion of the bioregions species diversity (about 20–40%). Moderate number of threatened species present and important for protecting a small number of those species.
B – Marine	Marine Sanctuaries scheduled under the *National Parks Act*
C	Park size ranges from 1 ha to 142 300 ha, predominantly nature conservation reserves, with a small number of parks scheduled under the *National Parks Act* that have relatively low or common biodiversity values. Parks are protecting vegetation communities largely of low to moderate significance and that are well represented in the parks system. Generally have moderate to high levels of internal fragmentation and adjacency to non-native vegetation. Parks have relatively lower species diversity, representing a moderate proportion of the bioregions species diversity (about 10–30%). Moderate but variable number of threatened species present and important for protecting a small number of those species.
D	Park sizes range from 10 ha to 15 000 ha, and are conservation reserves. Parks have relatively lower species diversity, representing a moderate proportion of the bioregions species diversity (about 2–15%). Relatively small number of threatened species present.
E	Generally have very low or nil recorded values of low biodiversity conservation significance.

Appendix B — Conservation assets

This appendix provides an overview of the area of ecosystems (assets), EVDs and EVCs) within the Grampians (Gariwerd) Park Landscape, and the biodiversity conservation status of each EVC.

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
Riparian	Damp Scrub	Riparian Scrub	Least Concern	2118.91
		Riparian Scrub/Sedgy Riparian Woodland Complex	Least Concern	308.76
		Riparian Scrub/Heathland Thicket Mosaic	Least Concern	55.48
		Floodplain Thicket/Wet Heathland Complex	Least Concern	43.78
		Riparian Scrub/Sedgy Riparian Woodland Mosaic	Least Concern	33.85
		Riparian Scrub/Heathland Thicket Complex	Least Concern	29.00
		Shrubby Woodland/Riparian Scrub Complex	Least Concern	20.16
		Heathland Thicket/Seasonally Inundated Shrubby Woodland Complex	Least Concern	10.92
		Riparian Scrub/Seasonally Inundated Shrubby Woodland Mosaic	Least Concern	8.00
		Riparian Scrub/Riparian Forest Complex	Least Concern	1.82
	Riparian (higher rainfall)	Riparian Forest	Depleted	149.88
		Riparian Shrubland	Least Concern	60.08
		Riparian Forest/Sedgy Riparian Woodland Complex	Depleted	8.56
		Riparian Shrubland/Riparian Scrub Complex	Least Concern	4.25
	Riverine Woodland / Forest	Floodplain Riparian Woodland	Vulnerable	25.33
		Riparian Woodland	Vulnerable	0.33
		Riparian Ecosystem Total		**2879.12**
Wetlands	Freshwater Wetland (ephemeral)	Plains Sedgy Wetland	Endangered	112.67
		Claypan Ephemeral Wetland	Vulnerable	3.02
	Freshwater Wetland (permanent)	Shallow Freshwater Marsh	Vulnerable	634.75
		Aquatic Herbland/Plains Sedgy Wetland Mosaic	Endangered	609.56
		Sedge Wetland	Endangered	320.85
		Red Gum Swamp	Endangered	63.84
		Shallow Freshwater Marsh/Floodplain Thicket Mosaic	Vulnerable	42.83
		Reed Swamp	Vulnerable	9.32
		Water Body — Fresh	not applicable	7.59
		Red Gum Wetland/Shallow Freshwater Marsh Mosaic	Vulnerable	7.05
		Shallow Freshwater Marsh/Seasonally Inundated Shrubby Woodland Complex	Vulnerable	5.67
	Treed Swampy Wetland	Floodplain Thicket	Least Concern	2229.34
		Sedgy Riparian Woodland	Least Concern	2227.69
		Seasonally Inundated Shrubby Woodland	Least Concern	1832.64
		Plains Sedgy Woodland	Depleted	357.62
		Creekline Grassy Woodland	Endangered	76.92
		Shrubby Woodland/Sedgy Riparian Woodland Complex	Least Concern	61.94
		Shrubby Woodland/Riparian Scrub Mosaic	Least Concern	58.75
		Floodplain Thicket/Riparian Scrub Complex	Least Concern	53.86
		Sedgy Riparian Woodland/Riparian Scrub Mosaic	Least Concern	31.41
		Sedgy Riparian Woodland/Dry Creekline Woodland Complex	Least Concern	30.22
		Seasonally Inundated Shrubby Woodland/Heathland Thicket Mosaic	Least Concern	26.65

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
		Shrubby Woodland/Seasonally Inundated Shrubby Woodland Mosaic	Least Concern	17.98
		Sedgy Riparian Woodland/Riparian Shrubland Complex	Least Concern	17.63
		Shrubby Woodland/Seasonally Inundated Shrubby Woodland Complex	Least Concern	14.68
		Seasonally Inundated Shrubby Woodland/Sedge Wetland Complex	Least Concern	11.30
		Floodplain Thicket/Sedgy Riparian Woodland Complex	Least Concern	5.32
		Creekline Sedgy Woodland	Endangered	5.18
		Sedgy Riparian Woodland/Lowland Forest Complex	Least Concern	2.51
		Sedgy Riparian Woodland/Damp Sands Herb-rich Woodland Mosaic	Least Concern	0.02
		Floodplain Thicket/Shrubby Woodland Mosaic	Least Concern	0.01
	Saline Wetland	Brackish Sedgeland	Endangered	3.86
		Water body — salt	not applicable	31.40
		Wetlands Ecosystem Total		**8914.09**
Heathland (treeless)	Heathland (sands)	Sand Heathland	Least Concern	10313.64
		Damp Heath Scrub	Least Concern	1308.64
		Wet Heathland	Vulnerable	1123.68
		Heathland Thicket	Least Concern	612.19
		Sand Heathland/Damp Heathland Complex	Least Concern	115.34
		Wet Heathland/Riparian Scrub Complex	Vulnerable	57.90
		Sand Heathland/Seasonally Inundated Shrubby Woodland Mosaic	Least Concern	33.91
		Damp Heathland/Riparian Scrub Complex	Least Concern	22.40
		Heathland Thicket/Sand Heathland Complex	Least Concern	14.01
		Heathland Thicket/Sedgy Riparian Woodland Complex	Least Concern	11.45
		Heathland Thicket/Wet Heathland Complex	Least Concern	10.36
		Damp Heathland/Wet Heathland Mosaic	Least Concern	9.96
		Damp Heathland/Riparian Scrub Mosaic	Least Concern	5.59
		Damp Heathland/Sand Heathland Mosaic	Vulnerable	0.27
		Damp Heathland	Least Concern	0.15
		Wet Heathland/Riparian Scrub Mosaic	Vulnerable	0.10
		Heathland (treeless) Ecosystem Total		**13639.58**
Heathy Forest and Woodland	Grassy / Heathy Dry Forest	Heathy Dry Forest	Least Concern	29070.43
		Shrubby Woodland	Least Concern	5810.49
		Lateritic Woodland	Depleted	1665.57
		Grassy Dry Forest	Depleted	1501.83
		Heathy Woodland/Heathy Dry Forest Complex	Least Concern	1290.18
		Heathy Dry Forest/Heathy Woodland Complex	Least Concern	466.68
		Herb-rich Heathy Forest	Least Concern	430.72
		Heathy Dry Forest/Valley Grassy Forest Complex	Vulnerable	423.34
		Shrubby Woodland/Heathy Woodland Complex	Least Concern	278.54
		Heathy Woodland/Plains Grassy Woodland Complex	Endangered	199.47
		Dry Creekline Woodland	Endangered	136.20
		Heathy Woodland/Grassy Dry Forest Complex	Depleted	80.85

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
		Heathy Dry Forest/Shrubby Woodland Complex	Least Concern	58.09
		Heathy Woodland/Valley Grassy Forest Complex	Vulnerable	39.94
		Sand Forest	Endangered	35.87
		Heathy Dry Forest/Riparian Scrub Mosaic	Least Concern	26.99
		Heathy Dry Forest/Damp Sands Herb-rich Woodland Complex	Least Concern	21.86
		Heathy Woodland/Shrubby Woodland Mosaic	Least Concern	19.91
		Heathy Woodland/Riparian Scrub Complex	Least Concern	11.20
		Heathy Dry Forest/Hills Herb-rich Woodland Complex	Least Concern	11.10
		Heathy Woodland/Shrubby Woodland Complex	Least Concern	10.76
		Heathy Woodland/Sedgy Riparian Woodland Complex	Least Concern	6.07
		Heathy Woodland/Plains Grassy Woodland Mosaic	Endangered	5.98
		Heathy Woodland/Sedgy Riparian Woodland Mosaic	Least Concern	5.26
		Heathy Woodland/Hills Herb-rich Woodland Complex	Least Concern	4.50
		Heathy Dry Forest/Sedgy Riparian Woodland Complex	Least Concern	2.92
		Grassy Dry Forest/Rocky Outcrop Shrubland Mosaic	Depleted	2.72
		Lateritic Woodland/Heathy Dry Forest Mosaic	Endangered	1.08
		Shrubby Woodland/Lateritic Woodland Mosaic	Least Concern	0.55
		Lateritic Woodland/Heathy Woodland Mosaic	Endangered	0.47
		Damp Sands Herb-rich Woodland/Heathy Woodland Mosaic	Least Concern	0.29
		Heathy Dry Forest/Sand Heathland Mosaic	Least Concern	0.08
		Box Ironbark Forest/Heathy Woodland Complex	Least Concern	2.39
	Heathland (sands)	Heathy Woodland	Least Concern	44493.70
		Shallow Sands Woodland	Vulnerable	496.21
		Heathy Woodland/Sand Heathland Mosaic	Least Concern	172.45
		Heathy Woodland/Sand Heathland Complex	Least Concern	30.87
		Shrubby Woodland/Sand Heathland Complex	Least Concern	23.66
		Heathy Woodland/Damp Heathland Complex	Least Concern	8.25
		Heathy Forest and Woodland Ecosystem Total		**86847.49**
Herb Forest and Woodland	Forby Forest	Hills Herb-rich Woodland	Least Concern	7416.01
		Damp Sands Herb-rich Woodland	Least Concern	4911.31
		Herb-rich Foothill Forest	Depleted	1087.36
		Hills Herb-rich Woodland/Heathy Woodland Complex	Least Concern	746.68
		Damp Sands Herb-rich Woodland/Shrubby Woodland Complex	Least Concern	323.15
		Damp Sands Herb-rich Woodland/Heathy Woodland	Least Concern	160.84

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
		Complex		
		Shrubby Woodland/Alluvial Terraces Herb-rich Woodland Mosaic	Least Concern	156.59
		Damp Sands Herb-rich Woodland/Sedgy Riparian Woodland Complex	Least Concern	149.87
		Shrubby Woodland/Damp Sands Herb-rich Woodland Complex	Least Concern	111.04
		Damp Sands Herb-rich Woodland/Shrubby Woodland Mosaic	Least Concern	100.64
		Grassy Woodland	Endangered	85.70
		Hills Herb-rich Woodland/Valley Grassy Forest Complex	Vulnerable	78.01
		Shrubby Woodland/Hills Herb-rich Woodland Complex	Least Concern	58.87
		Shrubby Woodland/Alluvial Terraces Herb-rich Woodland Complex	Least Concern	58.30
		Herb-rich Foothill Forest/Damp Sands Herb-rich Woodland Complex	Depleted	51.25
		Hills Herb-rich Woodland/Shrubby Woodland Complex	Least Concern	43.66
		Shrubby Woodland/Damp Sands Herb-rich Woodland Mosaic	Least Concern	32.67
		Herb-rich Foothill Forest/Lowland Forest Complex	Depleted	14.03
		Herb-rich Foothill Forest/Sedgy Riparian Woodland Complex	Depleted	12.76
		Damp Sands Herb-rich Woodland/Sedgy Riparian Woodland Mosaic	Least Concern	8.93
		Damp Sands Herb-rich Woodland/Dry Creekline Woodland Complex	Least Concern	7.62
		Damp Sands Herb-rich Woodland/Alluvial Terraces Herb-rich Woodland Complex	Least Concern	7.29
		Herb-rich Foothill Forest/Grassy Dry Forest Complex	Depleted	7.10
		Damp Sands Herb-rich Woodland/Plains Grassy Woodland Mosaic	Endangered	6.99
		Herb-rich Foothill Forest/Damp Sands Herb-rich Woodland Mosaic	Depleted	6.81
		Hills Herb-rich Woodland/Heathy Dry Forest Complex	Least Concern	3.85
		Hills Herb-rich Woodland/Sedgy Riparian Woodland Complex	Least Concern	3.81
		Hills Herb-rich Woodland/Riparian Shrubland Complex	Least Concern	3.67
		Damp Sands Herb-rich Woodland/Red Gum Wetland Mosaic	Least Concern	0.74
		Hills Herb-rich Woodland/Valley Grassy Forest Mosaic	Least Concern	0.26
		Hills Herb-rich Woodland/Heathy Woodland Mosaic	Least Concern	0.17
	Inland Plains Woodland	Plains Grassy Woodland	Endangered	3894.57
		Alluvial Terraces Herb-rich Woodland	Endangered	1263.20
		Shrubby Woodland/Plains Grassy Woodland Complex	Endangered	41.05
		Alluvial Terraces Herb-rich Woodland/Hills Herb-rich Woodland Complex	Least Concern	36.39
		Alluvial Terraces Herb-rich Woodland/Sedge Wetland Complex	Endangered	29.59
		Alluvial Terraces Herb-rich Woodland/Claypan Ephemeral Wetland Mosaic	Least Concern	27.49
		Plains Woodland	Endangered	17.27
		Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Mosaic	Endangered	15.28
		Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Complex	Endangered	12.86

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
		Alluvial Terraces Herb-rich Woodland/Claypan Ephemeral Wetland Complex	Least Concern	7.35
		Shrubby Woodland/Plains Grassy Woodland Mosaic	Endangered	6.48
		Alluvial Terraces Herb-rich Woodland/Shrubby Woodland Complex	Least Concern	3.71
		Plains Woodland/Plains Grassy Wetland Mosaic	Endangered	0.12
		Plains Woodland/Plains Sedgy Woodland/Damp Sands Herb-rich Woodland Mosaic	Endangered	0.02
	Western Plains Woodland	Plains Grassy Woodland/Shrubby Woodland Mosaic	Endangered	0.21
		Stony Rises Woodland	Vulnerable	0.01
		Herb Forest and Woodland Ecosystem Total		**21011.53**
Mixed Forest	Foothills Forest	Shrubby Foothill Forest	Least Concern	4168.59
		Valley Grassy Forest	Vulnerable	4078.87
		Valley Grassy Forest/Heathy Woodland Complex	Vulnerable	151.89
		Valley Grassy Forest/Grassy Dry Forest Complex	Vulnerable	139.47
		Shrubby Foothill Forest/Heathy Dry Forest Complex	Least Concern	107.52
		Valley Grassy Forest/Damp Sands Herb-rich Woodland Complex	Vulnerable	52.30
		Valley Grassy Forest/Sedgy Riparian Woodland Complex	Endangered	36.42
		Valley Grassy Forest/Shrubby Woodland Complex	Endangered	22.27
		Valley Grassy Forest/Herb-rich Foothill Forest Complex	Vulnerable	7.50
		Valley Grassy Forest/Lateritic Woodland Mosaic	Endangered	0.27
		Valley Grassy Forest/Plains Grassy Woodland Complex	Endangered	0.04
	Tall Mixed Forest (Eastern)	Lowland Forest	Least Concern	8680.49
		Lowland Forest/Valley Grassy Forest Complex	Vulnerable	1003.65
		Lowland Forest/Heathy Dry Forest Complex	Least Concern	737.38
		Lowland Forest/Heathy Woodland Complex	Least Concern	65.57
		Lowland Forest/Grassy Dry Forest Complex	Depleted	57.58
		Lowland Forest/Shrubby Woodland Complex	Least Concern	25.62
		Lowland Forest/Riparian Forest Complex	Least Concern	25.34
		Lowland Forest/Riparian Scrub Complex	Least Concern	9.70
		Lowland Forest/Damp Sands Herb-rich Woodland Complex	Least Concern	5.58
		Lowland Forest/Riparian Shrubland Complex	Least Concern	4.79
		Lowland Forest/Hills Herb-rich Woodland Complex	Least Concern	1.03
		Mixed Forest Ecosystem Total		**19381.88**
Wet Forest	Moist Forest	Shrubby Foothill Forest/Lowland Forest Complex	Least Concern	416.20
		Damp Forest	Least Concern	297.93
		Damp Forest/Herb-rich Foothill Forest Complex	Least Concern	148.03
		Damp Forest/Lowland Forest Complex	Least Concern	30.56
		Damp Forest/Herb-rich Foothill Forest Mosaic	Least Concern	22.79

ECOSYSTEM	EVD	EVC	Biodiversity conserv. status	Total (ha)
		Damp Forest/Riparian Scrub Complex	Least Concern	10.83
	Tall Mist Forest	Wet Forest	Least Concern	162.20
		Wet Forest/Damp Forest Complex	Least Concern	18.21
		Wet Forest Ecosystem Total		**1106.75**
Rocky Knoll	Rocky Knoll	Rocky Outcrop Shrubland	Least Concern	12574.46
		Rocky Outcrop Herbland	Least Concern	9903.01
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland Mosaic	Least Concern	5535.98
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Heathy Woodland Mosaic	Least Concern	182.86
		Rocky Outcrop Shrubland/Heathy Dry Forest Complex	Least Concern	144.23
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Hills Herb-rich Woodland Complex	Least Concern	79.49
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Grassy Dry Forest Mosaic	Depleted	46.33
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Heathy Dry Forest Mosaic	Least Concern	21.97
		Montane Rocky Shrubland/Shrubby Foothill Forest Complex	Least Concern	19.90
		Rocky Outcrop Shrubland/Grassy Dry Forest Complex	Least Concern	16.16
		Rocky Outcrop Shrubland/Heathy Woodland Complex	Least Concern	5.86
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Lowland Forest Complex	Least Concern	3.65
		Rocky Outcrop Shrubland/Lowland Forest Complex	Least Concern	2.90
		Rocky Outcrop Shrubland/Valley Grassy Forest Complex	Vulnerable	1.76
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Shrubby Foothill Forest Complex	Least Concern	0.78
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Sandstone Ridge Shrubland Mosaic	Least Concern	0.32
		Rocky Outcrop Shrubland/Rocky Outcrop Herbland/Hills Herb-rich Woodland Mosaic	Least Concern	0.12
		Rocky Knoll Ecosystem Total		**28539.77**
Montane	High Altitude Shrubland /	Montane Rocky Shrubland	Least Concern	1872.40
	Woodland	Montane Grassy Woodland	Least Concern	3.03
	High Altitude Wetland	Montane Wet Heathland	Least Concern	54.48
		Montane Ecosystem Total		**1929.90**
Unclassified	No valid EVD	No EVC assigned	not applicable	157.36
		Water Body — man-made	not applicable	4.95
		Unknown/Unclassified	not applicable	0.03
		Unclassified Total		**162.34**
		TOTAL		**184412.43**

Appendix C — Prioritisation of strategies

Management strategy	Priority
Fire to Maintain Habitat or species — Continue with the delivery of the Grampians Fire Ecology Strategy in partnership with DELWP. Focus on using fire in fire-dependent and fire influenced EFG's to maintain flora and fauna species, habitats and ecological requirements.	High
Exclude planned fire to maintain habitat or species — Continue with the delivery of the Grampians Fire Ecology Strategy in partnership with DELWP. Exclude planned fire from fire sensitive habitats (where possible, and) to achieve appropriate growth stages.	High
Landscape scale fox 1080 poison baiting	High
Integrated herbivore control, targeted Adaptive Experimental Management — Goat, red deer, fallow deer, macropod, and rabbit control in targeted areas using Adaptive Experimental Management project design. Smaller version of the desired large-scale approach. Demonstration project and proof of concept.	High
Sallow wattle containment — Contain sallow wattle to the current range (prevent expansion)	High
Targeted fox control in high value areas — Targeted fox baiting and leg-hold trapping around key fauna refuges and in response after bushfires and large prescribed burns (complementing large-scale fox poison baiting program)	High
Fire to Provide protection — Used planned fire peripheral to priority species (flora and fauna), communities (i.e. endemic EVC), riparian / feeder gullies, aquatic drought refuges (in-stream pools and priority wetlands) fauna refuge and core habitat areas to reduce the severity and impact of bushfires.	Medium
Integrated fox and cat control. Note: The feasibility score will change if cat legislation is changed and cat bait becomes commercially available.	Medium
Cat trapping in targeted areas – seek approvals to conduct cat trapping to protect smoky mouse populations and provide protection around the Wannon and Glenelg Rivers for the remaining priority ground-dwelling mammal populations.	Medium
Whole of landscape feral goat campaign by developing strategic partnerships to 'blitz' feral goats in targeted areas (Mt Difficult Range, Mt William Range) with follow up targeted effort.	Medium
Apply integrated large-scale herbivore control Adaptive Experimental Management — Goat, red deer, fallow deer, rabbit and macropod across the landscape.	Medium
Protect key assets from sallow wattle invasion such as asset protection of Grampians Duck Orchid population.	Medium
Implement 'simple' hydrological improvements by developing partnerships with CMA's and water authorities to achieve environmental flows. Note: see knowledge gaps regarding needing to identify high priority sites.	Medium
Restoration of missing ecosystem process – restore native predators such as devil, spot-tailed quoll and possibly eastern quoll as sustainable fox, cat and rabbit control.	Low
Landscape scale cat control — Trial deployment of cat baiting. Note: feasibility score will change if legislation is amended to allow for poison baiting of feral cats and the baits become commercially available.	Low
Opportunistic targeted removal of goats post-fire in rocky knolls and montane endemic EVC areas.	Low
Rabbit control in priority threatened EVC's	Low
Large-scale control to reduce sallow wattle across the landscape (large scale AEM approach) taking advantage of post-2014 bushfire conditions	Low
Establish off-track *Phytophthora cinnamomi* hygiene control measures for staff, firefighting and visitors.	Low

Appendix D — Scientific names of species mentioned in the plan

Common name	Scientific name
Barking Owl	*Ninox connivens*
Barn Owl	*Tyto javanica*
Blackberry	*Rubus fruticosus* spp. agg.
Blue Periwinkle	*Vinca major*
Bridal Creeper	*Asparagus asparagoides*
Brown Stringybark	*Eucalyptus baxteri*
Brown Toadlet	*Pseudophryne bibroni*
Brush-tailed Phascogale	*Phascogale tapoatafa*
Brush-tailed Rock-wallaby	*Petrogale penicillata*
Burrowing Crayfish	*Gramastacus insolitus*
Bush Stone-curlew	*Burhinus grallarius*
Candy Spider-orchid	*Caladenia versicolor*
Chestnut-rumped Heathwren	*Hylacola pyrrhopygia*
Chytrid Fungus	*Batrachochytrium dendrobatidis*
Cinnamon Fungus (Phythophthora)	*Phytophthora cinnamomi*
Club Moss	*Lycopodium* sp.
Common Dunnart	*Sminthopsis murina*
Cunningham's Skink	*Egernia cunninghami*
Diamond Firetail	*Stagonopleura guttata*
Dusky Antechinus	*Antechinus swainsonii*
Eastern Grey Kangaroo	*Macropus giganteus*
Eastern Pygmy-possum	*Cercartetus nanus*
Eastern Quoll	*Dasyurus viverrinus*
Elegant Spider-orchid	*Caladenia elegans*
Elk	*Cervus canadensis*
English Ivy	*Hedera helix*
European Rabbit	*Oryctolagus cuniculus*
Fairy Aprons	*Utricularia dichotoma*
Fallow Deer	*Dama dama*
Feathertail Glider	*Acrobates pygmaeus*
Feral Cat	*Felis catus*
Feral Goat	*Capra hircus*
Feral Pig	*Sus scrofa*
Gang-gang Cockatoo	*Callocephalon fimbriatum*
Glenelg Spiny Crayfish	*Euastacus bispinosus*
Grampians Bertya	*Bertya grampiana*
Grampians isopod	*Gariwerdus heehibensis*
Grampians isopod	*Gariwerdus ingletonensis*
Grampians isopod	*Gariwerdus turretensis*
Grampians Duck-orchid	*Paracaleana disjuncta*

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Common name	Scientific name
Grampians Grey Gum	*Eucalyptus alaticaulis*
Grampians Mountain Dragon	*Rankinia diemensis*
Grampians Pincushion-lily	*Borya mirabilis*
Grampians Rice-flower	*Pimelia pagophila*
Greencomb Spider-orchid	*Caladenia gladiolata*
Growling Grass Frog	*Litoria raniformis*
Heath Mouse	*Pseudomys shortridgei*
Hooded Robin	*Melanodryas cucullata*
King Quail	*Excalfactoria chinensis*
Long-nosed Potoroo	*Potorous tridactylus*
Messmate Stringybark	*Eucalyptus obliqua*
Monitor lizards	*Varanus* sp.
Mountain Grey Gum	*Eucalyptus cypellocarpa*
—	*Naiopegia xiphagrostis*
One-leaf Cape-tulip	*Moraea flaccida*
Ornate Pink Fingers	*Caladenia ornate*
Oyster Bay Pine	*Callitris rhomboidea*
Pardalote	*Pardalotus* sp.
Peregrine Falcon	*Falco peregrinus*
Phreatoicid isopod	*Phreatoicopsis raffae*
Phreatoicid isopod	*Phreatoicopsis terricola*
Platypus	*Ornithorhynchus anatinus*
Powerful Owl	*Ninox strenua*
Radiata Pine	*Pinus radiata*
Red Deer	*Cervus elaphus*
Red Fox	*Vulpes vulpes*
Red-necked Wallaby	*Macropus rufogriseus*
Sallow Wattle	*Acacia longifolia*
Sambar Deer	*Rusa unicolor*
Silver Banksia	*Banksia marginata*
Slaty Sheoak	*Allocasuarina muelleriana* subsp. *muelleriana*
Smoky Mouse	*Pseudomys fumeus*
South African Orchid	*Disa bracteata*
Southern Bettong	*Bettongia gaimardi*
Southern Boobook	*Ninox novaeseelandiae*
Southern Brown Bandicoot	*Isoodon obesulus obesulus*
Southern Pipewort	*Eriocaulon australasicum*
Southern Toadlet	*Pseudophryne semimarmorata*
Southern Water Skink	*Eulamprus tympanum*
Spiral Sun-orchid	*Thelymitra matthewsii*
Spot-tailed Quoll	*Dasyurus maculatus*
Squirrel Glider	*Petaurus norfolcensis*

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Common name	Scientific name
St john's Wort	*Hypericum perforatum*
Striped Worm Lizard	*Aprasia striolata*
Sugar Glider	*Petaurus breviceps*
Swamp Rat	*Rattus lutreolus*
Swamp Wallaby	*Wallabia bicolor*
—	*Synamphisophus ambiguous*
—	*Synamphisopus doegi*
Tawny-crowned Honeyeater	*Glyciphila melanops*
Water rat (Rakali)	*Hydromys chrysogaster*
Wedge-tailed Eagle	*Aquila audax*
Western Grey Kangaroo	*Macropus fuliginosus*
Western Swamp Crayfish	*Gramastacus insolitus*
White Arum-lily	*Zantedeschia aethiopica*
Wimmera Bottlebrush	*Callistemon wimmerensis*
Yellow-bellied Glider	*Petaurus australis*
Yellow Box	*Eucalyptus melliodora*
Yellow-tailed Black-cockatoo	*Calyptorhynchus funereus*

Appendix E — Biosecurity principles

Prevention

Prevention is a pre-emptive action to managing the risk of introducing weeds into the Park landscape and ensuring works or disturbance events do not provide an opportune environment for weed establishment. This is achieved by identifying the most likely invasion points, which are often vehicle access and parking sites and locations where animals are likely to act as vectors. Pre-emptive action includes measures such as maintaining vehicle and equipment hygiene, avoiding the introduction of soils, gravels and other materials which may carry seed and ensuring that appropriate site preparation and risk identification before planned disturbance events such as planned burning and environmental watering.

Eradication of new and emerging weeds

The initial part of the strategy is to ensure that resources are available to address the threat of new and emerging weeds before they can become established. Any new weed species identified within the Park Landscape should be eradicated as a management priority and the area of infestation monitored for re-emergence. Once a species has become established, its potential for eradication becomes less feasible and more resource intensive.

DELWP have designed a decision-making framework to managing Weeds of Early Stages of Invasion (WESI). This framework will guide and support the management of new and emerging weeds. The WESI principles are based on a landscape approach to identifying new and emerging species. The process to address new and emerging weed threats should follow the six-step approach outlined in the Weeds of Early Stages of Invasion framework. Eradication is the objective for new and emerging weeds where feasible.

Containment

Containment is an ongoing maintenance approach to managing the spread of established weeds. Management tracks, ridgelines and other landscape features are useful in defining containment boundaries. Containment is used when a species is not considered feasibly eradicable in the short-medium term, however a strategy establishing containment lines and constricting the containment area over time may have a long-term eradication goal.

It is important to inspect a buffer around an established containment area to ensure efforts are effective and new populations are not establishing beyond containment boundaries. Where there are pathways of spread through a containment area (eg. vehicles, walkers, river corridors) a concerted effort should be made to undertake control works along tracks and waterways to decrease the likelihood of spread. Containment includes the eradication of satellite or local populations of weeds outside the containment area.

Asset Protection

A range of weeds are well established and wide spread within the Grampians (Gariwerd) Park Landscape. If a weed species presents a specific threat to a specific value, an asset protection approach to weed management may be undertaken. Examples of assets include riparian corridors, threatened species, cultural heritage sites, visitor sites and infrastructure. Asset protection efforts will generally involve specifying a buffer around the asset and treating weeds within its perimeter. Biological controls can assist with containment efforts for established weeds, but are limited to species with an available control agent.


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