Conservation Action Plan:

Great Otway

parks and reserves managed by Parks Victoria

August 2020

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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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Cover: Port Campbell National Park (Wenbo Chen)

Foreword

Parks Victoria recognizes the diversity of cultures, deep connections and the rights and responsibilities that Traditional Owners have over the lands and waters covered by the Great Otway Conservation Action Plan. We recognize 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 and sea use and the impacts that introduced threats and intensive resource management 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.

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.

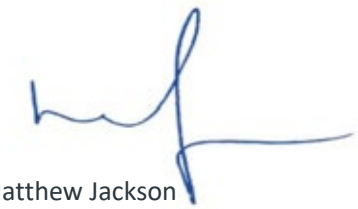
The Great Otway Conservation Action Plan focuses primarily on the first of Parks Victoria's three strategic themes:

- Caring for Country
- Connecting People and Nature
- Contributing to Healthy, Liveable Communities.

The goal for Caring for Country is to sustainably manage, protect and conserve Victoria's natural and cultural landscapes. It is our primary responsibility to ensure parks are healthy and resilient for current and future generations.

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 impacts of climate change, and the uncertainty it brings, will be considered in all conservation decisions and will significantly influence what can be achieved. The plan outlines Parks Victoria's understanding of the major threats to nature and wildlife in this ancient and unique cultural landscape, the impact of a changing climate, and the potential actions that we can take together with Traditional Owners and other partners in caring for and improving the health of the Great Otway Parks landscape.



Matthew Jackson
Chief Executive Officer
Parks Victoria

Metallic Sun-orchid,
Port Campbell National Park

Contents

Summary

The Great Otway Parks landscape is a region of great biodiversity and cultural heritage. It encompasses old-growth forests, cool temperate rainforests and wet forest, biodiverse heathlands, a large expanse of essentially unmodified coastline, and important marine ecosystems.

It is home to many threatened species, including the Long-nosed Potoroo, Southern Brown Bandicoot, Hooded Plover, Anglesea Grevillea and Metallic Sun-orchid. The areas covered by this plan form part of the Traditional Countries of the Eastern Maar and Wadawurrung peoples.

The Parks landscape includes The Great Otway National Park, Port Campbell National Park, Point Addis Marine National Park, Twelve Apostles Marine National Park and Bay of Islands Coastal Park, and 42 other reserves. It covers more than 135,000 hectares and is home to many endangered plant and animal species and significant cultural heritage places.

This Conservation Action Plan defines and prioritises conservation strategies for the Great Otway Parks landscape for the period to 2035, 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 direct the achievement of the conservation vision:

The resilience of natural assets in the Great Otway Parks landscape is increased and ecosystem services are maintained in the face of climate change and other stressors

Parks Victoria is responsible for managing over four million hectares of Victoria's most intact natural habitats and 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 appreciates the importance of long-term, respectful and meaningful partnerships with Traditional Owners, the opportunity to understand, share and celebrate Aboriginal cultural values, and the 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 integrated with the way Parks Victoria works.

The development, implementation and review of the plan follows Parks Victoria's cyclical 10-step conservation action planning and adaptive management process. The plan describes the first seven steps in this process, which includes scoping, identifying conservation assets and their condition, assessing threats to asset condition, developing strategies and actions to mitigate them, and articulating performance measures.

Six terrestrial and four marine conservation assets have been identified in the Great Otway Parks landscape. 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:

- Subtidal Reef is mostly in very good condition
- Heathland, Dry Forest and Woodland, Wet Forest and Rainforest, Riparian and Freshwater Wetland, Estuarine and Saline Wetlands, Intertidal Reef, Water Column (pelagic) and Soft Sediment are mostly in good condition
- Coastal (including islands) are in fair condition.

The trends in condition are mostly stable to improving, except in three conservation assets that are declining (Dry Forest and Woodland, Heathland and Coastal (including islands)). The desired future status of the majority of assets is good to very good but depends on the implementation of all the listed strategies.

Eleven key threats to the conservation assets in the Parks landscape are identified in the plan. In assessing risks, the compounding effects of climate change have been considered. Seven key threats are considered to pose an extreme or high risk and are therefore the priority threats considered in this plan. They are:

- inappropriate fire regimes
- weed invasion
- pathogens and diseases
- terrestrial predation by foxes and cats
- grazing and browsing pressure
- invasive or overabundant marine species
- habitat degradation caused by visitor impacts and illegal activities.

The ability of species and ecosystems to persist in a changing climate will be determined by their capacity to adapt to those changes. Some conservation assets and the nested assets within them will be more resilient than others and be better able to withstand the impacts of climate change. Conservation Strategies have been developed to mitigate threats, including the compounding effect of climate change, to improve the assets' capacity to adapt.

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 goals.

- **Manage fire for ecological health** — Work in partnership with fire management agencies to maintain and improve fire regimes that diversify vegetation age-class mosaics and protect fire-sensitive values.
- **Manage weeds and pathogens using a biosecurity approach** — Reduce the spread, establishment and impact of weeds, focusing on species that have, or are likely to have, significant impacts on the health of conservation assets and ecological processes.
- **Ongoing control of introduced predators to support resilient native fauna populations** — Implement targeted control of Red Foxes and Feral Cats at priority locations to support the persistence, movement and increase of native fauna vulnerable to predation.
- **Manage herbivores for healthy habitats** — Implement effective and integrated control of key herbivores to improve the regeneration and structural diversity of conservation assets across the Great Otway Parks landscape.
- **Manage over-browsing by Koalas** — Proactively manage koalas to maintain healthy Manna Gum communities through collaboration.
- **Manage marine pests for healthy marine protected areas** — Reduce the likelihood of populations of marine pests establishing in the Parks landscape, ensuring that the eradication of populations of new pests is rapid and targeted.
- **Reduce the impacts of recreation, illegal activities and natural resource extraction on natural values** — Encourage the public to enjoy nature-based activities, while ensuring the impacts on priority marine and terrestrial areas and species are minimised.
- **Reintroduce locally threatened species** — Reintroduce, where feasible, locally threatened species, and locally extinct species to restore ecological processes, including soil disturbance (digging, burrowing), seed and spore dispersal, and predation by native animals.
- **Collaborate and engage to build support for environmental management** — Strengthen collaboration and partnerships to maintain long-term engagement and guide adaptive environmental programs.

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

This Conservation Action Plan will provide directions for environmental conservation management for the next 15 years. The implementation of the Conservation Strategies is undertaken by regional staff at the operational level.

After 5 years the plan will be reviewed, 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. Performance measures have been identified in the plan which can be used to guide interim assessments of performance until a detailed Monitoring, Evaluation and Reporting Plan is established.

This particular version of the Great Otway Parks Conservation Action Plan may be revised before its scheduled review period to integrate traditional ecological knowledge and input from Traditional Owners, and to further capture their role in managing this highly biodiverse and culturally significant landscape in future conservation strategies. It may also be reviewed in the event of a landscape scale perturbation such as bushfire.

Triplet Falls,
Great Otway National Park

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 uses a collaborative approach to identify conservation priorities and develop strategies to address those priorities. These strategies are designed to achieve defined and measurable 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 for which the success of strategies 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.

Conservation Strategies have been developed and prioritised using the best available knowledge, and will enable specific operational activities to be implemented, monitored for success and further refined. The plan complements existing park management plans and may be used to guide the development of future joint management plans. Conservation strategies detailed in park management plans have been reviewed during the conservation action planning process and updated for inclusion where relevant.

The plan's purpose is to guide the management of conservation values and to articulate Parks Victoria's conservation priorities and strategies to stakeholders, land management partners and the public.

1.2 Parks landscapes

Parks landscapes are classified according to a combination of ecological attributes, landforms and administrative boundaries. There are 18 Parks landscapes across Victoria (Figure 1.1). They form a logical unit for applying conservation action planning and delivering specific operational activities to parks and reserves in these landscapes.

1.3 Planning method

Parks Victoria is using 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 (CMP 2020), 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 that it manages. It is consistent with the approach used by numerous other agencies that manage conservation lands in Victoria.

The emphasis is on identifying strategies that tackle the high-risk threats to priority conservation assets and their key ecological attributes, and that will contribute most to achieving the best possible conservation outcomes, taking into account the vulnerabilities of conservation assets to climate change. The impacts of climate change on threatening processes, and adaptation measures to mitigate them, are considered in the planning process.

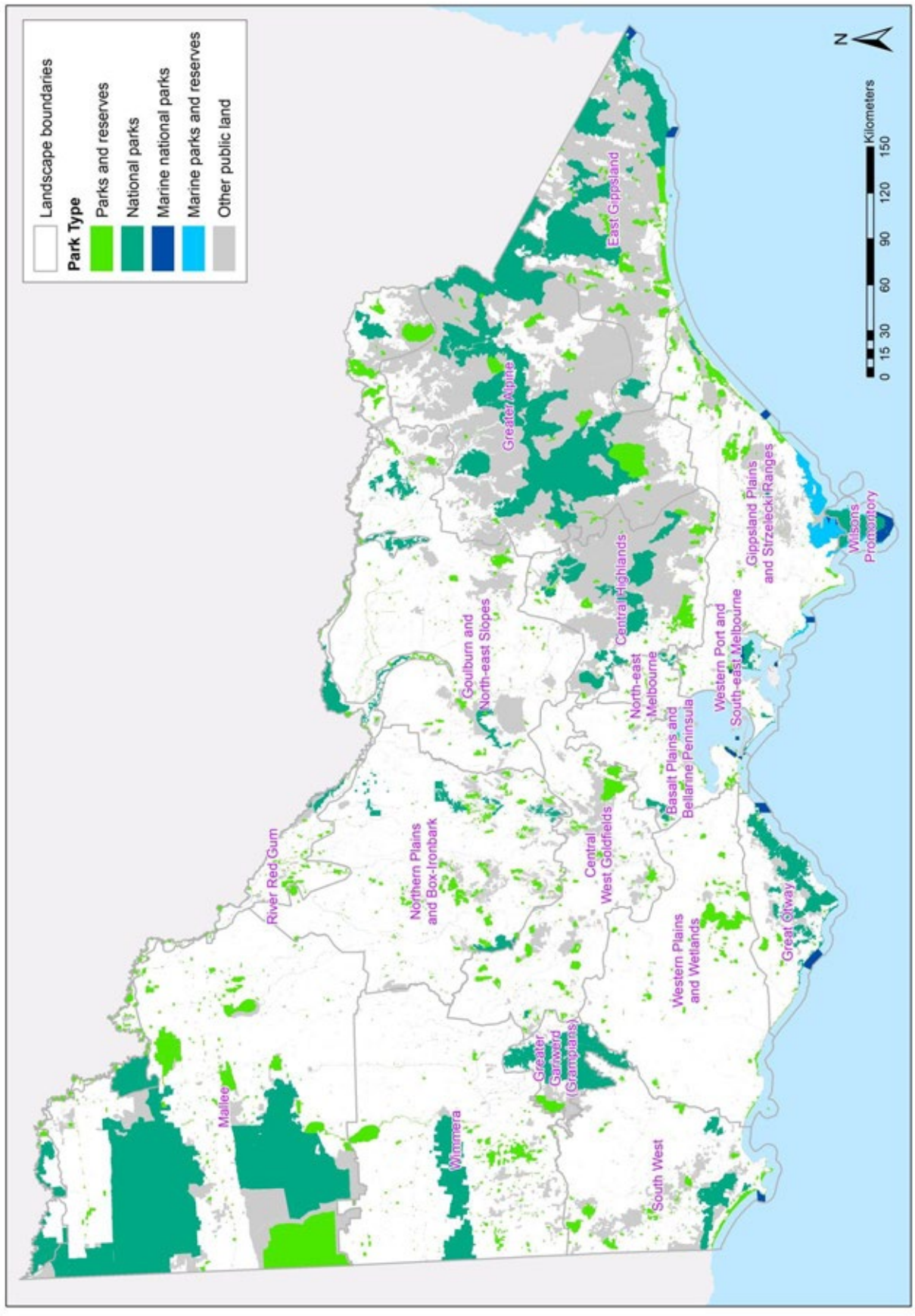


Figure 1.1 Parks Victoria's Parks landscapes.

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

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) is undertaken by regional staff at the operational level.

After 5 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 The 10-step conservation action planning process.

Rockpool at low tide,
Point Danger Marine Sanctuary

2 Scope

2.1 Geographic scope

The Great Otway Parks landscape includes both terrestrial and marine areas along and north of the coast between Torquay and Port Campbell (Figure 2.1). The parks and reserves in this landscape cover 136 000 hectares. Most of these reserves are accessed from the Great Ocean Road in the south or from the Princes Highway to the north. The southern part of the Great Otway Parks landscape reaches Bass Strait and the Southern Ocean, while the northern section of the landscape is adjacent to the much drier Western Plains and Wetlands Landscape.

The Parks landscape includes terrestrial habitats within the Warrnambool Plain and Otway Ranges bioregions, encompassing forested habitats and a cluster of parks and reserves in the foothills and ranges of the Otway Ranges. In the marine environment, the Parks landscape includes parks west of Cape Otway that are within the Otway Marine Bioregion, while the parks further east are within the Central Victorian Marine Bioregion. The major terrestrial and marine parks and reserves are shown in Table 2.1.

Table 2.1 Notable terrestrial and marine parks and reserves in the Great Otway Parks landscape.

Park/reserve name	Area (ha)	Level of Protection	IUCN Protected Areas Category
Great Otway National Park	110 339	A1	2 – National Park
Port Campbell National Park	2403	A2	2 – National Park
Bay of Islands Coastal Park	934	B	3 – Natural Monument or Feature
Cooriemungle Creek Flora Reserve	853	B	1a – Strict Nature Conservation Reserve
Aire River Wildlife Reserve	334	B	6 – Protected area with sustainable use of natural resources
Jancourt Nature Conservation Reserve	3355	C	1a – Strict Nature Conservation Reserve
Coradjil Nature Conservation Reserve	1610	Not rated	1a – Strict Nature Conservation Reserve
Point Addis Marine National Park	4412	Marine A	2 – National Park
Twelve Apostles Marine National Park	7506	Marine A	2 – National Park

2.2 Significant natural values

The natural values of significance identified in this Parks landscape are:

- two vegetation communities of state significance (listed under the Victorian *Flora and Fauna Guarantee Act 1998*)
- two vegetation communities of national significance (listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*)
- one nationally critically endangered fauna species, 38 nationally endangered or vulnerable fauna and flora species; four of these species (Orange-bellied Parrot, Hooded Plover, Swift Parrot and Australasian Bittern) are identified as priority species in the Australian Government's *Threatened Species Strategy* (AG 2015). Fifty-one flora and fauna species are currently listed under the Victorian *Flora and Fauna Guarantee Act 1988*
- many sites of geological and geomorphological significance, including Artillery Rocks, Dinosaur Cove, Lion Headland, Moonlight Head to Milanesia Beach, Point Sturt and View Point.

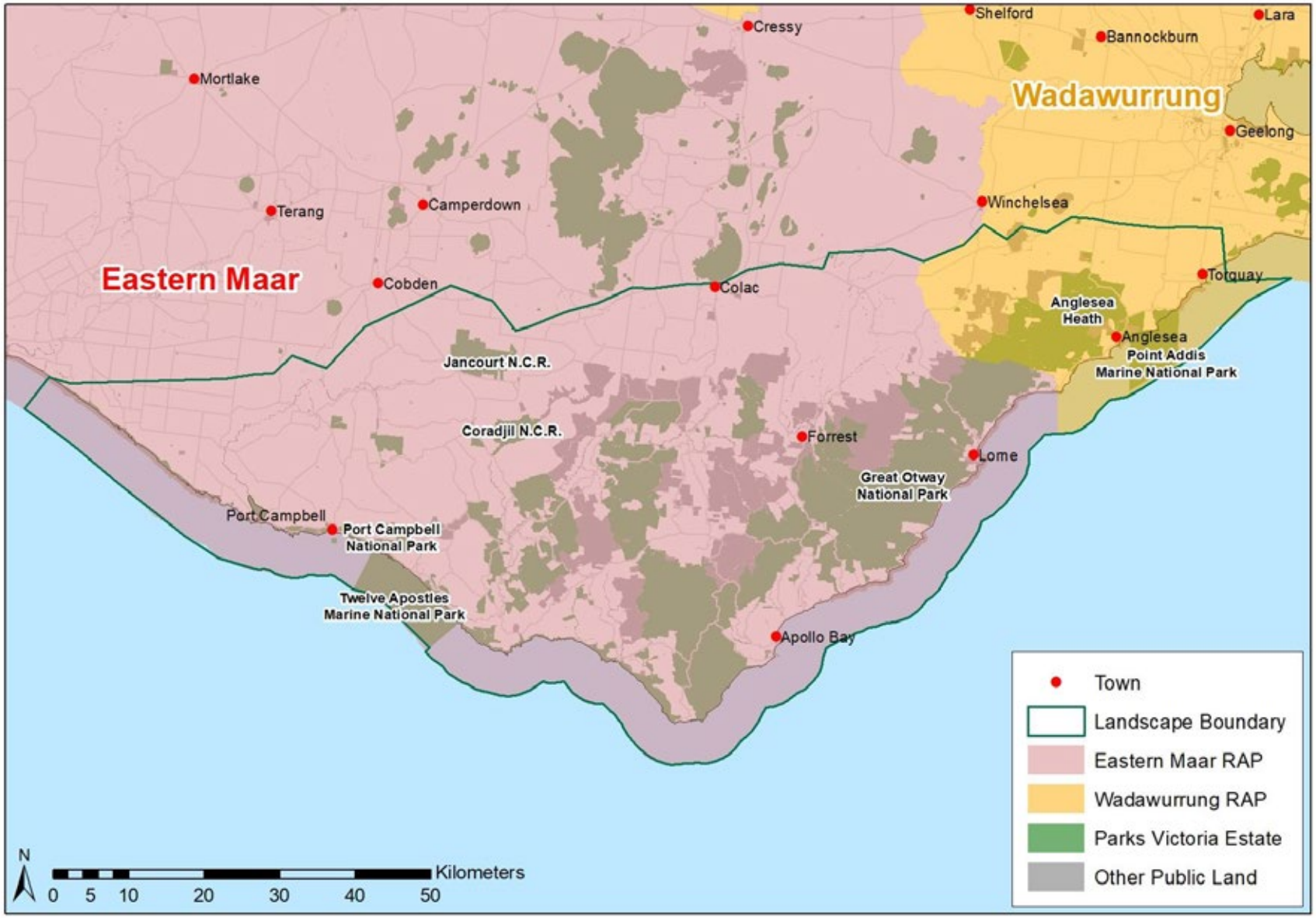


Figure 2.1 Geographic scope of conservation planning for the Great Otway Parks landscape, showing Registered Aboriginal Party (RAP) boundaries.

The Victorian Biodiversity Atlas includes records of more than 7388 species from the Great Otway Parks landscape, including:

- 3090 plants and algae
- 556 fungi
- 139 mammals
- 552 birds
- 20 amphibians
- 41 reptiles
- 156 fish
- 1207 insects
- 871 molluscs
- 1638 arthropods
- 318 crustaceans.

2.3 Cultural significance

The Eastern Maar and Wadawurrung peoples are the Traditional Owners for the lands covered in this plan, represented by the Eastern Marr Aboriginal Corporation and the Wadawurrung Traditional Owners Aboriginal Corporation (Figure 2.1). Both groups are recognised Traditional Owners under the *Aboriginal Heritage Act 2006* (Vic.) and have legislated authority for the protection and management of Aboriginal cultural heritage on their Country.

While European colonisation has had a devastating impact on the Eastern Maar and Wadawurrung peoples, which continues to this day, the Eastern Maar and Wadawurrung peoples maintain a strong connection with their Country.

The Otways is a cultural landscape that has been formed over many thousands of generations by skilled and knowledgeable Aboriginal Land Managers. In best-practice land and natural resource management, Traditional ecological knowledge and 'western' Natural Resource Management perspectives brought together benefit both the parks and the whole community.

Where possible, traditional ecological knowledge has been taken into account in the plan, however it is recognised that there is a greater need to work with the Eastern Maar and Wadawurrung peoples to ensure their goals for managing Country are captured in future iterations of this plan.

2.4 Legislative and planning context

The management of land and water resources, cultural heritage, and flora and fauna in the Great Otway Parks landscape is guided by many pieces of federal and state legislation, as well as Victorian Government policies and priorities. This domestic legislation, including the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), is also the instrument for implementing a number of Australia's international treaty obligations.

Parks Victoria's planning and management context is broadly illustrated in Figure 2.2.

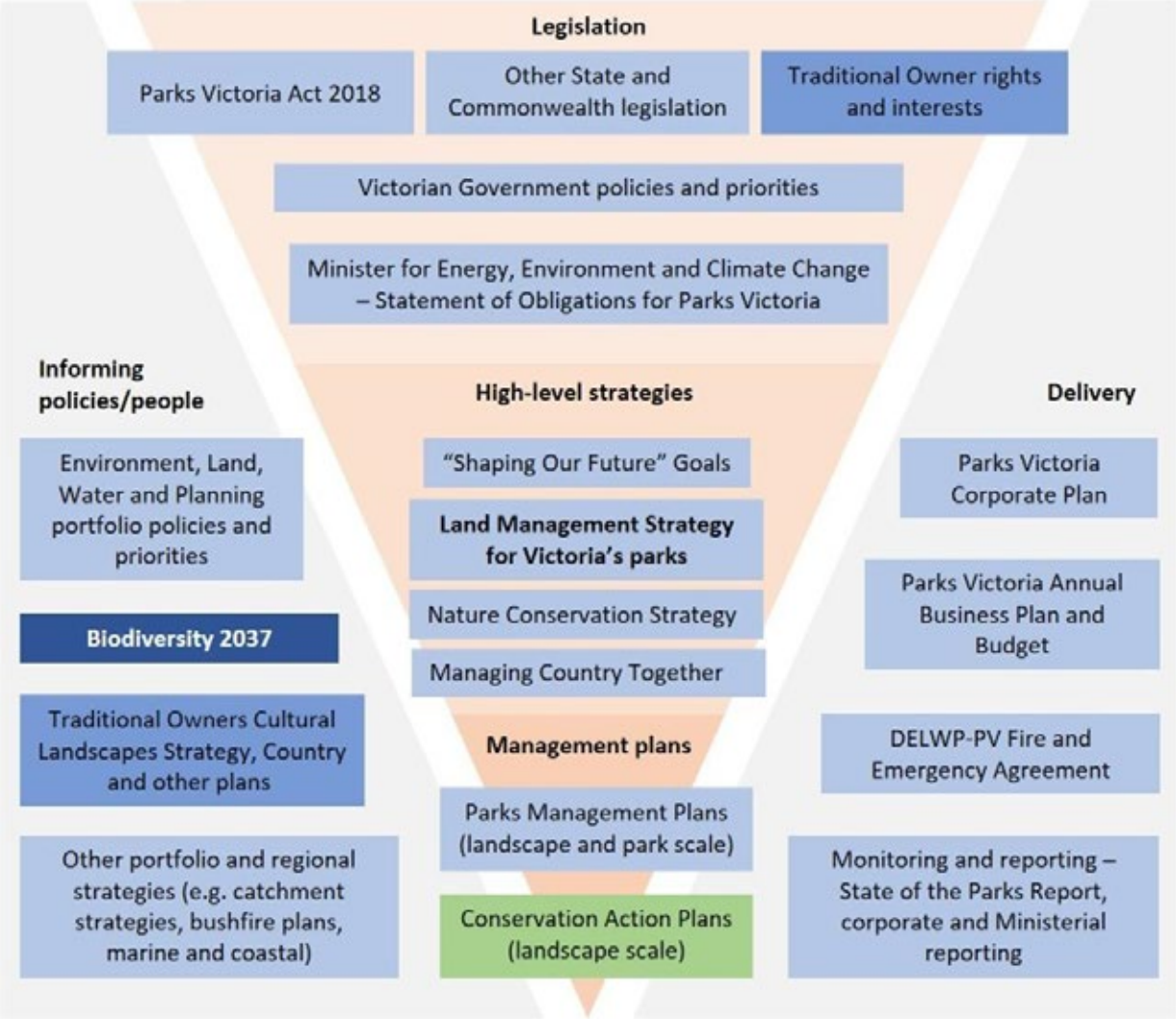


Figure 2.2 Parks Victoria's planning and management context.

Parks Victoria's objective is to protect, conserve and enhance Parks Victoria managed land, including its natural and cultural values, for the benefit of the environment and current and future generations. Parks Victoria also contributes to the achievement of State and regional land management outcomes, as far as it is consistent with the effective protection and management of land managed by Parks Victoria[1].

Conservation action planning provides a framework for delivering on these objectives, as well as supporting a variety of community and cultural objectives.

[1] *Parks Victoria Act 2018* (Vic.) Pt2 S7(a) and (f).

Australia, as a signatory to the Convention on Biological Diversity, is compelled to establish a network of protected areas for the purpose of maintaining biodiversity. This Conservation Action Plan will guide the management of Parks Victoria's protected areas and contribute to the delivery of Victoria's biodiversity strategy *Protecting Victoria's Environment — Biodiversity 2037,* which established a 20-year framework for the protection of biodiversity in Victoria (DELWP 2017).

The Great Otway Parks landscape consists of 45 parks and reserves, covering around 136 000 hectares, that are managed under various acts, including the Victorian *National Parks Act 1975* and *Crown Lands (Reserves) Act 1978*. The majority of the parks area is reserved and managed under the provisions of the National Parks Act (131 261 hectares), including Great Otway National Park, Port Campbell National Park, Bay of Islands Coastal Park, Point Addis Marine National Park, Twelve Apostles Marine National Park and four Marine Sanctuaries.

The most significant of the other reserves, in terms of biodiversity conservation, are Cooriemungle Creek Flora Reserve and Aire River Wildlife Reserve.

Reference Areas have been set aside under the *Reference Areas Act 1978* (Vic.) in Great Otway National Park (eight areas), Cooriemungle Creek Flora Reserve, Coradjil Nature Conservation Reserve and Jancourt Nature Conservation Reserve.

The Aire River between Hopetoun Falls and the river mouth has been proclaimed a Victorian Heritage River under the *Heritage Rivers Act 1992* (Vic.).

The protected area management categories of the International Union for Conservation of Nature and Natural Resources (IUCN) classify protected areas according to their management purpose. Parks Victoria uses a tool, called Levels of Protection, to aid planning and resource allocation at a state-wide scale by classifying parks according to composition and representation of biodiversity attributes. Both classifications are provided in the table of parks and reserves (Appendix A).

2.5 Alignment with other strategies and plans

Strategic management prospects

Information sources that have informed the preparation of this plan include the Victorian Government's *Protecting Victoria's Environment – Biodiversity 2037 Plan (*DELWP 2017). Under that plan, the Strategic Management Prospects (SMP) tool is a component of the Department of Environment, Land, Water and Planning's web-based *NatureKit* (DELWP 2019). This biodiversity mapping and reporting system has been used as a decision support tool, together with field-based evidence, to assist in identifying the relative importance of threats and actions. SMP outputs are focused on modelled biodiversity outcomes, and may need to be balanced with organisational and community priorities when implementing Conservation Strategies.

Regional Catchment Strategies

This plan addresses several key assets, objectives and actions in the Corangamite Regional Catchment Strategy (CCMA 2013) in relation to:

- threatened species and communities
- native vegetation
- coastal and marine systems
- rivers and estuaries.

This plan will support the Regional Catchment Strategy objectives for these assets by:

- improving conservation status of threatened species and communities in the Great Otway Parks landscape
- improving quality of native vegetation in the Great Otway Parks landscape
- maintaining extent and quality of significant native vegetation within the Great Otway Parks landscape
- maintaining integrity of biota and habitat within the Great Otway Parks landscape marine protected areas
- maintaining water quality across the Great Otway Parks landscape particularly in regard to reducing impacts on freshwater, estuarine and marine values.

Other information sources

Other plans and documents that have informed this Conservation Action Plan include, but are not limited to:

- *West Coast Implementation Plan. A structured decision-making framework for resource allocation* (Walshe et al. 2013)
- *Cape Otway Koala Management Actions* (DELWP 2015)
- *Caring for Country — The Otways and You. Great Otway National Park and Otway Forest Park Management Plan* (PV and DSE 2009)
- *Strategic Bushfire Management Plan: Barwon Otway Bushfire Risk Landscape* (DELWP 2015)
- *Protecting Victoria's Environment — Biodiversity 2037* (DELWP 2017).

Commonly used abbreviations

CMA	Catchment Management Authority.
DELWP	Victorian Department of Environment, Land, Water and Planning.
EPBC Act	The *Environment Protection and Biodiversity Conservation Act 1999*, under which threatened species, communities and locations can be listed for protection; administered by the Commonwealth Department of the Agriculture, Water and the Environment.
EVC	Ecological Vegetation Class, a vegetation classification system based on floristic species composition, structural features, and ecological traits of the community.
FFG	Relating to the Victorian *Flora and Fauna Guarantee Act 1988*, under which threatened species and communities can be listed for protection against potentially threatening processes.
IUCN	International Union for Conservation of Nature.

2.6 Participation

A series of conservation action planning workshops were held to support the planning process for the Great Otway Parks Conservation Action Plan. These workshops built on workshops previously undertaken to develop the Decision Support for the West Coast Natural Values Implementation Plan (Walshe et al. 2013).

The success of both sets of workshops was a result of the great depth of knowledge and experience of participants from Parks Victoria, Department of Environment, Land, Water and Planning and Corangamite Catchment Management Authority. Contributions by individuals and groups outside the formal workshops also contributed to the development of the plan.

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

Cool temperate rainforest,
Great Otway National Park

Pink-eared Ducks

3 Conservation assets

3.1 Identifying conservation assets

For planning and managing the terrestrial environment, Parks Victoria has classified conservation assets in its Parks landscapes according to similarities in biodiversity and natural values, and natural processes. The classification is based on eight previously identified terrestrial ecosystem groups (DNRE 1997):

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

Within each of these ecosystem groups, several sub-ecosystems have also been identified, defined by groupings of Ecological Vegetation Classes and Divisions (EVCs and EVDs) (White 2012).

Parks Victoria have identified seven key marine habitats across Victoria (Pocklington et al. 2012). The classification of marine assets is based on these groupings:

- Estuary
- Intertidal Reef
- Mangroves and Saltmarsh (Fringing Marshes)
- Seagrass
- Soft Sediment
- Subtidal Reef
- Water Column (pelagic).

Conservation assets within the Parks 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 have also been identified, to help define each conservation asset more completely. These 'nested' assets are mostly species assemblages and communities, but may also include habitat features, ecosystem services, or species that are of particular significance to Traditional Owners. Individual species are aggregated with others if they occur together 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 may also be included as nested assets if they have unique conservation requirements.

3.2 Assessing condition of conservation assets

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: **S**pecific, **M**easurable, **A**chievable, **R**elevant and **T**ime-bound.

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 attribute. 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 is assessed over a 15-year period and considers the impact of climate change over that period, and the role, if any, of management intervention to maintain long term viability. Trend in condition is evaluated over the preceding 15 years.
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.

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. The current condition and trend, and the likely condition under desired management, have been assessed using available literature and the knowledge of experts and participants in the conservation action planning workshops. The condition of each asset is considered across its occurrence in the Parks landscape. These attributes and outcomes have been used to guide the development and prioritisation of Conservation Strategies.

3.3 Great Otway Parks landscape conservation assets

Ten ecosystem-based conservation assets have been identified in the Great Otway Parks landscape. Each conservation asset is also associated with numerous nested assets. The distribution of these ten conservation assets is presented in Figure 3.1 and Table 3.1. The component Ecological Vegetation Classes and Ecological Vegetation Divisions are listed in Appendix B.

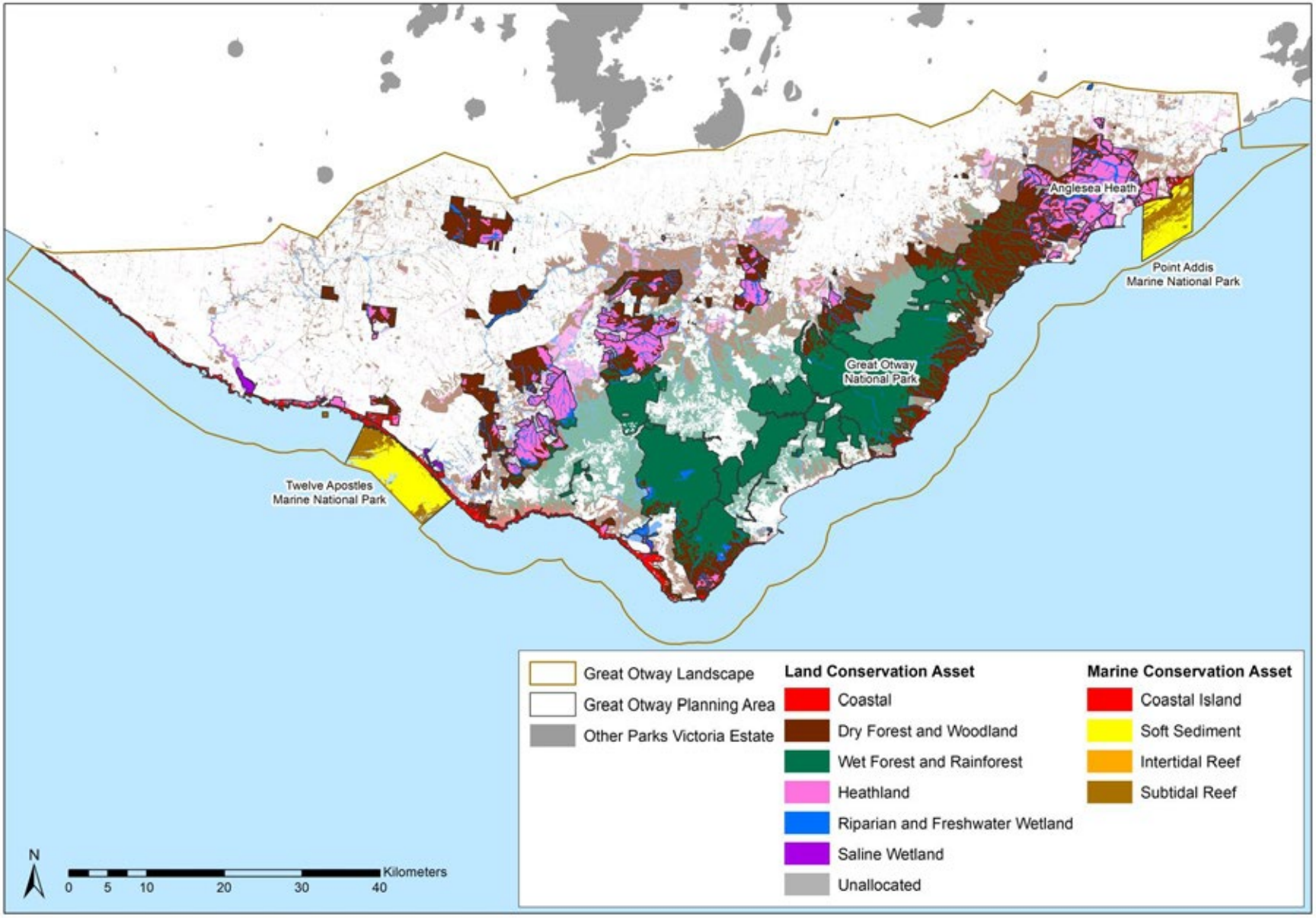


Figure 3.1 Conservation assets in the Great Otway Parks landscape. Crown land not managed by Parks Victoria is shown as grey shading.

Table 3.1 Areas of conservation assets in the Great Otway Parks landscape.

Conservation Asset	Area (hectares)
Wet Forest and Rainforest	52 056
Riparian and Freshwater Wetland	1931
Dry Forest and Woodland	38 868
Heathland	18 128
Coastal (including islands)	4437
Estuarine and Saline Wetlands	493
Soft Sediment	4406
Intertidal Reef	30
Subtidal Reef	7245
Water Column (pelagic)*	—

* Water Column (pelagic) overlaps other marine assets, so an area figure is not provided.

3.4 Great Otway Parks landscape conservation vision

Setting conservation outcomes involves defining a conservation vision and conservation goals (outcomes) for each asset (as described in Section 4). The conservation vision, based on Parks Victoria's Shaping our Future goal for conserving its special places, is an aspirational statement that describes the intended outcome of management and the future state of the Great Otway Parks landscape:

The resilience of natural assets in the Great Otway Parks landscape is increased and ecosystem services are maintained in the face of climate change and other stressors.

The Parks landscape is complex and, while there are areas that are relatively intact and in good condition, the past history of the landscape, and its extensive use for timber extraction have heavily influenced the vegetation communities within the landscape.

Wildfire and extensive planned burning have also played a key role in shaping the vegetation and structural complexity of some ecosystems. Fragmentation as a result of vegetation clearance, including the construction of roads and tracks has increased the spread of pest plants, and diseases such as *Phytophthora* dieback, in some areas.

The aim is therefore to maintain the Parks landscape's old-growth forest, cool temperate rainforest and wet forest as refugia, and to achieve the diversity of heathland habitat structure and condition for the diversity of flora and fauna they support; to minimise the impacts of human interactions in largely unmodified coastal and marine environments and protect the marine biota and avifauna dependent on these habitats; and to maintain hydrological function to support wetland and riparian habitats as far as is possible in a warming and drying climate.

Apollo Bay

Tree Fern fronds,
Great Otway National Park

4 Conservation asset descriptions

Conservation asset description format

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

Scientific names and conservation status of species mentioned in the plan are listed at Appendix C.

Conservation asset name

The ecosystem or habitat type considered to be the overarching value to be managed, including a description of key components, 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 components of the asset and may include threatened species, ecological (faunal) assemblages, vegetation communities, or species or communities of cultural importance. 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 goal. The goal represents a 15-year outcome based on the application of the strategies presented in this plan. Finally, the relevant strategy (abbreviated) is listed, for which the full strategy name and performance measures can be found in Table 7.1.

Key ecological attributes	Indicator	Current condition	Current trend	Key ecological attribute goal	Strategy abbrev.
Woodland bird diversity	Species richness	Fair	↘	Over xx% of surveyed sites have a richness of bird species representative of the vegetation age-class and expected bird community.	Predation
Canopy recruitment	Seedling recruitment	Good	→	Overstorey recruitment present at more than xx% of surveyed sites	Fire Herbivores

Conservation outcome

This statement reflects the key ecological attributes of the asset and includes key improvements in asset viability that will achieve the desired conservation outcome. An example is shown below.

Riparian	Current condition	Desired trend	Desired condition
By 2035, 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.	Good	↗	Very 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.

Definition of terms (attributes, indicators)

Indicator	Description
Assemblage	The range of species that occur together in a particular habitat.
Abundance	The number of individuals present of a particular species or functional group.
Demography	Identifies the age class of individuals as a surrogate measure of recruitment success over time (e.g. presence of young-of-year fish and turtles through to mature age; identification of eggs or fledgling birds in nesting colonies).
Extent	Area of cover of a particular species or functional group, attribute or area subjected to particular conditions (e.g. flooding, salinity).
Function and connectivity	The components needed to support ecosystem processes (e.g. flow regime, water quality).
Functional group	A group of species that share similar characteristics (e.g. colonial nesting birds, riverine/wetland specialist fish).
Health	Measured for long-lived flora and fauna that require certain conditions to maintain health. This indicator can be used to identify whether those conditions are achieved, and repeat surveys can detect change over time. A key example is riverine tree health, which is maintained through an appropriate flooding and drying regime.
Index of wetland condition (IWC) score	An assessment procedure used in Victoria to assess the condition of wetlands to assist in management decisions and prioritisation of sites.
Percentage cover	Compares the cover of a particular species or functional group to another. Can be used to identify change in dominance of species or functional groups over time. Particularly important in wetlands in which flora composition changes in response to wetland phases (e.g. wet/receding/dry) or changed hydrological conditions.
Representativeness	Compares the type and/or number of species, or presence of a particular representative indicator species, identified within a defined benchmark such as a functional group or EVC.
Site occupancy	The presence of a particular species or functional group within a suitable habitat. Repeated surveys provide greater confidence in data, particularly for mobile fauna, and seasonal flora. Key examples are waterbird surveys and the emergence of aquatic flora in wetlands during floods.
Spatial distribution	Identifies presence and cover of species or functional groups across the landscape. Can be used to detect change in distribution of species across habitats, or change in habitat qualities that may favour different, rather than expected, species. A key example here is the progression of terrestrial dominant flora into typically wetter environments, suggesting a change in flooding regime.
Species richness	Identifies how many different species are present at a particular location or across a landscape area.

Wet Forest and Rainforest

This asset is restricted to the foothills, mountain ranges and protected valleys within the Otway Ranges where rainfall exceeds 800 mm and may be as much as 2000 mm per annum, with a strong seasonal peak in winter. The main ridge has an elevation of 500–700 m and is frequently shrouded in mist. The asset includes Wet Forest, Shrubby Wet Forest and the endangered Cool Temperate Rainforest EVCs.

Wet forests dominated by Mountain Ash grow on fertile, well-drained loamy soils on a range of geologies at various elevations. They are largely restricted to protected sites in gullies and on southern aspects of hills and mountains where rainfall is high and cloud cover at ground level is frequent. These forests are characterised by a tall eucalypt overstorey to 30 m with scattered understorey trees over a tall, broad-leaved, shrubby understorey and a moist, shaded, fern-rich ground layer that is usually dominated by tree-ferns. Some key understorey species typical of wet forest include Musk Daisy-bush, Mountain Clematis, Hazel Pomaderris, Soft Tree-fern and Rough Tree-fern.

Shrubby wet tall eucalypt forests grow to 30 m tall, consisting mainly of Messmate Stringybark and Mountain Grey Gum and scattered understorey trees over a tall broad-leaved shrubby understorey, with a moist, shaded, fern-rich ground layer often overtopped by tree-ferns. Herbs may also be abundant where light penetrates the ground layer. These forests are restricted largely to western and northern aspects and ridgelines in areas of higher rainfall in the Otway Ranges.

Temperate rainforest or closed non-eucalypt forest to 25 m tall grows in high-rainfall areas protected from fire within Wet Forests. The main tree species are Myrtle Beech and Blackwood. The understorey is characterised by tree ferns and a rich epiphytic flora and the ground layer is dominated by a diversity of ground ferns.

Numerous animal species with a limited distribution live in wet forests and rainforests, including threatened species such as Agile Antechinus, Long-nosed Potoroo, Spot-tailed Quoll and Powerful Owl. Significant invertebrates include the carnivorous Otway Black Snail, which is endemic to this landscape's wet forests. Changes in habitat structure and predation are threats to the fauna in this asset.

Survival of wet forests and rainforest is largely determined by fire dynamics and climate. Since European settlement, an increase in fire frequency and changes in land use have influenced the condition of this asset.

The risk of fire is increasing as the climate becomes warmer and drier, and the predicted increase in the frequency, extent and intensity of fires is a significant threat to the extent of wet forest and rainforest.

Wet forests and rainforests are important refuges for animals during and after bushfires. These areas are particularly critical in the face of increased fire frequency for enabling populations of small mammals to recover after fire.

The exclusion of wildfire and ecological fire from wet forests and rainforests, along with actions to protect key threatened fauna and flora, may prevent further decline and maintain viability of this vulnerable asset.

Nested assets

Nested asset	Examples of components
Arboreal mammals	Yellow-bellied Glider
Ground-dwelling mammals	Spot-tailed Quoll*, Long-nosed Potoroo*,
Large forest owls	Powerful Owl, Masked Owl
Endemic invertebrates	Otway Black Snail
Wet tall eucalypt forests	Mountain Ash
Temperate Rainforest	Myrtle Beech, Tall Astelia*
Bat communities	Little Forest Bat, Chocolate Wattled Bat, Lesser Long-eared Bat

* Listed as nationally threatened under the EPBC Act.

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Canopy species age class structure	Growth stage distribution	Good	↗	Maintain different age classes with all growth stages represented by 2035.	Fire
Hollow-bearing trees	Abundance and distribution	Good	↗	No decrease in the extent of mature vegetation including hollow-bearing trees over the next 15 years.	Fire
Rainforest patches and refuges	Extent	Good	↗	Maintain existing extent and connectivity of rainforest cover for refuge areas.	Fire
Small ground-dwelling mammals	Species richness and distribution	Fair	↘	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Predation

Conservation outcome

Wet Forest and Rainforest	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain the extent of older growth-stages of wet forest and rainforest canopy species and the capacity to provide critical habitat features, and maintain the diversity and richness of flora and fauna.	Good	→	Good

Riparian and Freshwater Wetland

This asset includes a broad range of EVCs that occupy seasonally flooded alluvial flats of major rivers and streams, under an annual rainfall regime ranging from 600 mm to over 2000 mm. The large number of EVCs reflects the diversity of conditions driven by climate and the proximity to waterways and freshwater wetlands. The soils are generally fertile alluvial deposits and well-watered silty loams high in organic matter. The major EVCs in this asset are Riparian Forest and Riparian Scrub/Swampy Riparian Woodland Complex, which together account for more than half of the asset's total area.

Habitat characteristics within the asset vary enormously and include tall forests along riverbanks and associated alluvial terraces with occasional occurrences in the heads of gullies leading into creeks and rivers. Soils consist of fertile alluvium that is regularly inundated and permanently moist. Riparian and Freshwater Wetland is dominated by tall eucalypts, including River Red-gum and Swamp Gum, and have an open to sparse secondary tree layer of wattles and scattered dense patches of shrubs, ferns, grasses and herbs. At low elevations, closed scrub dominated by Woolly Tea-tree often forms a dense, impenetrable thicket, out-competing other species. Emergent trees such as Swamp Gum are sometimes present. Where light penetrates to ground level, a ground layer of herbs, bryophytes and lichens is often present.

In seasonally wet depressions on volcanic and sedimentary plains typically associated with fertile, silty soils, sedgy-herbaceous vegetation occurs, sometimes with scattered or fringing eucalypts or tea-tree/paperbark shrubs in higher rainfall areas. A range of aquatic herbs can be present, and species-richness is mostly relatively low to moderate, but higher towards drier margins.

Areas of permanent shallow water (to 1 m deep) and low current-scour with very low levels of salinity occur on swamps on river plains, especially in the lower reaches of the floodplain. In these areas, closed to open grasslands/sedgelands to 3 m tall, dominated by Common Reed and Cumbungi, are common. These vegetation communities depend on episodic flooding, with a period of 10 years between disturbance being ideal for many communities. Many freshwater wetland and riparian communities are heavily invaded by weeds.

Freshwater wetlands and waterways are habitats for a broad range of aquatic species, as well as species that take advantage of the availability of water, including many waterbirds such as swans, ducks, herons and grebes, and species covered by bilateral migratory bird agreements e.g. Latham's Snipe. They are also important for several fish species, including the culturally significant diadromous (migrating between salt

and fresh waters) Shortfin Eel as well as rare and threatened freshwater species such as the Australian Grayling.

Reptiles, including several skinks such as the Swamp Skink, and amphibians such as the Victorian Smooth Froglet, Southern Brown Tree Frog, and threatened Growling Grass Frog, depend on this asset. Endemic invertebrates, including the Otway Stonefly and Otways Cray, are also dependent on these systems.

The primary driver of condition in this asset is the water regime, particularly the timing, duration and frequency of inundation.

Nested assets

Nested asset	Examples of components
Freshwater fish	Shortfin Eel, Australian Grayling, Climbing Galaxias, Trout Galaxias
Swamp Scrub EVC (Endangered) and associated species	Woolly Tea-tree, Scented Paperbark, Swamp Greenhood
Riparian vegetation and drought refuge	Common Reed, Cumbungi
Rare and restricted aquatic and semi-aquatic invertebrates	Otway Stonefly, Otways Cray
Wetland-dependent herpetofauna	Swamp Skink, Southern Brown Tree Frog, Growling Grass Frog*
Wetland-dependent birds	Australasian Bittern*, Royal Spoonbill, Little Egret, Latham's Snipe**
Wetland-dependent flora	Swamp Gum, Tasman Flax-lily

* Listed as nationally threatened under the EPBC Act.

** EBPC Act Migratory Species List.

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Water quality	Index of Stream Condition	Good	↗	Index of Stream condition is maintained at 2010 condition for key rivers.	Condition*
Freshwater fish	Species richness and distribution	Good	↗	Maintain fish diversity including no loss of threatened species from known sites.	Recreation
Invertebrate assemblages	Species richness and presence of key indicator species	Good	↗	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Condition*
Riparian vegetation and drought refuge	Extent and quality EVC Benchmark	Fair	↗	Maintain important habitat features and structural complexity.	Weeds Fire Herbivores

*These KEA Goals are indicators of general condition, rather than an outcome representative of a specific strategy

Conservation outcome

Riparian and Freshwater Wetland	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain ecological processes and protect high water quality, habitat complexity and diverse riparian and wetland flora and fauna populations.	Good	→	Good

Dry Forest and Woodland

This broad asset occurs across a range of soil types and situations through the Great Otway Parks landscape. It is generally characterised by the dominance of a eucalypt forest or woodland canopy, with a variable range of understory components that are determined by aspect, substrate and management history. Most of this asset is Shrubby Foothill Forest or Lowland Forest EVC. All EVCs within this asset are at least vulnerable in some parts of the Parks landscape.

Dry Forest and Woodland occurs on a variety of gradients and altitudes and on a range of geologies. The overstorey is dominated by a low to medium forest of eucalypts to 20 m tall, sometimes resembling an open woodland. The understorey usually consists of a sparse shrub layer of medium height and a ground layer dominated by a high diversity of drought-tolerant grasses and herbs.

Herb-rich Foothill Forests occur in the foothills of the Otways, on relatively fertile, moderately well-drained soils on an extremely wide range of geological types and in areas of moderate to high rainfall. These tend to occupy easterly and southerly aspects, mainly on lower slopes and in gullies. A medium to tall open forest or woodland to 25 m tall with a small tree layer over a sparse to dense shrub layer, with a high cover and diversity of herbs and grasses in the ground layer is characteristic.

On flat or undulating areas on moderately fertile, relatively well-drained, deep sandy or loamy topsoils over heavier subsoils (duplex soils) Damp Sands Herb-rich Woodland, a low, grassy or bracken-dominated eucalypt forest or open woodland to 15 m tall with a tall shrub layer and ground layer rich in herbs, grasses, and orchids occurs.

On the Warrnambool Plain sections of the Parks landscape, open eucalypt forest to 25 m tall occurs on exposed aspects and slight to moderate slopes. The understorey is characterised by a distinctive middle stratum dominated by a diversity of narrow-leaved shrubs and a paucity of ferns, graminoids and herbs in the ground stratum.

These landscapes are impacted by both wildfire and controlled burns with major wildfires impacting the eastern part of this landscape in both 1983 and most recently in December 2015, resulting in large areas of single age-class. The timing, intensity, frequency and extent of fire are important drivers of condition in Dry Forests and Woodlands; frequent low-intensity fires improve overall habitat conditions, while large, fast-burning, high-intensity bushfires can have a detrimental impact.

In recent years, in some sections of this asset, particularly along the Otway coast and on the Warrnambool Plain, coastal woodlands, particularly Manna Gum communities have been heavily impacted by significant increases in Koala populations, resulting in a loss of canopy cover.

Throughout the landscape Red Fox and Feral Cat numbers are significant and represent a key threat to fauna, particularly ground-dwelling mammals, reptiles and birds.

Nested assets

Nested asset	Examples of components
Arboreal mammals	Yellow-bellied Glider, Sugar Glider, Eastern Pygmy-possum
Ground-dwelling mammals	Long-nosed Bandicoot, Long-nosed Potoroo*, Swamp Antechinus
Old-growth forest	Messmate Stringybark, Mountain Grey-gum
Manna Gum and Otway Blue Gum woodlands	Endangered Coastal Manna Gum Woodland EVC, Blue Gum, Messmate, Brown Stringybark
Significant flora species	Anglesea Grevillea*, Wrinkled Buttons*
Terrestrial orchid assemblages	Otway Midge Orchid, Green Leek Orchid, Leafy Greenhood*
Bat communities	Little Forest Bat, Southern Bent-wing Bat*
Forest birds	Powerful Owl, Swift Parrot*

* Listed as nationally threatened under the EPBC Act.

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Manna Gum and Otway Blue Gum Woodlands	Foliar cover and condition; Extent	Fair	↘	Maintain existing extent over the period to 2035. No net loss of canopy % cover over the period to 2035.	Fire Koalas
Orchid assemblage	Species richness and distribution	Good	→	No reduction in known populations over the period to 2035.	Fire Recreation
Arboreal mammals	Species richness and distribution	Good	→	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Fire Predation
Ground dwelling mammals	Species richness and distribution	Fair	↘	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Reintros Fire Predation
Extent and condition of threatened EVCs	EVC Benchmark	Good	→	Maintain extent and condition of threatened EVCs over next 15 years.	Herbivores Fire Recreation Weeds

Conservation outcome

Dry Forest and Woodland	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain the extent of Dry Forest and Woodland, improve the distribution of forest age classes to maintain floristic diversity and richness, and provide high-quality habitat for tree- and ground-dwelling mammals, woodland birds and bats.	Good	→	Good

Heathland

The Heathland asset is spread over 18 000 hectares of the Great Otway Parks landscape in both coastal and inland areas. Most of the asset occurs in the Great Otway National Park but other significant areas include Port Campbell National Park and Jancourt Nature Conservation Reserve.

The Heathland asset consists mostly of Heathy Woodland EVC (15 500 ha) a eucalypt-dominated low woodland lacking a secondary tree layer generally associated with nutrient-poor soils. Shrubs are dominant below the canopy except where frequent fire has reduced this to a dense cover of bracken. Treeless Wet Heathland and Damp Heath Scrub communities make up most of the remaining area, generally on soils subject to prolonged or seasonal waterlogging. The understorey is often dominated by a range of sedges, grasses and shrubs.

Some typical plants of Otway heathland include Scented Paperbark, Prickly Tea-tree, Silver Banksia, Common Heath and Spike Beard-heath.

The composition of these systems means they generally have very high species richness, including significant orchid species such as the Metallic Sun-Orchid and Dense Leek-orchid. This diversity in turn supports rich bird assemblages and several significant mammal species, including the Long-nosed Potoroo and Southern Brown Bandicoot.

The main driver of condition within heathland systems is fire with timing, intensity and frequency all seen as determinants of condition. There is a significant range of heathland condition within this asset across the Great Otway Parks landscape with higher quality examples in the north and west and poorer overall asset condition east of Cape Otway. These differences are largely associated with differences in fire regimes resulting in large areas of single age-class vegetation, levels of disturbance associated with proximity to population centres, and invasive species.

The soil-borne pathogen *Phytophthora cinnamoni* is widespread in heathland and forests across many of the eastern sections of the Otways and has significantly influenced heathland community composition. Species such as the Austral Grass-tree and Horny Cone-bush have been severely impacted in locations close to areas of soil disturbance and infection.

Nested assets

Nested asset	Examples of components
Ground-dwelling mammals	Long-nosed Bandicoot, Long-nosed Potoroo*, White-footed Dunnart, Swamp Antechinus, Southern Brown Bandicoot*
Heathland bird community	Rufous Bristlebird, Southern Emu-wren, Tawny-crowned Honeyeater, Beautiful Firetail, Blue-winged Parrot
Threatened flora	Clover Glycine, Square Raspwort, Lime Fern
Heathland orchid assemblage	Metallic Sun Orchid*, Scented Spider-orchid, Swamp Greenhood, Spiral Sun-orchid*, Dense Leek-orchid*

* Listed as nationally threatened under the EPBC Act.

Condition

Key Ecological Attributes	Indicator	Area of landscape	Current condition	Current trend	KEA Goal	Strategy abbrev.
Heathland vegetation growth stage	Growth stage distribution	East	Fair	↘	Establish and maintain a diversity of growth stage distribution by 2035.	Herbivores Fire
		West	Good	→		
Heathland vegetation extent and condition	Species richness, presence of key indicator species	East	Fair	↘	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Herbivores Fire Recreation Weeds
		West	Good	→		
Small ground-dwelling mammals	Species richness and distribution	East	Fair	↘	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Reintros Fire Predation
		West	Good	→		
Heathland bird diversity	Species richness and distribution	East	Fair	↘	Maintain species richness at current levels and no net loss in number of sites occupied by key indicator species.	Fire
		West	Good	→		

Note: The table has been divided where a significant difference in the condition of the KEA occurs across the landscape.

Conservation outcome

Heathland	Area of landscape	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain the extent and improve the distribution of heathland vegetation growth-stages to maintain floristic diversity and richness and provide high-quality habitat for ground-dwelling mammals and heathland birds.	East	Fair	↗	Good
	West	Good	↗	Very Good

Coastal (including islands)

This asset includes the sandy beaches, coastal dune grasslands and scrub, and the shrublands and grasslands occurring on exposed coastal cliffs and headlands along the Great Ocean Road and the Port Campbell coastline as well as offshore islands including the famous limestone stacks at the Twelve Apostles. Most of this asset is made up of the Coastal Headland Scrub and Coastal Dune Scrub/Coastal Dune Grassland Mosaic EVCs, both of which are depleted or vulnerable across the landscape. All seven EVCs in this asset are listed as at least vulnerable in their respective bioregions.

Coastal Scrub grows on rocky coastal headlands and is often associated with cliffs exposed to the stresses of extreme salt-laden winds and salt spray from the south west. These generally occur on shallow sands in association with rocky sections of the coast. Coastal Gully thickets occur along drainage lines and small creeks close to the coast and have occasional stunted eucalypts wind pruned by prevailing south-west winds. Coastal Dune Scrub occupies the secondary dunes along ocean beaches, and consists of scrub to 3 m tall with occasional emergent trees. Bird Colony Succulent Herbland grows on coastal sand and is almost entirely restricted to seabird breeding colonies on islands. The nutrient-enriched sandy substrates are dominated by Bower Spinach and other succulent herbs. Typical plants in this asset are Drooping Sheoak, Common Boobialla, Coast Beard-heath, White Correa, and Silver Banksia.

Shorelines, rock stacks and islands provide breeding colonies for seabirds, including breeding colonies of Short-Tailed Shearwaters on Mutton Bird Island and Little Penguins in the Twelve Apostles Marine National Park that both forage in open waters. Coastal dune habitats have been demonstrated to provide important refuge for small mammal populations including Swamp Antechinus during times of reduced rainfall (Wilson et al. 2018). There are haul-out sites of Australian Fur Seals along the coast, and coastal cliff caves and rock crevices provide critical roost sites for the Southern Bent-wing Bat.

The main drivers of condition in this system are the levels of disturbance and weed invasion. Higher-quality examples of this asset are associated with coastal islands and more remote areas subject to minimal disturbance such as vehicular traffic, human visitation and predation. The more disturbed areas of this asset are generally around areas of greater human use and visitation associated with the Great Ocean Road townships and visitor nodes.

Nested assets

Nested asset	Examples of components
Colonially breeding seabirds	Little Penguin, Short-tailed Shearwater*, Fairy Tern*
Shorebirds	Hooded Plover*
Seal haul-outs	Australian Fur Seals at Marengo
Ground dwelling mammals	Southern Brown Bandicoot*
Foredune vegetation	Drooping Sheoak, Coast Beard-heath
Bird colony succulent herbland	Bower Spinach
Coastal scrub birds	Rufous Bristlebird, Chestnut-rumped Heathwren
Coastal Raptors	White-bellied Sea-Eagle
Threatened flora	Metallic Sun Orchid*, Clover Glycine*, Leafy Greenhood*

*Listed as nationally threatened under the EPBC Act

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Coastal vegetation community	Extent Intactness	Good	→	Maintain current extent with less than 5% cover of introduced species.	Weeds Recreation Fire Herbivores Koalas
Beach-nesting birds	Breeding success and abundance of specific beach-nesting species (Hooded Plover, Pied Oystercatcher, Red-capped Plover)	Poor	↘	By 2035 annual fledging success is at 0.5 fledglings per pair. No decline in species abundance.	Predation Recreation
Seabird colonies	Abundance at key locations	Good	↘	No decline in species abundance at key locations from 2020 levels.	Condition*

*These KEA Goals are indicators of general condition, rather than an outcome representative of a specific strategy

Conservation outcome

Coastal (including islands)	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, increase the extent and heterogeneity of coastal vegetation and shorelines to provide suitable nesting habitat for colonial nesting seabirds and shorebirds, and to maintain small mammal populations.	Fair	↗	Good

Estuarine and Saline Wetlands

Estuaries with mixed fresh and saltwater are found on the coastal plains where streams and rivers run into the sea. These can range in size from small pools at the bottom of steep creeks to large saline wetland complexes that stretch inland for many kilometres. Plant and animal communities in this asset must be able to cope with the extreme variability in salinity experienced throughout the year as rainfall and seawater inundation change. Many of these plant communities grow on anaerobic peat-rich muds on the edges of estuarine waterbodies such as creeks, rivers and lagoons with intermediate salinity conditions. Vegetation is determined by fluctuating salinity, which varies in time from occasionally fresh to brackish or occasionally saline, according to river flood and marine tide events. These are dominated by graminoids and halophytic herbs and often fringed by a tall scrub layer of Woolly Tea-tree at the landward edge.

On the edge of estuarine waterbodies such as creeks, rivers and lagoons with intermediate salinity and poor drainage conditions, Swamp Paperbark with a halophytic (succulent) ground layer dominated by graminoids and herbs often occur.

Estuarine Wetlands and Permanent Saline Wetlands EVC comprise almost all of this asset. Treeless EVCs dominated by sedges and herbs are generally indicative of highly saline conditions. True halophytic species such as Beaded Glasswort, Creeping Brookweed and Austral Seablite grow in estuaries, along poorly defined drainage lines, and around shorelines of brackish lakes. Many of the plant species in these communities are rare or threatened.

Estuarine Reedbed occurs in areas that are semi-permanently inundated by moderately saline water, on anaerobic silts and clays, and may be strongly dominated by Common Reed, often with very few or no other species. Where present, these include a range of salt-tolerant herbs, sedges and rushes.

Many estuaries play important roles in the life cycles of fish and other aquatic species. Otway estuaries support fish such as Estuary Perch, Black Bream, Luderick, Sea Mullet, and Long-snouted Flounder, many of which are highly sought after by recreational fishers.

Some wading birds nest near the entrances of estuaries, and many use estuaries and saline wetlands as feeding grounds. The endangered Orange-bellied and Blue-winged Parrots have been observed in these saline wetlands. Drivers of conditions for this asset include disturbance by visitors and changes in hydrology due to climate change.

Nested assets

Nested asset	Examples of components
Estuarine fish assemblages	Estuary Perch, Black Bream
Estuarine flora	Beaded Glasswort, Creeping Brookweed
Estuarine fauna including birds	Blue-winged Parrot, White-fronted Chat

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Estuarine vegetation	Condition and extent	Good	↗	Maintain current extent and no net loss in number of sites occupied by key indicator species.	Condition*
Estuarine fish assemblages	Species richness and abundance	Good	↗	No decline in species richness and abundance consistent with the carrying capacity and conditions of individual estuaries.	Recreation
Estuarine-dependent fauna including birds	Species richness and presence of key indicator species	Fair	↗	Maintain species richness at current levels and no net loss in the number of sites occupied by key indicator species.	Condition*

*These KEA Goals are indicators of general condition, rather than an outcome representative of a specific strategy

Conservation outcome

Estuarine and Saline Wetlands	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, improve and maintain natural ecological processes in estuaries and saline wetlands, to maintain high water quality and habitat complexity and diverse estuarine flora and fauna populations.	Good	→	Good

Soft Sediment

Soft sediment is widespread across marine components of the Great Otway Parks landscape. They are mostly unvegetated systems falling across both intertidal and subtidal areas.

These sediments are inhabited predominantly by infauna (small crustaceans and worms that burrow into the sand), meiofauna (very small animals that live between the sand grains), and a range of bottom-dwelling fish including skates and rays. Drift algae and algae attached to shells and debris are also common on soft sediment.

In protected and sheltered waters, such as the larger estuaries west of Cape Otway, fine particles in the water settle out to form nutrient rich mud. At low tide some of these mudflats are exposed, providing feeding opportunities for many shorebirds and waders, including several species of high conservation significance that migrate annually from the northern hemisphere. At high tide fish move in to feed over the mudflats, in turn providing food for seabirds and larger fish.

In areas of higher wave energy or strong tidal currents, sediments are much coarser and form vast, sandy plains. As the tides move, ripples of sand are formed along the bottom, appearing as large rolling waves of sand in deep water. These sandy areas include many beaches that are important foraging areas for shorebirds, including the regionally threatened Hooded Plover that nests on some Otway coast beaches.

Infauna such as marine worms and bivalves live in intertidal sandy plains, whereas animals such as scallops live in deeper waters, and many fish and other larger animals foraging in these areas.

Within the deep-water soft sediment of Point Addis Marine National Park are unique assemblages of sponges, bryozoans, ascidians and hydroids. Large areas are dominated by unusual rounded coralline algae known as rhodoliths, which were only discovered in the area during the mapping of the park. They have been shown to contain a high density of invertebrate fauna (e.g. crustaceans, polychaetes and molluscs) and cryptofauna, mostly polychaetes.

Drivers of condition in this asset include disturbance by visitors and changing hydrology caused by climate change.

Nested assets

Nested asset	Examples of components
Characteristic invertebrate communities	Benthic epifauna and infauna
Seaweed and seagrass wrack	Beach-washed material and detritus
Foraging areas for shorebirds	Hooded Plover

* Listed as nationally threatened under the EPBC Act.

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Benthic invertebrate communities	Diversity of invertebrate communities across range of soft sediment	Good	→	Maintain diversity across a range of unvegetated sediment types.	Recreation Marine
Resident and migratory shorebirds (intertidal)	Species richness and abundance	Good	→	Maintain species richness and abundance of resident and migratory shorebirds at priority sites.	Predation

Conservation outcome

Soft Sediment	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain ecological processes which allow for natural wrack deposition patterns, sediment transport patterns, and the structural integrity and composition of intertidal and subtidal soft sediment, to support an abundant and diverse assemblage of invertebrate and bird species.	Good	→	Good

Intertidal Reef

Intertidal reefs occur where rock platforms extending from shorelines are alternately exposed and inundated by the rise and fall of tides. Organisms living in these areas are subjected to a range of extreme stresses including the impact of waves when under the water and the impacts of desiccation and higher temperatures when out of the water.

This asset includes two main ecological components: sessile and mobile invertebrate communities, and habitat-forming algae.

In sessile and mobile invertebrate communities, aggregating sessile invertebrates such as mussels (including the Little Black Horse Mussel), barnacles and tubeworms provide structural habitat for other species. The structure provided by these sessile invertebrates is habitat for many small and soft-bodied organisms, including flatworms, polychaetes and sipunculids, and are feeding areas for predatory gastropods such as the Dog Winkle and Wine-mouthed Lepsiella.

A large diversity of molluscs, echinoderms, and crustaceans are found within this habitat, including some with a restricted distribution. The Twelve Apostles Marine National Park has one of the highest diversities of intertidal invertebrates on limestone in Victoria, including echinoderms, crustaceans, cnidarians, polychaetes and numerous molluscs.

On the intertidal reefs in most Marine Protected Areas, the dominant habitat is formed by the brown alga Neptune's Necklace. This alga provides habitat for other flora and fauna, including many macroinvertebrate grazers, predators, scavengers and microepifauna. Algal turfs (e.g. *Capreolia implexa*), coralline algae and sea lettuces can also form intertidal habitats.

Drivers of condition in this asset include disturbance from visitors and changing hydrology caused by climate change.

Nested assets

Nested asset	Examples of components
Characteristic invertebrate communities	Tubeworms, Cunjevoi
Habitat-forming algae	Neptune's Necklace, coralline algae

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Habitat-forming algal cover	Percentage cover of key habitat-forming algal species	Good	↗	Maintain the cover extent of algae species to 2035.	Marine Recreation
Mobile and sessile invertebrate communities	Abundance of key species	Good	↗	Maintain mobile invertebrate abundance and species richness. Maintain mussels above 20% cover in suitable habitat.	Marine Recreation

Conservation outcome

Intertidal Reef	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain and improve patches of habitat-forming algae and sessile invertebrates that provide cover and food for a diverse assemblage of invertebrates in the intertidal reef ecosystems of Marine Protected Areas in the Parks landscape.	Good	↗	Very Good

Subtidal Reef

Subtidal Reef lies in the shallow water below the low tide mark, providing anchoring points for marine plants and sessile invertebrates and habitat for mobile invertebrates and fish. The reefs are complex and have several complex key ecological attributes, including the following.

Brown macroalgal dominated beds

Kelp and other seaweeds are a prominent biological component of Victorian shallow reefs in areas where there is adequate light. In the Great Otway region, the algal canopy can be mixed brown algae including Crayweed, Common Kelp and (in a decreasing number of locations) the nationally threatened Giant Kelp Forests of South East Australia ecological community.

These brown algae and beds of mixed red, brown or green algae, or a combination of algae and sessile invertebrates, dominate the Twelve Apostles Marine National Park reefs. The algal assemblage of Ingoldsby Reef in Point Addis Marine National Park is particularly diverse. Branching and coralline red algae are common in all the Great Otway marine protected areas (MPAs).

Large brown algae play a similar role to forests on land, contributing energy to reef ecosystems through photosynthesis and forming a complex structural habitat, and consequently are often referred to as algal or kelp forests.

Mobile macroinvertebrates

Grazing and predatory mobile invertebrates are prominent animal inhabitants of subtidal reefs. Motile invertebrate assemblages include grazers, predators and filter feeders, and play an important role in ecological function. Common grazers can influence the growth and survival of habitat-forming organisms. For example, sponges and foliose seaweeds are often prevented from growing on encrusting coralline algae surfaces by the grazing actions of abalone and sea urchins.

Large predatory invertebrates such as rock lobsters, octopuses, whelks, crabs and seastars influence the abundance of grazing and other invertebrates. Other large reef invertebrates include particle-feeding animals such as feather stars.

Black-lip Abalone characterise the subtidal reefs of all MPAs in this landscape, and the Southern Rock Lobster is abundant in Point Addis Marine National Park, Merri Marine Sanctuary, The Arches Marine

Sanctuary, Twelve Apostles Marine National Park and Marengo Reefs Marine Sanctuary. Seastars are also common in all MPAs.

Large mobile fish

Reef fish assemblages include roaming predators, herbivores, planktivores and picker-feeders. Many fish species play a substantial ecological role in the functioning and shaping of the ecosystem. For example, the feeding activities of fish such as the Victorian Scalyfin and Zebra Fish promote the formation of open algal turf areas, free of larger canopy-forming seaweeds.

The Blue-Throated Wrasse is common across all Great Otway marine protected areas. The Rosy Wrasse, along with Sea Sweep and Magpie Perch, are abundant on the shallow subtidal reefs in the Otway bioregion MPAs.

Sessile invertebrates

Sessile invertebrates comprise a large proportion of biotic communities, living on reef or sediment substrates in deeper water in all marine areas in the Parks landscape. They become dominant with depth, as light intensity for plant growth diminishes.

Below 40 m these communities are dominated by sponges, and below 70 m by Gorgonian corals. Large hydroid fans are found on reef tops, and soft corals, hydroids, bryozoans, ascidians and sea whips (40–50 m) are also common. Sessile invertebrates (ascidians, gorgonians, sponges, hydroids, bryozoans, soft coral) provide habitat for other fauna, such as pycnogonids (sea spiders).

Sessile invertebrates, particularly sponges, dominate the deep reefs of the Point Addis Marine National Park, Twelve Apostles Marine National Park, and The Arches Marine Sanctuary.

Drivers of condition in this asset include disturbance caused by recreation, commercial fishing and illegal resource extraction, and changing hydrology caused by climate change.

Nested assets

Nested asset	Examples of components
Beds dominated by brown macroalgae	Crayweed, Common Kelp
Sessile invertebrate communities	Sponges, Gorgonian corals, hydroids
Macrocystis ecological community	Giant Kelp
Mobile macroinvertebrates	Black-lip Abalone, Southern Rock Lobster
Large mobile fish, including sharks and rays	Victorian Scalyfin, Zebra Fish

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Brown macroalgae dominated beds	Canopy cover of brown macroalgae	Very Good	→	Maintain the cover extent of brown algae to 2035.	Recreation Marine
Sessile invertebrate communities e.g. Mussels	Percentage cover of key indicator invertebrate species	Very Good	→	Maintain mussels above 20% cover in suitable habitat.	Recreation Marine
Mobile macroinvertebrates	Abundance of key species	Good	↗	Maintain mobile macroinvertebrate abundance and species richness.	Recreation Marine
Large mobile fish, including sharks and rays	Species richness and abundance Presence of key indicator species	Good	↗	Maintain species richness at current levels and no net loss in the number of sites occupied by key indicator species.	Recreation

Conservation outcome

Subtidal Reef	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain the highly productive dense stands of habitat-forming algae and invertebrates that provide cover and food and improve the diverse assemblage of fish and macro-invertebrates.	Very Good	→	Very Good

Water Column (pelagic)

The water column supports a great variety of species, ranging in size from tiny planktonic organisms (including the larvae of many marine species) to the much larger and more mobile resident, migratory and transitory species of pelagic fish, whales and dolphins. Open waters are also primary feeding areas for seabirds that feed off pelagic species, including fish and cephalopods such as squid.

Good water quality is important for maintaining the health of all these species, and also those associated with other ecosystems such as soft sediment and subtidal reefs.

Seabirds are major extractors of marine biomass throughout the world, and therefore play an important role in marine tropho-dynamics. A significant number of conservation-listed seabird species have been sighted in the marine component of the Great Otway Parks landscape including the Wandering Albatross and Southern Giant Petrel.

Southern Right Whales (critically endangered in Victoria and endangered nationally) and Humpback Whales (vulnerable in Victoria and nationally) have been recorded in the two Marine National Parks. Blue Whales have also been sighted in Point Addis Marine National Park. Australian Fur Seals are regularly seen foraging in parks within this area, as there is a major breeding colony at Lady Julia Percy Island (Deen Maar), just west of the Parks landscape.

The main drivers of condition for this asset are climate change and disturbance caused by human activity.

Nested assets

Nested asset	Examples of components
Seabird populations	Wandering Albatross*, Southern Giant Petrel*, Shy Albatross*, Black-browed albatross*, Indian Yellow-nosed Albatross*, Fairy Prion*
Marine mammals	Southern Right Whale*, Australian Fur Seal,
Pelagic fish communities	Sharks, rays
Reptiles	Leathery Turtle*

*Listed as nationally threatened under the EPBC Act

Condition

Key Ecological Attributes	Indicator	Current condition	Current trend	KEA Goal	Strategy abbrev.
Water quality	Water quality parameters	Very Good	→	Maintain water quality at 'Good' (water quality index score).	Condition*
Seabird populations	Presence and abundance of key indicator species	Good	↗	Maintain species richness at current levels and no net loss in the abundance of key indicator species.	Condition*
Marine mammals (cetaceans and fur seals)	Presence and abundance	Fair	→	No decline in marine mammal populations.	Condition*

*These KEA Goals are indicators of general condition, rather than an outcome representative of a specific strategy

Conservation outcome

Water Column (pelagic)	Current condition	Desired trend	Desired condition
Over the 15 years to 2035, maintain or improve water quality and reduce the impacts of extractive human activity on open water communities within Marine Protected Areas in the Parks landscape.	Good	→	Good

Myrtle Beech, Beauchamp Falls

5 Threats

5.1 Identifying priority threats to conservation outcomes

A broad range of key threats to the conservation assets of the Great Otway Parks landscape were identified by experts, including participants in the conservation action planning workshops. These threats have been assessed and classified using the methodology described below. The highest-ranked threats identified from this process are discussed in the following sections and will be addressed directly through this plan.

The key threats to the 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. The outcome of mitigating these threats is to ensure that habitats and ecological communities are functioning within acceptable bounds to maintain key species and threatened flora and fauna populations (e.g. Hooded Plover, Metallic Sun-orchid, Southern Brown Bandicoot).

Methodology

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) over a defined period of 15 years. Threats are assessed assuming the absence of any ongoing mitigation activity. This is to ensure that priorities are not biased towards threats that do not have any current mitigation action. 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. The objectives are directional rather than quantitative, and rely on the strategies to specify priority locations where they will apply, and may rely on monitoring or adaptive management actions to specify the level of effective threat mitigation required to achieve conservation outcomes.

5.2 Identifying and addressing threats associated with climate change

Protected areas play a significant role in climate change adaptation and mitigation. Parks and reserves sequester and store carbon, and well-managed protected areas are essential for the ability of biodiversity to adapt to future conditions. Climate change impacts the ability of ecosystems to function (e.g. through the reduction in availability of fresh water, and rising ocean levels) as well as causing shifts in species ranges to follow movements in suitable climatic ranges. It can also influence the success of project delivery (e.g. where the increased severity of drought or flood provides sub-optimal conditions for pest control) and project outcomes. Victoria's parks and reserves stand to be particularly affected by climate change because they offer cool-climate refuge for many species which already have relict distributions, and because the legacy of land degradation and fragmentation precludes many mitigating processes such as migration and clinal adaptation.

Threatening processes associated with climate change have been considered in the way that they compound other anthropogenic threats such as invasive species, or through their direct impacts on habitats through drying, warming, or sea-level rise. Identifying and mitigating compounded threats will increase the resilience of ecosystems to climate change and improve their capacity to adapt. In some cases, particularly where climate-vulnerable landscapes such as coasts, saline wetlands, wet forests and rainforests are impacted, climate change will have a profound impact on the functioning of these ecosystems to the extent that they may transition into different ecosystem types.

The threat table below (Table 5.1) identifies threatening processes and agents and their relative risk. These threats were considered in the context of key climate projections developed by CSIRO for the Southern Slopes Victoria West sub-cluster (Grose 2015). Impacts of future climatic conditions that are projected with a high or very high degree of confidence were considered as part of the threat identification and analysis process. These include:

- average temperatures to continue to increase in all seasons
- more hot days and warm spells
- sea level continuing to increase
- less rainfall in winter and spring
- increased intensity of extreme rainfall events
- harsher fire-weather climate.

5.3 Priority threatening processes

The following threatening processes have been assessed as priorities for mitigation:

- inappropriate fire regimes
- weed invasion
- pathogens and diseases
- terrestrial predation by foxes and cats
- grazing and browsing pressure
- invasive or overabundant marine species
- habitat degradation caused by visitor impacts and illegal activities.

The characteristics and impacts of these priority threats are described in the following pages, together with an objective for the level of threat reduction required over a 5-year period to effectively reduce the impact on the achievement of conservation outcomes.

Table 5.1 Key threats to the conservation assets of the Great Otway Parks landscape and their relative risk.

Threatening process	Threat agent(s) and impact	Heathland	Dry Forest & Woodland	Wet Forest & Rainforest	Coastal (islands)	Riparian & Freshwater Wetland	Estuarine and Saline Wetlands	Intertidal Reef	Subtidal Reef	Water Column	Soft Sediment
Terrestrial predation	Predation by Red Foxes and Feral Cats on fauna populations, particularly ground-dwelling fauna, resulting in reduced breeding success, changes in distribution, and potential localised extinction.	Very High	Very High	Very High	Very High	High	High				
Weed invasion	The spread of herbaceous, perennial and woody weeds, resulting in loss of native flora and fauna, altered habitat structure and decreased diversity and abundance of native flora.	Very High	Very High	High	Very High	High	Mod				
Fire regimes and management	Too frequent or infrequent, or wrong timing, severity or scale, causing the degradation of habitat, landscape functioning and connectivity and a reduced capacity of the Parks landscape to support biodiversity.	Very High	Very High	High	Very High	High	High				
Over-grazing/ over-browsing	Introduced herbivores affect the regeneration and recruitment of native species, resulting in simplification of vegetation structure and reduced floral diversity.	Mod	High	Mod	High	High	Low				
	Overabundant koalas can result in the loss of palatable native flora by selective grazing and prevention of regeneration.	Low	Very High	Low	Low	Low					
Diseases	Pathogens such as *Phytophthora*, AbHV and Myrtle Rust can reduce populations sizes, change species composition and cause population mortality.	High	High	High	High	Low	Low	Low	High	Low	Low
Marine invasive or overabundant species	Marine invasive and overabundant species such as Northern Pacific Sea Star, Japanese Kelp, Purple Urchin can cause loss of native aquatic plant diversity and biomass, a reduction in number of native fish and loss of habitat quality.						Mod	Mod	High	Low	Mod

Threatening process	Threat agent and impact	Heathland	Dry Forest & Woodland	Wet Forest & Rainforest	Coastal (islands)	Riparian & Freshwater Wetland	Estuarine and Saline Wetlands	Intertidal Reef	Subtidal Reef	Water Column	Soft Sediment
Natural resource extraction	Legal and illegal activities such as fishing, bait and shellfish collection and firewood collection can cause loss of habitat structure and reduced populations.	Mod	Mod	Mod	Mod	Mod	Low	High	High	High	High
Habitat degradation	Habitat degradation from extreme weather events such as flooding can result in erosion, sedimentation, and damage to vegetation and habitat.	Low	Mod	Mod	Mod	Mod	Low	Low	Low	Low	Low
	Visitor impacts such as camping, mountain biking and wood collection for campfires degrades habitat by disturbing soil and vegetation and depleting coarse woody debris.	High	Mod	Mod	High	Mod	Mod	Mod	Low	Low	Mod
Habitat fragmentation	External land uses, roads, tracks, carparks, telecommunications and easements can disturb populations and cause weed invasion, erosion and reduced connectivity.	High	Mod	Mod	High	Mod	Mod	Low	Low	Low	Low
Alteration to natural hydrology	Alteration to natural hydrology such as artificial estuary openings can affect water quality and movements of aquatic biota and change species distribution.	Mod	Mod	Mod	Mod	Mod	Mod	Low	Low	Low	Low
Pollution	Pollution from internal and external sources can cause large-scale death, changes to habitat, loss of flora or fauna, and the introduction of weeds and pathogens.	Low	Low	Low	Mod	Mod	Low	Low	Mod	Mod	Mod

Inappropriate fire regimes

Threat description

Bushfires, prescribed burning and fire management activities pose an extreme risk to a range of assets across the Great Otway Parks landscape. The role of fire varies in different conservation assets; there may be insufficient fires for maintaining ecosystem health in some assets, while in others fires are too frequent, resulting in reduced habitat quality.

In both cases, inappropriate fire regimes result in a skewing of growth stages and a reduction in heterogeneity of vegetation and habitat, which impacts species' ability to persist and survive in the landscape. Some species, such as Rufous Bristlebird, Southern Brown Bandicoot, Swamp Antechinus and Anglesea Grevillea, typically inhabit bushfire-prone heathy woodland close to towns. These species respond well to some fires, but large-scale, intense bushfires or prolonged, frequent fire (such as can occur with planned burning) may harm them (DELWP 2015).

A major conservation challenge for this landscape will be balancing the ecological needs of vegetation communities with the management of fire risk to life and property located adjacent to parks, particularly the Great Otway National Park. Frequent burning results in an increase in younger (juvenile and adolescent) growth stages. This reduces the abundance of important habitat, such as vegetation cover, logs and hollow-bearing trees, that occurs in older vegetation. Fire management to maintain tolerable fire intervals (TFIs: the minimum times between fires that will allow an ecosystem to recover to a healthy state) and achieve an optimal distribution of vegetation growth stages should be applied to mitigate this threat where resulting outcomes don't increase fire risk to life and property.

High community sensitivity to wildfire risks might present difficulties for achieving TFIs, particularly in areas close to townships, residences and other assets close to parks and reserves.

Large areas of Wet Forest and Rainforest have been degraded by repetitive logging, clearing, and fire in the 20th century, resulting in a collapse in canopy species. Keeping fire out of these areas during the life of this plan is a high priority.

Fire management activities, such as creating tracks and control lines for planned burning and bushfire suppression and the use of fire retardants, can damage habitat and sites of Aboriginal and European cultural heritage. Management vehicles can also introduce and spread pathogens such as Phytophthora and Myrtle

Rust, as well as weeds. Where possible, existing roads and tracks should be used to limit the physical impacts of fire management, as well as the spread of pathogens and weeds.

Threat objectives

By 2025, exclude bushfire and prescribed burning from Wet Forest and Rainforest. Apply appropriate ecological fire regimes to fire-dependent ecosystems. Reduce the negative impacts of other threats (e.g. weeds, pathogens, herbivores and predators) during and following fire.

This threat is addressed through the Conservation Strategy: **Manage fire for ecological health**.

Weed invasion

Threat description

Weeds are present across most of the Parks landscape, the only exceptions being intact areas of native forest away from roads and tracks.

Weeds compete with native species for space, light and nutrients and their presence can prevent recruitment of seedlings, and outcompete established plants leading to reduced diversity. Weeds pose a direct threat to many rare and threatened plant species and communities in this landscape. They can also degrade sites of cultural significance. The impacts of weed invasion on conservation assets is likely to be exacerbated in a changing climate.

Fire and flooding events can cause soil disturbance and spread weed propagules, creating conditions for weeds to rapidly establish and expand their populations. Mechanical works, such as fire prevention and management activities, also create opportunities for weed invasion through soil disturbance and the spread of seed on equipment. Animals also spread weeds and pathogens through the landscape, particularly feral predators and herbivores that travel long distances.

The cause of weed invasion may be indicated by factors such as the pattern of weed invasion and type of weeds, and invasion points such as roads and tracks, boundaries with adjacent farmland, and disturbed areas such as campsites and old quarry and mill sites. In this landscape the edges of townships are a significant cause of weed invasions requiring a collaborative approach to management across land tenures to be effective in increasing the health of vegetation assets.

Climate change with a hotter and drier climate, more extreme weather events and changing fire regimes can put increased stress on vegetation communities, making them more vulnerable to invasion by hardier, more adaptable weed species. Communities that are particularly vulnerable to climate change, including riparian and rainforest communities, may be impacted by new and established weeds.

Many significant weeds are already having a direct impact on conservation assets, limiting recovery and restoration across many of the Parks landscape's conservation assets. In the Coastal (including islands) asset, weeds such as Mirror Bush and Sea Spurge are now widespread, and a wide range of herbaceous and woody weeds in Dry Forest and Woodland, Heathland, and Riparian and Freshwater Wetland reduce habitat availability and quality.

High-priority weed species in the Parks landscape include Asparagus Fern, Sweet Pittosporum, Bluebell Creeper, Coast Tea-tree, Coast Wattle and Boneseed.

An appropriate monitoring program, supported with the required resources, is needed to directly treat and eradicate new populations of weeds likely to affect key ecological assets. A continuing focus on the control of existing weed species in high priority areas will result in a significant improvement in the condition of conservation assets.

Threat objectives

By 2025, prevent new and emerging weeds from establishing in the landscape, contain the spread of identified established populations, and eradicate high-priority species from high value locations.

This threat is addressed through the Conservation Strategy: **Manage weeds and pathogens using a biosecurity approach**.

Pathogens and diseases

Threat description

Pathogens and diseases affect many native plants and animals in both terrestrial and marine ecosystems and have contributed to significant losses of some species and reduced vigour within several Great Otway communities.

Diseases, fungi and parasites can affect the health of native species, reducing their ability to reproduce or survive. Threatened species with reduced and restricted populations due to other factors are particularly vulnerable to outbreaks caused by these introduced organisms.

Many invasive species are widespread across Australia, and eradication is not feasible. Effective detection, monitoring and management of these species is more important in limiting their impacts.

Pathogens and diseases currently of particular concern in the Great Otway Parks landscape because of their impact on native species are Phytophthora, Myrtle Rust, Myrtle Wilt, and Abalone Herpes.

Plant disease

Phytophthora dieback is a disease caused by a fungus-like water mould, *Phytophthora cinnamomi*, that infects plants, causing crown dieback and usually death in many native species. It is widespread across the landscape and has significant impacts in Dry Forests and Woodlands and Heathland, where species such as the Austral Grass-tree and Horny Cone-bush are highly sensitive, and also causes significant dieback and loss of vigour in eucalypt woodlands. The threatened Clover Glycine is also known to be susceptible to Phytophthora (DEE 2018). Phytophthora can also affect fauna species through alteration of habitat, such as the loss of grass-trees that provide nesting habitat for small ground-dwelling animals.

Myrtle Rust is a disease affecting the Myrtaceae family of plants, which includes many Australian natives such as tea-trees and eucalypts. It is caused by the fungal pathogen *Puccinia psidii*. The disease can result in deformed leaves, heavy defoliation of branches, reduced fertility, dieback, stunted growth, and plant death. Myrtle Rust has been found on private property adjacent to the Great Otway Parks landscape.

Myrtle Wilt is a fatal disease of *Nothofagus cunninghamii* (Myrtle Beech) caused by the fungal pathogen *Chalara australis*. The disease develops initially in a stand of Myrtle Beech through the infection of stem or root wounds via air or waterborne inoculum. ‘Human activity which results in artificially elevated or

epidemic levels of Myrtle Wilt within Nothofagus-dominated Cool Temperate Rainforest' is a potentially threatening process listed under the Victorian *Flora and Fauna Guarantee Act 1988*. Myrtle Wilt could significantly limit the abundance and distribution of many flora and fauna species that are primarily dependent upon Nothofagus Cool Temperate Rainforest by removing the dominant tree species of this community.

Marine disease

An outbreak of Abalone Herpes Virus (AbHV), which killed more than 90% of Blacklip Abalone in western Victorian marine environments in 2010, had significant impact on that keystone grazing species of Subtidal Reef in the Parks landscape. Since this time there has been good recovery of abalone in the Otway parks, but there is a need for vigilance to prevent the spread of AbHV and other marine diseases where possible.

Ensuring diseases do not spread further or become established is an important management activity in maintaining conservation assets within the Great Otway Parks landscape.

Threat objectives

By 2025, reduce further spread in the extent of areas currently impacted by existing pathogens and diseases, and implement measures to respond to new and emerging pathogens to limit impacts on ecological community structures.

This threat is addressed through the Conservation Strategy: **Manage weeds and pathogens using a biosecurity approach**.

Terrestrial predation by foxes and cats

Threat description

Predation by Red Foxes and Feral Cats threatens a range of ground-dwelling species of birds, small mammals and reptiles. It is a high to extreme threat across all terrestrial conservation assets in the Parks landscape and has contributed to declines in sensitive fauna populations. Cats and foxes are widespread throughout the Great Otway Parks landscape.

In coastal areas, wading birds and beach-nesting birds such as the Hooded Plover are particularly vulnerable. Predation is also a significant threat to the survival of heathland-dwelling small mammals such as the Southern Brown Bandicoot and White-footed Dunnart. In forest habitats, predators take animals including the Long-nosed Bandicoot, Long-nosed Potoroo and Broad-toothed Rat.

The primary threat posed by predators is directly decreasing the populations of prey species. However, reduced numbers of native fauna also affect the health of the ecosystems they inhabit, especially species that support ecological processes, such as small digging mammals and pollinators. Changes in the composition of native fauna populations can also disrupt the function of food chains. Predators can also act as weed and disease vectors, moving propagules (such as blackberry seeds in fox droppings) across the landscape.

Predation can also compound the impacts of drought and bushfire on animal populations. Research has found that foxes and cats have the greatest impact on native fauna directly after fire, when there is little vegetation for fauna to use as refuges from predators (Hradsky et al. 2017). Therefore, fire regimes may have a greater impact on the survival of small mammal species where foxes and cats are present in the landscape. Predation pressure can also hinder species movements across the landscape and the ability for individuals to recolonise habitat as it recovers and become suitable after fire, which might be decades after the event.

Focusing on reducing numbers of a single predator species has often been associated with an increase in populations of other predator species, e.g. controlling foxes can result in increasing feral cat numbers. Therefore, integrated control of predator species is required to reduce the threat to prey species. Recent changes to the legislation and policy regulating Feral Cat control in Victoria will improve the ability to reduce

predation pressure throughout the Parks landscape, especially when techniques for landscape-scale control of Feral Cats are better established.

Because of the distribution of foxes and cats across the landscape, and their mobility and ability to rapidly reinvade treated areas, control of predators where small mammals and birds are most vulnerable will be important for maximising species survival. In order to do this, it is important to maintain the current collaborative cross-tenure control with neighbours, agencies and research institutions through the Otway Ark project. However, continuing to review and adapt the program as new information becomes available will be critical to prioritise actions and have the best chance of reducing impacts of predation on fauna in the landscape.

There is a gap in our knowledge about the ecological roles of native predators, as well as the impact of large-scale fox baiting on small mammals through changes to cat behaviour and abundance. The interaction of other management actions such as prescribed burning and weed control as well as climate change on the effectiveness of predation management also need to be better understood.

Threat objective

By 2025, reduce fox and feral cat predation at key locations and times to levels low enough to support increasing populations of priority native animal species.

This threat is addressed through the Conservation Strategies: **Ongoing control of introduced predators to support resilient native fauna populations**, and **Reintroduce locally threatened species**.

Grazing and browsing pressure

Threat description

Grazing and browsing pressure is a threat that poses a high or extreme risk to several assets across the terrestrial Great Otway Parks landscape.

Over-grazing and over-browsing degrade vegetation by lowering plant diversity, altering the structure of vegetation and reducing habitat resilience to disturbance such as fire. Grazing of emergent plants prevents their establishment and contributes to the lack of regeneration and maintenance of vegetation canopy structures required by various fauna species. Grazing of more palatable plants by herbivores can result in selective removal of some species including some that are rare or threatened. Grazing animals can also cause erosion damage to cultural heritage sites and waterways.

Grazing by introduced herbivores, particularly European Rabbits, has a negative impact on the regeneration of Coastal (including islands), Heathland, and Dry Forest and Woodland assets and is a significant threat to several vegetation communities across the Parks landscape. Rabbits are widespread in the areas to the north and east of the Otway Ranges where there has been a history of clearing and farming, and along the coastline in the Port Campbell area. Where they are abundant, rabbits prevent recruitment of native species and contribute to unnatural erosion in coastal and riparian areas. Because rabbits are a common prey species for foxes and cats, predator control needs to be undertaken alongside rabbit control to ensure that native animals do not then become more heavily predated.

Deer are now established in the Parks landscape, particularly on the eastern and western edges of the Otway Ranges. Fallow Deer are the main species, but there are reports of Sambar Deer at the back of Wye River and Red Deer in Carlisle River. As well as grazing and browsing, deer degrade the water quality of wetlands and waterways by excreting and wallowing in shallow water.

Feral pigs are a new and emerging threat. Although they are not exclusively herbivores, they are included here because their browsing and wallowing have impacts similar to those of herbivores such as deer.

Overabundant macropods are also causing some issues in woodlands, where they target certain native grasses and herbs.

Since their reintroduction to the region after being almost hunted out in the 1800s, Koalas have become overabundant in a number of locations and are having a significant impact on coastal woodlands, particularly Manna Gum communities in the western Otways. Koala densities in parts of the Great Otway National Park are estimated to be 2-8 per hectare, and Manna Gum in the park has been almost eliminated from the park by over-browsing (Ramsey et al. 2016). Southern Blue Gums and Mountain Grey Gums north of Cape Otway are also losing condition as Koala densities rise in the region (J. Pascoe, pers. comm.).

Over-browsing by Koalas can lead to habitat loss, fragmentation and degradation and reduce regeneration and recruitment, resulting in simplification of vegetation structure and reduced diversity in canopy species. Koala impacts on coastal Manna Gum woodland from over-browsing is apparent between Lorne and Apollo Bay, at Cape Patton, and especially at Kennett River, Grey River Road and Cape Otway.

Management of grazing and browsing pressure is necessary to promote the regeneration of key canopy species, increase the diversity of plants and animals and improve overall vegetation cover and complexity.

Threat objectives

By 2025, reduce grazing, browsing and trampling of native vegetation by introduced herbivores at priority sites across the landscape.

By 2025, reduce the impact of browsing by Koalas to promote regeneration of key canopy species.

This threat is addressed by the Conservation Strategies: **Manage herbivores for healthy habitats**, and **Manage over-browsing by Koalas**.

Invasive or overabundant marine species

Threat description

Marine invasive or overabundant species pose a moderate to high risk to a range of marine assets in the Great Otway Parks landscape. This threat involves a range of factors which have a demonstrated impact on the health of marine ecosystems through competition for space with native species, direct predation, and alterations to food chains.

On subtidal reefs there are particular concerns for the spread of species such as Japanese Kelp, already well established in Apollo Bay harbour, and from the highly predatory Northern Pacific Seastar, which is well established in Port Philip Bay and has spread to many locations east of Port Phillip Bay. Many other marine pests that are already well established in Victoria, particularly in Port Phillip, could spread to the Parks landscape.

Although marine pests have not been detected in the Parks landscape, the risk of invasion is high, and increasing, through both natural vectors, such as water currents, and human vectors such as the movement of vessels and materials along the coast, particularly from infected ports.

An integrated approach to preventing marine pest spread is needed, along with vigilance in detecting new pests or overabundant native species within parks. An early response to incursions is essential if marine protected areas are to remain pest-free.

An emerging threat in other areas of Victoria, particularly in eastern Victoria and Port Phillip Bay, is the rapid increase in numbers of overabundant native grazing animals such as sea urchins. These animals have the potential to radically alter subtidal reef communities by over-grazing and removing habitat-forming brown algae. Regular monitoring of the number of sea urchins, and responding early to significant increases in populations, are the best options available for preventing these significant impacts on marine assets.

Threat objective

By 2025, ensure that marine invasive or overabundant marine native species do not impact on the health of marine assets or their key ecological attributes.

This threat is addressed through the Conservation Strategy: **Manage marine pests for healthy marine protected areas**.

Habitat degradation from visitor impacts and resource collection

Threat description

The Great Otway Parks landscape contains high-quality habitat for significant populations of threatened species, including some of the most fragile coastal landscapes in Victoria. The Parks landscape is also extremely popular for nature-based recreation. Walking, hiking, camping, scenic tours, fishing and boating, and mountain biking are popular activities. Enjoyment of the parks must be balanced with conservation of the plants, animals and ecosystems they support, as both legal and illegal recreation can degrade natural and cultural assets.

Visitor impacts

The Great Ocean Road, an internationally recognised touring route and Victoria's most significant tourism asset, winds its way along the length of the landscape. The road was Inscribed on the National Heritage List in 2011. Rapidly increasing numbers of visitors add pressure to an already vulnerable coastline compounded by rising sea levels and erosion and reduce available habitat for many species.

Additional infrastructure to support increasing visitation can further fragment habitats, impact vulnerable species and disturb previously undisturbed areas. Recreational activities such as off-road driving (4WDs and trailbikes) mountain biking, horse-riding, off-track walking and camping can cause erosion and facilitate the movement of weeds and pathogens, and can threaten significant plant species through trampling.

Resource collection

Illegal activities, including fishing and shellfish collection in marine national parks and marine sanctuaries, affects the diversity of intertidal areas and can reduce available habitats (e.g. removing cunjevois for bait) and food resources. Removal of predatory species such as finfish, sharks, rays, and rock lobsters, or taking key grazers such as abalone, can result in imbalances in marine ecosystems through significant impacts on food chains.

Threat objective

By 2025, ensure recreation activities and natural resource extraction are managed to reduce the impacts of visitors on the health of priority conservation and cultural assets across the Parks landscape.

This threat is addressed through the Conservation Strategy: **Reduce the impacts of recreation, illegal activities and natural resource extraction on natural values**.

Hooded Plover

Twelve Apostles

6 Conservation strategies

6.1 Priority conservation strategies

A broad range of conservation strategies have been considered, including those in existing park management plans and regional catchment strategies and other actions identified by regional staff and conservation partners. The following strategies and their component actions have been designed to achieve the desired conservation outcomes identified in this plan. The Strategic Management Prospects decision support tool (DELWP 2019) will be used to help determine the priority areas for implementing these strategies, along with other assessments of impact, feasibility and cost. Where appropriate, adaptations to climate change have been considered in developing these strategies.

These strategies will support the persistence of conservation assets in this landscape by mitigating priority threats, thereby strengthening the capacity of ecosystems to absorb impacts of long-term climatic change. In some assets, climate change will have a profound impact on the function and composition of ecosystems. The proposed adaptation measures aim to maintain ecosystem function.

Strategies for this landscape take into account a range of recognised climate adaptation strategies (Gross et al. 2016), such as:

- **ensuring connectivity** of wet forest and rainforests through minimising the impacts of fire.
- **protecting key ecosystem features** such as coastal vegetation and heathland, which provide important habitat for a number of small mammal species.
- **supporting ex-situ conservation and relocating organisms** such as the reintroduction of locally threatened and extinct species.
- **reducing non-climate stressors**, including controlling pest plants and animals that hinder the ability of ecosystems to withstand or adjust to a changing climate.

Priority strategies were developed further 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 then 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.

Each strategy may be suitable for further refinement or development with conservation partners and stakeholders who wish to further support conservation outcomes in the Great Otway Parks landscape.

Strategies prioritised and developed through this process are as follows:

- Work in partnership with fire management agencies to maintain and improve fire regimes that diversify vegetation age-class mosaics and protect fire-sensitive values.
- To reduce the spread, establishment and impact of weeds and diseases, focus on species that have, or are likely to have, significant impacts on the health of conservation assets and ecological processes.
- Implement targeted control of foxes and cats at priority locations to support the persistence, movement and increase of native fauna vulnerable to predation.
- Implement effective and integrated control of key herbivores to improve the regeneration and structural diversity of conservation assets across the Great Otway Parks landscape.
- Pro-actively manage Koalas to maintain healthy Manna Gum communities through collaboration.
- Reduce the likelihood of populations of marine pests establishing in the Parks landscape, ensure that the eradication of populations of new pests is rapid and targeted.

- Encourage the public to enjoy nature-based activities while ensuring the impacts on priority marine and terrestrial areas and species are minimised.
- Reintroduce, where feasible, locally threatened species, and locally extinct species to restore ecological processes, including soil disturbance (digging, burrowing), seed and spore dispersal, and predation by native animals.
- Strengthen collaboration and partnerships to maintain long-term engagement and guide adaptive environmental programs.

Strategy description format

Conservation Strategies are detailed on the following pages in the format described below.

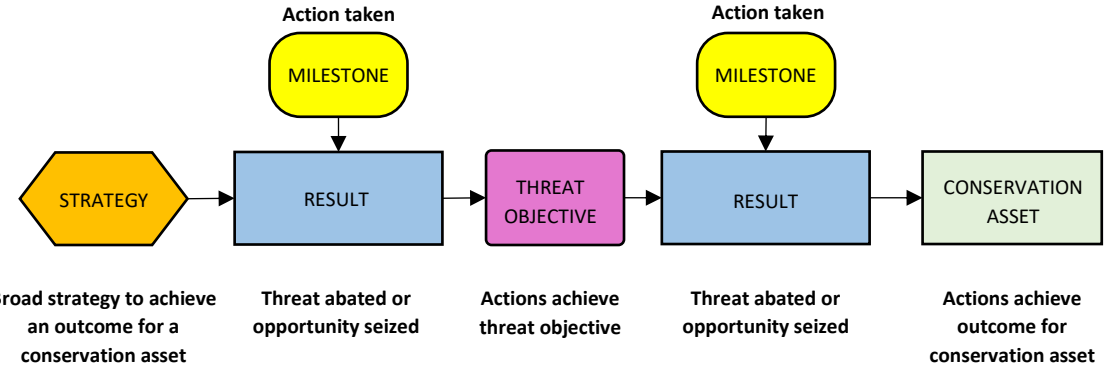
Conservation strategy

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 the conservation asset(s). 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	Action
Statement of what implementation success looks like	• Milestone from results chain, with locational and other detail
	•
Threat objective	•

Manage fire for ecological health

Conservation outcomes

Improve the structural diversity and growth-stage distribution of vegetation communities that depend on fire and protect ecosystem assets that may be impaired by inappropriate fire management.

Strategy

Fire management is a high priority program in the Great Otway Parks landscape that is successfully planned and delivered in partnership with DELWP and the broader community.

The program aims to apply appropriate fire regimes using strategic planned burning and mechanical fuel treatments to reduce the incidence of large-scale high severity bushfires and manage for continuing habitat and refuges for key species. It is developed and applied in a partnered, cross-tenure approach.

Fire management within the Parks landscape is directed by the 2017 Strategic Bushfire Risk Assessment and Strategy Selection (SBRASS) fuel management strategy for the Barwon Otway (Otway District) Bushfire Risk Landscape (DELWP 2015). This approach has been developed through the use of sophisticated long-term modelled scenarios investigating the impacts of bushfire, planned burning, and mechanical fuel treatments on fire scale, severity, intensity, frequency and seasonal timing, and relates these to outcomes for community risk reduction and local ecology. As the Great Otway Parks landscape comprises several significant townships embedded in natural areas, fire planning and management involves a cross-tenure fuel management strategy with partners (DELWP, Parks Victoria, the Country Fire Authority and private landowners) working together to manage the risk to high-risk townships and optimise the environmental and ecological outcomes of the fire management program.

Balancing the needs for township and asset protection in the broader landscape with the ecological needs of vegetation communities can achieve significant benefits and ensure priority conservation assets in the Parks landscape are maintained in good health.

The major east-west ridgeline that extends from Anglesea through to Port Campbell has shaped the distribution of forest communities within the Otway Ranges, resulting in drier forest types on the north-

facing slopes and wetter forests on the southern slopes. The dry north-facing slopes have the ability to significantly increase the intensity of any bushfires that may ignite in the grasslands to the north and run south towards the coast, placing vulnerable township communities at risk during such bushfire events.

The targeted use of planned burning in the fire dependent/independent vegetation on the northern slopes of the ranges to reduce the intensity of any bushfires that may threaten the coast, will also provide a buffer for the Wet Forest and Rainforest and other fire-sensitive communities from the same threat.

The need to minimise bushfire risk to fire sensitive vegetation, catchments, and high value habitats, including in the Wet Forest and Rainforest, Riparian and Freshwater Wetland, and Estuarine and Saline Wetlands assets is recognised in this strategy. In fire sensitive areas such as Wet Forest and Rainforest, planned burning will be excluded, and these assets will be sought to be protected through environmentally-sensitive suppression strategies during bushfires and using planned burning in adjacent fire dependent/independent vegetation as buffers to halt or minimise bushfire impacts.

In the Heathland, Dry Forest and Woodland, and Coastal (including islands) assets, fire is natural, and an important regeneration event for vegetation. Appropriate fire management contributes to healthy ecosystems by improving floristic and growth-stage diversity, which supports fauna habitat requirements and the treatment of invasive species. Within the significant heathland areas of Anglesea and Carlisle, planned burning is being used to promote floristic diversity and protect habitat for small mammals including Southern Brown Bandicoots and Swamp Antechinus. Implementing a program of 'cool burns' (patchy-planned burns in late Autumn and winter) over several years aims to create a more complex distribution of vegetation age-classes while protecting critical habitat refuge areas through the establishment of buffers for minimising impacts of wildfire events and protecting swamplands and drainage lines.

As fires can trigger invasion from weeds and pest animals, fire management will be carried out in conjunction with the strategies that address these threats and recovery activities after bushfire will be well-timed to reduce the impacts of pest species and support the rehabilitation of conservation assets and cultural sites.

Strategy summary

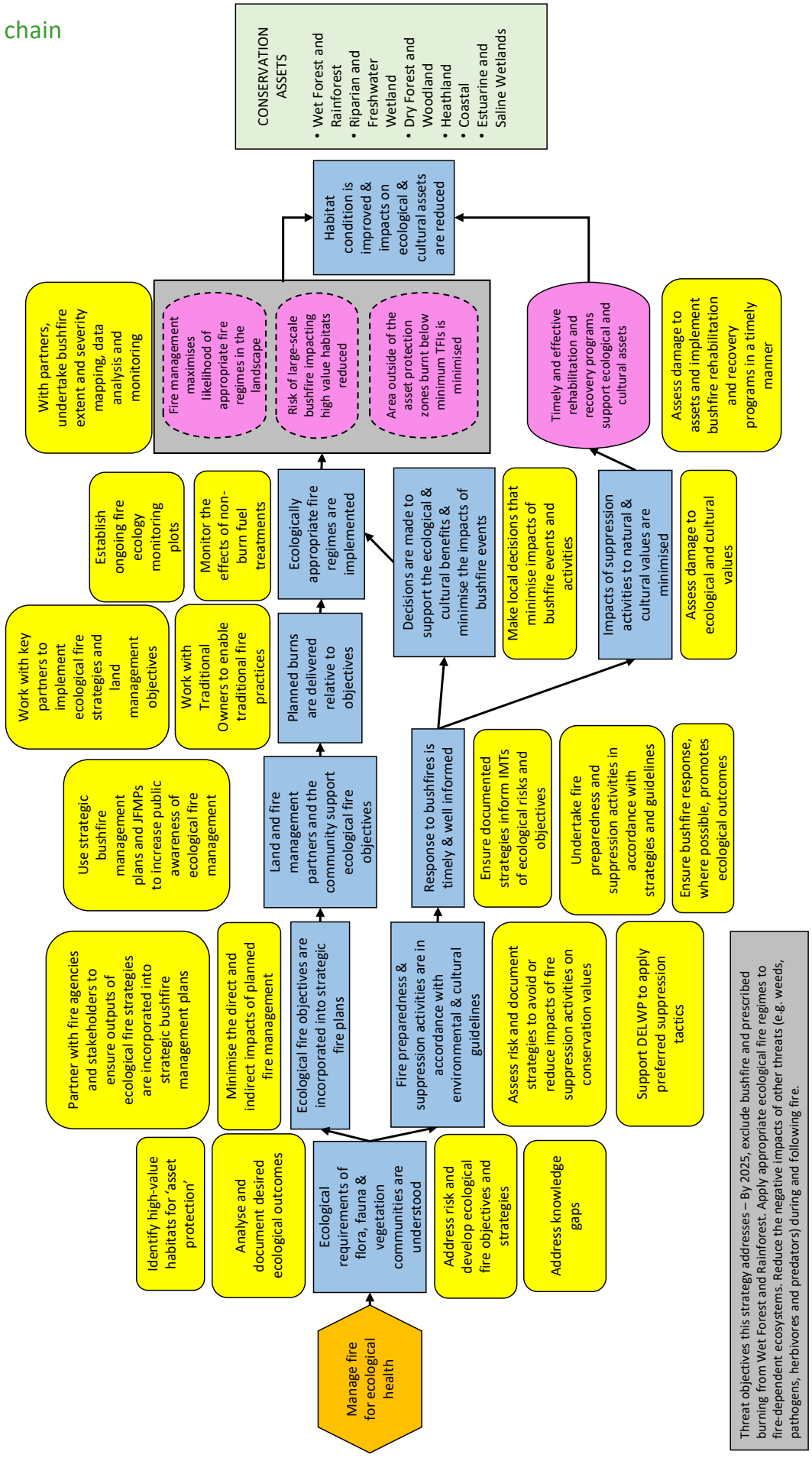
Work in partnership with fire management agencies to maintain and improve fire regimes that diversify vegetation age-class mosaics and protect fire-sensitive values.

Table 6.1 Priority fire management in the Great Otway Parks landscape.

Strategy	Conservation Asset to benefit*	Priority location
Exclude fire	Wet Forest and Rainforest Riparian and Freshwater Wetland Estuarine and Saline Wetlands	Great Otway National Park
Protection of fire-sensitive communities and townships through targeted planned-burning	Dry Forest and Woodland Heathland	Northern slopes of Otway Range
Improve floristic and growth-stage diversity	Heathland Dry Forest and Woodland Coastal (including islands)	Great Otway National Park – Anglesea Heath, Carlisle Heath

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action

Ecological requirements of flora, fauna and vegetation communities are understood.	• Identify high-value habitats for ecological asset protection, including fire sensitive vegetation, critical habitat and wildlife refugia in priority areas.
	• Analyse and document desired ecological outcomes, informed by:
	  • bushfire risk analysis of impacts of future fire in sensitive vegetation, critical habitat and wildlife refugia.
	  • ecological growth stage structure (spatial and temporal) for habitat in fire dependent vegetation.
	  • tolerable fire intervals, for floristic diversity.
	  • future fire scenarios under climate change predictions.
	  • understanding links between desired ecological outcomes and Traditional Owner cultural landscape management.
	• Assess risk and develop ecological fire objectives and strategies for priority areas to:
	  • exclude fire from fire sensitive conservation assets, including rainforest and wet forest, or important older habitat. Mitigations may include reducing the potential severity of future fires by burning in nearby fire dependent / fire tolerant vegetation.
	  • use planned burning (ecological burning) in heathlands and other fire dependent vegetation to maintain floristic diversity, provide a range of habitat growth stages and protect important wildlife refugia.
	  • maintain or improve ecosystem health and avoid or reduce impacts on ecological assets, including the interactions between fire and invasive species.
	  • reduce impacts on ecological assets from problem native species, such as coast tea tree and coast wattle.
	• Address knowledge gaps to allow better implementation of sound, risk-mitigation based fire management, including:
	  • ecosystem, habitat and species responses to fire.
	  • interactions between fire and invasive species.
	  • interactions between fire and problem native species.

Ecological fire objectives and strategies are incorporated into strategic fire plans.	• Partner with fire agencies and stakeholders to ensure the outputs of ecological fire strategies are incorporated into strategic bushfire management planning processes, including setting land management objectives for ecological burning that may include:
	  • reducing bushfire risk on fire sensitive vegetation, catchments and high value habitats, and
	  • contributing to healthy ecosystems; floristic diversity, growth stage diversity of fire-dependent vegetation, fauna habitat requirements.
	• Minimise the direct and indirect impacts of planned fire management, including:
	  • planning to manage pre- and post-treatment invasive species issues.

Result	Action
	• minimise the area of planned fuel breaks in conservation assets, where possible, by working with partners across land tenures. • with agency partners, continually review fire management zoning.

Fire preparedness and suppression activities are planned in accordance with environmental and cultural guidelines.	• Assess risk and document strategies to avoid or reduce impacts of fire suppression activities on conservation values.
	  • High value fire sensitive conservation assets that are likely to be significantly impacted by bushfire are spatially identified for potential suppression activity.
	  • Important conservation assets are spatially identified and mitigations to reduce impacts from machinery and other tactical activities during bushfire suppression are documented.
	  • Map key values (both natural and cultural) and threatening processes (including weeds, pests and pathogens) that fire suppression will impact.
	• Support DELWP to apply preferred suppression tactics in environmentally and culturally sensitive areas.

Land and fire management partners and the community support ecological fire objectives.	• Use strategic bushfire management plans, Joint Fuel Management Programs (JFMPs), and Parks Victoria / DELWP fire communications staff to increase public awareness of ecological fire management in the landscape, including ecological burning, planned burn exclusion, and the use of non-burn fuel treatments. Including:
	  • Partner with DELWP, CFA and Traditional Owners, and use the strategic bushfire management plan to engage with the community, including how this supports ecological fire management, and the Joint Fuel Management Program to inform regular conversations with communities and stakeholders on implementing the strategy, including consideration of conservation outcomes.
	  • In partnership with DELWP, CFA and Traditional Owners engage with the community about why we are doing ecological burns, what we are learning when we do them, how they might help reduce the negative impacts of bushfires, and what the results are telling us.

Response to bushfires is timely and well informed.	• Ensure documented strategies inform Incident Management Teams (IMTs) of ecological risks and objectives and enable them to make dynamic decisions. • Undertake fire preparedness and suppression activities in accordance with strategies and guidelines. • Ensure that the bushfire response promotes ecological outcomes (which may include actively limiting or halting suppression activities).

Result	Action

Planned burns are delivered relative to objectives (e.g. for health of species, vegetation communities and cultural assets).	• Work with key partners to implement ecological fire strategies and land management objectives, through JFMPs.
	  • Land and fire managers refer to ecological fire strategies to inform JFMP development and support decisions on where and when and how to burn.
	  • Ecological burns are scheduled, prioritised, resourced and implemented.
	  • Consider use of cool, patchy mosaic burning where appropriate (monitor the effectiveness of this for floristic diversity and habitat values). This may be in a layered approach to implement strategies over multiple years within ecological / burn units.
	  • Consider and plan for potential post-fire impacts (such as invasive species) during JFMP development and implementation.
	• Work with Traditional Owners to enable traditional fire practices.

Ecologically appropriate fire regimes are implemented.	• Establish ongoing fire ecology monitoring plots in selected areas to measure ecosystem health and to assess and refine ecological fire regimes. • Monitor the effects of non-burn fuel treatments.
Decisions are made to support the benefits and minimise the impacts of bushfire events.	• Make local decisions that minimise impacts, such as placing mechanical breaks and fire retardants away from priority areas, and where appropriate allowing bushfires to burn naturally to promote ecological outcomes.
Impacts of suppression activities to natural and cultural values are minimised.	• Assess damage to ecological and cultural values
Fire management maximises the likelihood of appropriate fire regimes in the landscape. Risk of large-scale bushfire impacting high-value habitats reduced. The area outside of the asset protection zones that is burnt below minimum TFIs is minimised.	• With partners, undertake bushfire extent and severity mapping, data analysis and monitoring. • Use monitoring data to adapt management, informing the most appropriate spatial and temporal growth stage distributions and ensure a continuous long-term supply of appropriately aged vegetation to support habitats, including sufficient high-value areas of mid and older growth stages. • When competing objectives must be managed ensure that monitoring data supports the decision-making, e.g. some high-value areas for threatened species may require active fire exclusion, contrary to risk-minimisation needs.

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.
	  • ensure risks to impacted threatened species populations can be managed effectively, with assistance from partners.
	  • minimise post-fire establishment of:
	  • invasive species.
	  • impacts of erosion and sedimentation.

Habitat condition is improved and impacts on ecological and cultural assets are reduced.	

Manage weeds and pathogens using a biosecurity approach

Conservation outcomes

Increase the health of conservation assets where ecosystem-altering invasive weeds and diseases are present, and maintain the integrity of ecosystems by preventing new and emerging pests and diseases from becoming established.

Strategy

This strategy guides the management of weeds and pathogens to reduce their establishment, spread and impact. The strategy focuses on species that have, or are likely to have, significant impacts on the health of conservation assets and ecological processes in the Great Otway Parks landscape.

The Victorian Government's biosecurity approach to pest plant and pathogen management (DPI 2010) is the basis for determining appropriate management interventions. There are four general management responses to controlling weeds and pathogens: prevention, eradication, containment and asset protection (see Appendix D). The management responses in this strategy are based on the current extent and the level of risk of weeds and pathogens in the Great Otway Parks landscape.

The prevention and eradication responses for new and emerging weeds and pathogens require resources for surveillance and rapid response when needed. This can be helped by identifying the most likely invasion points and pathways. Invasion pathways are particularly important for weed establishment in the Great Otway Parks landscape. Transport corridors provide a mechanism for spreading weeds through vehicles and management activities such as road works and slashing; townships increase the risk of garden escapes; boundaries with farmland increase the risk of weed invasion; and disturbance sites such as campsites and historic mills can also be the source of weeds into relatively intact areas.

Another key component of this strategy is to focus on significantly reducing or eradicating environmental (and regulated) weed species that are already established. A focus on species that have the capacity to change the character, condition and nature of ecosystems (transformer weeds) is likely to result in greater gains in the health of assets.

Fires, fire management activities and other management activities such as road works can result in weed and pathogen spread. Incorporating weed and pathogen management into fire and road management

planning and practices by working with authorities, departments and contractors currently involved in these management activities will be an important step in integrated weed control and prevention across the Great Otway Parks landscape.

Management responses have been categorised using the groupings below.

Prevention

Prevention is a pre-emptive action to manage the risk of introducing weeds and soil-borne pathogens into the Parks landscape and ensuring works or disturbance events do not provide an opportune environment for weed establishment. This is achieved by identifying high-risk weeds in adjoining land and other 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 education and cooperation with neighbours to eradicate or control high-risk weeds, and measures such as maintaining vehicle and equipment hygiene, avoiding the introduction of soils, gravels and other materials which may carry seed and spores, and ensuring that appropriate site preparation and risk identification is undertaken before planned disturbances such as ecological burning.

Eradication of new and emerging weeds and pathogens

For weeds at the early stages of invasion, initial control efforts and surveillance are the main priorities. The objective of control is generally eradication to limit the potential for establishment. The process of addressing new and emerging weed threats should follow the 'Weeds in Early Stage of Invasion Framework' outlined in Appendix D.

This group includes weed species such as Silky Hakea, South African Weed Orchid and Blue Psoralia, the pathogens Myrtle Wilt and Myrtle Rust, and the soil-borne Honey Fungus.

New and emerging weeds are the highest priority across the Parks landscape. Increasing community awareness and engagement in surveillance and reporting is necessary to ensure these weeds are prevented from establishing.

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, but the establishment of containment lines and constriction of the containment area over time could result in eradication in the long term.

Where there are pathways of spread through a containment area (e.g. vehicles, walkers, river corridors) a concerted effort should be made to undertake control works along tracks and waterways to decrease the likelihood of spread. Biological controls can assist with containment efforts for established weeds, but are limited to species with an available control agent (biological controls are currently approved for Boneseed, Blackberry, Bridal Creeper, European Gorse, Paterson's Curse, Horehound and Ragwort). Containment includes the eradication of satellite or local populations of weeds outside the containment area.

Asset protection

Some weeds are well-established and widespread in the Parks landscape. At this scale, there are limited control options available. Eradication or containment of these species is unlikely to be possible without the development of novel control agent methods and as such management of this group of species is generally limited to reducing their impact on high priority assets. Species that are indicative of this group include Bluebell Creeper, Coast Wattle and Blackberry.

Because widespread control of these weeds is not feasible, the objective is to reduce their abundance and to prevent invasion into priority areas such as riparian and other refuge areas.

Asset areas

The *Local Area Planning for Managing the Environmental Impacts of Weeds on Public Land in Victoria - Otway Weeds Case Study 2008* (Platt et al. 2008) established five priority asset areas in which to concentrate control of established weeds. These areas were identified as important biodiversity asset areas using a number of parameters, and have been the basis of ongoing control and monitoring. These areas are identified in Figure 6.1 (the Port Campbell Asset Area has been enlarged since the original report).

Outside these areas, priority for control includes new and emerging species wherever they occur, protection of threatened species and community priorities. DELWP's (2019) Strategic Management Prospects (SMP) model can be used to assist in identifying these priority areas. It models the likelihood that a transformer weed is present or will be present within the next 20 years.

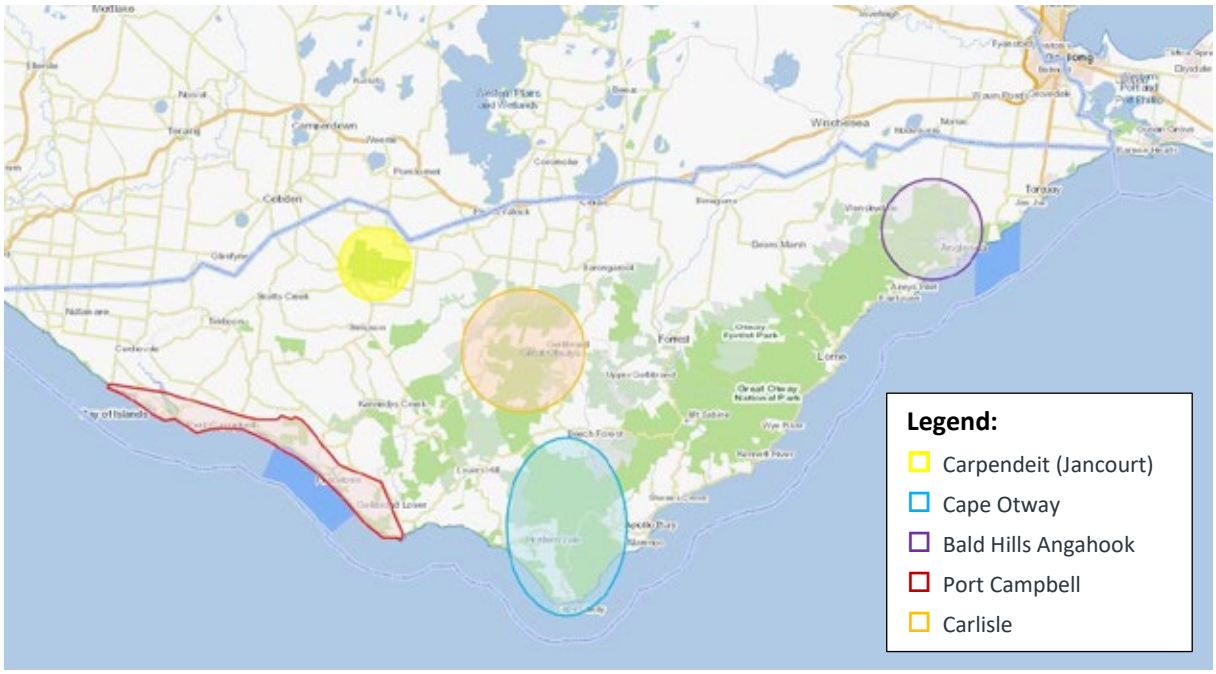


Figure 6.1 Weed asset areas for the Great Otway Parks landscape.

Phytophthora and other pathogens

Applying good hygiene and preventative approaches to limit the spread and mitigate the impact of Phytophthora in areas of high biodiversity value is a key component to managing Phytophthora and other pathogens or disease in the Great Otway Parks landscape. To do this, understanding the current distribution of the species in the Parks landscape is a critical first step.

Understanding the species and ecological communities that are most susceptible to Phytophthora, and the current extent of Phytophthora in the broader landscape, will allow a risk-based approach to management. As human activity can spread Phytophthora farther and faster than any other means, modifying human activities through education, restricting access to certain sites, and hygiene measures will be most effective (DEE 2018).

Reducing the risk of the spread of Phytophthora requires consideration of awareness and hygiene practices to be integrated into the early planning of built assets, tourism and recreation activities, fire management actions and research projects.

Strategy summary

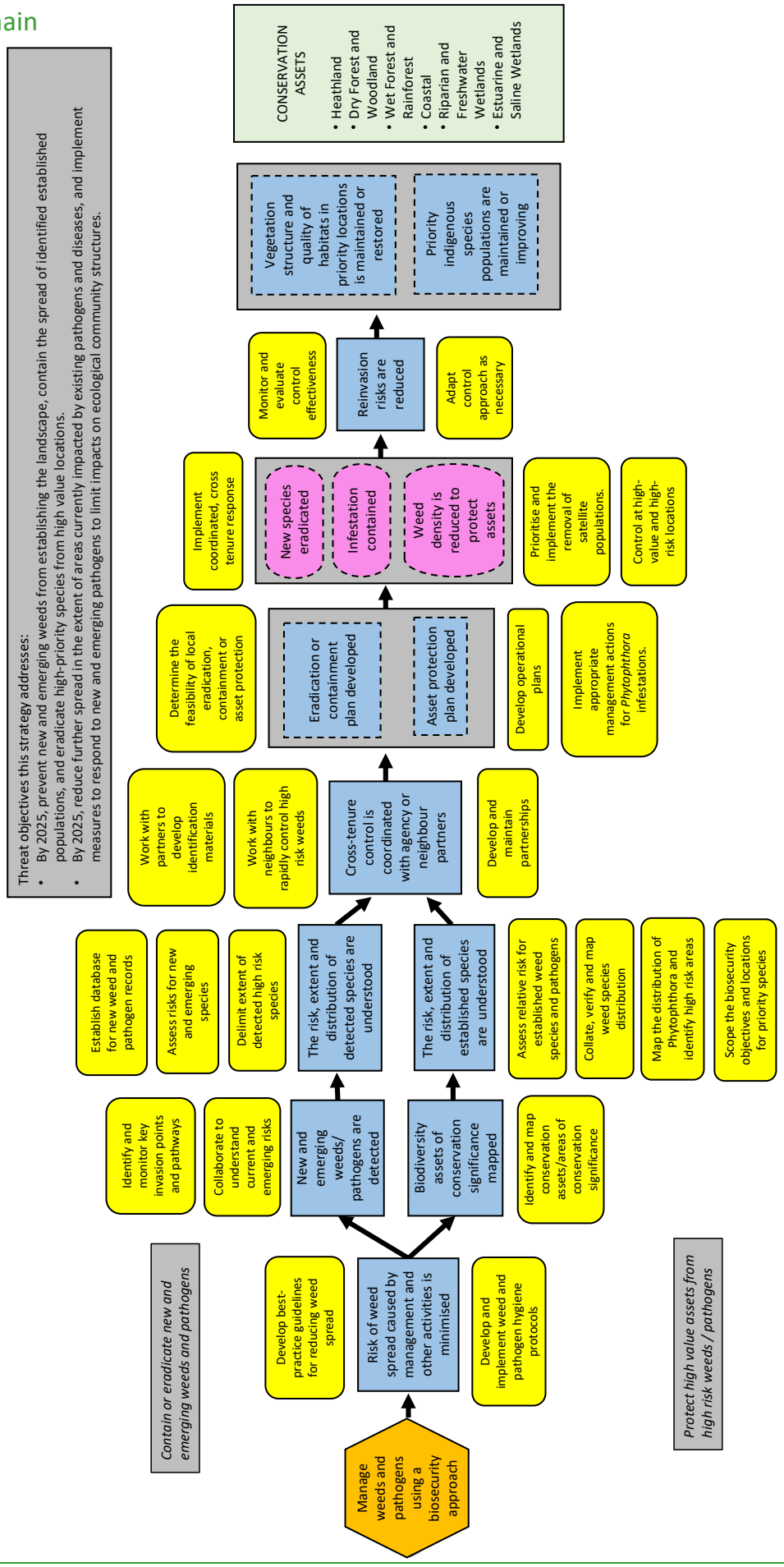
Reduce the spread, establishment and impact of weeds and diseases, focusing on species that have, or are likely to have, significant impacts on the health of conservation assets and ecological processes.

Table 6.2 Priority areas, management actions and weed species in the Great Otway Parks landscape.

Priority location	Conservation Assets*	Objective/action	Species
Bald Hills/Angahook Asset Area	Dry Forest and Woodland Heathland Riparian and Freshwater Wetland	Surveillance and **eradication**	Giant Honey-myrtle, Silky Hakea, South African Weed-orchid, Bridal Creeper
		Containment to protect high diversity sites	African Boneseed, Coast Tea-tree, Coast Wattle
		Asset protection through treatment in high diversity sites	Bluebell Creeper
Carpendeit (Jancourt) Asset Area	Dry Forest and Woodland Heathland Riparian and Freshwater Wetland	Surveillance and **eradication**	Agapanthus, Blackberry, English Ivy, Mirror Bush, Montpellier Broom, Purple Hop-bush, Spanish Heath, Sweet pittosporum
		Containment with localised eradication	Watsonia
Port Campbell Asset Area	Coastal (inc islands) Riparian and Freshwater Wetland Heathland	**Eradicate** and monitor	Boneseed, Boxthorn, Agapanthus, Red-hot Poker, Shasta Daisy, Blue Periwinkle, Sicilian Sea-lavender, Mirror Bush, Coast Tea-tree
		Containment with localised eradication where possible	Watsonia, Sweet Pittosporum, White Arum-lily
		Protection of high value **assets**	Coast Wattle, Blackberry
Carlisle Heath	Coastal (inc islands) Riparian and Freshwater Wetland Heathland	**Eradicate** and monitor for reinvasion	Boneseed, Blue Psoralia, Pincushion
		Containment with localised eradication where possible	Sweet Pittosporum, Blue Periwinkle, White Arum-lily, Asparagus Fern, Bluebell Creeper, English Ivy, Cape Ivy, Wandering Creeper
Cape Otway Asset Area	Wet Forest and Rainforest Dry Forest and Woodland Riparian and FW Wetland Coastal (inc islands)	**Eradicate** and monitor	Boneseed, Japanese Honeysuckle, Blue Psoralia, Pincushion
		Containment and localised eradication where possible	Sweet Pittosporum, Blue Periwinkle, White Arum Lily, Asparagus Fern, Bluebell Creeper, Cape Ivy, English Ivy, Wandering Creeper, Coast Tea-tree

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action
Risk of weed spread caused by management and other activities is minimised.	• Develop best-practice guidelines for reducing weed spread, in collaboration with key stakeholders (VicRoads, local government and DELWP). • Develop and implement weed and pathogen hygiene protocols in collaboration with key groups (tourism bodies, researchers, DELWP and local government).
Contain or eradicate new and emerging weeds and pathogens	
New and emerging weeds/pathogens are detected.	• Collaborate with land management and biosecurity partners to understand current and emerging risks. • Identify and monitor key invasion points and pathways for new and emerging weeds and pathogens. Possible sites include previously disturbed sites, walking tracks and roads, private/public land interface and townships.
The risk, extent and distribution of detected species are understood.	• Assess risks for new and emerging species using a biosecurity approach. Use SMP maps to assist in identifying priority surveillance areas. • Delimit the extent of detected high risk species within parks. • Establish a database for recording new weed and pathogen records consistently across the Parks landscape.
Protect high-value assets from high-risk weeds and pathogens	
Biodiversity assets of conservation significance are mapped	• Identify and map conservation assets/areas of conservation significance including within identified focal areas.
The risk, extent and distribution of established species are understood.	• Assess relative risk for established weed species and pathogens. • Collate, verify and map weed species distribution. • Scope the biosecurity objectives and locations for priority species across the landscape. • Map the distribution of Phytophthora in the Park and identify other high-risk areas.
Cross-tenure control is coordinated with agency or neighbour partners.	• Work with partner agencies to develop and distribute weed and pathogen identification materials. • Work with neighbouring land managers to rapidly control new and emerging and established high-risk weeds. • Develop and maintain partnerships with CMAs, Traditional Owners and neighbouring landholders.
Eradication or containment plan is developed.	• Determine the feasibility of eradication or containment for species and sites. • Develop operational plans for eradicating or containing identified new and emerging weed species.
Asset protection plan is developed.	• Develop operational asset protection plans for priority established weeds. • Implement appropriate management actions to minimise the adverse impacts of existing Phytophthora infestations.

Result	Action
New species are eradicated or contained. Weed density is reduced to protect assets.	• Implement coordinated, cross-tenure responses to eradicable and containable infestations. • Prioritise and implement the removal of satellite weed populations. • Control weeds and pathogens at high-value and high-risk locations.
Reinvasion risks are reduced.	• Monitor and evaluate weed and pathogen control effectiveness against threat and conservation objectives. • Adapt the control approach as necessary.
Vegetation structure and quality of habitat in priority locations is maintained or restored. Priority indigenous species populations are maintained or improving.	

Ongoing control of introduced predators to support resilient native fauna populations

Conservation outcomes

Populations of native fauna vulnerable to predation are able to persist or increase in abundance, and the diversity and distribution of ground-dwelling mammals in the Great Otway National Park, Anglesea Heath and the surrounding landscape is maintained.

Strategy

The control of introduced predators (foxes and feral cats) will help vulnerable native fauna to persist and increase their population sizes. It may also support individuals to move through the landscape and colonise suitable habitat if it becomes available in response to climatic changes and disturbance.

A collaborative and long-term approach, working with key research and delivery partners and private landowners, will be most effective in reducing predation pressure on declining ground-dwelling mammals such as Long-nosed Potoroos, Southern Brown and Long-nosed Bandicoots and Swamp Antechinus.

Integrated cross-tenure control of predator species is important to effectively manage the threat of predation and must be based on understanding where and when predators are most active. This may be influenced by seasonal factors or disturbance events. Over the last six years, Otway Ark, a predator-focused project targeting foxes, has been established in the Great Otway Parks landscape. The long-term aim of this project is to maintain the species richness, distribution and abundance of ground-dwelling mammals in the Great Otway National Park, Anglesea Heath and the surrounding landscape.

Feral Cats have recently been declared an established pest animal on specified Crown land under the Victorian *Catchment and Land Protection Act 1994*. This will allow the control of Feral Cats to be integrated into the Otway Ark program, to more effectively control predation pressure from cats at a landscape scale. The support and engagement of key agencies is needed to develop effective and humane approaches to Feral Cat control, including targeted baiting programs.

Predator control programs should be integrated with other strategies that improve the structure and extent of suitable habitat for native fauna, e.g. fire management, management of grazing and browsing pressure, and weed management. In some situations, it may be necessary to establish exclusion fences around existing or reintroduced populations of vulnerable species, and implement enhanced control programs within the fenced area. A novel technique being investigated elsewhere is the deployment of artificial fauna refuges after fire.

Monitoring the presence and activity of foxes and cats is critical for evaluating the effectiveness and long-term success of control programs. Monitoring predation-sensitive fauna species to assess the recovery responses of populations will allow the program to be adapted and inform the development of other predator control programs.

The identification of areas of critical habitat for priority fauna populations in the Parks landscape will allow targeted management and monitoring of these areas and surrounding habitat. Understanding whether species are most at risk to predation pressure during specific times (e.g. nesting or fledging) or after events (e.g. large-scale fires) would support the development of more targeted and effective programs.

Strategy summary

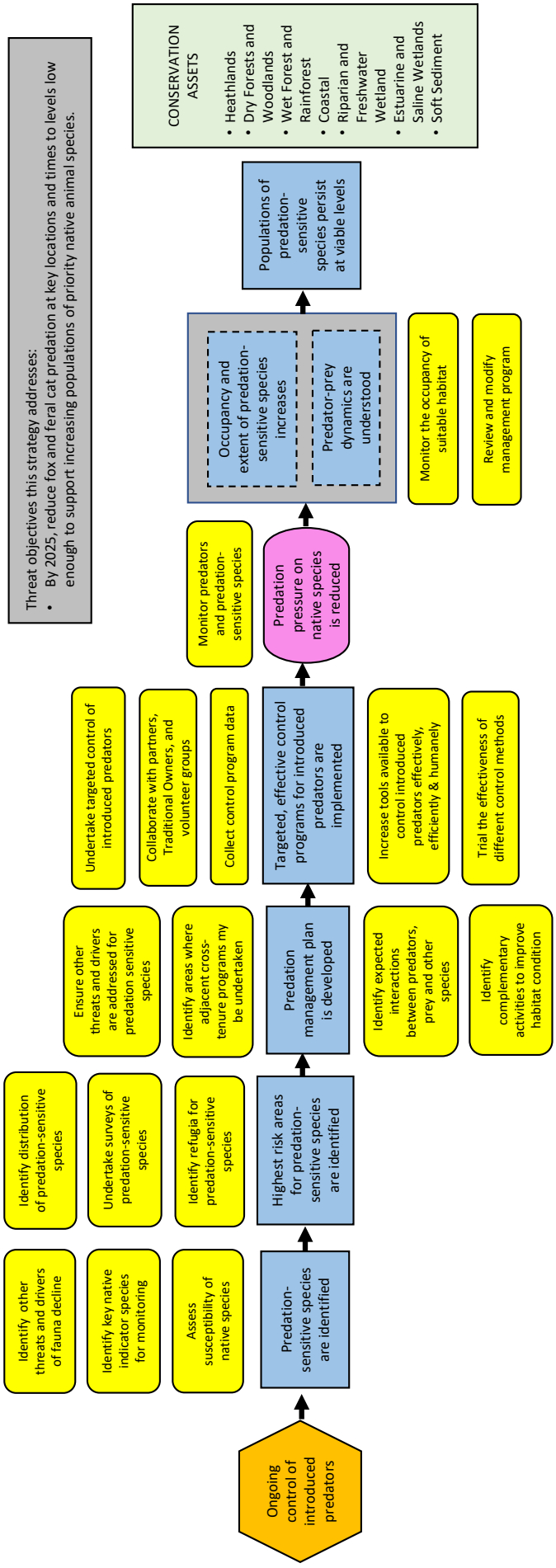
Implement targeted control of Red Foxes and Feral Cats at priority locations to support the persistence, movement and increase of native fauna vulnerable to predation.

Table 6.3 Priority introduced predator (Fox/Cat) management in the Great Otway Parks landscape.

Nested Assets	Conservation Assets to benefit*	Treatment type	Priority location
Ground-dwelling mammals	Wet Forest and Rainforest Dry Forest and Woodland Heathland Coastal (including islands)	Landscape scale – cross tenure control	Otway Ark focal areas
Ground-dwelling mammals	Dry Forest and Woodland Heathland Coastal (including islands)	Targeted, localised control	Burnt areas following planned burns and wildfire
Beach nesting birds	Coastal (including islands) Soft Sediment	Targeted localised control if multiple nests are taken by a fox in a given location	Great Otway National Park

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Activities
Predation-sensitive species are identified.	• Identify other threats and drivers of fauna decline. • Assess susceptibility of native species to predation by cats and foxes. • Identify key native species to be monitored to determine success of control program.
Highest risk areas for predation-sensitive species are identified.	• Identify distribution of predation-sensitive species. • Undertake surveys of predation-sensitive species to determine presence and distribution. • Identify refugia for predation-sensitive species, and where management activities can be modified to protect these areas.
Predation management plan is developed.	• Ensure other threats and drivers are addressed for predation-sensitive species. • Identify areas where adjacent cross-tenure programs may be undertaken. • Identify complementary activities that may improve habitat condition and support predation-sensitive species to persist. • Identify interactions between predators, prey and other species to understand potential impacts (including prey switching).
Targeted, effective control programs for introduced predators are implemented.	• Collaborate with partners, Traditional Owners and volunteer groups. • Undertake targeted control of introduced predators. • Collect control program data to analyse and review programs. • Increase tools available to control introduced predators effectively, efficiently and humanely. • Trial the effectiveness of different control methods.
Predation pressure on native species is reduced.	• Monitor the abundance and distribution of predators. • Monitor the abundance and distribution of native prey species. • Monitor interactions between introduced predators.
Occupancy and extent of predation-sensitive species increases Predator-prey dynamics are understood.	• Monitor the occupancy of suitable habitat by predation-sensitive indicator species. • Review and modify the management program as necessary to support the persistence of key species.
Populations of predation-sensitive species persist at viable levels.	

Manage herbivores for healthy habitats

Conservation outcome

The regeneration of key canopy species and an increase in the diversity and viability of all terrestrial assets.

Strategy

This strategy will result in the effective control or management of exotic grazing and browsing species to reduce competition with native fauna and prevent degradation of conservation and cultural assets.

Grazing and browsing issues are widespread and varied. The strategy identifies the priorities for action for individual species that currently occur across the Parks landscape, and actions needed to prevent new incursions from becoming established populations. Targeting control activities at high-value sites where exotic herbivores are having the greatest impact will maximise conservation outcomes.

Landscape-scale management of grazers involves an integrated approach to the control of rabbits and deer, including building community awareness, engagement of volunteer hunters, and the use of specialist contractors to reduce grazing and browsing pressure.

Parks Victoria will continue to carry out humane and safe rabbit control, partnering with reputable contractors and shooting organisations. New sites suitable for biological control release will also be investigated. Because population numbers can increase quickly when predators are removed from an area, rabbit control will be carried out in association with the introduced predator control strategy.

Deer numbers and their ecological impacts are not well understood. Although there are reliable reports of significant numbers of Fallow, Red and Sambar Deer in the Otways, comprehensive data on population status and the damage caused is poor. An understanding of the problem would be assisted by a systematic assessment of deer populations across the entire Parks landscape, including habitat use, movement patterns, and the pathways used to enter parks. Priority could then be given to eradicating small, isolated populations and lowering impacts on high conservation areas.

Public cooperation is essential for successful herbivore management. Deer populations are valued by hunters as game species, so care must be taken to communicate the need for and benefits of deer management.

Pigs have been identified as an emerging threat in some areas, particularly in the northern reserves including Jancourt NCR and in areas of the Great Otway National Park near Cape Otway.

A combination of integrated control methods will be used to control exotic herbivores, including building community awareness of impacts, engaging volunteer hunters, using specialist contractors and targeting control efforts to high conservation value areas.

Strategy summary

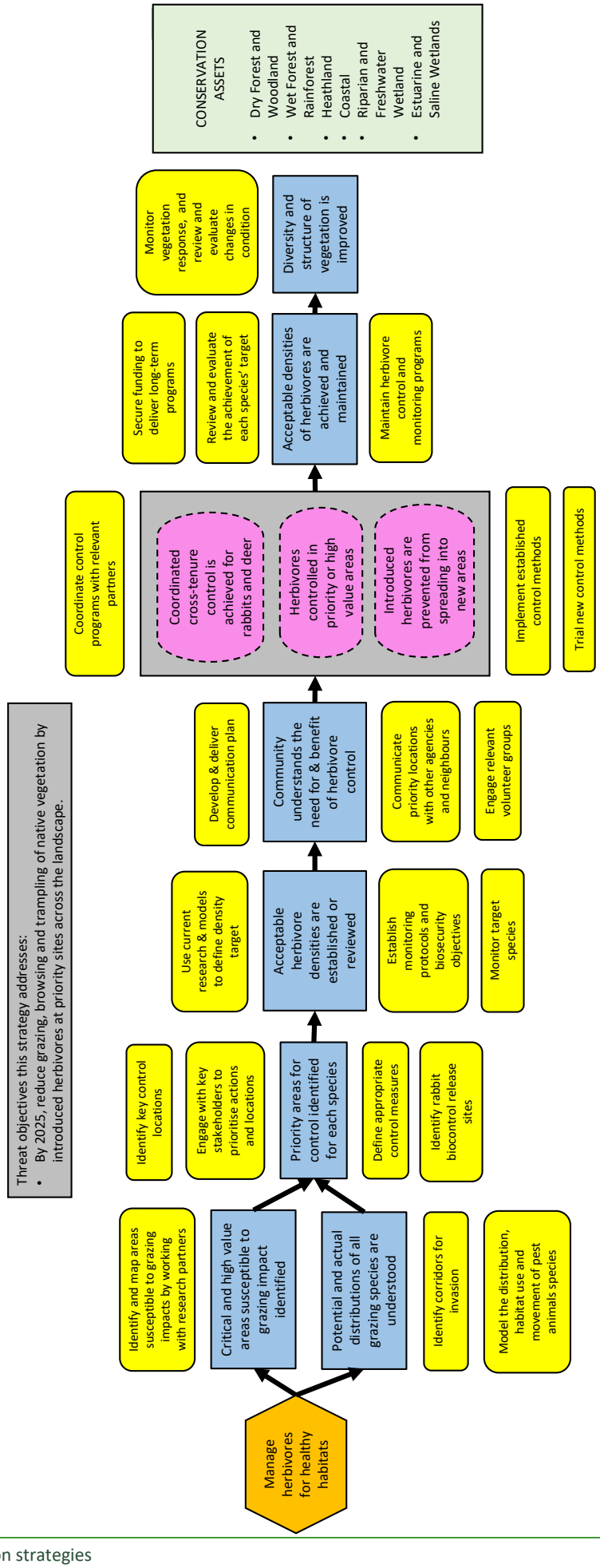
Implement effective and integrated control of key herbivores to improve the regeneration and structural diversity of conservation assets across the Great Otway Parks landscape.

Table 6.4 Priority herbivore management in the Great Otway Parks landscape.

Target species	Conservation Asset to benefit*	Priority locations
Deer and pigs	Dry Forest and Woodland Heathland Wet Forest and Rainforest Riparian and Freshwater Wetland	Great Otway National Park – east of Cape Otway and Otway Range Jancourt NCR (pigs)
Rabbits	Coastal (including islands) Heathland Dry Forest and Woodland	Great Otway National Park – northern and eastern boundaries Port Campbell NP

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action
Critical and high-value areas susceptible to grazing impact have been identified.	• Identify and map areas susceptible to grazing impacts by working with research partners.
Potential and actual distributions of all grazing species are understood.	• Identify corridors for invasion. • Monitor the distribution, habitat use and movement of pest animal species (feral scan, community reports).
Priority areas for control have been identified for each species.	• Identify key control locations. • Engage with key stakeholders to prioritise actions and locations. • Define appropriate control measures. • Identify rabbit biocontrol release sites if appropriate
Acceptable herbivore densities are established or reviewed.	• Use current research and models to define density targets for herbivore species. • Establish herbivore monitoring protocols and biosecurity objectives. • Monitor target species.
The community understands the need for, and benefit of, herbivore control.	• Develop and deliver a communications plan. • Communicate priority locations with other agencies and neighbours. • Engage relevant volunteer groups where feasible, e.g. Sporting Shooters Association of Australia.
Coordinated cross-tenure control is achieved for rabbits and deer. Herbivores are controlled in priority or high-value areas. Introduced herbivores are prevented from spreading into new areas.	• Coordinate rabbit control with relevant partners e.g. Landcare and the Department of Jobs, Precincts and Regions. • Implement established control methods. • Trial new control methods.
Acceptable densities of herbivores are achieved and maintained.	• Secure funding to deliver long-term programs, and prioritise investment to maintaining effective management of priority areas. • Review and evaluate the achievement of each species' targets. • Maintain herbivore control and monitoring programs.
Diversity and structure of vegetation is improved.	• Monitor vegetation response, and review and evaluate changes in condition.

Manage over-browsing by Koalas

Conservation outcomes

Restore coastal Manna Gum habitat and maintain populations of Koalas that are sustainable in the long-term.

Strategy

Managing Koala populations to ecologically sustainable densities is a collaborative strategy involving all land managers over all land tenures, to maintain healthy Manna Gum communities. It is undertaken in accordance with the Victorian Koala Management Strategy (DSE 2004) and aims to manage existing populations of Koalas within the parks and reserves of the Great Otway Parks landscape. It also considers the potential for parks to receive translocated Koalas from other populations that are being managed to maintain sustainable densities.

Collaboration with DELWP and other affected land managers to understand the distribution and condition of both preferred Koala habitat and Koala populations across the Great Otway Parks landscape is required to ensure both a consistent landscape wide approach for any Koala management decisions and a shared knowledge of Parks Victoria's desired outcomes for Koala management and habitat protection. This should lead to proactive management of Koalas at high-risk sites before habitat is irreversibly degraded and animal welfare issues occur.

The Great Otway Parks landscape has a long history of Koala management, and the majority of its Koalas are descendants of animals translocated from French and Phillip islands between 1928 and 1987. Unrestrained Koala population growth resulting in Koala starvation and Coastal Manna Gum habitat destruction has previously led to DELWP undertaking fertility control and translocations of Koalas on public and private land in the Cape Otway area.

Where over-browsing in preferred habitat is an issue, the key component of the strategy is monitoring and detection. Early detection achieved through a monitoring program of both Koala densities and signs of canopy depletion at high-risk locations will allow early management intervention when identified habitat condition triggers have been reached.

Although translocation of Koalas should be undertaken as a last resort, potential areas of habitat that may support Koalas in the event of translocation need to be identified**.** An agreed approach to determining appropriate release sites and a commitment to ongoing monitoring of those sites should be applied. Translocation should only be used if a release site can be found that meets the criteria in Appendix 3 of Victoria's Koala Management Strategy (DSE 2004).

Strategy summary

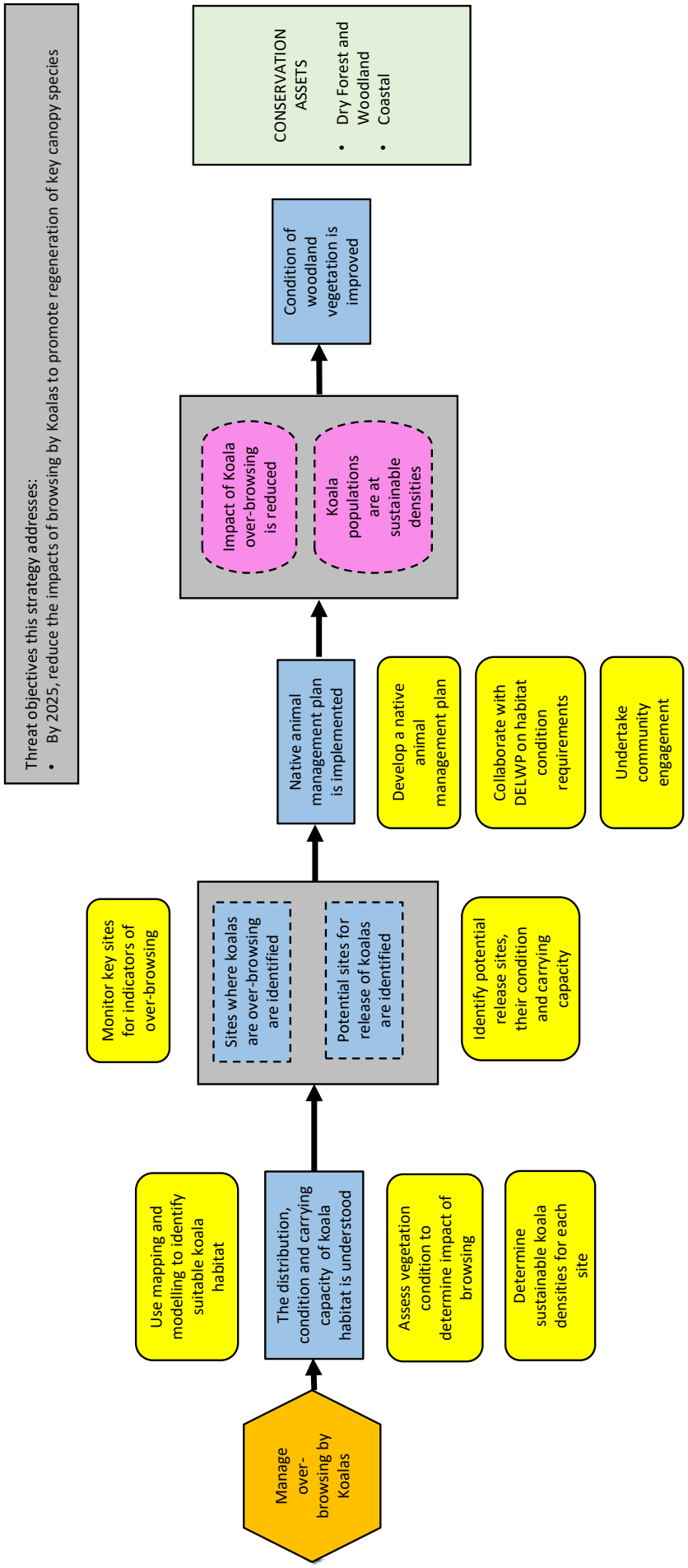
Collaborate with other land managers to proactively manage Koalas to maintain healthy Manna Gum communities.

Table 6.5 Priority Koala management in the Great Otway Parks landscape.

Conservation Asset to benefit*	Priority location
Dry Forest and Woodland Coastal (including islands)	Great Otway NP - Cape Otway and other areas of preferred habitat

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action
The distribution, condition and carrying capacity of key Koala habitat is understood.	• Use mapping and spatial modelling to identify suitable Koala habitat (The Koala Habitat Spatial Model and/or a Manna Gum species distribution model (ARI Ecological Analysis and Synthesis) can be used to identify areas likely to support Manna Gum). • Assess vegetation condition to determine the impact of browsing • Assess current population densities at identified sites and determine sustainable densities of koalas
Sites where koalas are over-browsing are identified. Potential sites for release of koalas are identified.	• Monitor key sites for indicators of over-browsing using established habitat condition triggers (Ramsey 2016) and monitoring protocols • Identify potential release sites by their condition and carrying capacity.
Native animal management plan is implemented	• Develop a native animal management plan according to Parks Victoria Policy and in accordance with the Victorian Koala Management Strategy. • Collaborate with DELWP on habitat condition requirements and agreed locations, ensuring translocation does not impact at-risk vegetation communities • Undertake community engagement in areas of sensitivity
Koala populations are at sustainable densities Impact of Koala over-browsing is reduced	
Condition of woodland vegetation is improved.	

Manage marine pests for healthy marine protected areas

Conservation outcomes

Marine pests will have a minimal impact on marine ecosystems in marine protected areas.

Strategy

This strategy uses an integrated approach to prevent marine pests from spreading to, and becoming established in, marine and estuarine protected areas in the Parks landscape. It involves continual monitoring to identify and respond to new outbreaks of marine pests before they become established as well as increasing public awareness of marine pests and good boat and equipment hygiene practices.

Preventing marine pests from spreading and becoming established is a priority for the Great Otway marine and estuarine areas. Vigilance to enable the early detection of marine pests or overabundant native species is required, along with a rapid response to any detected incursions, if marine protected areas in the Great Otway Seascape are to remain pest-free.

Working with other stakeholders, including agencies and the community, to increase public awareness of good boat and equipment hygiene practices will reduce the risk of marine invasive species being spread via boat hulls and fishing and diving equipment.

Continual monitoring of the marine environment is required to identify and respond to new outbreaks of marine pests before they become established. Parks Victoria will work with partners to carry out surveillance for marine pests. Sufficient sites will be identified to establish a strong monitoring program that is likely to detect new infestations. Together with a rapid control response, the program will reduce the likelihood of new pest populations establishing.

This strategy will ensure that marine assets continue to be maintained in very good condition. It will reduce the likelihood of marine pests establishing in the Parks landscape and ensure that the eradication of populations of new pests is rapid and targeted.

Strategy summary

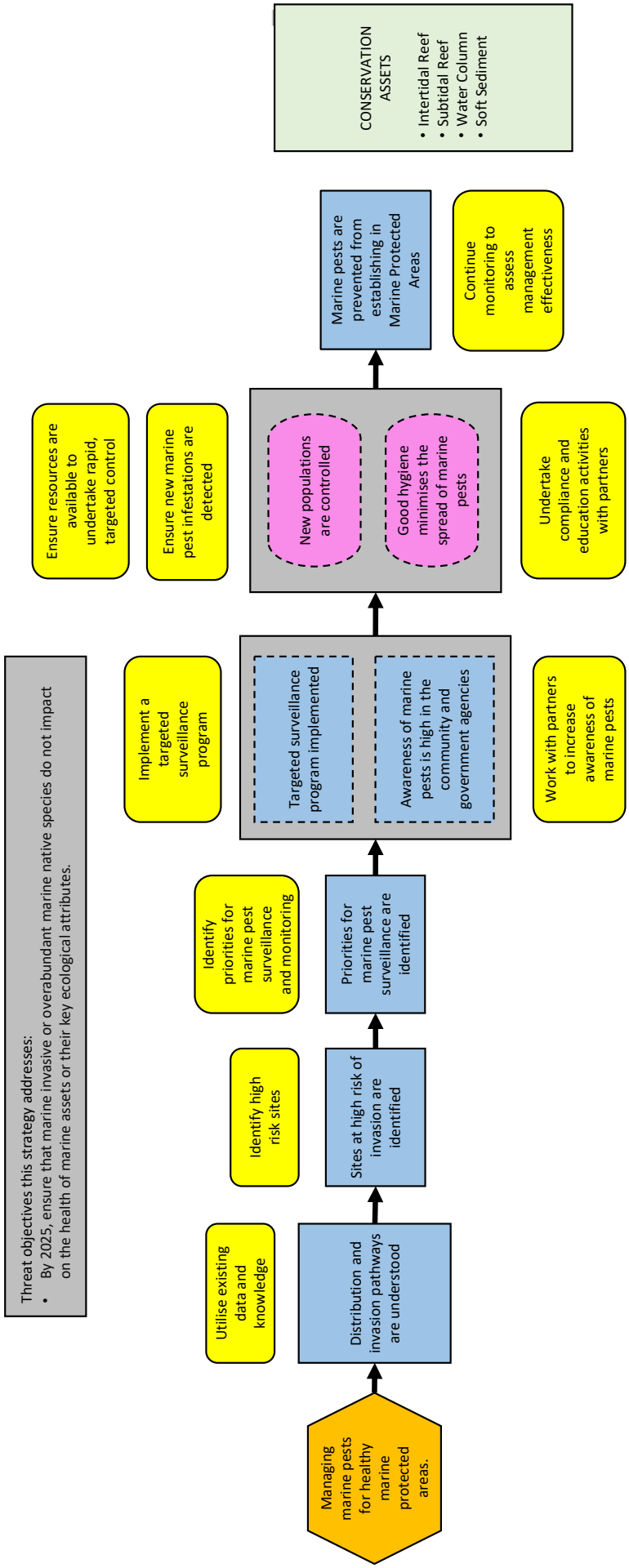
Reduce the likelihood of populations of marine pests establishing in the Parks landscape and ensure that the eradication of populations of new pests is rapid and targeted.

Table 6.6 Priority marine pest management in the Great Otway Parks landscape.

Target species	Action type	Conservation Assets to benefit*
Undaria, Northern Pacific Seastar, European fan worm, other new and emerging species	Surveillance, monitoring Education and compliance	Subtidal Reef, Intertidal Reef, Soft Sediment

*For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Activities
Distribution and invasion pathways are understood.	• Utilise existing data and knowledge to understand marine pest distribution and invasion pathways.
Sites at high risk of invasion are identified.	• Identify high risk sites by developing and running a risk assessment and modelling process, taking invasion pathways into account
Priorities for marine pest surveillance are identified.	• Identify priorities for marine pest surveillance and management.
A robust, targeted surveillance program that is likely to detect new infestations is implemented.	• Implement a targeted surveillance program for new infestations.
Awareness of marine pest threats is high within the community and government agencies.	• Work with partners to increase the awareness of the community and government agencies about marine pests.
New marine pest populations are controlled.	• Ensure that new marine pest infestations are detected, and responses to new infestations or species follow established action plans. • Ensure that resources are available to undertake rapid, targeted control.
Increased practice of good hygiene by recreational divers and boat owners.	• Undertake compliance and education activities with partners with respect to boat and equipment hygiene.
Marine pests are prevented from establishing in Marine Protected Areas.	• Continue monitoring to assess the effectiveness of management and surveillance for 'local' spread.
The impact of marine pests on marine ecosystems in marine protected areas is minimised.	

Reduce the impacts of recreation, illegal activities and natural resource extraction on natural values

Conservation outcomes

The impacts of recreation and illegal activities on priority marine and terrestrial areas and species are minimised and natural resource extraction is sustainable.

Strategy

The aim of this strategy is to encourage the public to enjoy nature-based activities while reducing the impacts on environmental and cultural values.

Human impacts on nature and the parks estate take many forms but can be classified into two broad categories: visitation pressures, and people behaving badly, for example illegal fishing and shellfish poaching, off-track access and rubbish dumping.

In marine protected areas, Parks Victoria will work with partners to ensure that access activities are undertaken in a manner that minimises risk to marine environments and in compliance with regulations (e.g. Go Fish No Fish, monitoring of target species, compliance patrols, compliance education).

The conservation and cultural values of the Parks landscape, as well as the consequences of off-track access and illegal behaviour will also be communicated, encouraging responsible behaviour.

Compliance activities across marine and terrestrial assets will be prioritised to high-infringement and sensitive areas as necessary.

It is important to achieve the right balance between rich nature experiences and protecting environmental and cultural values. This equally applies to recreational pursuits with potential high impacts.

There is an ever-increasing demand for visitation to many key iconic sites in the Great Otway Parks landscape. This brings increased pressure to ecosystems and species, many of which are already under stress.

In high-use areas that have high environmental values, Parks Victoria will investigate solutions to reduce damage to sensitive habitats, while continuing to facilitate recreation. Together with ongoing monitoring, this information will be used to gauge the level of impact caused by park users.

At these locations Parks Victoria will work to reduce identified threats by developing communication tools and strategies that increase the awareness and understanding of environmental values and permissible activities and locations.

Future projects and activities in the Great Otway Parks landscape must be planned, designed and delivered in a way that is environmentally sustainable, and any potential environmental impacts must be addressed and mitigated so that park-based activities can be enjoyed while ensuring that the natural and cultural values of the landscape are sustained for the future.

Strategy summary

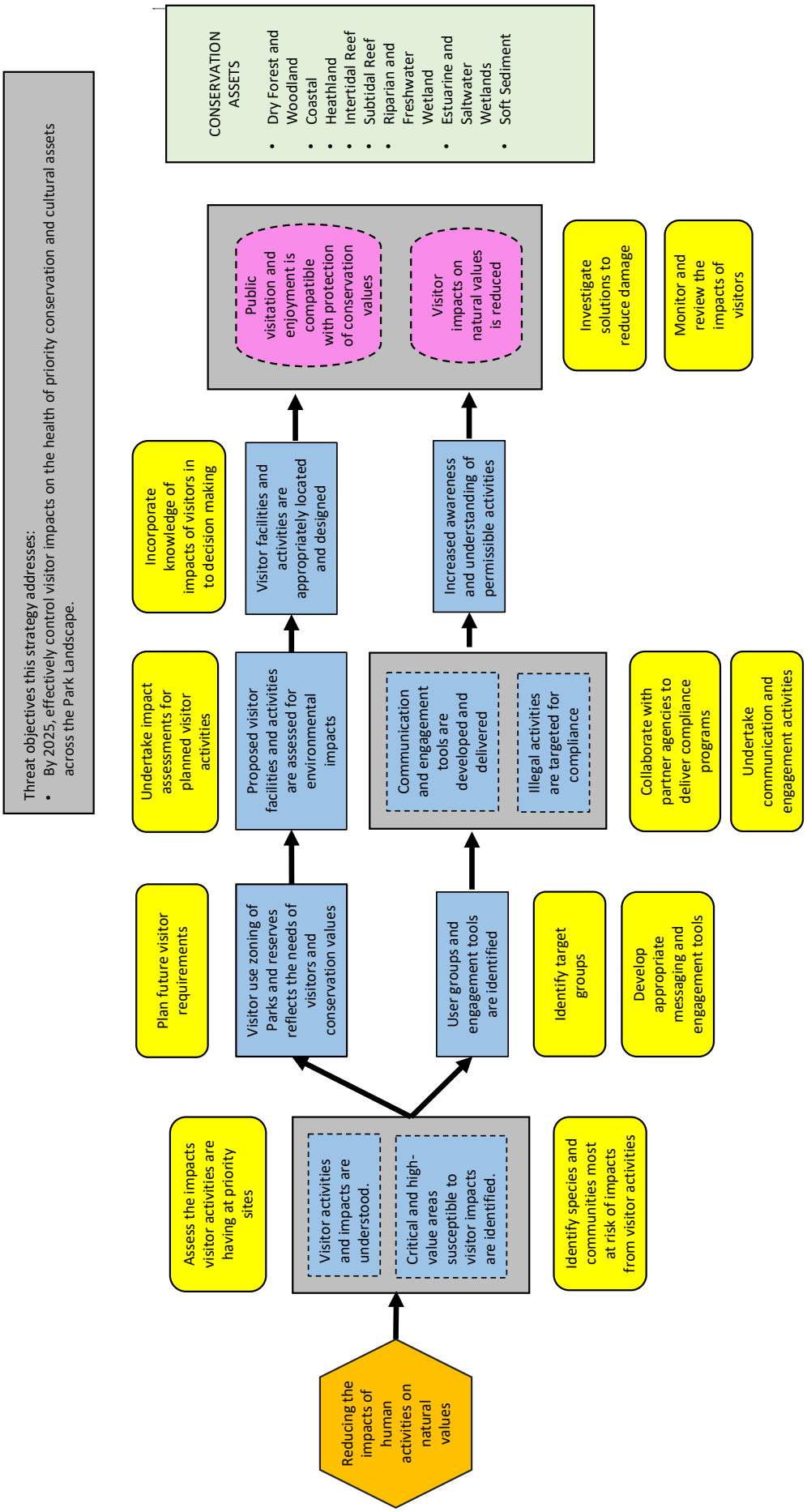
Encourage the public to enjoy nature-based activities while ensuring the impacts on priority marine and terrestrial areas and species are minimised.

Table 6.7 Priority visitor management in the Great Otway Parks landscape.

Impact managed	Conservation Asset to benefit*	Priority location
Visitation pressures (access to high use areas, new visitor facilities, vessel impacts)	Heathland Coastal (including islands) Intertidal Reef Subtidal Reef	Port Campbell National Park Great Otway National Park Marine Protected Areas
Illegal activities (off-track access, rubbish dumping, illegal fishing, poaching, fossicking	Dry Forest and Woodland Heathland Intertidal Reef Subtidal Reef	Great Otway National Park Marine Protected Areas
Resource collection (Fishing, shellfish collection)	Riparian and Freshwater Wetland Estuarine and Saltwater Wetlands Soft Sediment	TBD

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action

Visitor activities and impacts are understood.
 	
Critical and high-value areas susceptible to visitor impacts are identified.
	• Assess the impacts visitor activities are having at priority sites.
	  • Monitor areas with reports of illegal activity and inappropriate behaviour
	  • Identify direct impacts (trampling, damage to reefs, removal of habitat) and indirect impacts (spread of weeds and pathogens)
	  • Identify the characteristics of visitor behaviour and activities causing direct and indirect impacts.
	• Identify species and communities most at risk of impacts from visitor behaviour and activities, particularly where they occur close to current visitor sites.

Visitor use zoning of parks and reserves reflects the needs of visitors and conservation values.	• Plan future visitor requirements
	  • Assess suitability of current and future visitor activities
	  • Ensure conservation values are incorporated into visitor facility and activity planning.

Proposed visitor facilities and activities are assessed for environmental impacts.	• Undertake impact assessments for planned visitor activities and facilities.
Visitor facilities and activities are appropriately located and designed.	• Incorporate knowledge of visitor impacts on environmental values into decision making.
User groups and engagement tools are identified.	• Identify target groups having greatest impacts on conservation values in priority areas. • Develop appropriate messaging and engagement tools through collaboration with key partners including Government agencies and authorities, tourism bodies and community groups.
Communications and engagement tools are delivered. Illegal activities are targeted for compliance. Increased awareness and understanding of permissible activities.	• Undertake communication and engagement activities with key partners to raise awareness of the impact that visitor activities are having on environmental values. • Collaborate with partner agencies to deliver compliance programs at priority areas such as high-infringement and sensitive areas.
Impacts to natural values by park users is minimised. Public visitation and enjoyment is compatible with protection of conservation values.	• Investigate solutions to reduce damage to sensitive species and communities at high use sites. • Monitor and review the impacts of visitor activity on conservation assets.

Reintroduce locally threatened species

Conservation outcomes

Ensure the survival of locally threatened species, and reintroduce locally extinct species to restore ecological processes, including soil disturbance (digging, burrowing), seed and spore dispersal, and predation by native animals.

Strategy

Since European settlement, populations of many fauna species have become significantly reduced or locally extinct in the Great Otway Parks landscape. Predation pressure from foxes and cats, habitat loss and changes to climate, water and fire regimes are all contributing factors to this loss. The purpose of this strategy is to reintroduce some of these species into the Parks landscape, with a long-term vision for self-sustaining populations.

The ongoing effective control of foxes and the opportunity now to control Feral Cats provides an opportunity to return locally extinct species or enhance sparse populations of species such as New Holland Mouse, Smoky Mouse, Broad-toothed Rat and Swamp Antechinus in key locations. The return of these small mammal species is likely to benefit the landscape's ecosystems by re-establishing their function as diggers, seed dispersers and fungivores. The successful reintroduction of these species could pave the way for a broader program, including more threatened species such as Spot-tailed Quoll and Long-nosed Potoroo.

Such an ecological restoration project is a long-term endeavour, involving a high standard of predator control and usually within a fenced enclosure (sanctuary) and a staged translocation of several species. However, fenced predator exclusion areas require significant maintenance and may be difficult to install at an adequate size in the complex terrain of the Great Otway Parks landscape. A virtual exclosure where there is effective continuous predator control around the perimeter of a defined area may be an alternative to a physical barrier (Robley 2003). Using existing research on refugia and introducing artificial habitat structures into areas of modelled suitable habitat will improve the success of potential species reintroductions that are not within traditional fenced exclosures.

Enhancing habitat suitability over an extended area of the Great Otway National Park may be an important component of potential species management programs for fauna species at high risk of genetic isolation, genetic variation and inbreeding, such as the New Holland Mouse (Kriesner et al. 2019).

Strong collaboration with key partners, including research institutions, local environmental organisations and the Department of Environment, Land, Water and Planning will be critical in the successful implementation of this strategy. It will require a long-term commitment of resources, detailed planning, a high level of community support, and a better understanding of ecological processes in the landscape, such as nutrient cycling and food webs.

The long-term aim should be to establish self-sustaining animal populations that do not require further intensive intervention except for ongoing predator control.

Strategy summary

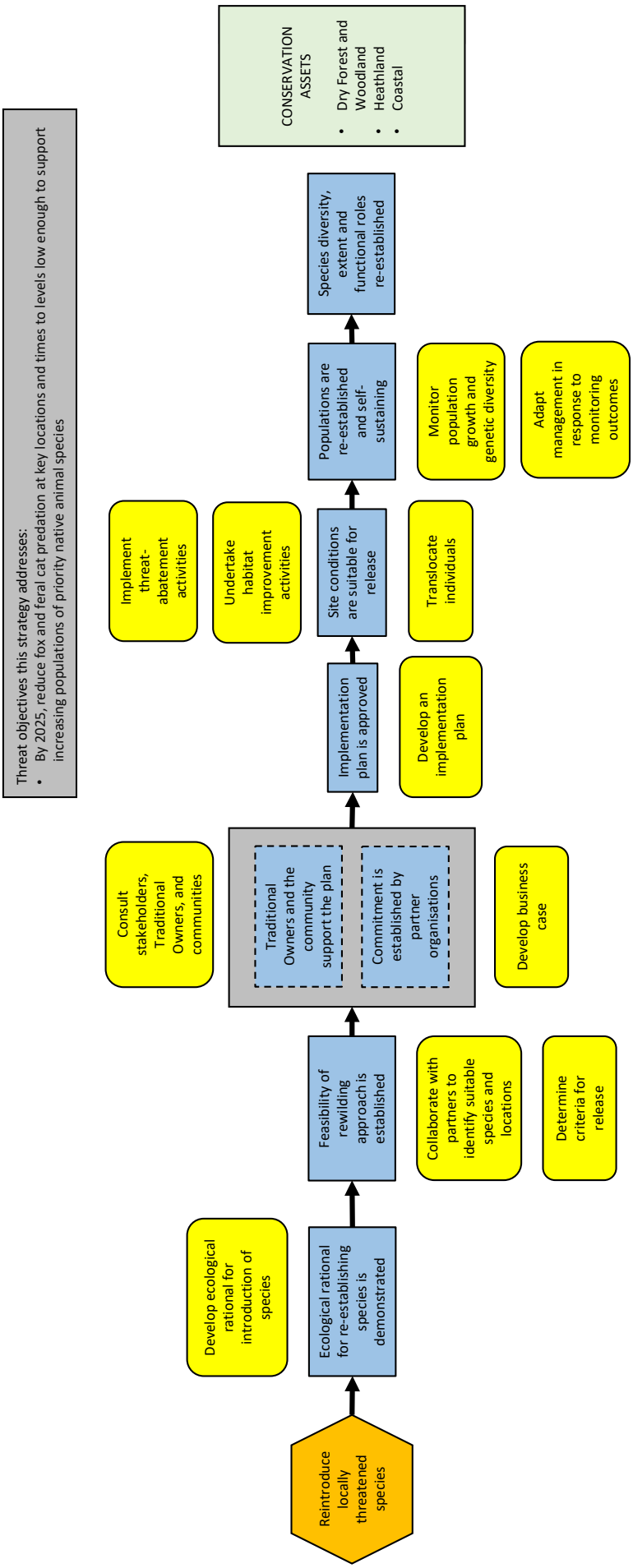
Reintroduce, where feasible, locally threatened species, and locally extinct species to restore ecological processes, including soil disturbance (digging, burrowing), seed and spore dispersal, and predation by native animals.

Table 6.8 Priority reintroductions in the Great Otway Parks landscape.

Species	Conservation Asset to benefit*	Action type
Small ground-dwelling mammals (e.g. New Holland Mouse, Smoky Mouse, Broad-toothed Rat, Swamp Antechinus	Dry Forest and Woodland Heathland Coastal (including islands)	Feasibility study

* For the specific KEA Goals associated with this strategy, see the Condition table in the relevant Conservation Asset description

Results chain



Implementation milestones

Result	Action
Ecological rationale for re-establishing species and/or populations is demonstrated.	• Develop ecological rationale according to the Procedure Statement for Threatened Native Fauna in Victoria (DELWP 2019), through collaboration with partners including DELWP, Zoos Victoria and research institutions.
Feasibility of rewilding approach is established.	• Collaborate with key partners to identify suitable species and locations. • Determine criteria for release, including condition of habitat, time of year, and translocation size.
Traditional Owners and the community support the plan.	• Consult stakeholders, Traditional Owners, and communities.
Commitment is established by partner organisations.	• Develop business case including relative costs and benefits, key partners, governance model and resourcing opportunities.

Implementation plan developed.	• Develop an implementation plan that includes:
	  ○ phasing of re-introductions and complementary threat-abatement activities
	  ○ monitoring requirements
	  ○ translocation plans
	  ○ necessary approvals.

Site conditions are made suitable.	• Implement threat-abatement activities with partners as needed, including necessary infrastructure. • Undertake habitat improvement activities. • Translocate individuals to selected sites.
Populations re-established and self-sustaining.	• Monitor population growth and genetic diversity. • Adapt management in response to monitoring outcomes.
Species diversity, extent and functional roles re-established.	

Collaboration and engagement to build support for environmental management

Conservation outcome

The efficacy of outcomes for the key conservation assets will be increased through effective community engagement, partnerships and collaboration to build support for environmental management programs in the Great Otway Parks landscape.

Strategy

This strategy intends to support community activity that contributes effectively to Parks Victoria management programs and to increase the level of collaboration and partnership between Parks Victoria, other land managers, partner agencies, Traditional Owners and researchers, in the Great Otway Parks landscape.

Good community engagement can be achieved by using a wide range of tools and techniques and can improve decisions and outcomes. Linking opportunities for the community to connect with nature to on-ground biodiversity outcomes will contribute to the *Biodiversity 2037* State-wide target of 5 million Victorians acting to protect the natural environment and build support for environmental programs in the Parks landscape.

A high level of community awareness and understanding of the parks' values and management activities is critical for delivering successful conservation management programs, particularly in areas around townships and high visitation areas. The community is more likely to support and develop a sense of custodianship if its views and values are respected so seeking to understand community expectations is critical. All of the strategies in this plan will benefit from strong, dedicated and pro-active community engagement to develop strong community connections. This will be particularly important to gain community support for feral cat control, reduce spread of weeds from townships and prevent marine pests from establishing.

Parks Victoria already has strong collaborative working arrangements with many groups and will take an active role in building and maintaining these partnerships to increase the effectiveness of on-ground management, share knowledge, and provide cross-tenure support for projects and partners.

The establishment of meaningful partnerships with Traditional Owners will seek to bring their skills, expertise, and cultural knowledge into management of the Parks landscape. By improving our understanding of natural and cultural values through sharing the skills and knowledge of Traditional Owner communities, effective park management that respects and values indigenous culture and traditions can be achieved.

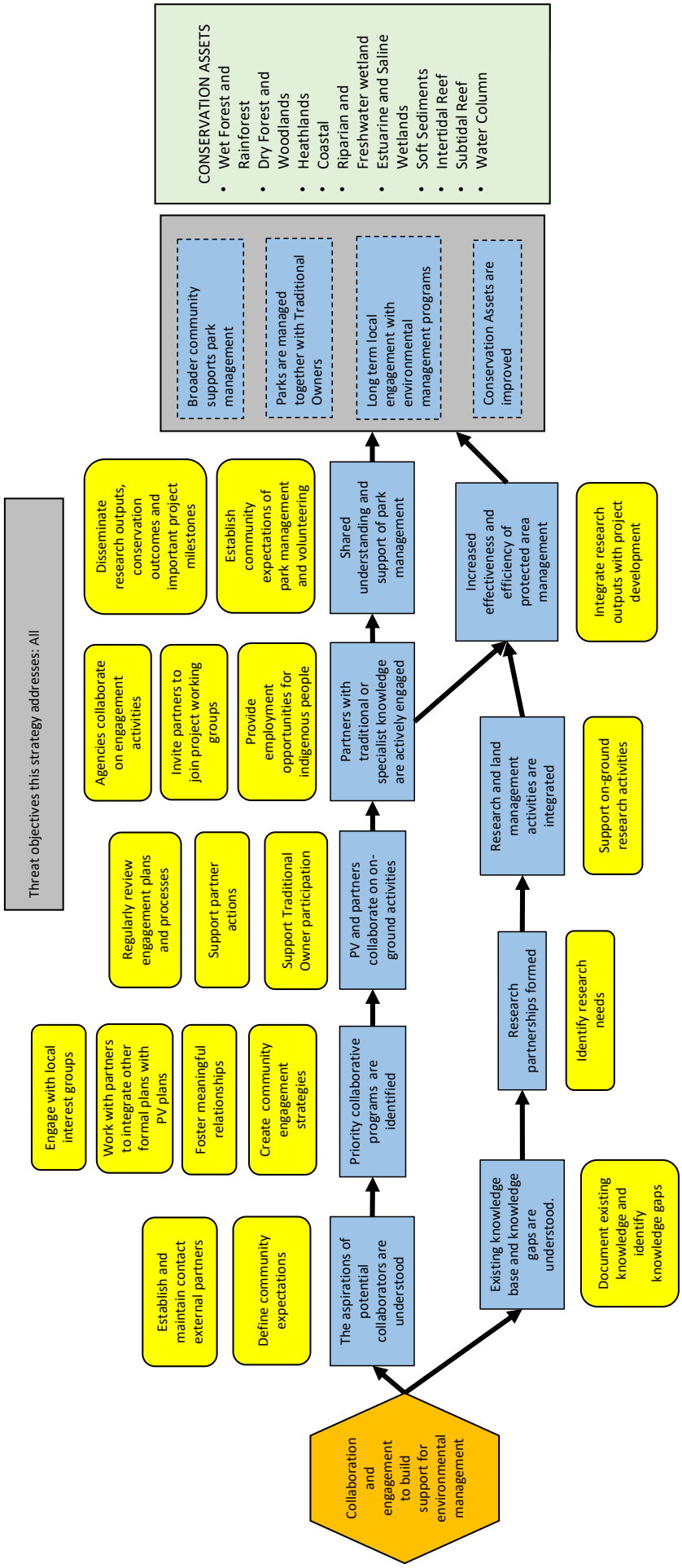
Increased collaboration with researchers to address knowledge gaps through adaptive management and formal research will build on existing partnerships. Areas of investigation may include the impact of fire regimes on small mammal populations, effective feral cat control including predator-prey relationships and the role of native predators, the impacts of herbivores (particularly feral pigs) and modelling the impacts of climate change on coastal and marine communities.

Implementation of this strategy will result in an increase in the effectiveness and efficiency of conservation asset management within the Great Otway Parks landscape through improved support for environmental management; better coordination and communication of research and monitoring programs; and partnership initiatives that result in the application of key learnings into management.

Strategy summary

Collaborate and engage to build support for environmental management. Strengthen collaboration and partnerships to maintain long-term engagement and guide adaptive environmental programs.

Results chain



Implementation milestones

Result	Action
The aspirations of potential collaborators are understood.	• Establish and maintain contact points with external partners. • Define community expectations about park management and volunteering.
Priority collaborative programs are identified, and involvement is agreed.	• Engage with local interest groups to identify opportunities for new collaborations and building community capacity. • Work with external partners to integrate other formal plans with Parks Victoria plans. • Foster meaningful relationships based on trust and mutual respect. • Create community engagement strategies for priority programs e.g. Feral Cat control.
Parks Victoria and partners collaborate on on-ground activities that support mutual outcomes.	• Regularly review engagement plans and processes. • Support partner actions. • Support Traditional Owner participation.
Partners with traditional or specialist knowledge are actively and effectively engaged in adaptive management.	• Agencies collaborate on engagement activities to make the most efficient use of agency and community time. • Invite partners to join project working groups. • Provide employment opportunities for Indigenous people
Shared understanding and support of park management.	• Disseminate research outputs, conservation outcomes and important project milestones. • Establish community expectations of park management and volunteering
Existing knowledge base and knowledge gaps documented	• Document existing knowledge and identify knowledge gaps.
Research partnerships formed.	• Identify research needs.
Research and land management activities are integrated.	• Support research activities in the Parks landscape.
Increased effectiveness and efficiency of protected area management.	• Integrate research outputs with project development.
Broader community supports park management. Parks are managed together with Traditional Owners. Long-term local engagement with environmental management programs.	
Health of conservation assets is improved.	

Gibson Steps, Twelve Apostles

7 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 Great Otway Parks landscape (see Table 7.1). This can be used to guide interim assessments of performance until a detailed plan is established.

Table 7.1 Performance measures for each strategy developed for the Great Otway Parks landscape.

Activity measures	Threat measures	Outcome measures
FIRE		
STRATEGY: Manage fire for ecological health **THREAT ADDRESSED: Inappropriate fire regimes**		
• Frequency of engagement with bushfire management agencies and the community • Priority areas with current ecological fire strategies • Number and area of planned burns undertaken with ecological objectives • Timeliness of bushfire recovery and rehabilitation programs	• Incidence of bushfire in Wet Forest and Rainforest • Incidence of planned burning in Wet Forest and Rainforest • Spatial and temporal distribution of ecological growth stages of fire-dependent ecosystems in the Parks landscape	• Area of Wet Forest and Rainforest remaining within intermediate to mature growth stages • Occupancy of Wet Forest and Rainforest by characteristic arboreal mammal species • Occupancy of Heathland and Dry Forest and Woodland by characteristic small mammal species • Occupancy of Heathland and Dry Forest and Woodland by characteristic bird species • Spatial and temporal distribution of vegetation growth stages of fire-dependent ecosystems in the Parks landscape • Orchid diversity in Heathland and Dry Forest and Woodland Assets

Activity measures	Threat measures	Outcome measures
WEEDS		
STRATEGY: Manage weeds and pathogens using a biosecurity approach **THREAT ADDRESSED: Weed invasion; Pathogens and diseases**		
• Surveys to fill knowledge gaps (areas surveyed, person-days) • Surveillance effort for new and emerging weeds, and pathogens (area surveyed, person-days) • Area of weeds treated (species, area treated, person-days) • Treatment effort for new and emerging weeds (species, area treated, person-days) • Plans developed for high priority species • Hygiene stations installed	• Spread of identified established populations • Number of populations of new and emerging weeds or diseases identified • Extent of high priority weed species or diseases in high value locations	• Maintained or improving complexity of vegetation structure • Maintained or improved populations of priority indigenous species
PREDATION		
STRATEGY: Ongoing control of introduced predators to support resilient native fauna populations **THREAT ADDRESSED: Terrestrial predation by foxes and cats**		
• Extent and frequency of fox control in identified high risk areas • Extent and frequency of cat control in identified high risk areas • Area treated for predator control • Person-days of predator control undertaken • Number of baits taken	• Fox activity in identified high risk areas • Cat activity in identified high risk areas	• Small and critical weight range native mammals will be regularly detected at selected sites with suitable habitat
HERBIVORES		
STRATEGY: Manage herbivores for healthy habitats **THREAT ADDRESSED: Grazing and browsing pressure**		
• Extent and frequency of herbivore control in high value areas • Extent of cross-tenure herbivore control • Efficacy of communication to the public about control activities	• Herbivore densities in high value natural areas • Cross-tenure densities of rabbits, pigs and deer	• Multiple age classes present in Wet Forest and Rainforest stands with enough seedlings present to maintain each structural component • All growth stages are represented within Heathland and Dry Forest and Woodland • Projected crown cover of canopy species • Native ground cover and understorey species diversity
KOALAS		
STRATEGY: Manage over-browsing by Koalas **THREAT ADDRESSED: Grazing and browsing pressure**		
• Area of habitat monitored for preferred Koala food trees • Area of habitat monitored for Koala distribution and abundance	• Koala densities in high value areas	• Projected crown cover of canopy species • Vegetation life-stage distribution (cohorts) • Koala numbers at sustainable levels

Activity measures	Threat measures	Outcome measures
MARINE		
STRATEGY: Manage marine pests for healthy marine protected areas **THREAT ADDRESSED: Invasive or overabundant marine species**		
• Number of person-days of surveillance for pests and overabundant species • Number of partners engaged in marine hygiene practices	• Reduced dispersal of marine pests by human vectors • Number of new pest species/ infestations established • Reduction of pest populations (if established)	• Identified focal species are detected in each survey • Presence of key bird species is maintained
RECREATION		
STRATEGY: Reduce the impact of recreation, illegal activities and natural resource extraction on natural values **THREAT ADDRESSED: Habitat degradation from visitor impacts and resource collection**		
• Number of compliance patrols • Number of collaborations with user groups and partner agencies • Amount of new communication around illegal activities and natural values	• Reduced effect of permissible visitor activities on natural values, particularly threatened species • Reduction in illegal activities affecting natural values, particularly threatened species • Reduced disturbance to natural values • Reduced pathways of invasion for pest plants, diseases and animals	• Improve fledging success at key hooded plover sites • Diversity and abundance of key marine species is maintained • Extent of priority habitat in Coasts and Heathland is maintained or improved
REINTROS		
STRATEGY: Reintroduce locally threatened species **THREAT ADDRESSED: Terrestrial predation by foxes and cats**		
• Number of suitable reintroduction site(s) identified • Business case prepared • Operational plan approved • Number of translocated individuals		• Distribution and abundance of threatened or locally extinct species, or species performing specific functional roles, e.g. soil disturbance (digging, burrowing), seed and spore dispersal, and predation
COLLABS		
STRATEGY: Collaboration and engagement to build support for environmental management **THREAT ADDRESSED: All threats**		
• Number of partner groups contacted • Number of on-ground activities carried out with partner groups • Number of research projects supported/carried out • Number of volunteer days engaged in park management • Number of community partners represented on project working groups	• Total effort to manage each threat • Total cost to manage a unit of threat	• Improved efficacy of park management • Strength of partnerships with traditional Owners and other groups • Increase in preparedness to respond to climate change • Costs/benefit of management

Coast Bonefruit, Point Addis

8 Plan implementation

8.1 Traditional Owner and cultural heritage considerations

Parks Victoria has organisational commitments and legal obligations to ensure that land management activities are both culturally appropriate and support the capacity and role of Traditional Owners to manage Country. Parks Victoria must work within existing legal frameworks and agreements relevant to each Traditional Owner group and Parks landscape. Practically, this means partnering with Traditional Owners to implement Conservation Strategies in a way that is consistent with their recognised rights and interests under the *Native Title Act 1993* (C'wth), *Traditional Owner Settlement Act 2010* (Vic) and/or *Aboriginal Heritage Act 2006* (Vic).

Parks Victoria conducts or authorises many land management activities that have the potential to harm Aboriginal cultural heritage. Harming Aboriginal heritage without an appropriate authorisation is illegal, and compliance with the provisions of the *Aboriginal Heritage Act 2006* (Vic) is mandated across all activities on land and waters managed by Parks Victoria. Procedures to assist in complying with the Act are available to the organisation (*PRO-819 Compliance with the Aboriginal Heritage Act*).

In accordance with these procedures, it is essential that activities to implement Conservation Strategies are assessed by PV Aboriginal heritage specialists prior to commencement of works, as the assessment process will ensure adequate management and protection measures are in place to mitigate the risk of harm to Aboriginal cultural heritage. Depending on the nature of the works and characteristics of the site, the assessment may be undertaken as a desktop analysis or may require a site visit. Where the activity is considered likely to harm Aboriginal heritage, a recommendation may be made to modify the proposed activity or change the location of proposed works. Where adapting the activity is not possible, cultural heritage statutory authorisations, such as a Cultural Heritage Permit or Cultural Heritage Management Plan, will be required. By initiating the assessment early in the planning stages, the risk of time delays will be minimised and resourcing requirements for complying with the *Aboriginal Heritage Act 2006* can be identified and appropriately incorporated into project budgets.

Implementation of this Conservation Action Plan through on-ground land management can provide opportunities for Traditional Owner involvement and further sharing of contemporary and traditional land management learnings. Where possible, planning for the implementation of Conservation Strategies should consider the incorporation of traditional land management techniques by Traditional Owners. This commitment should also promote the cultivation and adaptation of Traditional Owner land management methods to achieve joint environmental and cultural outcomes.

Implementation should also explore opportunities and partnerships to involve Traditional Owners and should consider the nature of individual Traditional Owner agreements in each Parks landscape. Procurement of goods and services related to implementing Conservation Strategies must be consistent with PV guidelines for Traditional Owner procurement, which include a first right of refusal for all contracts within a Recognition and Settlement Agreement area. Actively identifying opportunities to incorporate cultural and management services in park management activities, and ensuring the right Traditional Owners are involved, can facilitate effective partnerships which are mutually beneficial and empowering.

8.2 Monitoring, evaluation and reporting

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 combined activities of the Conservation Strategies have been adequately implemented and whether the desired conservation outcomes are being achieved
- monitoring and demonstrating trends in the level of threat and the consequent condition of conservation assets
- evaluating the effectiveness and efficiency of resources invested in the Conservation Action Plan
- supporting the review and adaptation of Conservation Strategies.

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 '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.

8.3 Implementation steps for priority strategies

Steps 8 to 10 of the 10-step process for conservation action 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 Great Otway Parks 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 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 operational plans

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 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 revised in response to the outcomes of the Monitoring, Evaluation and Reporting Plan and in response to emerging issues. Revision of this Conservation Action Plan 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 revision 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.

Cushion Bush, Port Campbell National Park

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Appendices

Appendix A — Parks and reserves in the Great Otway Parks landscape and their protection status

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 state-wide 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 10 000 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.

Table A.2: List of parks and reserves in the Great Otway Parks landscape

Parks Victoria area codes used: SCH = Shipwreck Coast and Hinterland, CO = Colac Otway, SC = Surf Coast

Park/reserve name		IUCN categ.	Area (hectare)	Level of Protection	PV Area
Aire River Wildlife Reserve	Natural Features Reserve — Wildlife Reserve (Hunting)	VI	334	B	CO
Anglesea Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	12	Not rated	SC
Bambra Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	38	E1	SC
Barham Paradise Scenic Reserve	Natural Features Reserve — Scenic Reserve	III	117	E2	CO
Barongarook West Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	1	Not rated	CO
Barwon Downs Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	22	Not rated	CO
Bay of Islands Coastal Park	Other Park — Schedule 3, National Parks Act	III	934	B	SCH
Brown Swamp Wildlife Reserve	Natural Features Reserve — Wildlife Reserve (Hunting)	VI	37	E1	SC
Carpendeit Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	11	Not rated	CO
Cooriemungle Creek Flora Reserve	Nature Conservation Reserve — Flora Reserve	Ia	853	B	SCH
Coradjil Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	162	D	SCH
Coradjil Nature Conservation Reserve	Nature Conservation Reserve	Ia	1610	Not rated	SCH
Eagle Rock Marine Sanctuary	Marine Sanctuary — Schedule 8, National Parks Act	III	18	B – Marine	SC
Elliot River – Addis Bay Coastal Reserve	Coastal Reserve		104	C	CO
Gellibrand Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	115	E1	CO
Gellibrand North Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	1	E2	CO
Gherang Gherang Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	113	E1	SC
Great Otway National Park	National Park — Schedule 2, National Parks Act	II	110,339	A1	SCH, CO, SC
Irrewillipe Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	26	Not rated	CO
Jancourt Nature Conservation Reserve	Nature Conservation Reserve	Ia	3355	C	SCH
Johanna Falls Scenic Reserve	Natural Features Reserve — Scenic Reserve	III	12	E1	CO
Lake Ayrey Wildlife Reserve	Nature Conservation Reserve — Wildlife Reserve (No Hunting)	Ia	19	C	CO

Park/reserve name		IUCN categ.	Area (hectare)	Level of Protection	PV Area
Latrobe Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	298	D	SCH
Marengo Nature Conservation Reserve	Nature Conservation Reserve — Flora Reserve	Ia	26	D	CO
Marengo Reefs Marine Sanctuary	Marine Sanctuary — Schedule 8, National Parks Act	III	13	B – Marine	CO
Murroon Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	2	E1	CO
Paraparap Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	4	E1	SC
Penny Royal Creek Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	11	D	SC
Peterborough Coastal Reserve	Coastal Reserve		342	C	SCH
Point Addis Marine National Park	Marine National Park — Schedule 7, National Parks Act	II	4412	A – Marine	SC
Point Danger Marine Sanctuary	Marine Sanctuary — Schedule 8, National Parks Act	III	22	B – Marine	SC
Port Campbell Coastal Reserve	Coastal Reserve		1	Not rated	SCH
Port Campbell National Park	National Park — Schedule 2, National Parks Act	II	2403	A2	SCH
Port of Port Campbell	Port and Coastal Facility		1	Not rated	SCH
Princetown Wildlife Reserve	Natural Features Reserve — Wildlife Reserve (Hunting)	VI	73	C	SCH
Retreat Creek Streamside Reserve	Natural Features Reserve — Streamside Reserve	III	7	Not rated	SC
The Arches Marine Sanctuary	Marine Sanctuary — Schedule 8, National Parks Act	III	48	B – Marine	SCH
Timboon Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	277	D	SCH
Twelve Apostles Marine National Park	Marine National Park — Schedule 7, National Parks Act	II	7506	A – Marine	SCH
Wensleydale Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	11	E1	SC
Wild Dog Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	26	Not rated	CO
Wild Dog Creek Streamside Reserve	Natural Features Reserve — Streamside Reserve	III	21	E1	CO
Wongarra Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	1	E1	CO
Yaugher Bushland Reserve	Natural Features Reserve — Bushland Reserve	IV	5	E1	CO
Yeo Streamside Reserve	Natural Features Reserve — Streamside Reserve	III	6	E1	CO

Appendix B — Conservation Assets

This appendix provides an overview of the area of conservation assets (aligned to EVDs and EVCs) within the Great Otway Parks landscape.

Conservation Asset	EVD	EVC	Bioregion	Biodiversity Conservation status	Total (hectares)
Wet Forest & Rainforest	Moist Forest	Coast Gully Thicket	Warrnambool Plain	Endangered	159
	Tall Mist Forest	Shrubby Wet Forest	Otway Plain	Least Concern	66
			Otway Ranges	Least Concern	16 875
			Warrnambool Plain	Least Concern	12
		Wet Forest	Otway Plain	Least Concern	221
			Otway Ranges	Least Concern	28 219
	Closed Forest	Cool Temperate Rainforest	Otway Ranges	Endangered	6504
	Wet Forest & Rainforest total				**52 056**
Riparian and Freshwater Wetland	Freshwater Wetland (ephemeral)	Plains Sedgy Wetland	Otway Plain	Endangered	13
	Freshwater Wetland (permanent)	Aquatic Herbland/Plains Sedgy Wetland Mosaic	Otway Plain	Endangered	32
		Floodplain Reedbed	Otway Plain	Endangered	83
			Otway Ranges	Endangered	3
		Shallow Freshwater Marsh	Otway Plain	Endangered	4
		Water Body – Fresh	Otway Plain	Not Applicable	25
			Warrnambool Plain	Not Applicable	24
	Riparian (higher rainfall)	Riparian Forest	Otway Plain	Vulnerable	220
			Otway Ranges	Least Concern	1088
			Warrnambool Plain	Vulnerable	264
	Damp Scrub	Riparian Scrub/Swampy Riparian Woodland Complex	Otway Plain	Depleted	2416
			Otway Ranges	Least Concern	96
			Warrnambool Plain	Vulnerable	131
		Swamp Scrub	Otway Plain	Vulnerable	187
			Otway Ranges	Endangered	5
			Warrnambool Plain	Endangered	34
		Wet Sands Thicket	Otway Plain	Rare	289
			Otway Ranges	Rare	628
	Treed Swampy Wetland	Sedgy Riparian Woodland	Otway Plain	Depleted	602
			Otway Ranges	Vulnerable	42
			Warrnambool Plain	Endangered	209
	Riparian and Freshwater Wetland total				**6395**

Conservation Asset	EVD	EVC	Bioregion	Biodiversity Conservation status	Total (hectares)
Dry Forest and Woodland	Foothills Forest	Grassy Forest	Otway Plain	Endangered	1
		Shrubby Foothill Forest	Otway Plain	Least Concern	534
			Otway Ranges	Least Concern	15 612
			Warrnambool Plain	Depleted	1141
	Forby Forest	Damp Sands Herb-rich Woodland	Otway Plain	Vulnerable	602
			Otway Ranges	Vulnerable	207
			Warrnambool Plain	Endangered	9
		Damp Sands Herb-rich Woodland/Damp Heathland/Damp Heathy Woodland Mosaic	Warrnambool Plain	Endangered	4
		Grassy Woodland	Otway Plain	Endangered	19
		Herb-rich Foothill Forest	Otway Plain	Vulnerable	834
			Otway Ranges	Depleted	112
			Warrnambool Plain	Vulnerable	1395
		Herb-rich Foothill Forest/Shrubby Foothill Forest Complex	Otway Plain	Vulnerable	8
			Otway Ranges	Depleted	1437
	Grassy/Heathy Dry Forest	Grassy Dry Forest	Otway Ranges	Depleted	177
		Shrubby Dry Forest	Otway Plain	Least Concern	367
			Otway Ranges	Least Concern	983
	Tall Mixed Forest (Eastern)	Lowland Forest	Otway Plain	Depleted	8910
			Otway Ranges	Depleted	1234
			Warrnambool Plain	Vulnerable	5276
	Western Plains Woodland	Scoria Cone Woodland	Otway Ranges	Endangered	1
	Dry Forest and Woodland total				**38 866**
Heathland	Heathland (sands)	Clay Heathland	Otway Plain	Vulnerable	32
		Damp Heath Scrub	Otway Plain	Endangered	26
			Otway Ranges	Endangered	4
			Warrnambool Plain	Vulnerable	1110
		Damp Heath Scrub/Heathy Woodland Complex	Warrnambool Plain	Vulnerable	15
		Damp Heathland/Damp Heathy Woodland Mosaic	Warrnambool Plain	Endangered	6
		Heathy Woodland	Otway Plain	Least Concern	14 897
			Otway Ranges	Least Concern	338
			Warrnambool Plain	Vulnerable	214
		Sand Heathland	Otway Plain	Rare	144
		Wet Heathland	Otway Plain	Least Concern	923
			Otway Ranges	Least Concern	156
			Warrnambool Plain	Endangered	262
	Heathland total				**18 128**

Conservation Asset	EVD	EVC	Bioregion	Biodiversity Conservation status	Total (hectares)
Coastal (including islands)	Coastal	Bird Colony Shrubland	Warrnambool Plain	Rare	3
		Coastal Dune Scrub	Warrnambool Plain	Depleted	64
		Coastal Dune Scrub/Coastal Dune Grassland Mosaic	Otway Plain	Depleted	692
			Otway Ranges	Depleted	27
			Warrnambool Plain	Vulnerable	291
		Coastal Headland Scrub	Otway Plain	Vulnerable	459
			Otway Ranges	Depleted	767
			Warrnambool Plain	Vulnerable	1096
		Coastal Headland Scrub/Coastal Tussock Grassland Mosaic	Warrnambool Plain	Vulnerable	583
		Coastal Tussock Grassland	Otway Plain	Vulnerable	16
			Otway Ranges	Vulnerable	40
			Warrnambool Plain	Vulnerable	399
	Coastal (incl. islands) total				**4437**
Estuarine and Saline Wetlands	Saline Wetland	Estuarine Wetland	Otway Plain	Endangered	42
			Otway Ranges	Endangered	0.05
			Warrnambool Plain	Depleted	164
		Permanent Saline	Warrnambool Plain	Not Applicable	285
		Water body – salt	Warrnambool Plain	Not Applicable	2
	Estuarine and Saline Wetlands total				**493**
Unallocated		Water Body – artificial	Otway Plain	Not applicable	1
			Otway Ranges	Not applicable	4
	Unallocated total				**5**

Appendix C — Scientific names and conservation status of species mentioned in the plan

Common Name	Scientific Name	Conservation status*		
		EPBC	FFG	VROTS
African Boxthorn	*Lycium ferocissimum*			
Agapanthus	*Agapanthus* spp.			
Agile Antechinus	*Antechinus agilis*			
Algal Turf	*Capreolia implexa*			
Anglesea Grevillea	*Grevillea infecunda*	Vulnerable	Listed	Vulnerable
Asparagus Fern	*Asparagus scandens*			
Austral Grass-tree	*Xanthorrhoea australis*			
Austral Seablite	*Suaeda australis*			
Australian Fur Seals	*Arctocephalus pusillus*	Vulnerable		
Australian Grayling	*Prototroctes maraena*	Vulnerable	Vulnerable	
Banana Passionfruit	*Passiflora tarminiana*			
Beaded Glasswort	*Sarcocornia quinqueflora*			
Beautiful Firetail	*Stagonopleura bella*			
Black Bream	*Acanthopagrus butcheri*			
Black-spined Sea Urchin	*Diadema antillarum*			
Black Wallaby	*Wallabia bicolor*			
Black-browed Albatross	*Thalassarche melanophris*	Vulnerable		
Black-lip Abalone	*Haliotis rubra*			
Blackberry	*Rubus fruticosus* agg.			
Blackwood	*Acacia melanoxylon*			
Blue Gum	*Eucalyptus globulus*			
Blue Periwinkle	*Vinca major*			
Blue Petrel	*Halobaena caerulea*	Vulnerable		
Blue Psoralea	*Psoralea pinnata*			
Blue Whale	*Balaenoptera musculus*	Endangered	Listed	Critically Endangered
Blue-throated Wrasse	*Notolabrus tetricus*			
Blue-winged Parrot	*Neophema elegans*			
Bluebell Creeper	*Billardiera heterophylla*			
Boneseed	*Chrysanthemoides monilifera* ssp. *monilifera*			
Bower Spinach	*Tetragonia implexicoma*			
Bridal Creeper	*Asparagus asparagoides*			
Broad-toothed Rat	*Mastacomys fuscus*		Nominated	Endangered
Cart-wheel Purple	*Dicathais orbita*			
Chestnut-rumped Heath Wren	*Hylacola pyrrhopygia*		Listed	Vulnerable
Cinnamon Fungus	*Phytophthora cinnamoni*			
Climbing Galaxias	*Galaxias brevipinnis*			
Clover Glycine	*Glycine latrobeana*	Vulnerable	Listed	Vulnerable
Coast Beard-heath	*Leucopogon parviflorus*			

Common Name	Scientific Name	Conservation status*		
		EPBC	FFG	VROTS
Coast Tea-tree	*Leptospermum laevigatum*			
Coast Wattle	*Acacia longifolia*			
Common Boobialla	*Myoporum insulare*			
Common Dipogon	*Dipogon lignosus*			
Common Heath	*Epacris impressa*			
Common Kelp	*Ecklonia radiata*			
Common Reed	*Phragmites australis*			
Coralline Algae	*Corallina* spp.			
Crayweed	*Phyllospora comosa*			
Creeping Brookweed	*Samolus repens*			
Cumbungi	*Typha orientalis*			
Cunjevoi	*Alocasia brisbanensis*			
Dense Leek-orchid	*Prasophyllum spicatum*	Vulnerable	Listed	Endangered
Dingo	*Canis lupus dingo*			
Drooping Sheoak	*Allocasuarina verticillata*			
Dusky Antechinus	*Antechinus swainsonii*			
Dusky Hydroid	*Solanderia fusca*			
Dwarf Galaxias	*Galaxiella pusilla*	Vulnerable	Endangered	
Eastern Pygmy-possum	*Cercartetus nanus*			
English Ivy	*Hedera helix*			
Estuary Perch	*Macquaria colonorum*			
European Rabbit	*Oryctolagus cuniculus*			
Fairy Prion	*Pachyptila turtur*	Vulnerable		
Fairy Tern	*Sternula nereis*	Vulnerable	Endangered	
Fallow Deer	*Dama dama*			
Feral Cat	*Felis catus*			
Forest Wire-grass	*Tetrarrhena juncea*			
Giant Honey-myrtle	*Melaleuca armillaris* subsp. *armillaris*			
Giant Kelp	*Macrocystis pyrifera*			
Gorse	*Ulex europaeus*			
Green Leek-orchid	*Prasophyllum lindleyanum*			
Green-striped Greenhood	*Pterostylis chlorogramma*	Vulnerable	Listed	Vulnerable
Grey-headed Flying-fox	*Pteropus poliocephalus*	Vulnerable	Vulnerable	
Ground Parrot	*Pezoporus wallicus wallicus*			
Growling Grass Frog	*Litoria raniformis*	Vulnerable	Endangered	
Hazel Pomaderris	*Pomaderris aspera*			
Hooded Plover	*Thinornis rubricollis*	Vulnerable	Vulnerable	
Horehound	*Marrubium vulgare*			
Horny Cone-bush	*Isopogon ceratophyllus*			
Humpback Whale	*Megaptera noveangliae*	Vulnerable	Vulnerable	
Indian Yellow-nosed Albatross	*Thalassarche carteri*			
Intertidal Tube Worm	*Galeolaria caespitosa*			
Italian buckthorn	*Rhamnus alaternus*			

Common Name	Scientific Name	Conservation status*		
		EPBC	FFG	VROTS
Japanese Kelp	*Undaria pinnatifida*			
Koala	*Phascolarctos cinereus*			
Latham's Snipe	*Gallinago hardwickii*			
Leafy Greenhood	*Pterostylis cucullata*	Endangered	Listed	Endangered
Leathery Turtle	*Dermochelys coriacea*			
Lime Fern	*Pneumatopteris pennigera*			
Little Black Horse Mussel	*Xenostrobus pulex*			
Little Egret	*Egretta garzetta*		Endangered	
Little Forest Bat	*Vespadelus vulturnus*			
Little Penguin	*Eudyptula minor*			
Long-nosed Bandicoot	*Perameles nasuta*			
Long-nosed Potoroo	*Potorous tridactylus*	Vulnerable	Near threatened	
Long-snouted Flounder	*Ammotretis rostratus*			
Luderick	*Girella tricuspidata*			
Macquarie Perch	*Macquaria australasica*	Endangered	Endangered	
Magpie Perch	*Cheilodactylus nigripes*			
Manna Gum	*Eucalyptus viminalis*			
Maroon Leek-orchid	*Prasophyllum frenchii*	Endangered	Listed	Endangered
Messmate Stringybark	*Eucalyptus obliqua*			
Metallic Sun-orchid	*Thelymitra epipactoides*	Endangered	Listed	Endangered
Mirror Bush	*Coprosma repens*			
Montbretia	*Crocosmia* x *crocosmiiflora*			
Montpellier Broom	*Genista monspessulana*			
Mountain Ash	*Eucalyptus regnans*			
Mountain Clematis	*Clematis aristata*			
Mountain Grey-gum	*Eucalyptus cypellocarpa*			
Musk Daisy-bush	*Olearia argophylla*			
Myrtle Beech	*Nothofagus cunninghamii*			
Myrtle Rust	*Austropuccinia psidii*			
Myrtle Wilt	*Chalara australis*			
Nankeen Kestrel	*Falco cenchroides*			
Neptune's Necklace	*Hormosira banksii*			
New Holland Mouse	*Pseudomys novaehollandiae*		Vulnerable	
Northern Pacific Sea Star	*Asterias amurensis*			
Orange-bellied Parrot	*Neophema chrysogaster*	Critically Endangered	Critically Endangered	
Otway Back Snail	*Victaphanta compacta*		Endangered	
Otway Midge Orchid	*Corunastylis* sp. aff. *nudiscapa*			
Otway Stonefly	*Eusthenia nothofagi*			
Otways Cray	*Geocharax gracilis*			
Paterson's Curse	*Echium plantagineum*			
Pig	*Sus scrofa*			
Powerful Owl	*Ninox strenua*			

Common Name	Scientific Name	Conservation status*		
		EPBC	FFG	VROTS
Prickly Moses	*Acacia verticillata* ssp.			
Prickly Tea-tree	*Leptospermum continentale*			
Purple Eyebright	*Euphrasia collina* subsp. *muelleri*	Endangered	Listed	Endangered
Purple Hop-bush	*Dodonaea viscosa*			
Purple-mouthed Rock Shell	*Bedeva vinosa*			
Ragwort	*Senecio jacobaea*			
Red Deer	*Cervus elaphus*			
Red Fox	*Vulpes vulpes*			
Red-hot Poker	*Kniphofia uvaria*			
River Red-gum	*Eucalyptus camaldulensis*			
Rosy Wrasse	*Pseudolabrus psittaculus*			
Rough Tree-ferns	*Cyathea australis*			
Royal Spoonbill	*Platalea regia*			
Rufous Bristlebird	*Dasyornis broadbenti*		Near Threatened	
Sallow Wattle	*Acacia longifolia* subsp. *longifolia*			
Sambar Deer	*Rusa unicolor*			
Scented Paperbark	*Melaleuca squarrosa*			
Scented Spider-orchid	*Caladenia fragrantissima*			
Sea Lettuce	*Ulva* spp.			
Sea Mullet	*Mugil cephalus*			
Sea Sweep	*Scorpis aequipinnis*			
Shasta Daisy	*Leucanthemum* × *superbum*			
Short-Tailed Shearwater	*Ardenna tenuirostris*			
Shortfin Eel	*Anguilla australis*			
Shy Albatross	*Thalassarche cauta*	Vulnerable	Vulnerable	
Sicilian Sea-lavender	*Limonium hyblaeum*			
Silky Hakea	*Hakea sericea*			
Silver Banksia	*Banksia marginata*			
Smoky Mouse	*Pseudomys fumeus*			
Soft Tree-fern	*Dicksonia antarctica*			
South African Weed-orchid	*Disa bracteata*			
Southern Bent-wing Bat	*Miniopterus schreibersii bassanii*	Critically Endangered	Listed	Critically Endangered
Southern Brown Bandicoot	*Isoodon obesulus*	Endangered	Near Threatened	
Southern Brown Tree Frog	*Litoria ewingii*			
Southern Elephant Seal	*Mirounga leonina*	Vulnerable		
Southern Emu-wren	*Stipiturus malachurus*			
Southern Giant Petrel	*Macronectes giganteus*	Endangered	Vulnerable	
Southern Right Whale	*Eubaleana australis*	Endangered	Listed	Critically Endangered
Southern Rock Lobster	*Jasus edwardii*			
Spanish Heath	*Erica lusitanica*			
Spike Beard-heath	*Leucopogon australis*			

Common Name	Scientific Name	Conservation status*		
		EPBC	FFG	VROTS
Spiral Sun-orchid	*Thelymitra matthewsii*			
Spot-tailed Quoll	*Dasyurus maculatus maculatus*	Endangered	Endangered	
Square Raspwort	*Haloragis exalata* var. *exalata*	Vulnerable		Vulnerable
Stemless Thistle	*Onopordum acaulon*			
Subantarctic Fur Seal	*Arctocephalus tropicalis*	Vulnerable		
Sugar Glider	*Petaurus breviceps*			
Swamp Antechinus	*Antechinus minimus maritimus*		Near Threatened	
Swamp Greenhood	*Pterostylis tenuissima*	Vulnerable		Vulnerable
Swamp Gum	*Eucalyptus ovata*			
Swamp Paperbark	*Melaleuca ericifolia*			
Swamp Skink	*Lissolepis coventryi*		Vulnerable	
Sweet Pittosporum	*Pittosporum undulatum*			
Swift Parrot	*Lathamus discolor*	Endangered	Endangered	
Tall Astelia	*Astelia australiana*	Vulnerable	Listed	Vulnerable
Tasman Flax-lily	*Dianella tasmanica*			
Tawny-crowned Honeyeater	*Gliciphila melanops*			
Thatch Saw-sedge	*Gahnia radula*			
Trout Galaxias	*Galaxias truttaceus*			
Victorian Scaly Fin	*Parma victoriae*			
Victorian Smooth Froglet	*Geocrinia victoriana*			
Wandering Albatross	*Diomedea exultans*	Vulnerable	Endangered	
Wandering Creeper	*Tradescantia fluminensis*			
Watsonia	*Watsonia meriana* var. *bulbillifera*			
White Arum-lily	*Zantedeschia aethiopica*			
White-bellied Sea Eagle	*Haliaeetus leucogaster*		Vulnerable	
White Correa	*Correa alba*			
White-footed Dunnart	*Sminthopsis leucopus*		Near Threatened	
Woolly Tea-tree	*Leptospermun lanigerum*			
Wrinkled Buttons	*Leiocarpa gatesii*	Vulnerable	Listed	Vulnerable
Yellow-bellied Glider	*Petaurus australis*			
Zebra Fish	*Girella zebra*			

* EPBC = National status under the Environment Protection and Biodiversity Conservation Act 1990
FFG = Victorian status under the Flora and Fauna Guarantee Act 1998
VROTS = Vulnerable Rare or Threatened Species listed in Victorian threatened species advisory lists

Appendix D — Biosecurity principles

Prevention

Prevention is a pre-emptive action to managing the risk of introducing weeds into the Parks 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 occurs 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 Parks 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 for 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 (e.g. 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

This applies to weeds that are well established in the Parks 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 will generally involve specifying a buffer around the asset and treating weeds within its perimeter. Biological controls can assist with containment for established weeds, but are limited to species with an available control agent.


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