GRAMPIANS
PYRENEES
BIOLINK

Grampians to Pyrenees Biolink Conservation Action Plan

PROJECT PLATYPUS
UPPER WIMMERA LANDCARE

CENTRAL VICTORIAN BIOLINKS ALLIANCE

Australian Government

Parks VICTORIA

Wimmera CMA

Glenelg Hopkins CMA

Trust for Nature

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Executive Summary

Restoring ecological connectivity between the Grampians and Pyrenees Ranges has motivated numerous conservation efforts by different organisations over many years and has given rise to the Grampians to Pyrenees Biolink project.

This Strategic Plan arose from the recognition that: (1) existing conservation strategies in the region do not capture the larger-scale ecological processes represented through this area that encompasses numerous bio-regional, catchment and administrative boundaries and (2) success of a large-scale project of this scale will require the many stakeholders in the region to align their objectives and reporting on outcomes.

The objectives of the plan were to further refine the G2P project area, identify priority zones in the area that need protection or restoration for large-scale connectivity, identify threats to ecological connectivity, and to set targets for the next 10 years. Project Platypus collaboratively developed the Plan with Landcare members, Wimmera CMA, Glenelg Hopkins CMA, Trust for Nature, Parks Victoria and Central Victorian Biolink Alliance.

The plan:

- Provides strategic context for the Grampians to Pyrenees Biolink from an ecological and stakeholder organisation perspective.
- Defines the project area and priority functional zones within it, that have larger-scale functional value, and could provide a framework for ongoing finer-scale project definition and planning
- Defines and identifies key ecological and functional assets that were considered to represent the range of biodiversity and functional processes supporting biodiversity, in the region.
- Identifies key threats to the assets and actions to address threats
- Provides key strategic recommendations for the implementation of the G2P project.

The project's Vision is to achieve: 'A healthy and connected landscape between the Grampians (Gariwerd) and Pyrenees that supports our people and our biodiversity.'

To achieve this vision, the following key ecological assets will be the focus for protection and/or restoration:

- Large intact dry forests and woodlands
- River and creek systems
- Medium to small intact dry forests and woodlands on public land
- Woodlands and forests on private land
- Native grasslands on private land
- Roadside vegetation and paddock trees

Key threats to those assets are; (1) Previous and on-going catchment-scale clearing and fragmentation, (2) Inappropriate fire regimes (3) Feral species; predation on fauna, over-grazing and weed invasion and (4) Land management practices including grazing.

Conservation objectives and actions were identified for each asset;

- Objective 1 Maintain current area of large intact dry forests and woodlands and improve their condition to very good to maintain viable populations of prey species by 2035,
- Objective 2 (a) Buffer and protect all target waterways, increasing riparian vegetation extent to 80% and

for that vegetation to be in good condition (b) Increase the number of deep pools in the waterways which hold water through dry periods,

- Objective 3 Maintain current area of medium to small sized intact dry forests and woodlands on public land and improve their condition to maintain viable populations of prey by 2035,
- Objective 4 Maintain existing, increase extent of, and improve the condition of Plains Grassland, Plains Woodlands and Dry Forests in strategic locations on private land to 30% cover with the aim of improving ecological connectivity and functionality,
- Objective 5 Ensure that larger patches of native grasslands on private land support viable populations of grassland faunal species,
- Objective 6 (a) Maintain high quality roadside vegetation in strategic locations for ecological connectivity. (b) Maintain existing paddock trees and achieve recruitment of paddock trees.

The following strategic actions were determined that if implemented collectively will assist in accomplishing the projects' objectives:

- Strategic Action 1: Increase the extent of native vegetation in strategic locations through encouraging natural regeneration and revegetation.
- Strategic Action 2: Maintain and improve the quality and condition of existing native vegetation on both public and private land
- Strategic Action 3: Targeted and coordinated predatory pest-control
- Strategic Action 4: Increase resources and cooperation
- Strategic Action 5: Improve awareness and appreciation of the value of the Grampians to Pyrenees Biolink amongst landholders, government agencies and the general community
- Strategic Action 6: Improve knowledge, fill knowledge gaps, monitor and review

Contents

1. Introduction

1.1 Background

Restoration of ecological connectivity between the Grampians and Pyrenees Ranges has motivated numerous conservation efforts by different organisations over many years. In 2008, the Grampians to Pyrenees Biolink Project commenced as a partnership between the Wimmera Catchment Management Authority, Project Platypus and landholders of the Upper Wimmera Catchment.

Renewed focus to the goal was given in 2013 when Project Platypus, in collaboration with the Wimmera CMA, Glenelg Hopkins CMA, Trust for Nature and Parks Victoria received $2 Million from the Australian Government's Biodiversity Fund for a three year Grampians to Pyrenees Biolink Project.

The Grampians to Pyrenees Biolink Project is implementing an integrated set of on-ground and community capacity building activities including revegetation, vegetation protection through fencing areas of remnant vegetation, private land agreements and pest management. Additionally, funding was obtained to undertake a strategic planning process that will provide an assessment of priorities for the 3 year duration of the funding and to guide project investment beyond.

The planning process was undertaken by Central Victorian Biolinks in conjunction with the project's key participants. Central Victorian Biolinks is an alliance of landcare and environmental networks operating through Central Victoria with the purpose of improving the connectivity and resilience of the landscape – especially ensuring that larger-scale ecological patterns and processes are linked to local scale actions. This document reports on the outcomes of that planning process.

1.2 Objectives and approach

This Plan arose from the recognition that larger-scale ecological processes that operate across catchment boundaries are not necessarily the focus of, or are captured, in existing conservation prioritisations that have been undertaken in the region, and that the Grampians to Pyrenees Biolink project needed a set of shared objectives to guide future investment in the project.

The objectives of the Plan were to;

- Further refine the Grampians to Pyrenees project area to improve connectivity between the Grampians to Pyrenees Ranges
- Prioritise zones with the total project area to achieve maximum ecological connectivity
- Consolidate existing information on the current extent of native vegetation on both public and private land including past revegetation and restoration efforts
- Identify current threats to the biodiversity of the region including its ecological connectivity and identify and prioritise activities to address those threats
- Set targets and stages for the Biolink over the next 10 years.

Participants in the planning process saw it as an opportunity to focus on what the diverse environmental organisations in the region are trying to achieve and why, and to ensure that regional conservation efforts were as strategic as they could be. The Plan was also seen as an opportunity to explicitly assess threats to

biodiversity in the region and to prioritise actions around those threats that are the most imminent.

Stakeholders saw the planning process as also being important in identifying relationships between existing conservation projects across the area, as well as with surrounding regions. This could provide a foundation for new partnerships and a new level of coordination of conservation efforts across the region.

Participants saw this plan as an opportunity to take more quantitative approaches to setting conservation objectives, establishing measurable targets and monitoring performance against these. It was also hoped that the plan could increase understanding around managing biodiversity with changing fire regimes and climate. The outcomes of the planning process would help to guide environmental investment and activities.

The plan was developed through a series of three stakeholder workshops. A conservation action planning framework (CAP) was used to guide the development of the plan (Appendix 1). CAP is an approach to planning, implementing and measuring success of conservation projects, that has been developed by the Nature Conservancy based on "Open Standards for Conservation". It is an adaptive management framework that encourages teams of stakeholders to capture their best understanding of the conservation situation, build a set of actions based on that understanding, implement the actions, learn from outcomes and refine actions over time.

1.3 Strategic context

Connectivity conservation

Conservation planning has focused on the protection of large intact areas of the landscape, however it has become increasingly apparent that, in many cases, the natural ecological processes required to maintain biodiversity in the long-term operate at larger scales than the reserves themselves (Soule, 2006). Ecological processes, such as gene flow, species movements, hydrological flows are more likely to occur in landscapes that are ecologically connected through stepping stones or corridors than those that are heavily cleared (Forman, 1995; Wiens, 1995).

This has led to the development of connectivity conservation, the key design elements of which are the protection of a core reserve system. Connectivity conservation has been recognised as highly necessary to the long-term conservation of biodiversity in Australia and as a primary mechanism to allow biodiversity to adapt to climate change (Australian Government, 2012).

The principles of connectivity design are based on established biogeographic and ecological principles. It involves the identification and protection of key core assets, their protection through establishing buffers and their connection through the protection or the re-establishment a permeable matrix (Rouget *et al,* 2006; Bennett *et al.,* 1998; Lindenmeyer *et al.*, 2008; Mackey *et al*., 2010; Doerr *et al*., 2012).

Restoring connectivity to maintain both ecological and evolutionary processes requires actions at multiple spatial scales; from the connection of many small fragments in a landscape to the connection of large intact natural areas. The underpinning design principles are true at both small and large scales.

Biological importance of the Grampians to Pyrenees Biolink

The Grampians to Pyrenees region is a highly biologically significant landscape in central western Victoria. It supports a diversity of habitats with six bioregions meeting within its extent; the Victorian Volcanic Plains, Central Victorian Uplands Goldfields, Wimmera, Greater Grampians and Dundas Tablelands.

This wide range of environments support a high diversity of ecological communities from wet, dry and heathy forests found in the mountainous areas to woodlands and grasslands on the intersecting lower-elevation

plains. The Grampians are a core area for biodiversity in Victoria, supporting one third of the state's plant species and known as 'the single most important botanical reserve in Victoria' (Parks Victoria, 2000). They also support a high fauna diversity (312 vertebrate species including a diverse macropod fauna). The area contains a high proportion of endemic species. The high levels of endemism likely in part reflect the important role the Grampians has played as a climate refuge in the past. Its moist gullies and caves provide a refuge from fire and drought in the present day.

Species and ecological communities of conservation significance

The area contains many plant and animal species of high conservation significance due to their rare and or threatened status – See Appendix 3 for a listing of species recorded in the area and their National (Environmental Protection and Biodiversity Conservation Act) and Victorian (Flora and Fauna Guarantee Act) significance. The Nationally critically endangered Regent Honeyeater and Golden Sun Moth, Spiny Rice-flower and Wimmera Bottlebrush occur in the region. In total the area contains 33 and 24 Nationally listed threatened flora and fauna species respectively.

The area supports a diverse range of vegetation formations each of which has been impacted by varying degrees through past land management practises such as land clearing and stock grazing. (Table 1). The most impacted are the communities in the Plains grasslands and Plains woodlands groups. Overall 35 Ecological Vegetation Classes have been classed as being Endangered and they represent some 20% of the total remaining vegetation in the study area (Table 2). The area contains four listed communities under the Federal Government's Environmental Protection and Biodiversity Conservation Act; Victorian Volcanic Plain Natural Temperate Grassland, Victorian Volcanic Plain Grassy Eucalypt Woodland, Grey Box (*Eucalyptus microcarpa*) Grassy Woodland and Seasonally Herbaceous Wetlands.

Table 1. The Ecological Vegetation Class 'Super-Groups' found in the G2P project area, their extent in 2005, 1770 and the proportion of original extent remaining.

EVC Group or "Vegetation Formation"	2005 extent (ha)	Original extent (ha)	Proportion remaining (%)
Plains grasslands and Chenopod shrublands	1958	231076	0.84
Plains woodlands or forest	52704	321240	16.4
Heathy woodlands	67763	82238	82.39
Lower slopes or hills woodlands	65806	193099	34.07
Box iron bark forest	29889	58718	50.9
Lowland Forest	10876	11027	98.63
Dry Forest	31255.1	177768	17.5
Wet or Damp Forests	1131	1132	99.9
Heathlands	545	14592	3.7
Rocky Outcrop or Escarpment Scrubs	28264	28684	98.5
Montane grasslands, shrublands or Woodlands	1895	1895	100
Mallee	1315	3588	36.64
Riparian Scrubs or Swampy Scrubs and Woodlands	8640	10645	81.16
Riverine Grassy Woodlands or Forest	9312	31015	30.02
Wetlands	7582	15079	50.28

Table 2. The conservation status of native vegetation (Ecological Vegetation Classes, 2005) in the G2P project area, showing that over half the remnant vegetation communities in the area are endangered, vulnerable or depleted in Victoria.

EVC threat class	Hectares	Proportion of total vegetation
Endangered	92101	20.03%
Vulnerable	53788	11.69%
Depleted	104601	22.81%
Least concern	204867	44.55%
Not applicable	4123	0.89%

Regional and continental connectivity

The Grampian Ranges are the southern-most point of the Australian Great Dividing Ranges, as such the Grampians to Pyrenees project is a key component of a continental-scale environmental system. Continental-scale spatial analyses undertaken by the Great Eastern Ranges initiative identify several corridors between the Grampians and Pyrenees Ranges (Figure 1).

The Great Eastern Ranges are highly significant and internationally listed as the 35th global biodiversity hotspot by Conservation International. They contain 60% of Nationally listed threatened species, the richest concentration of mammal species in Australia and highest number of bird species. They contain three World Heritage Areas and countless Aboriginal cultural sites. The Great Eastern Ranges provide one of the key areas of relatively intact natural connectivity along wide-environmental and climate gradients in Australia and as such are particularly important for bird migrations and in provision of drought and climate refuges. They also contain a strong network of protected areas.

The Grampians to Pyrenees Biolink links the Great Eastern Ranges to Habitat 141, a large-scale north-south running connectivity project in the west of the state, abutting the southwestern Grampians region.

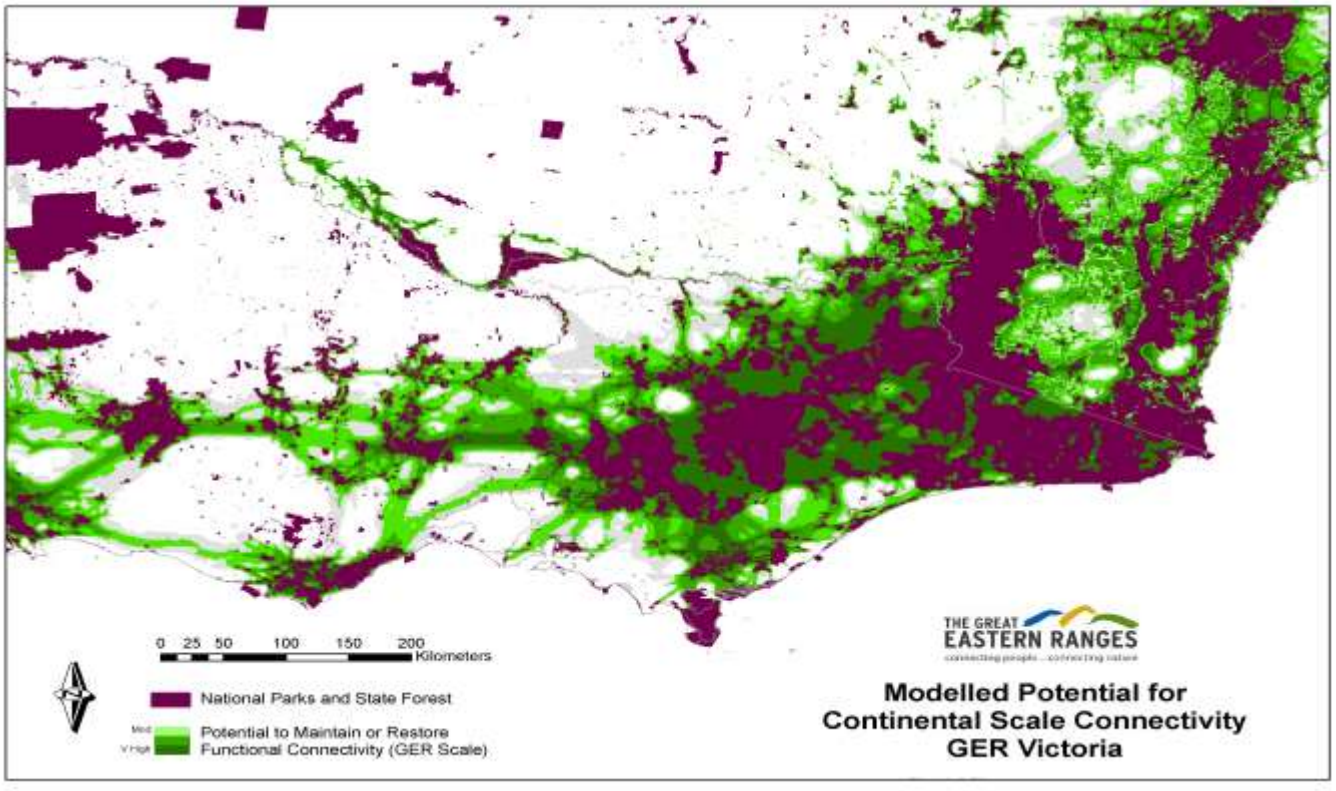


Figure 1. Modelled Potential for Continental Scale connectivity along the Great Eastern Ranges in Victoria.

Spatial analyses undertaken by the Great Eastern Ranges initiative.

Climate change

Victoria's climate is changing and is likely to change further in the future. Recent climate change projects undertaken by CSIRO and the Bureau of Meteorology (BoM) for Australia provide regional information on how climate is changing and will continue to change over this Century. The table below summarises the impacts.

Climate projections for the Central Victorian region (CSIRO and BoM, February 2015)	**Level of confidence**
Average temperatures will continue to increase in all seasons	Very high
More hot days and dry warm spells	Very high
Fewer, but possibly damaging, frosts	High
Less rainfall in the cool season, by late century	High
Rainfall will remain unchanged in the warm season	Medium
Heavy rainfall intensity will increase, even though mean annual rainfall will decline	High
A harsher fire-weather climate	High

It is expected that these changes will intensify the existing threats of the impacts of habitat loss, weeds, pest animals and drought. Rivers and wetlands will be impacted by change in the available water quantity and quality (Steffan, 2009). The most vulnerable ecosystems in the region are areas that are vulnerable to moisture stress and increased risk of bushfires. While species have survived previous climate changes by evolving, taking refuge in areas buffered from the changes or migrating to areas with more suitable climate, the rate of current change and fragmentation of the landscape will make it difficult for species to adapt. Climate change will also provide opportunities for new invasive species to establish. Increasing the area of native vegetation and its connectivity is a primary response to conserving biodiversity in the face of climate change.

Indigenous owners

The Grampians to Pyrenees Biolink spans across the traditional lands of the Djab Wurrung, Jadawadjali and Wadawurrung language groups. These traditional owners are today represented by Martang Pty Ltd and Eastern Maar Aboriginal Corporation (Djab Wurrung), Barengi Gadjin Land Council Aboriginal Corporation (Jadawadjali), and Wathaurung Aboriginal Corporation (Wadawurrung). These groups have had a strong cultural connection to their country over a long period of time with scientific evidence providing an indication of at least 22,000 years. Over this time many complex land management practices were undertaken in line with each group's cultural responsibilities. With the wave of European settlement in the area commencing around the 1830's access to cultural land became problematic with many unfortunate conflicts between aboriginal and non-aboriginal people. The Grampians to Pyrenees Biolink Project aims to assist in reconciling the past through restoring biodiversity and ecological function that has been degrading over the past 190 years. Protection of Indigenous cultural heritage, including identified significant sites, will be given a high priority when undertaking these works. It is hoped that traditional owner knowledge can be utilised to improve the Project's outcomes in all respects.

Existing conservation strategies

Numerous organisations are actively managing and restoring aspects of the environment in the Grampians and Pyrenees regions, guided by their own strategies and plans. Regional Catchment Management Strategies have a strong, but not exclusive, focus on waterways. Parks Victoria's Park strategies primarily focus on reserve land but also address the importance of taking regional approaches to threats not restricted to Park boundaries. Trust for Nature's Statewide Conservation Plan (2013) has a focus on prioritising conservation actions on private land. Key environmental organisations and their relevant strategies are listed in Table 3.

Table 3. Key environmental organisations in the Grampians to Pyrenees area and their existing relevant strategies

Agency	Strategy
Project Platypus	Project Platypus Strategic Plan 2015-2018
	Southern Brown Bandicoot Recovery Plan (Upper Wimmera Region)
	Platypus distribution and abundance in the upper Wimmera region
Glenelg Hopkins CMA	Glenelg Hopkins Regional Catchment Strategy 2013 – 2019
	Glenelg Hopkins Regional Weed Plan 2007 – 2012
	Glenelg Hopkins Invasive Animal Strategy 2010 – 2015
	Glenelg Hopkins Habitat Network Action Plan 2006
	Glenelg Hopkins Waterway Strategy 2014 -2022
	Glenelg Hopkins Plan for Climate Change
Wimmera CMA	Wimmera Regional Catchment Management Strategy 2013 – 2019
	Wimmera Invasive Plant & Animal Strategy 2010 – 2015
	Wattle Creek Waterway Action Plan
	Wimmera Waterway Strategy 2014-2022
	Concongella Creek Waterway Action Plan
	Glenlofty Waterway Action Plan
	Wimmera River Water Action Plan
	Wimmera Carbon Ready Plan 2016
North Central CMA	North Central Regional Catchment Strategy 2013 – 2019
	North Central Invasive Plants and Animal Strategy 2010 – 2015
	North Central Region Climate Change Adaptation and Mitigation Plan 2016
Parks Victoria	Kara Kara National Park Management Plan 2013
	Mt Cole Waterway Action Plan
	Glenpatrick and Nowhere Creek Waterway Action Plan
	Grampians National Park Management Plan 2003
	Greater Grampians Conservation Action Plan (in preparation)
	Greater Grampians Fire Ecology Strategy (Draft)
DEWLP	Biodiversity Action Planning • Landscape Plan for the Wimmera bioregion Northern Footslopes Landscape Zone in the Wimmera Bioregion. Revised March 2006 • Strategic Overview for the Victorian Volcanic Plain Bioregion 2003. • Ararat Landscape Zone Plan for the Goldfields Bioregion, 2005 • Buangor Landscape Zone Plan for the Central Victorian Uplands Bioregion, 2005.
Trust for Nature	Statewide Conservation Plan for Private Land 2013; G2P area is part of 'Victorian Midlands' Focal Area

2. Conservation vision

The long term vision for the Grampians to Pyrenees area is the conservation of:

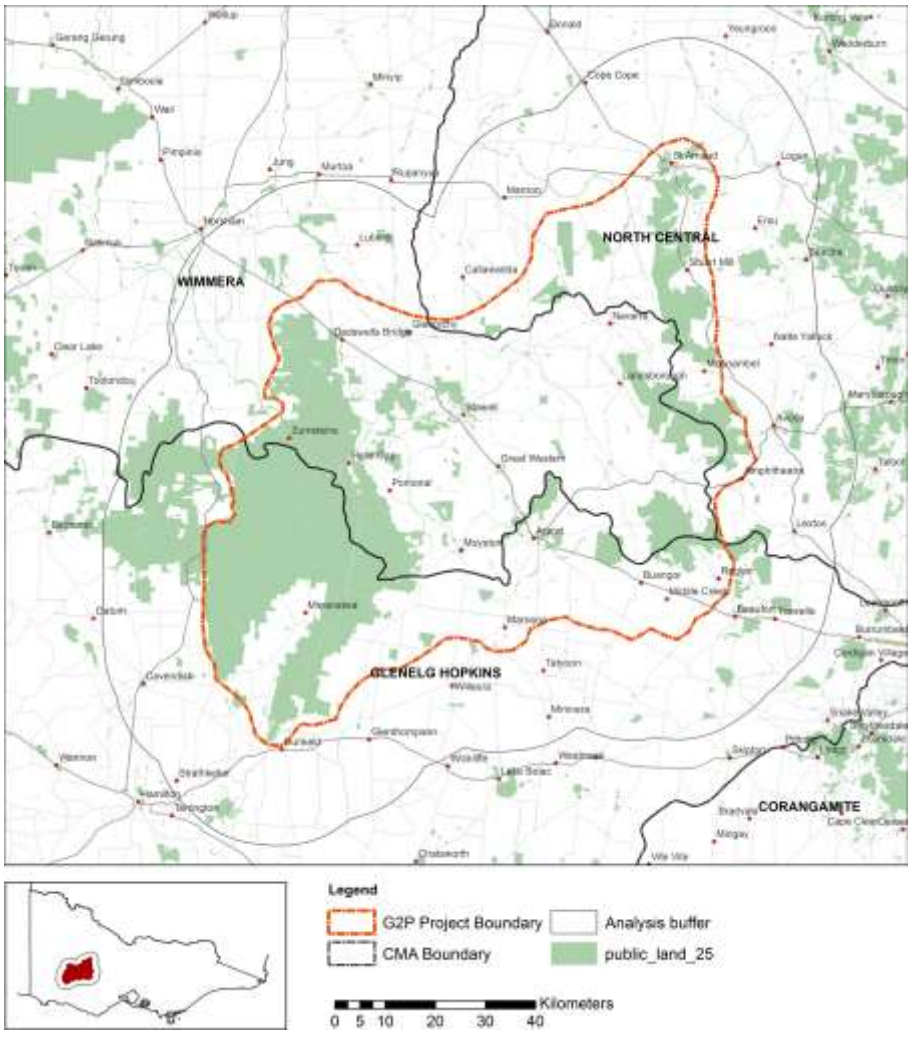
'A healthy and connected landscape between the Grampians (Gariwerd) and Pyrenees that supports our people and our biodiversity.'

3. Project area

3.1 Project boundary

The project area includes and extends between the full length of the Grampians Ranges and the Pyrenees-St Arnaud Ranges. It is an area of some 790,000 hectares. A 20 kilometre buffer was constructed around the project area for analysis purposes, so that linkages to adjacent landscapes could be considered in the planning process. The region takes in parts of the Wimmera, Glenelg Hopkins and North Central Catchment Management Authorities. The Northern Grampians, Southern Grampians, Pyrenees and Ararat Rural City Shires occur within the region.

Figure 2: Map of the project area and buffer region used for analyses and Catchment Management Authority boundaries.



3.2 Priority functional zones

Priority functional zones were identified to define sub-regions that have larger-scale functional value and could provide a framework for ongoing finer-scale project definition and planning.

They were determined through first identifying key remaining functional features in the region; large blocks of vegetation, remnant vegetation and major waterways. In the absence of any spatial analyses of regional-scale connectivity in the region, priority functional zones were heuristically mapped through considering the spatial arrangement of these features. These are areas where substantial functional features remain and would benefit from consolidation through linking or retaining their current connectivity values. The planning team's local knowledge of the region's ecology, threats and capacity for project implementation also influenced zone delineation.

The zones are described below and mapped in Figure 3.

(1) Morrl Morrl Link

(2) Navarre Connection

(3) Upper Wimmera Corridor

(4) Mt William Creek Corridor

(5) Black Range Biolink

(6) Ararat Link (includes Jallukar Link, Dunworthy Link and Saddle Link)

(7) Pyrenees Enhancement

(8) Grampians Enhancement

(9) Upper Mt Emu Creek Biolink (in buffer)

Two other existing biolink projects were identified in the Buffer region of the G2P project area on the north eastern side of the Pyrenees ranges (10) Dalyenong Biolink and (11) Hard Hills Connection. They are also presented in Figure 3.

Zone 1: Morrl Morrl Link

The Morrl Morrl Link extends from the Eastern side of Mt William Creek taking in Lake Londsdale, Lonsdale Nature Conservation Reserve, Illawara State Forest and Deep Lead Flora and Fauna Reserve. The zone then crosses the Wimmera River at Campbell's Bridge and links up with the Upper Reaches of the Avon River taking in Glynwylin State Forest, Morrl Morrl Nature Conservation Reserve, Mount Bolangum Flora and Fauna Reserve, Big Tottington Nature Conservation Reserve and Tottington State Forest before linking up with the Pyrenees Enhancement Zone. In between these patches of public land reserves is a combination of lifestyle properties and farming enterprises focusing mainly around sheep grazing and dryland cropping. The zone was prioritised because the string of medium sized patches of vegetation it encompasses providing one of the best examples of relatively intact natural-connectivity in the project area. A number of the larger-patches provide significant habitat and are being managed for conservation. Some connectivity exists through the vegetation on intervening private lands and there is potential to increase this due to the low production value from a farming perceptive.

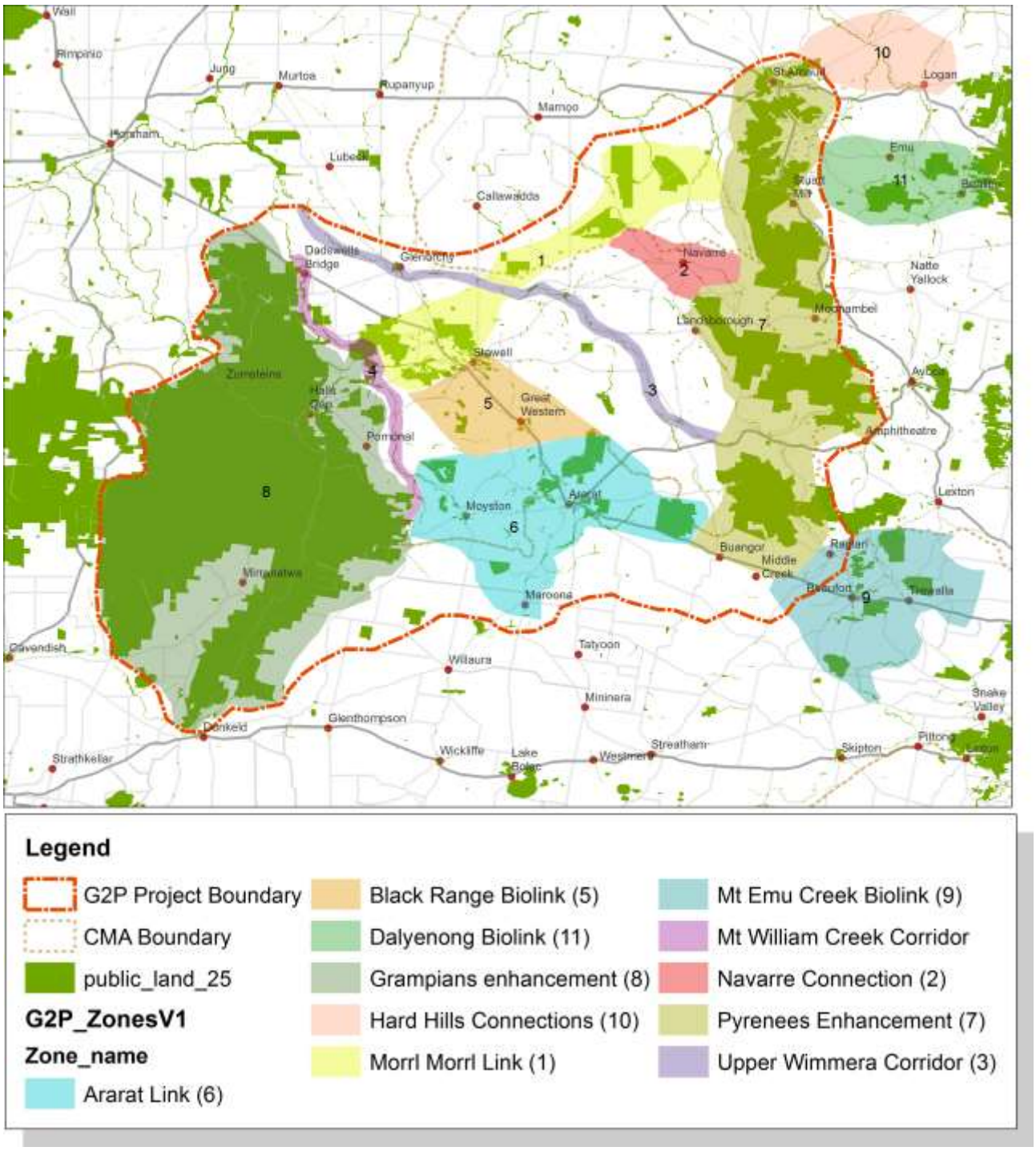


Figure 3: Priority functional zones (1-8) in the Grampians to Pyrenees Biolink and functional zones in the buffer region of the Grampians to Pyreenes Biolink providing regional connections (9-11).

Zone 2: Navarre Connection

The Navarre Connection links the Morrl Morrl Nature Conservation Reserve to the Kara Kara National Park and the Landsborough Nature Conservation Reserve/Landsborough Hill Nature Conservation Reserve/Pyrenees State Forest. The area was prioritised as it provides an important link from the Pyrenees Ranges to the Morrl Morrl Link and then linking into the Grampians National Park. It takes in the mid reaches of Wattle Creek and the Navarre and Barkley Hill Country. Wattle Creek is listed as a High Value Waterway in the Wimmera Waterway Health Strategy and the area encompasses reach 4 and 5 in the Wattle Creek Waterway Action Plan. Large areas of native grasslands remain on the Navarre and Barkly hills. These were likely to have been more heavily wooded prior to European arrival and have since been infiltrated at varying

degrees by mixed annual weed species. Significant patches of remnant vegetation exist on roadside reserves within this zone. Weed species such as pasture grasses and annual weeds are also present. Many paddock trees including Grey Box, Yellow Box, Buloke and Redgum also exist on private land within this zone. Extensive areas have been revegetated over last 20 years within the Navarre and Barkly Hill country and due to the low productivity of the hill country, the potential and likely uptake of further work is high.

Zone 3: Upper Wimmera River Corridor

The Upper Wimmera River Corridor is comprised of the upper reaches of the Wimmera River from its inception in the Pyrenees Ranges, along its north-westerly passage, to the confluence of Mt William Creek at the Northern tip of the Grampians Range. Its upper-most reaches are contained within the Mt Cole/Beerimpo State Forest before heading through predominantly private land for most of its course. The river is an integral component in ecological connectivity by providing deep watering holes and other refuges for native fauna. The zone was prioritised as the Wimmera River is the largest and most significant river in the project area, providing natural connectivity between the Grampians and Pyrenees Ranges. It physically connects the Pyrenees Enhancement Zone (Zone 7), the Grampians Enhancement Zone (Zone 8), the Mt William Creek Corridor (Zone 4) and the Morrl Morrl Link (Zone 1). As well as this functional role, reaches of it have specific high conservation values. The upper reaches are in good condition providing important habitat for birds, fish, platypus and macroinvertebrates. Spring fed pools in its upper reaches act as drought refuges for species including Platypus and Black Fish. Components of this corridor are high priority waterways (Reach 9 and Reach 10) in the Wimmera Waterway Strategy 2014-2022.

Zone 4: Mt William Creek Corridor

The Mt William Creek Corridor follows the Mt William Creek from its beginnings in the Grampians Ranges, passing through Lake Londsdale to its junction with the Wimmera River. Its course closely flanks the Grampians Ranges. Mt William Creek is one of the larger waterways in the project area providing high value habitat for fish, bird and vegetation communities. It is an important element of the natural values of the Grampians National Park. The upper reaches of the corridor has been designated as a high priority waterway (Reach 31) in the Wimmera Waterway Strategy 2014-2022. The corridor abuts the Grampians enhancement zone (Zone 7) providing the connection between the Ararat Link (Zone 7) and the Morrl Morrl Link (Zone 1).

Zone 5: Black Range Biolink

The Black Range Biolink is largely covered with high quality remnant vegetation. It contains mostly private land holdings which are used for, lifestyle properties, vineyards, conservation properties or grazed with sheep or horses. This area links the Lonsdale Nature Conservation Reserve, Illawara State Forest and Deep Lead Flora and Fauna Reserve with Ararat Hills Regional Park, Jallukar Nature Conservation Reserve and Black Range Scenic Reserve. Large areas of native grasslands remain on the Bulgana hills and Rhymney area. These were likely to have been more heavily wooded prior to European arrival and have since been infiltrated invaded at varying degrees by pasture and mixed annual weed species. Significant patches of remnant vegetation and paddock trees occur in the zone. The zone also contains a section of the Concongella Creek (referred to as Reach 49) that has been identified as a high priority waterway as part of the Draft Wimmera Waterway Strategy 2014-2022. The area has been prioritised also due to the potential for further uptake of works on private land. The soils in the zone have low production values (acidic granites) and the area contains a high number of lifestyle and conservation properties. Extensive areas of the zone have been revegetated over last 20 years.

Zone 6: Ararat Link

The Ararat Link follows the Great Diving Range from Moyston to Buangor linking the Grampians Enhancement zone (Zone 8) with the Pyrenees Enhancement zone (Zone 7). It includes the Hopkins River from its upper reaches down to the township of Maroona, including many significant wetlands. This zone includes the important refuges of Jallukar Nature Conservation Reserve, Ararat Regional Park and Langi Ghiran State Park. The zone supports good remnant patches of woodlands, forests and native grasslands on private land and along roadsides, with a high degree of existing connectivity and the potential for enhancement. Continental-scale spatial analyses of connectivity identify this zone as a high value contributing corridor of the Great Eastern Ranges (Figure 1). The Native Grasslands found in the zone include the EPBC listed Victorian Volcanic Plains communities; including Plains Grassy Woodlands and Plains Grassland amongst others. Six faunal species of national significance have also been recorded in the area, including the Brush Tailed Phascogale, Australasian Bittern, Brown Treecreeper, Speckled Warbler and Swift Parrot. Aims of developing habitat linkages and ecological community resilience will be achieved by connecting the Hopkins River habitat corridor with Langi Ghiran State Park, from the Ararat Hills in the north to Maroona in the south west. Wetlands will be protected in the south.

Zone 7: Pyrenees Enhancement

The Pyrenees Enhancement zone runs from the Great Dividing Range to the north, containing a string of large blocks of intact areas of dry forest and woodlands on public land. It takes in the Kara Kara National Park/St Arnaud State Forest, Pyrenees State Forest/Landsborough Hill Nature Conservation Reserve/ Landsborough Nature Conservation Reserve and Mt Cole State Forest/Mt Buangor State Parks. The zone was prioritised because it provides the eastern foundation for the Grampians to Pyrenees Biolink and high potential for establishing a north-south running corridor from the southerly ranges. The large area of intact vegetation in the zone provides excellent habitat for arboreal and ground-dwelling fauna. Additionally, the zone also includes small to medium patches of native grasslands on private land of varying quality, paddock trees and significant roadside vegetation and numerous creeks, including Nowhere Creek, Glenlofty Creek, Spring Creek, the Upper Reaches of the Mount Cole Creek and Fiery Creek, Wimmera River and Wattle Creek.

Zone 8: Grampians enhancement

The Grampians Enhancement takes in the Grampians National Park with private land adjoining the Park incorporating the area between the Grampians National Park and the Mount William Creek Corridor (Zone 4), the Victoria Valley which is surrounded by the Grampians NP on three sides, and smaller parcels of private land adjoining the Grampians National Park which can contribute to buffering the Grampians National Park. The area was prioritised because of the extremely high conservation value of the Grampians and the need to buffer it from external threats. The area of intact vegetation in the zone and proximity to the Grampians National Park provides significant habitat for arboreal ground-dwelling fauna. The buffer region contains the Fyans Creek Bushland Reserve, Mirranatwa Bushland Reserve and Bullawin Flora Reserve as well as good patches of remnant vegetation on private land and roadsides. Reaches of numerous creeklines are in the zone; Fyans Creek, Barney's Creek, Millers Creek and the Upper Section of Mt William Creek; Wannon R., MacKenzie R., Glenelg R. and Golton Creek.

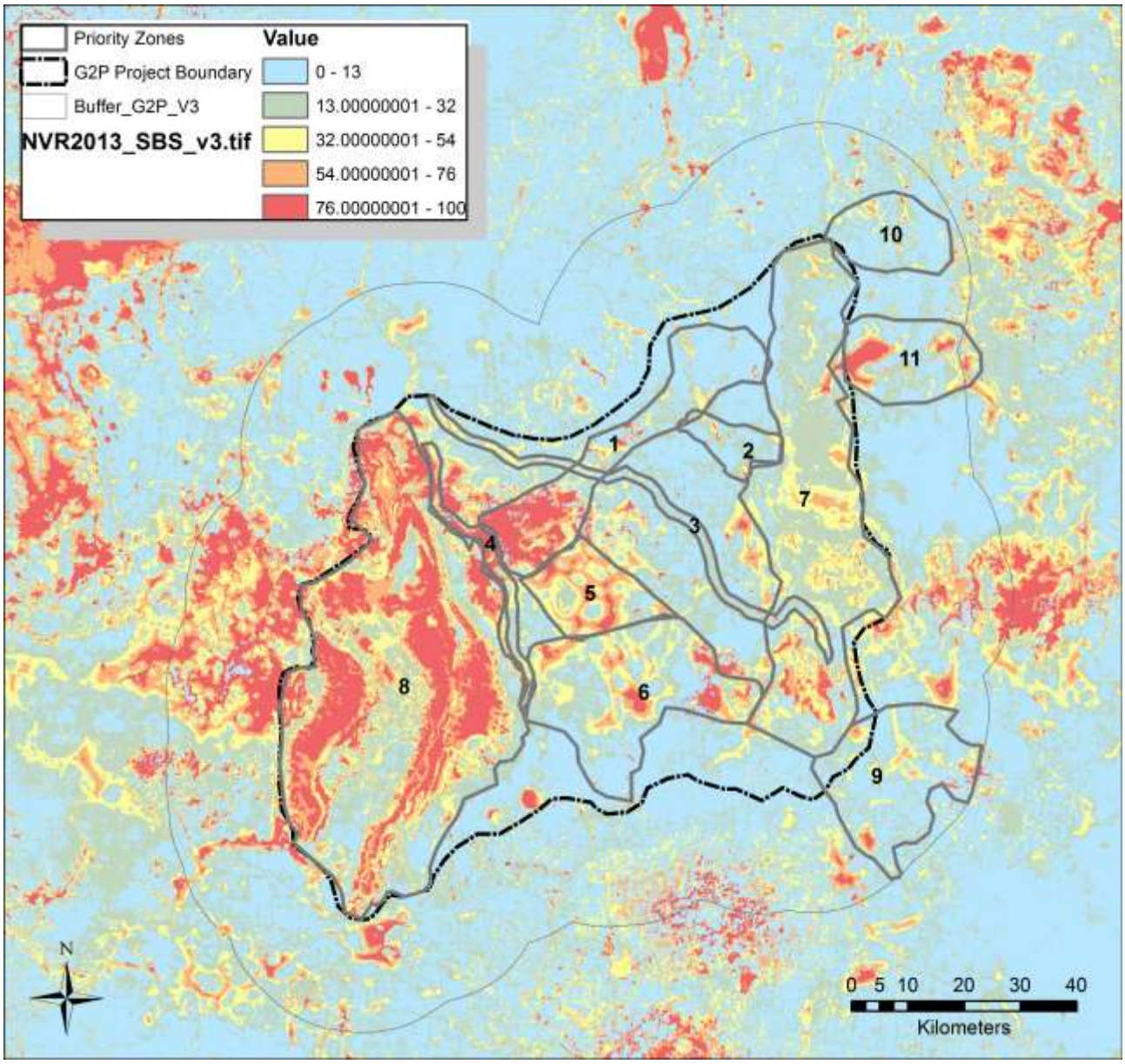
Zone 9: Upper Mount Emu Creek Biolink

This zone forms the south eastern corner of the biolink with many scattered remnant woodlands with the potential to provide ecological connectivity with the Great Eastern Ranges conservation corridor.

It contains patches of significant vegetation communities including Creekline Grassy Woodland, Herb rich

Woodland and Plains Grassland on private land. Significant faunal species recorded include Eastern Barred Bandicoot, Phascogales, Brown Treecreepers, Plains Wanderer and the Regent Honeyeater. Works will improve the linkage between the Ben Major Forest Reserve and the remnant woodland area to the east of Beaufort.

Figure 4 NaturePrint3 biodiversity values and the Priority Functional Zones.



4. Ecological assets

Connectivity conservation projects need to bridge large-scale processes such as migrations and range shifts with on-ground actions. They require planning at multiple spatial-scales. The priority functional zones identified in the project area provide a guide for prioritisation of investment at a large scale – representing regions with high potential for the maintenance and or restoration of functional ecological processes that support the region's biodiversity. We sought to further define what we want to conserve and manage within the project area and priority zones.

The planning team decided upon a combination of ecological and functional assets that were considered to represent the range of biodiversity and functional processes supporting that biodiversity, in the region. Improving the viability of each of these targets, will improve the ecological condition of the entire system and enhance its resilience and ability to adapt to environmental change.

Each asset includes nested assets. Nested assets are species of high conservation value (either threatened and or 'keystone') associated with the asset, and have similar needs, and threats. They were considered to warrant inclusion for their potential use for broader engagement and interest in the G2P project. Additionally, further analyses may determine nested assets are appropriate indicators for the health of the assets themselves.

Assets identified are listed below and described in the following section:

1. Large intact dry forests and woodlands
2. River and creek systems
3. Medium to small intact dry forests and woodlands on public land
4. Woodlands and forests on private land
5. Native grasslands on private land
6. Roadside vegetation and paddock trees

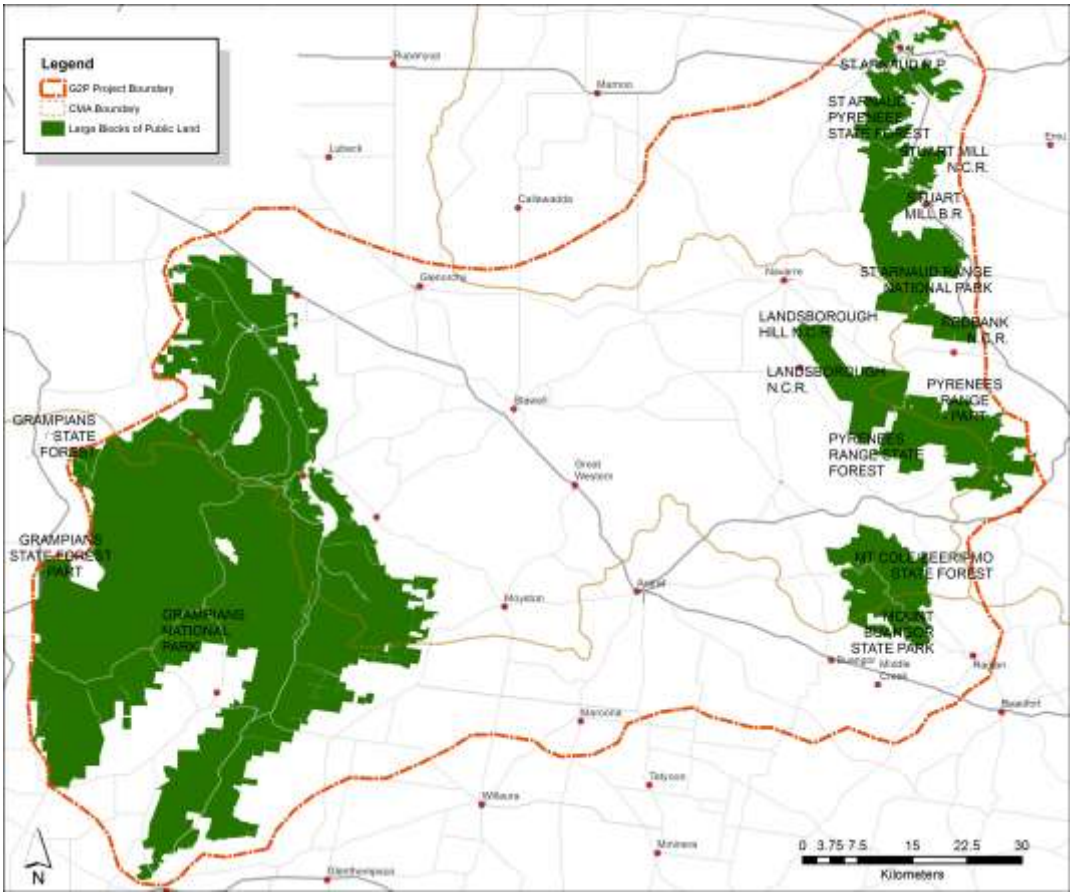
4.1 Large-intact dry forests and woodlands

The largest intact blocks of vegetation are the cornerstones for biological diversity and its conservation, providing minimum viable habitat for species requiring large areas of forest and woodland as home range. They can be thought of as the foundation pillars on a bridge; without them the connectivity project has no underpinning support.

The Grampian Ranges, the Pyrenees and St Arnaud Ranges and Mt Cole are the largest areas of intact vegetation in the region and restoring their ecological connectivity forms a primary conservation objective of this project. They are under various tenures and management; the Grampians Ranges are mostly reserved as the Grampians National Park (NP). The Pyrenees Ranges contain Landsborough Nature Conservation Reserve (NCR), Landsborough Hill NCR and the Pyrenees Range State Forest (SF). The St Arnaud Ranges contain Redbank NCR, St Arnaud Range NP, Stuart Mill NCR, Stuart Mill NCR, St Arnaud-Pyrenees SF., Mt Cole/Beerimpo State Forest and Mount Buangor State Park

The Grampians support a diverse ranges of vegetation communities; Dry Forest with Heath Woodlands; Rocky Outcrop Escarpment scrubs, Lowland Forests, Montane Grasslands, shrubs or woodlands. They are predominantly surrounded by Plains Woodlands or Forests. The St Arnaud Ranges support Box Iron Bark Forest and Dry Forests (EVC Super-group descriptions) with a small amount of Lower-slopes and Hills Woodland. The Pyrenees Ranges support less Box Ironbark Forest being predominantly Dry forest and Lower slopes and Hills Woodland. Mount Cole supports predominantly Dry Forests and a smaller area of Wet or Damp Forest and some Rocky Outcrop or Escarpment Scrubs.

Nested assets: Nested assets in this class identified through the planning process include the Southern Brown Bandicoot, Koala, Long-nosed Potoroo, Powerful Owl, Squirrel Glider, Antechinus spp., bats spp. and the Brush tailed Phascogale and Wallabies.



4.2 River and creek systems

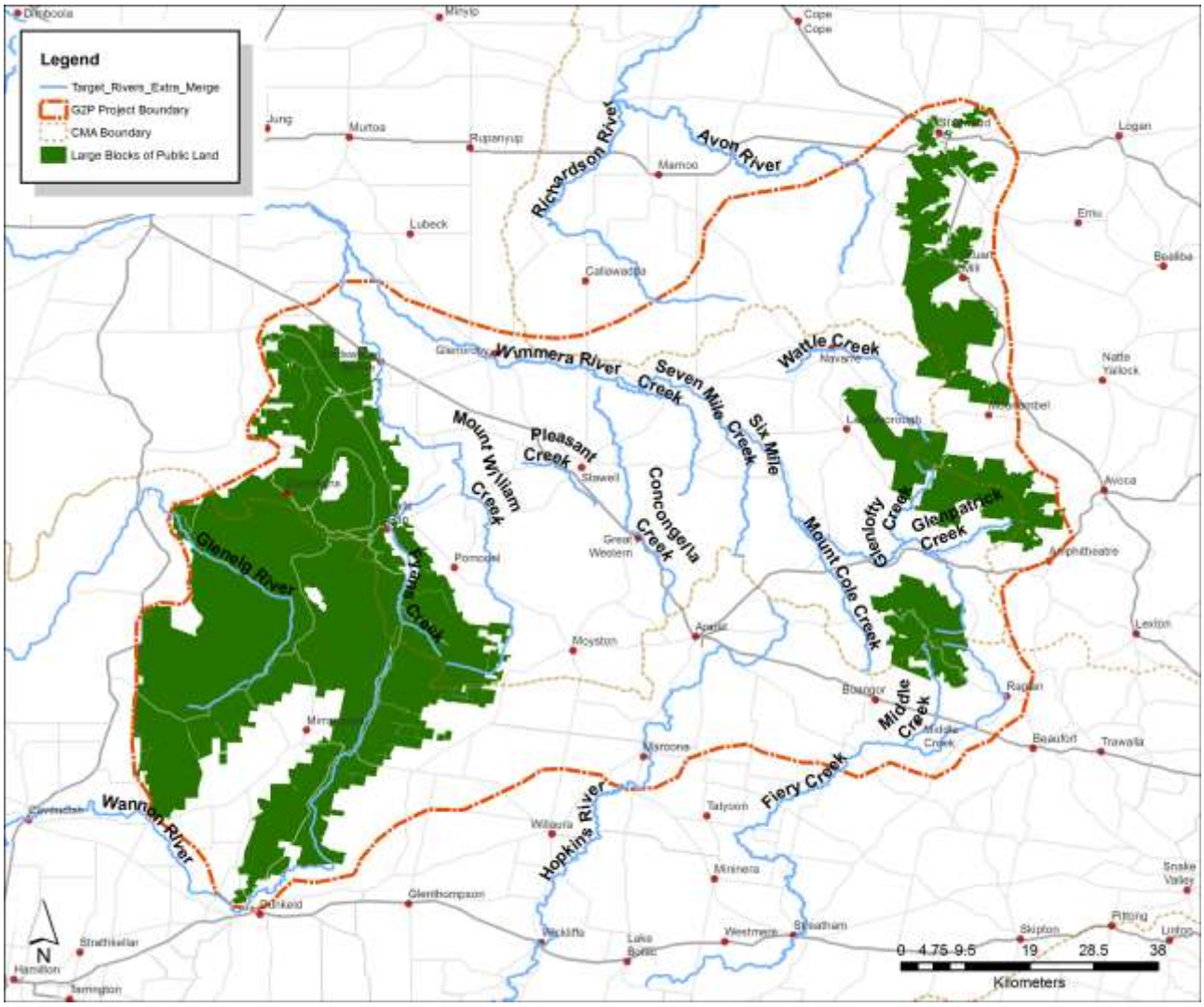
The major waterways are natural linkages running through and connecting major protected areas and elevational gradients in the region.

Those in the priority zones region are the Wimmera, Hopkins, Upper Glenelg, Wannon, Richardson and Avon Rivers, and the Mt William and Mt. Emu Creeks. They are associated with numerous other smaller tributaries including Mt Cole Creek, Six Mile Creek, Concongella Creek, Glenlofty Creek, Glenpatrick Creek, Seven Mile Creek, Wattle Creek, Pleasant Creek, Fiery Creek, Middle Creek and Fyans Creek.

The Wimmera River runs N-NW connecting the major protected areas of Mt Cole to the Grampians National Park. Other watercourses provide connectivity along elevational gradients; Mt Emu Creek connects the higher elevation areas of the southern Pyrenees Ranges with lower slopes and the Avon and Richardson Rivers run from the northern Pyrenees in a northerly direction, connecting the higher elevations with the northern woodland and grasslands.

Only 30% of the original extent of riparian vegetation on all waterways in the region remains and it is classed variously as endangered or vulnerable under Victorian legislation.

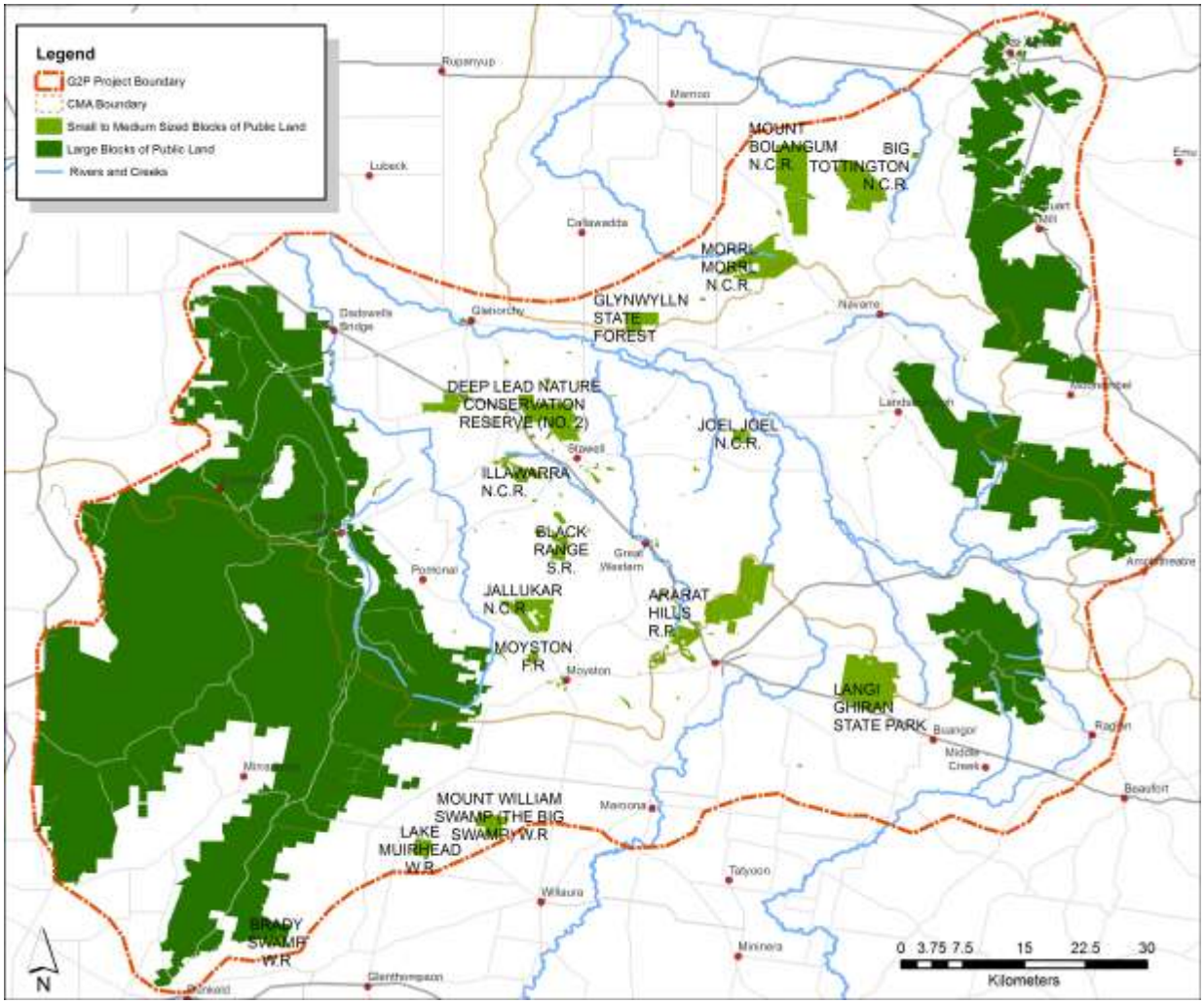
Nested assets: Platypus and growling grass frogs were identified as nested assets, occurring in some of the river reaches.



4.3 Medium to small-sized intact dry forests and woodlands on public land

Relatively intact small to medium sized patches of vegetation provide significant habitat as well as act as stepping stones providing the potential for major linkages between the Grampians to Pyrenees. Significant patches of vegetation on public land include; Joel Joel Nature Conservation Reserve; Langi Ghiran State Park; Jallukar Nature Conservation Reserve; Dunolly- Inglewood State Forest; Lonsdale Nature Conservation Reserve; Big Tottington Nature Conservation Reserve; Glynwyllyn SF; Mt Bolangum Nature Conservation Reserve; Deep Leed Nature Conservation Reserve; Ararat Hills RP; Morrl Morrl Nature Conservation Reserve.

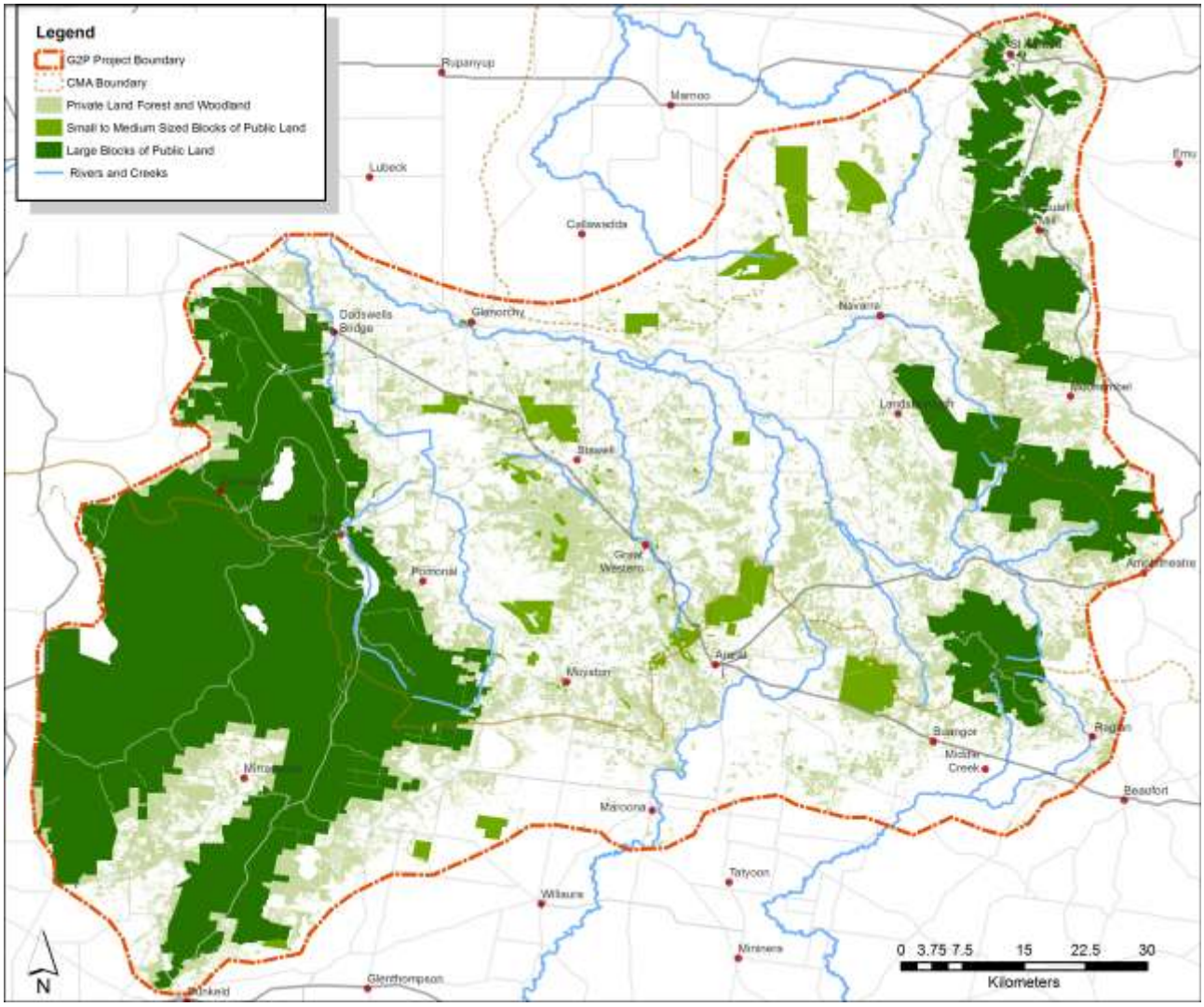
Nested assets: Nested assets for further consideration (or consideration as indicators) identified for this class include; Koala, Lace Monitor, Southern brown bandicoot, Long-nosed potaroo, Sugar glider, Antechinus spp., Brush tailed phascogale, Squirrel glider, bats spp. and woodland birds.



4.4 Woodlands and forests on private land

Woodlands and forests on private land form a large part of the connecting fabric of the region. Plains Woodlands or Forests are found in the west of the region, Lower-slopes or Hills Woodlands occur in the west and central part of the region and Herb Rich Woodlands in the south and central areas. They are highly diminished from their original extent, fragmented and variously classed as vulnerable or endangered. Many are grazed and so are missing their former understorey and suffer from a lack of recruitment.

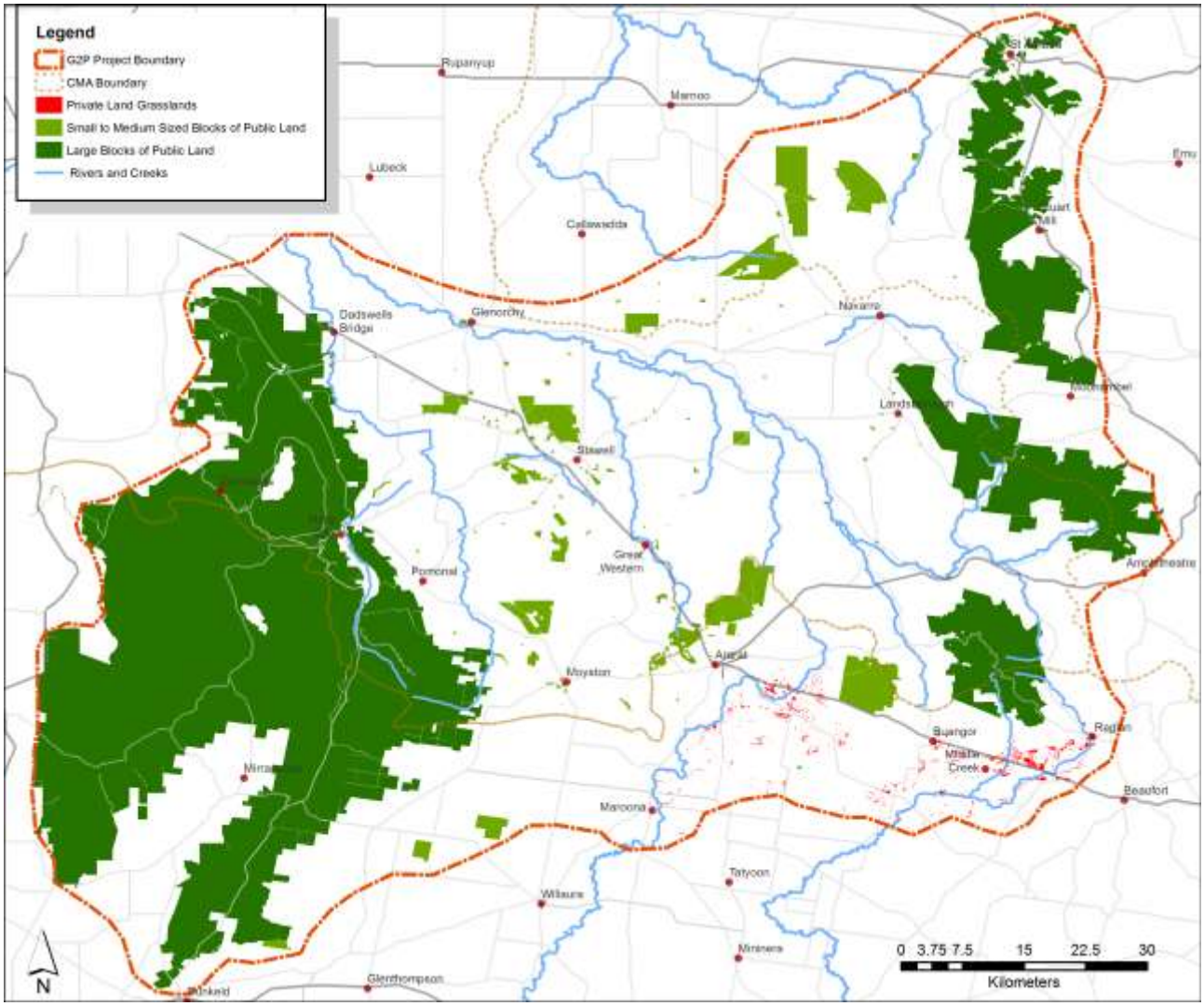
Nested assets: Woodland birds (including both ground-dwelling and arboreal, and both nectar feeders and insectivores) were identified as being nested assets for this ecological asset type. Woodland birds identified as being key to the region and/or of conservation concern included the Hooded Robin, Jacky Winter, Grey-crowned Babbler, Brown Treecreeper, White-browed Babbler, Swift Parrot, Yellow-tufted Honeyeater, Varied Sittella, Speckled Warbler, Little Lorikeet, and the Regent Honeyeater. The ground-dwelling Bush Stone Curlew and Southern Brown Bandicoot could also warrant nested-asset status. Antechinus spp. and Brush tailed Phascogale and bats spp. mammals that may also be useful indicators or warrant separate nested-asset status for this target.



4.5 Native grasslands on private land

Grasslands form part of the connecting fabric of the region as well as providing habitat for specialist grassland species. They occur in greatest extent south of Stawell (Plains Grasslands) and in the northern reaches of the project area (in a mosaic with Plains Woodlands). They are highly diminished in extent and classed as endangered. The asset includes both remnant grasslands and those that have been modified but still retain good quality herb and native grass diversity.

Nested assets: The striped legless lizard and Red Chested Button Quail were identified as potential nested assets for this ecosystem type.



4.6 Roadside vegetation and paddock trees

Roadside vegetation and paddock trees often provide the remaining examples of the connective fabric between the Grampians to Pyrenees and populations of threatened species. They are of value as they provide existing connections, albeit tenuous, through agricultural areas. They have the potential to act as the anchors for landscape rehabilitation. Paddock trees are particularly important habitat for hollow dependant species, such as bats, as many of them are old. Roadside vegetation in particular has the potential to provide a focus for community effort and can be an accessible educational resource.

Nested assets: Sugar gliders and woodland birds (species as listed above).

Nested assets

The nested assets were either species, or groups of species, occurring in the area believed to co-occur with the assets and share common ecological processes and similar threats. Further investigation around these assumptions is warranted. Table 4 presents the scientific names, functional group and conservation status of nested assets. Survey records showing their distribution in the region can be viewed at: http://spatial.ala.org.au/webportal/?ss=5267EA7B8F3A469492CB3F93BE11D828

Table 4 Nested assets and the species represented by them in the G2P area.

Nested asset	Species represented by the Nested Assets (common names)	Scientific name	Functional group	Conservation status (Vic and Aust)
Antechinus	Agile antechinus	*Antechinus agilis*	Insectivorous	-
	Yellow footed antechinus	*Antechinus flavipes*	Insectivorous	-
	Dusky antechinus	*Antechinus swainsonii*	Insectivorous	-
Bats	Gould's Wattled Bat	*Chalinolobus gouldii*	Insectivorous	-
	Chocolate Wattled Bat	*Chalinolobus morio*	Insectivorous	-
	Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	Insectivorous	-
	Common Bent-wing Bat (southern Ssp.)	*Miniopterus schreibersii bassanii*	Insectivorous	-
	Little Mastiff-bat	*Mormopterus planiceps*	Insectivorous	-
	Lesser Long-eared Bat	*Nyctophilus geoffroyi*	Insectivorous	-
	Gould's Long-eared Bat	*Nyctophilus gouldi*	Insectivorous	-
	Inland Broad-nosed Bat	*Scotorepens balstoni*	Insectivorous	-
	White-striped Freetail-bat	*Tadarida australis*	Insectivorous	-
	Large Forest Bat	*Vespadelus darlingtoni*	Insectivorous	-
	Eastern Forest Bat	*Vespadelus pumilus*	Insectivorous	-
	Southern Forest Bat	*Vespadelus regulus*	Insectivorous	-
	Little Forest Bat	*Vespadelus vulturnus*	Insectivorous	-
Brush tailed phascogale	Brush tailed phascogale	*Phascogale tapoatafa tapoatafa*	Insectivorous	Listed FFG (V)
Bush stone curlew	Bush stone curlew	*Burhinus grallarius*	Ground dwelling bird	Listed FFG (E)

Nested asset	Species represented by the Nested Assets (common names)	Scientific name	Functional group	Conservation status (Vic and Aust)
Gliders	Sugar glider	*Petaurus breviceps*	Nectar feeder/hollow dependant	-
	Squirrel glider	*Petaurus norfolcensis*	Nectar feeder/hollow dependant	Listed FFG (E)
Growling grass frog	Growling Grass Frog	*Litoria raniformis*	Frog	Listed FFG (E), EPBC (V)
Woodland birds	Hooded robin	*Melanodryas cucullata cucullata*	Insectivorous	Listed FFG (NT)
	Jacky winter	*Microeca fascinans*	Insectivorous	-
	Swift Parrot	*Lathamus discolor*	Nectar feeder	Listed FFG (E); EPBC (E)
	Brown Treecreeper south eastern spp.	*Climacteris picumnus victoriae*	Insectivorous	Advisory list (NT)
	Yellow-rumped pardelote	*Pardalotus punctatus sub sp. Xanthopyge*	Nectar feeder	-
	Spotted pardelote	*Pardalotus punctatus sub sp. punctatus*	Insectivorous	-
	Yellow tufted honey eater	*Lichenostomus melanops*	Nectar feeder	-
	Regent honey-eater	*Xanthomyza phrygia*	Nectar feeder	Listed FFG, EPBC (CE)
	Varied sittella	*Daphoenositta chrysoptera*	Insectivorous	-
	White browed babbler	*Pomatostomus superciliosus*	Insectivorous	-
	Grey crowned babbler	*Pomatostomus temporalis temporalis*	Insectivorous	Listed FFG (E)
	Speckled warbler	*Chthonicola sagittata*	Insectivorous	Listed FFG (V)
	Little lorikeet	*Glossopsitta pusilla*	Nectar feeders	-
	Purple-crowned lorikeet	*Glossopsitta porphyrocephala*	Nectar feeders	-
Koala		*Phascolarctos cinereus*		-
Lace monitor	Lace monitor	*Varanus varius* predator	Hollow dependant, arboreal	Advisory list (V)
Long-nosed potaroo	Long-nosed potaroo	*Potorous tridactylus tridactylus*	Ground-dwelling mammal	Listed FFG (NT); EPBC (V)
Platypus	Platypus	*Ornithorhynchus anatinus*	Aquatic mammal	-
Powerful owl	Powerful owl	*Ninox strenua*	Hollow dependant	Listed FFG (V)
Red Chested Button Quail	Red Chested Button Quail	*Turnix pyrrhothorax*	Ground dwelling bird	Listed FFG (V)
Southern brown bandicoot	Southern brown bandicoot	*Isoodon obesulus obesulus*	Ground-dwelling mammal	Listed FFG (NT); EPBC (E)
Striped legless lizard	Striped legless lizard	*Delma impar*	Ground dwelling reptile	Listed FFG (E); EPBC (V)

5. Identifying threats – stresses and sources

An analysis of the factors most problematic to the viability of conservation assets was undertaken so that strategic actions can be directed to where they will have the most impact.

Ecological stresses for each conservation target were first determined. Stresses are the impaired aspects of conservation assets that result directly or indirectly from human activities. Most assets had multiple stresses, that cumulatively affect their viability. For example, rivers and creeks are experiencing siltation and lower flow regimes. Stresses were ranked according to their likely scope (geographic spread) and their severity and these are detailed in Appendix 2.

The specific sources of ecological stresses were then determined. The source of stress is the proximate activity or process that has directly caused the ecological stress. It can be thought of as being the 'direct threat' to the conservation asset that its destruction or degradation. Identifying the source of the stress allows strategies to be aimed at removing that source, rather than only addressing its symptoms.

A matrix of direct threats relative to each asset was drawn up (Table 3) to determine key threats across the project area. The analysis separated some of the nested assets into functional species groups (arboreal fauna and ground dwelling fauna) to explore any unique threats that they may have, that do not obviously emerge for the asset classes.

Amongst the most critical threats, those that pose a threat to a variety of conservation assets across the region are;

- Previous and on-going catchment-scale clearing and fragmentation
- Inappropriate fire regimes
- Feral species; predation on fauna, over-grazing and weed invasion
- Land management practices including grazing

Table 5 Direct threat rating summary (threat rating applies to nested assets also)

Threats/assets	Rivers and creek systems	Large-intact dry forests and woodlands	Native grasslands on private land	Woodlands and forests on private land	Medium to small intact dry forests and woodlands	Roadside vegetation	Paddock trees	Overall threat rank
Stock grazing	Med	-	High	High	-	Low	Med	Med
Agricultural land-use practices	High	-	Very high	Med	-	Low	High	High
Farm dams/off takes	Med	-	-	-	-	-	-	Low
Changing land-use	-	-	High	Med	-	-	High	Med
Weed invasion	Low	Med	High	High	Med	High	-	High
Fertiliser and pesticide run-off	Low	-	-	-	-	Low	High	Med
Aquatic pest species	Low	-	-	-	-	-	-	Low
Grazing pest species (deer, Rabbits)	-	Med	Med	Med	Med	Low	-	Med
Predator pest species (foxes, cats)	Med	High	Med	High	High	Med	-	High
Severe bushfire	Med	Med	Med	High	High	High	Med	High
Inappropriate fire regimes	Low	High	High	Med	High	Med	High	High
Soil pathogens	-	Med	Low	Low	Med	Low	-	Low
Native animal grazing	Low	Low	-	Low	Low	Low	Low	Low
Extreme weather events	High	Med	-	-	Med	-	High	Medium
Firewood collection	Low	Low	Low	Med	Med	Med	Med	Medium
Utility works	-	-	-	-	-	Med	-	Low
Habitat fragmentation	Med	Low	High	High	Med	High	High	High
Vehicle hygiene	-	-	Low	Low	-	Low	-	Low
Vegetation loss (clearing)	-	-	High	High	-	Med	High	Med
Summary Target Rating	Med	Medium	Very high	High	Medium	Medium	High	

The overall ranking of threats for each asset is dependent on a number of factors including; the severity of impact of the threat, whether the damage to the asset is widespread or localised and the reversibility of the threat. A ranking of Very High indicates that threats are widespread and not easily reversible, while a ranking of Low indicates that the effects of the threat are reversible at relatively low cost.

5.1 Description of key direct threats

Habitat fragmentation and vegetation loss

Habitat fragmentation and loss is a major threat to all assets. It results in a loss of genetic diversity, population declines, and deterioration in habitat quality and inadequate habitat and resources for animal species. It has been caused by wide-spread historical vegetation clearance but is ongoing through firewood collection, housing and infrastructure development, increases in farm machinery sizes, incremental ongoing clearing of vegetation and other land management practices. Key stakeholders include developers, private landholders, DELWP, logging industry, firewood users, local government and CMAs.

Inappropriate fire regimes and extreme fire events

Fire regimes and extreme fire events are a key threat to all assets, altering vegetation composition and structure and thus habitat availability, impacting already fragmented and reduced populations of plant and animal species. Increased frequency and extent of severe bushfires is a key predicted impact of climate change. Government bushfire prevention policy is affecting changes to the fire regimes experienced across public lands, arguably resulting in some areas receiving too high a fire frequency and others too low. Key stakeholders include DELWP, Parks Victoria, CFA, neighbouring landholders and the wider community.

Introduced pest species

Introduced pest species pose a medium to high threat to assets. Foxes and cats are the key predatory pest species in the area, having a high impact on native animal populations. Reasons for their presence was attributed to a lack of awareness of the impact of cats and foxes, limited cost effective controls, cat dumping, lack of incentive for landholders to do much about it (i.e. why would they invest time and money into cat control) and limited integrated management. Stakeholders include public land managers, landholders, cat owners, regulators (policy) and DELWP.

Pest grazers impacting vegetation communities include rabbits, hares, deer, goats and pigs. Their proliferation in native systems is caused by historic releases (rabbit and deer), pigs being released by hunters, resources (time and money), limited integrated management and lack of awareness (tree changers). Key stakeholders include hunters, landholders, DELWP, DEDJTR, public land managers and local government.

Problem weed species are widespread and, in areas, pose a serious threat to vegetation communities. Problem species include; Sallow Wattle, Bridal Creeper, Blackberry, Gorse, Briar Rose, Patterson's Curse, Spiny Rush, Broom, Phalaris, African Weed Orchid, St John's Wort, Chilean Needle Grass and Gazania. Their spread and persistence is caused by fire regimes, transport (in stock feed, lack of vehicle hygiene), lack of consistent control works (classification of weeds impacting funding and compliance), lack of awareness of new and emerging species, farm finances and time constraints, poor farm practices and a lack of awareness (tree changers). Key stakeholders include transport companies, stock agents, hay companies, DELWP, DELWP, DEDJTR, landholders, local government and CMAs.

Land management practices

Land management practices are a high to medium threat for all assets. Threatening agricultural practices of note include the conversion of grazing land to cropping, pasture improvement and blue-gum plantation establishment. However, although there are blue-gum plantations present most are not going a second rotation and are being sold off and reverted back to agriculture. Changing land ownership from farming to hobby farms and life-style blocks is putting pressure on the ecological system, through poor management practices by often absentee-landholders. The shift in land management practices is driven by changing farm

economics (shifting commodity prices, input costs, interest rates, access to markets and climate change), a lack of knowledge, planning policies, climate change and apathy towards the environment.

Grazing pressure

Inappropriate grazing practices on waterways, grassland, woodland and forest remnants by stock on private land and around paddock trees is impacting grasses, understorey and impacting recruitment of all structural components of vegetation. Grazing practices are determined by the changing economics of farming, dry seasons interacting with commodity prices, a lack of awareness and cultural practices inherited from former generations.

Grazing pressures from native species pose a high threat to some components of some systems also. Stakeholders include land managers and the government.

Ecological changes observed by Workshop participants

How the region's ecology has changed in recent times; observations of workshop participants

- There has been a marked change from grazing to cropping which alters grasslands and reduces the opportunities for trees.
- Many creeks have been formed by land holders putting in rip lines and then erosion has scoured out 6 to 8 foot creeklines. The result is a drying of the land in the proximity of the creekline.
- Country roads being built up and changing the flow of water by acting as levee banks. Springs have been turned into dams.
- Revegetation has been too dense in places. Especially around wetlands, there are too many trees around them, impacting flight paths into those wetlands.
- There have been marked changes to fire regimes
- There are many more Corellas than there used to be competing with less abundant and less aggressive hollow dependant fauna. They were threatened but changed their feeding behaviour to survive.
- Kangaroos are more abundant but Koalas are less so and we need more in freehold vegetation
- Natural springs have not been flowing as much as they used to.
- Around Raglan you could fish for trout and there were lots of platypus but now 8-10 months of the year the rivers/creeks are dry.
- 70 years ago brolgas were shot but now we are working to protect them
- Brolga numbers have declined rapidly indicating there is less water in the landscape
- Over the last 15 years there has been a loss of vistas due to blue gum plantings.
- Due to a well-coordinated and persistent effort there is much less gorse (90% reduction in 15 years).
- There has been serious modification of vegetation including change in forest structures

6. Objectives and actions

The overall vision for the Grampians to Pyrenees Biolink is “A healthy and connected landscape between the Grampians (Gariwerd) and Pyrenees Ranges that supports our people and our biodiversity”.

The objectives for each of the ecological asset have been identified below with the aim of these objectives being more specific than the overall project vision, but cumulatively will result in the project vision being realised.

Key ecological attributes of our assets (those qualities of an ecological asset’s biology or ecology that if missing or altered, would lead to the loss of that target over time) were identified. They are the most critical components that sustain an asset’s viability or ecological integrity over space and time; they can include biological composition, structure, interactions and processes, environmental regimes such as fire frequencies and landscape configuration.

With those vital qualities in mind, using available datasets we attempted to assess their current state (‘health’) and determined our desired future state. Potential indicators for each ecological attribute were identified, providing a means to measure or rate that attribute (Appendix 4).

Specific actions to address key threats and status of key ecological attributes were identified. Targets for actions will be set pending further quantification of the current and desired states of the key ecological attributes.

6.1 Large intact dry forests and woodlands

Desired future state: Complex and diverse ecosystems that provide plentiful prey species for higher order predators (birds, mammals and aquatic).

Objective 1: Maintain current area of large intact dry forests and woodlands and improve their condition to very good to maintain viable populations of prey species by 2035.

Key ecological attributes of the system, for which indicators and indicator ratings are required, were identified as being (1) Fire regimes experienced by the intact blocks of forests and woodlands (2) Species composition– with a focus on the presence of nested assets in this Asset class and (3) Large-scale landscape connectivity. Appendix 4 presents initial analyses of the present condition of indicators from available data for these ecological attributes.

Specific actions to address key threats and status of key ecological attributes include;

- Improvement of fire regimes,
- Integrated pest management,
- Pathogen control and
- Weed control.

6.2 River and creek systems

Desired future state: Ecologically functioning and resilient, highly connected rivers that provide habitat features, resources, movement and permanent pools in dry times, acting as drought refuges.

Objective 2 (a): Buffer and protect all target waterways, increasing riparian vegetation extent to 80% and for that vegetation to be in good condition,

Objective 2 (b): Increase the number of deep pools in the waterways which hold water through dry periods

Key ecological attributes of the system, for which indicators and indicator ratings are required for a quantitative assessment of the attributes' current state and future desired state, were identified as (1) Extent of riparian vegetation, (2) Width of riparian vegetation (3) Riparian vegetation fragmentation and (4) Presence of persistent deep pools through dry times. Appendix 4 presents initial analyses, from available data, of the present condition of indicators for these ecological attributes.

Specific actions to address key threats and status of key ecological attributes include;

- Revegetation of riparian corridors to ensure target waterways support at least 80% of their pre-1770 cover and that vegetation is not fragmented,
- Excluding stock from waterways to ensure 80% of riparian vegetation is in good condition,
- Encourage alternative stock watering to reduce regular stock access to waterways reducing rill, tunnel and gully erosion,
- Rabbit and weed control where required,
- Releasing environmental flows in regulated sections of waterways,
- Reducing the impact of farm dams through water authorities/council regulation, extension and education.

6.3 Medium to small-sized intact dry forests and woodlands on public land

Desired future state: Improved structural heterogeneity, habitat diversity, patch-size and ecological connectivity to ensure persistence of characteristic fauna and flora

Objective 3: Maintain current area of medium to small sized intact dry forests and woodlands on public land and improve their condition to maintain viable populations of prey by 2035.

Key ecological attributes of the system, for which indicators and indicator ratings are required, were identified as being (1) Size of patches, (2) Fire regimes experienced by the intact blocks of forests and woodlands (2) Condition of patches (3) Species composition – with a focus on the presence of nested assets in this Asset class (4) Vegetation structure and (5) Landscape connectivity. Appendix 4 presents initial analyses of the present condition of indicators from available data for these ecological attributes.

Specific actions to be undertaken to meet the objectives set for significant patches of remnant vegetation on public land were identified as including;

- Buffer on private land through revegetation, natural regeneration, weed and feral animal control
- Strategic improvement of habitat quality through activities such as ecological thinning, infill planting, control of firewood collection, rabbit control and nest boxes
- Improve fire regimes
- Pathogen control
- Coordinated pest-control program

6.4 Woodlands and forests on private land

Desired future state: Increased extent, ecological connectivity and structural diversity of woodlands and forests on private land with larger remnants supporting viable populations of woodland and forest faunal species.

Objective 4: Maintain existing, increase extent of, and improve the condition of Plains Grassland, Plains Woodlands and Dry Forests in strategic locations on private land to 30% cover with the aim of improving ecological connectivity and functionality.

Key ecological attributes of the system, for which indicators and indicator ratings are required, were identified as being (1) Area remaining (2) Size of patches (3) Condition of patches (4) Vegetation structure – with particular focus on regeneration and number of hollow-bearing trees and (5) Landscape connectivity. Appendix 4 presents initial analyses of the present condition of indicators from available data for these ecological attributes.

Specific actions to be undertaken to meet the objectives set for woodlands and forests on private land were identified as including;

- Revegetation and regeneration to increase overall extent, size of patches and their connectivity
- Habitat enhancement in remnant vegetation and revegetated areas including establishing nest boxes, maintaining logs and rocks
- Stock control
- Coordinated pest-control program of predator and grazers
- Fine-scale connectivity planning to guide activities at the local-scale and 'zone' scale.
- Awareness raising of the value of remnant vegetation to production systems and management techniques available
- Incentive provision for native vegetation/habitat establishment and maintenance
- Improve regulatory protection utilising existing legislation including the Native Vegetation Act, EPBC Act.

6.5 Native grasslands on private land

Desired future state: Increased extent and quality of grasslands on private land to support viable populations of grassland dependent fauna.

Objective 5: Ensure that larger patches of native grasslands on private land support viable populations of grassland faunal species.

Key ecological attributes of the system, for which indicators and indicator ratings are required, were identified as being (1) Area remaining (extent) (2) Size of patches remaining (3) Fire regimes (4) Species composition- – with a focus on the presence of nested assets in this Asset class. Appendix 4 presents initial analyses of the present condition of indicators from available data for these ecological attributes.

Specific actions to address key threats and status of key ecological attributes include;

- Comprehensive mapping to increase the knowledge of native grassland condition and distribution,
- Coordinated fox and cat control programs in areas of significance,
- Improve awareness of their environmental and production value, and of the management techniques available,
- Offer incentives for protection with detailed management plans including fox and cat control, weed control (specifically species such as Phalaris and Tall Wheat Grass), fire responsibilities and tight grazing control,
- Fine-scale connectivity planning to guide activities at the local-scale and 'zone' scale,
- Improve regulatory protection utilising existing legislation including the Native Vegetation Act, EPBC Act.

6.6 Roadside vegetation and paddock trees

Desired future state: Paddock trees managed to ensure their longevity and new recruitment. High quality remnant vegetation on roadsides remains in high condition.

Objective 6 (a) Maintain high quality roadside vegetation in strategic locations for ecological connectivity.

Objective 6 (b) Maintain existing paddock trees and achieve recruitment of paddock trees.

Key ecological attributes of the system, for which indicators and indicator ratings are required, were identified as being (1) Species composition, (2) Area of roadside vegetation in good condition and landscape supporting paddock trees (3) Structure – with a focus on recruitment and density of paddock trees and (4) Landscape connectivity. Appendix 4 presents initial analyses of the present condition of indicators from available data for these ecological attributes.

Specific actions to be undertaken to meet the objectives set for paddock trees and roadside vegetation were identified as including;

- Undertake a coordinated program to control weeds, rabbits and firewood collection on roadsides synchronising with works on private land and large public land reserves
- Education and awareness of paddock trees and roadside vegetation

- Encourage fencing and complimentary planting of existing paddock trees
- Improve fire regime – CFA, Local Government, Adjoining landholders
- Map paddock trees
- Encourage improved farm management actions to better protect paddock trees

6. Strategic actions

Six strategies were developed to achieve the conservation objectives set for the Grampians to Pyrenees Biolink.

All will require cooperation between the key stakeholders working in the region.

STRATEGIC ACTION 1: ***Increase the extent of native vegetation in strategic locations through encouraging natural regeneration and revegetation.***

This will be done with a focus on cost-effective techniques including stock control, planting using direct seeding techniques, tube stock planting and capitalising on natural regeneration where possible. Finer-scale spatial prioritisation of areas where revegetation would give the greatest benefit to the conservation assets should be undertaken within priority zones. Emerging carbon markets and government climate adaptation and mitigation plans (eg CMAs Carbon Plans) supporting biodiverse revegetation should be utilised. The project should further scope the opportunity for an increase in regeneration and revegetation activities in areas that are becoming uneconomic to farm across the whole Grampians to Pyrenees Project area.

STRATEGIC ACTION 2: ***Maintain and improve the quality and condition of existing native vegetation on both public and private land***

This will be achieved through decreasing the opportunity for indiscriminate stock grazing of existing native vegetation on private land. It will also require increasing the habitat quality of existing vegetation on public and private land where it is required (through various methods including introducing artificial habitat such as next boxes, logs and rocks). Ensuring the implementation of fire regimes based on ecological need will be required. Weed, rabbit, deer, pig and goat control, as well as control of new and emerging weeds, will need to be undertaken in a coordinated and targeted manner.

STRATEGIC ACTION 3: ***Targeted and coordinated predatory pest-control***

Targeted and coordinated predatory pest management control will require the development of strategies for the region for foxes and cats. Pathway management will also be required. This work will need to be targeted towards the protection of specific species, will need to be developed for the long-term and will require good communication and cooperation between land managers.

STRATEGIC ACTION 4: ***Increase resources and cooperation***

Achieving the objectives set in this plan will require an increase in the resources available for environmental work in the project area. It will also require stakeholders to continue working together through establishing a Grampians to Pyrenees Biolink key stakeholder committee. Partnerships and program alignment will be needed, with neighbouring biolinks (for example with Dalyenong Biolinks, Hard Hills Connections and Grampians to Little Desert) and with larger-scale connectivity conservation initiatives such as those being developed by the Central Victorian Biolinks Alliance, the Great Eastern Ranges initiative and Habitat 141. New sources of funding, such as corporate, philanthropic, and government investment or alternative sources such as bequests, crowd sourced funding and sponsorship that focus on increasing the awareness and levels of

support from city dwellers, should be investigated. A prospectus for the Grampians to Pyrenees project will be developed to assist with fundraising. Biodiversity Offset provision for projects such as the Western Highway upgrade, should be investigated as a potential funding opportunity.

STRATEGIC ACTION 5: ***Improve awareness and appreciation of the value of the Grampians to Pyrenees Biolink amongst landholders, government agencies and the general community***

Increased community profile of and engagement with the Grampians to Pyrenees Vision and objectives is essential to the success of the project. It will be raised through a variety of activities such as a Landholder Advocate program, one-on-one landholder visits, working with existing local groups and through field days, workshops, newsletters through direct mail outs, newspaper articles, radio and television. The communications programs will explicitly address project risks that may affect community buy-in such as fire and kangaroos. The community engagement program will consider the new corporate farming, tree changer and absentee landowner demographics in the region.

STRATEGIC ACTION 6: ***Improve knowledge, monitor and review***

This Plan does not quantify the objectives and set targets around actions due to a lack of fit-for-purpose measures of the current status of assets, as well as knowledge of what future state the key ecological attributes assets need to be in, to ensure their long term persistence and functionality. For example, there is little recent species population survey information, or spatial analyses of connectivity relevant to the scales and objectives of this plan.

Quantified objectives and actions should be derived for Assets in this plan. In doing so, it would additionally provide a strong basis for the development of indicators that would allow effective monitoring, evaluation and reporting on effectiveness of actions and overall progress of the project.

Partnerships with scientists, statisticians and resource managers will need to be established to;

- Review the nested assets identified this plan,
- Review and refine indicators for ecological asset objectives,
- Determine base-line (current status) indicator ratings for the key attributes of each asset objective,
- Determine ‘desired status’ for each key attribute,
- Develop a Monitoring, Evaluation and Reporting Plan that capable of supporting performance evaluation and outcomes monitoring of the Grampians to Pyrenees project.

The Strategic Plan will be reviewed and adapted at least every five years.

Appendices

Appendix 1. Methodology

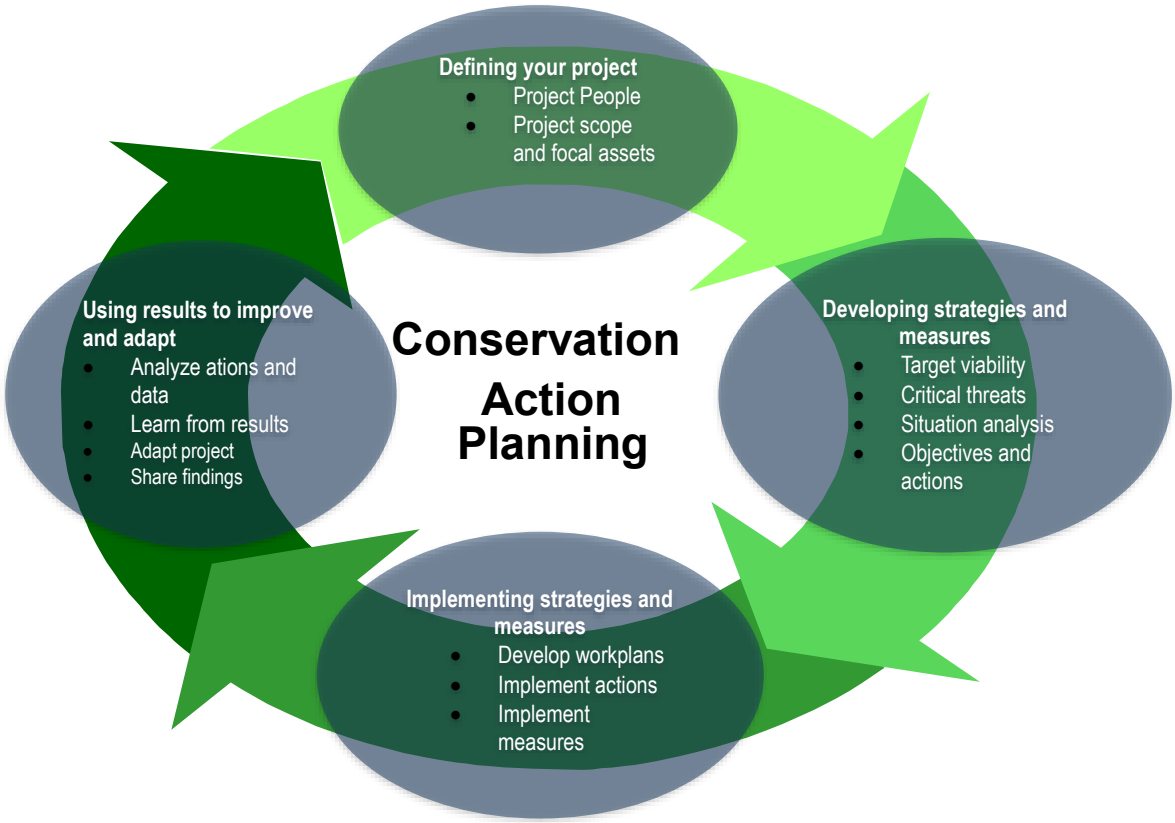
Conservation Action Planning cycle

Conservation Action Planning is The Nature Conservancy's version of the Open Standards for the Practice of Conservation.

https://www.conservationgateway.org/ConservationPlanning/ActionPlanning/Pages/conservation-action-plann.aspx

Conservation Action Planning addresses a complete project cycle, including design, implementation and evaluation. The first two phases of the cycle (below) were carried out in developing this Plan.

It is being adopted by numerous conservation projects in Australia – including by the Habitat 141, Gondwana Link connectivity projects.



Appendix 2. Threat rating analysis – stresses and their sources.

1. Large intact dry forests and woodlands

Stresses to large intact dry forests and woodlands

Stresses	Severity	Scope	Stress rank
Altered structure	High	High	High
Altered composition	Med	Med	Med
Habitat Fragmentation	Med	Med	Med
Predation	High	High	High

Sources of stress to large intact dry forests and woodlands (direct threats)

- Inappropriate fire regimes – Government burning
- Over grazing by rabbits, deer and goats
- Over grazing by abundant native wildlife (Kangaroos)
- Pest plants – sallow wattle
- Logging
- Severe bushfires
- Extreme weather
- Soil pathogens and diseases (*Phytothera cinnamonni, Armillaria*)
- Firewood collection

2. Rivers and creek systems

Stresses to river and creek systems

Stresses	Severity	Scope	Stress rank
Siltation[1] (loss of deep holes)	Very high	Very High	Very high
Alteration of riparian vegetation[2]	Med/High	High	High
Altered flow regimes	Med	High	Med
Water quality (salt and nutrients)	High	High	High
Lack of in-stream habitat	Low	Low	Low

[1]Wimmera, Mt William

[2] Upper Hopkins – poor; Mt William (Phragmites and spiny rush)

Sources of stresses to rivers and creek systems (direct threats)

- Poor farming practices; over-grazing, burning stubble, excessive tillage, land clearing, eroding gullies and nutrient run-off *
- Introduction of exotic fish species- Carp, Gambosia, Redfin and a lack of control works

- Plant species – *Phragmites* and spiny rush
- Dams
- Historical clearing of vegetation in recharge areas
- Climate change (extreme weather events, severe bushfires, drying)
- Extraction of water

Habitat fragmentation (Past vegetation loss)

3. Medium to small sized intact dry forest and woodlands on public land

Stresses medium to small-sized intact dry forests and woodlands

Stresses	Severity	Scope	Stress rank
Altered composition	Medium	Very high	High
Altered fire regime	High	High	High
Altered structure	High	High	High
Habitat fragmentation	Med	Med	Med

Sources of stresses medium to small-sized intact dry forests and woodlands (direct threats)

- Over-abundant native wildlife
- Rabbits, goats, foxes, cats
- Weeds
- Inappropriate fire regimes
- Firewood collection
- Severe bushfires
- Extreme weather
- Off-road driving – motor bikes and 4WDs
- Soil pathogens

4. Woodlands and forest on private land

Stresses to woodlands and forests on private land

Stresses	Severity	Scope	Stress rank
Habitat fragmentation	Medium	Very high	High
Altered fire regime	High	High	High
Habitat conversion	Very high	Medium	High
Altered composition	High	High	High
Altered structure	High	High	High

Sources of stress to woodlands and forests on private land (direct threats)

- Changes in land use from grazing to cropping, vegetation clearing.
- Changed fire regimes – government fire policy and loss of indigenous knowledge

- Agricultural land use practices, including stock grazing regimes and fertiliser use.
- Inappropriate fire regimes
- Severe bushfires
- Weed invasions

5. Native grasslands on private land

Stresses to native grasslands on private land

Stresses	Severity	Scope	Stress rank
Habitat fragmentation	Medium	Very high	High
Altered fire regime	High	High	High
Habitat conversion	Very high	Medium	High?
Altered composition	High	High	High

Sources of stress to native grasslands on private land (direct threats)

- Agricultural land-use practices, including stock grazing regimes, fertiliser use and clearing
- Changes in land use from grazing to cropping
- Changed fire regimes – loss of indigenous knowledge
- Weed invasion
- Predator pest species, foxes and cats.
- Rabbits

6. Paddock trees and roadside vegetation

Stresses to paddock trees

Stresses	Severity	Scope	Stress rank
Habitat fragmentation	High	Very high	High
Habitat destruction	Very high	Medium	High
Altered structure	Very high	Very high	Very high
Altered composition	High	Very high	High

Sources of stresses to paddock trees

- Land use change – grazing to cropping
- Grazing
- Agricultural practices- increases in machinery size and use, fertiliser and pesticides
- Extreme weather events
- Severe bushfires
- Firewood collection or ‘cleaning up’

Stresses to roadside vegetation

Stresses	Severity	Scope	Stress rank
Habitat fragmentation	Medium	Very high	High
Habitat destruction	Very high	Low	Medium
Altered structure	Medium	High	Medium
Altered composition	High	Very high	Very high

Sources of stresses to roadside vegetation (direct threats)

- Past land clearing
- Utilities, roadworks, fire breaks
- Fire wood collection
- Weed invasions- seeds from passing vehicles
- Garden plant invasions
- Grazing by rabbits, hares, kangaroos

Appendix 3: Fauna and flora occurring in the G2P Biolink and their Australian and Victorian conservation status

Conservation status in Australia (EPBC)

Code	Category
EX	Extinct: A taxon is extinct when there is no reasonable doubt that the last individual of the taxon has died.
CR	Critically Endangered: A taxon is critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.
EN	Endangered: A taxon is endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.
VU	Vulnerable: A taxon is vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium-term future

Conservation status in Victoria

Code	Category
x	Presumed Extinct in Victoria: not recorded from Victoria during the past 50 years despite field searches specifically for the plant, or, alternatively, intensive field searches (since 1950) at all previously known sites have failed to record the plant.
e	Endangered in Victoria: at risk of disappearing from the wild state if present land use and other causal factors continue to operate.
v	Vulnerable in Victoria: not presently endangered but likely to become so soon due to continued depletion; occurring mainly on sites likely to experience changes in land-use which would threaten the survival of the plant in the wild; or, taxa whose total population is so small that the likelihood of recovery from disturbance, including localised natural events such as drought, fire or landslip, is doubtful.
r	Rare in Victoria: rare but not considered otherwise threatened - there are relatively few known populations or the taxon is restricted to a relatively small area.
k	Poorly Known in Victoria: poorly known and suspected, but not definitely known, to belong to one of categories (x, e, v or r) within Victoria. At present, accurate distribution information is inadequate

Status under the Flora and Fauna guarantee act

Code	Category
D	Delisted as threatened
I	Rejected for listing as threatened; taxon invalid
L	Listed as threatened N Nominated for listing as threatened
X	Rejected for listing as threatened; taxon ineligible

Fauna

Scientific Name	Common Name	EPBC	DELWP	FFG	
Accipiter novaehollandiae novaehollandiae	Grey Goshawk		V		L
Acrodipsas brisbanensis	Large Ant Blue		CE	L	
Alcedo azurea	Azure Kingfisher		NT		
Anas rhynchotis	Australasian Shoveler		V		
Anseranas semipalmata	Magpie Goose		NT		L
Anthochaera Phrygia	Regent Honeyeater	EN	CE		L
Aprasia striolata	Striped Worm-lizard		NT		L

Scientific Name	Common Name	EPBC	DELWP	FFG
Ardea intermedia	Intermediate Egret		E	L
Ardea modesta	Eastern Great Egret		V	L
Ardeotis australis	Australian Bustard		CE	L
Aythya australis	Hardhead		V	
Biziura lobate	Musk Duck		V	
Botaurus poiciloptilus	Australasian Bittern	EN	E	L
Burhinus grallarius	Bush Stone-curlew		E	L
Calidris alba	Sanderling		NT	
Calidris canutus	Red Knot		E	
Calidris ferruginea	Curlew Sandpiper		E	
Calidris melanotos	Pectoral Sandpiper		NT	
Calidris subminuta	Long-toed Stint		NT	
Calyptorhynchus banksii graptogyne	Red-tailed Black-Cockatoo	EN	E	L
Cercartetus nanus	Eastern Pygmy Possum		NT	I
Charadrius australis	Inland Dotterel		V	
Chlidonias hybridus javanicus	Whiskered Tern		NT	
Chrysococcyx osculans	Black-eared Cuckoo		NT	
Chthonicola sagittata	Speckled Warbler		V	L
Cinclosoma castanotus	Chestnut Quail-thrush		NT	
Cinclosoma punctatum	Spotted Quail-thrush		NT	
Circus assimilus	Spotted Harrier		NT	
Climacteris picumnus victoriae	Brown Treecreeper (south-eastern subspecies)		NT	
Coracina maxima	Ground Cuckoo-shrike		V	L
Coturnix chinensis victoriae	King Quail		E	L
Dasyurus maculatus maculatus	Spot-tailed Quoll	EN	E	L
Delma impar	Striped Legless Lizard	VU	E	L
Dromaius novaehollandiae	Emu		NT	
Egretta garzetta nigripes	Little Egret		E	L
Eulamprus kosciuskoi	Alpine Water Skink		CE	L
Falco subniger	Black Falcon		V	
Gadopsis marmoratus **upper Wannon**	River Blackfish upper Wannon River form		CE	
Galaxiella pusilla	Dwarf Galaxias (Barwon River to Mitchell River)	VU	E	L
Gallinago hardwickii	Latham's Snipe		NT	N
Geopelia cuneate	Diamond Dove		NT	L
Gobiomorphus australis	Striped Gudgeon		NT	
Gobiomorphus coxii	Cox's Gudgeon		E	L
Grantiella picta	Painted Honeyeater		V	L
Grus rubicunda	Brolga		V	L
Haliaeetus leucogaster	White-bellied Sea-Eagle		V	L
Hesperilla flavescens flavescens	Yellow Sedge-skipper	L	V	
Hirundapus caudacutus	White-throated Needletail		V	
Hylacola pyrrhopygia	Chestnut-rumped Heathwren		V	L
Isoodon obesulus obesulus	Southern Brown Bandicoot	EN	NT	L
Larus pacificus pacificus	Pacific Gull		NT	
Lathamus discolour	Swift Parrot	EN	E	L

Scientific Name	Common Name	EPBC	DELWP	FFG
Leipoa ocellata	Malleefowl	VU	E	L
Lichenostomus cratitius	Purple-gaped Honeyeater		V	
Limosa limosa	Black-tailed Godwit		V	
Lissolepis coventryi	Swamp Skink		V	L
Litoria raniformis	Growling Grass Frog	VU	E	L
Lophoictinia isura	Square-tailed Kite		V	L
Maccullochella peelii	Murray Cod	VU	V	L
Macquaria ambigua	Golden Perch (natural populations)		NT	I
Macquaria australasica	Macquarie Perch	EN	E	L
Mastacomys fuscus mordicus	Broad-toothed Rat		E	N
Melanodryas cucullata cucullata	Hooded Robin		NT	L
Morethia adelaidensis	Samphire Skink		E	L
Nannoperca obscura	Yarra Pygmy Perch	VU	V	L
Neophema elegans	Elegant Parrot		V	
Ninox connivens connivens	Barking Owl		E	L
Ninox strenua	Powerful Owl		V	L
Notomys mitchelli	Mitchell's Hopping Mouse		NT	
Numenius madagascariensis	Eastern Curlew		V	
Nycticorax caledonicus hillii	Nankeen Night Heron		NT	
Oreoica gutturalis gutturalis	Crested Bellbird		NT	L
Oxyura australis	Blue-billed Duck		E	L
Pachycephala rufogularis	Red-lored Whistler	VU	E	L
Pedionomus torquatus	Plains-wanderer	VU	CE	L
Petauroides volans	Greater Glider		V	
Petaurus norfolcensis	Squirrel Glider		E	L
Petrogale penicillata	Brush-tailed Rock Wallaby	VU	CE	L
Phalacrocorax varius	Pied Cormorant		NT	
Phascogale tapoatafa tapoatafa	Brush-tailed Phascogale		V	L
Phreatoicopsis terricola	Phreatoicid isopod		V	
Planigale gilesi	Gile's Planigale		NT	L
Platelea regia	Royal Spoonbill		NT	
Plegadis falcinellus	Glossy Ibis		NT	
Pogona barbata	Bearded Dragon		V	
Polytelis anthopeplus monarchoides	Regent Parrot	VU	V	L
Pomatostomus temporalis temporalis	Grey-crowned Babbler		E	L
Porzana pusilla palustris	Baillon's Crake		V	L
Potorous tridactylus tridactylus	Long-nosed Potoroo	VU	NT	L
Prototroctes maraena	Australian Grayling	VU	V	L
Pseudalmenus chlorinda fisheri	Silky Hairstreak	I		
Pseudemoia cryodroma	Alpine Bog Skink		E	L
Pseudemoia pagenstecheri	Tussock Skink		V	
Pseudomys fumeus	Smoky Mouse	EN	E	L
Pseudomys novaehollandiae	New Holland Mouse		V	L
Pseudomys shortridgei	Heath Mouse	VU	NT	L
Pseudophryne bibronii	Brown Toadlet		E	L
Pseudophryne semimarmorata	Southern Toadlet		V	

Scientific Name	Common Name	EPBC	DELWP	FFG	
Pteropus poliocephalus	Grey-headed Flying-fox	VU	V		L
Pyrrholaemus brunneus	Redthroat		E		L
Ramphotyphlops proximus	Woodland Blind Snake		NT		
Sminthopsis crassicaudata	Fat-tailed Dunnart		NT		
Sminthopsis murina murina	Common Dunnart		V		
Stagonopleura guttata	Diamond Firetail		NT		L
Stictonetta naevosa	Freckled Duck		E		L
Stiltia Isabella	Australian Pratincole		NT		
Synemon plana	Golden Sun Moth	CR	CE	L	
Tandanus tandanus	Freshwater Catfish		E		L
Tringa glareola	Wood Sandpiper		V		
Tringa nebularia	Common Greenshank		V		
Turnix pyrrhothorax	Red-chested Button-quail		V		L
Turnix velox	Little Button-quail		NT		
Varanus varius	Lace Monitor		E		
Vermicella annulata	Bandy Bandy		V		L

Flora

Scientific Name	Common Name	EPBC	DELWP	FFG	
Acacia deanei* subsp. *Paucijuga	Deane's Wattle		r		
Acacia farinosa	Mealy Wattle		k		
Acacia glandulicarpa	Hairy-pod Wattle	VU	v		L
Acacia leprosa* var. *graveolens	Common Cinnamon-wattle		k		
Acacia rupicola	Rock Wattle		r		
Acacia verticillata* subsp. *Ruscifolia	Broad-leaf Prickly Moses		r		
Allocasuarina grampiana	Grampians Sheoak		r		
Allocasuarina luehmannii	Buloke		e		L
Allocasuarina mackliniana* subsp. *hirtilinea	Western Sheoak		r		
Alternanthera nodiflora	Common Joyweed		k		
***Alternanthera* sp. 1 (Plains)**	Plains Joyweed		k		
Amphibromus pithogastrus	Plump Swamp Wallaby-grass		e		L
Amyema linophylla* subsp. *Orientale	Buloke Mistletoe		v		
Asperula minima	Mossy Woodruff		r		
Asplenium aethiopicum	Shredded Spleenwort		v		
Asplenium appendiculatum* subsp. *Appendiculatum	Ground Spleenwort		r		
Asterolasia phebalioides	Downy Star-Bush	VU	v		L
***Astrotricha* sp. 1 subsp. 1**	Grampians Star-hair		r		
***Astrotricha* sp. 1 subsp. 2**	Greater Grampians Star-hair		v		
Atriplex lindleyi* subsp. *Conduplicata	Baldoo		r		
Austrostipa breviglumis	Cane Spear-grass		r		
Austrostipa exilis	Heath Spear-grass		r		
Austrostipa hemipogon	Half-bearded Spear-grass		r		
Austrostipa macalpinei	Annual Spear-grass		r		
Austrostipa puberula	Fine-hairy Spear-grass		r		
Austrostipa trichophylla	Spear-grass		r		

Scientific Name	Common Name	EPBC	DELWP	FFG
Austrostipa tuckeri	Tucker's Spear-grass		x	
Banksia saxicola	Rock Banksia		r	
Bauera sessiliflora	Grampians Bauera		r	
Bertya grampiana	Grampians Bertya		v	
Boronia latipinna	Grampians Boronia		r	
Boronia nana* var. *pubescens	Dwarf Boronia		r	
Borya mirabilis	Grampians Pincushion-lily	EN	e	L
Bossiaea cordigera	Wiry Bossiaea		r	
Bossiaea riparia	River Leafless Bossiaea		r	
Bossiaea rosmarinifolia	Grampians Bossiaea		r	
Brachyloma depressum	Spreading Brachyloma		r	
Brachyscome readeri	Reader's Daisy		r	
Burnettia cuneata	Lizard Orchid		r	
Caesia parviflora* var. *minor	Pale Grass-lily		k	
Caladenia ampla	Dainty Spider-orchid		e	
Caladenia audasii	McIvor Spider-orchid	EN	e	L
Caladenia cretacea	Stuart Mill Spider-orchid		e	L
Caladenia cruciformis	Red-cross Spider-orchid		e	L
Caladenia formosa	Elegant Spider-orchid	VU	v	L
Caladenia fulva	Tawny Spider-orchid	EN	e	L
Caladenia grampiana	Grampians Spider-orchid		v	L
Caladenia leptochila	Narrow-lip Spider-orchid		k	
Caladenia mentiens	Cryptic Pink-fingers		k	
Caladenia ornata	Ornate Pink-fingers	VU	v	L
***Caladenia reticulata* s.s.**	Veined Spider-orchid		v	
Caladenia toxochila	Bow-lip Spider-orchid		v	L
Caladenia venusta	Large White Spider-orchid		r	X
Caladenia versicolor	Candy Spider-orchid	VU	e	L
Caladenia vulgaris	Slender Pink-fingers		r	
Callistemon wimmerensis	Wimmera Bottlebrush	CR	e	L
Callitriche umbonata	Winged Water-starwort		r	X
Cardamine lineariloba	Western Bitter-cress		v	
***Cardamine tenuifolia* (large-flower form)**	Slender Bitter-cress		e	
Cassinia diminuta	Dwarf Cassinia		r	
Centipeda crateriformis* subsp. *Compacta	Compact Sneezeweed		r	
Centipeda nidiformis	Cotton Sneezeweed		r	
Centipeda pleiocephala	Tall Sneezeweed		e	
Choretrum glomeratum* var. *chrysanthum	Golden Sour-bush		r	
Choretrum spicatum* subsp. *Continentale	Spiked Sour-bush		r	
Chorizandra australis	Southern Bristle-sedge		k	
Comesperma polygaloides	Small Milkwort		v	L
Convolvulus angustissimus* subsp. *Omnigracilis	Slender Bindweed		k	
Coronidium adenophorum	Branched Everlasting		v	
Coronidium gunnianum	Pale Swamp Everlasting		v	
Correa aemula	Hairy Correa		r	
Correa lawrenceana* var. *grampiana	Grampians Mountain-correa		r	

Scientific Name	Common Name	EPBC	DELWP	FFG
Correa reflexa* var. *angustifolia	Grampians Correa		r	
Corunastylis ciliate	Fringed Midge-orchid		k	
Crowea exalata* subsp. *revolute	Whipstick Crowea		v	
Cyperus concinnus	Trim Flat-sedge		v	
Cyperus victoriensis	Yelka		k	
Cyphanthera anthocercidea	Large-leaf Ray-flower		r	
***Daviesia genistifolia* s.s.**	Broom Bitter-pea		r	
Daviesia laevis	Grampians Bitter-pea	VU	v	L
Deyeuxia imbricata	Bent-grass		v	
Dianella callicarpa	Swamp Flax-lily		r	
***Dianella* sp. aff. *longifolia* (Benambra)**	Arching Flax-lily		v	
***Dianella* sp. aff. *longifolia* (Riverina)**	Pale Flax-lily		v	
Dianella tarda	Late-flower Flax-lily		v	
Digitaria divaricatissima* var. *divaricatissima	Umbrella Grass		v	
Dillwynia oreodoxa	Grampians Parrot-pea		r	
Diuris basaltica	Small Golden Moths	EN	e	L
Diuris behrii	Golden Cowslips		v	
Diuris daltonii	Western Purple Diuris		v	L
Diuris gregaria	Clumping Golden Moths		e	L
Diuris palustris	Swamp Diuris		v	L
Diuris punctata	Purple Diuris		v	L
Diuris* X *palachila	Broad-lip Diuris		r	
Dodonaea boroniifolia	Hairy Hop-bush		r	
Dodonaea heteromorpha	Maple-fruited Hop-bush		x	
Dodonaea procumbens	Trailing Hop-bush	VU	v	
***Dryopoa dives* subsp. B**	Grampians Mountain-grass		v	
Duma horrida* subsp. *Horrida	Spiny Lignum		r	
Eleocharis pallens	Pale Spike-sedge		k	
Eleocharis plana	Flat Spike-sedge		v	
Enneapogon gracilis	Slender Bottle-washers		v	
Epacris impressa* var. *grandiflora	Grampians Heath		r	
Eriocaulon australasicum	Southern Pipewort	EN	e	L
***Eucalyptus* aff. *serraensis* (Mt William)**	Mt William Stringybark		k	
Eucalyptus alaticaulis	Grampians Grey-gum		r	
Eucalyptus carolaniae	Mount Martha Bundy		e	
Eucalyptus falciformis	Western Peppermint		r	
Eucalyptus froggattii	Kamarooka Mallee		r	L
Eucalyptus pauciflora* subsp. *Parvifructa	Grampians Sally		r	
Eucalyptus polybractea	Blue Mallee		r	
Eucalyptus pyrenea	Pyrenees Gum		r	
Eucalyptus sabulosa	Wimmera Scentbark		r	
Eucalyptus serraensis	Grampians Stringybark		r	
Eucalyptus tricarpa* subsp. *Decora	Bealiba Ironbark		v	
Eucalyptus verrucata	Mt Abrupt Stringybark		r	
Eucalyptus Victoriana	Victoria Range Stringybark		r	
Eucalyptus yarraensis	Yarra Gum		r	X
Euphrasia collina* subsp. *Muelleri	Purple Eyebright	EN	e	L

Scientific Name	Common Name	EPBC	DELWP	FFG
Euphrasia collina* subsp. *Trichocalycina	Purple Eyebright		r	
Euphrasia scabra	Rough Eyebright		e	L
Euryomyrtus ramosissima* subsp. *prostrata	Nodding Baeckea		r	
Gahnia ancistrophylla	Donkey Saw-sedge		v	
Gahnia deusta	Heathy Saw-sedge		e	
Gahnia microstachya	Slender Saw-sedge		r	
Galium curvihirtum	Tight Bedstraw		r	
***Geranium* sp. 3**	Pale-flower Crane's-bill		r	
Glycine latrobeana	Clover Glycine	VU	v	L
Gnephosis drummondii	Slender Cup-flower		r	
Gonocarpus mezianus	Hairy Raspwort		r	
Goodenia lineata	Grampians Goodenia		r	
Goodia medicaginea	Western Golden-tip		r	
Goodia pubescens	Silky Golden-tip		r	
Grevillea confertifolia	Grampians Grevillea		r	
Grevillea dimorpha	Flame Grevillea		r	
Grevillea dryophylla	Goldfields Grevillea		r	
Grevillea floripendula	Ben Major Grevillea	VU	v	L
Grevillea gariwerdensis	Gariwerd Grevillea		k	
Grevillea micrantha	Small-flower Grevillea		r	
Grevillea microstegia	Mount Cassell Grevillea		r	L
Grevillea montis-cole* subsp. *Brevistyla	Langi Ghiran Grevillea	VU	v	L
Grevillea montis-cole* subsp. *montis-cole	Mount Cole Grevillea		r	
Grevillea rosmarinifolia* subsp. *Glabella	Smooth Grevillea		r	
Grevillea rosmarinifolia* subsp. *rosmarinifolia	Rosemary Grevillea		r	
Hibbertia cistiflora* subsp. *rostrate	Rock Rose Guinea-flower		r	
Hibbertia humifusa* subsp. *Debilis	Dergholm Guinea-flower	VU	v	L
Hibbertia humifusa* subsp. *Humifusa	Rising Star Guinea-flower		r	
Hovea corrickiae	Glossy Hovea		r	
Huperzia Australiana	Fir Clubmoss		r	
Huperzia varia	Long Clubmoss		v	
Hypoxis vaginata* var. *brevistigmata	Yellow Star		k	
Isoetes drummondii* subsp. *Anomala	Plain Quillwort		k	
Isolepis congrua	Slender Club-sedge		v	L
Isolepis wakefieldiana	Tufted Club-sedge		r	
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	v	L
Lachnagrostis punicea* subsp. *Filifolia	Purple Blown-grass		r	L
Lachnagrostis punicea* subsp. *Punicea	Purple Blown-grass		r	
Lachnagrostis robusta	Salt Blown-grass		r	
Lachnagrostis scabra* subsp. *Curviseta	Rough Blown-grass		e	
Lawrencia spicata	Salt Lawrencia		r	
Leionema bilobum* subsp. *Bilobum	Truncate Leionema		r	
Leionema bilobum* subsp. *Thackerayense	Notched Leionema		k	
Lemna trisulca	Ivy-leaf Duckweed		k	
Lepidium aschersonii	Spiny Peppercress	VU	e	L
Lepidosperma canescens	Hoary Rapier-sedge		r	
Leptorhynchos elongates	Lanky Buttons		e	

Scientific Name	Common Name	EPBC	DELWP	FFG
Leptorhynchos orientalis	Annual Buttons		e	L
Leptorhynchos waitzia	Button Immortelle		v	
Leptospermum turbinatum	Shiny Tea-tree		r	
Lepyrodia flexuosa	Twisting Scale-rush		r	
Leucochrysum albicans* var. *tricolor	White Sunray	EN	e	L
Leucopogon neurophyllus	Veined Beard-heath		r	
Leucopogon thymifolius	Thyme Beard-heath		r	
Leucopogon virgatus* var. *brevifolius	Common Beard-heath		r	
Levenhookia sonderi	Slender Stylewort		r	
Lomandra micrantha* subsp. *tuberculate	Small-flower Mat-rush		r	
Lycopodiella serpentine	Bog Clubmoss		r	
Marianthus bignoniaceus	Orange Bell-climber		r	
Marsilea mutica	Smooth Nardoo		k	
Melaleuca armillaris* subsp. *Armillaris	Giant Honey-myrtle		r	
Minuria integerrima	Smooth Minuria		r	
Monotoca billawinica	Grampians Broom-heath		r	
Nematolepis squamea* subsp. *Squamea	Satinwood		r	
Olearia asterotricha	Rough Daisy-bush		r	
Olearia speciose	Netted Daisy-bush		k	
Olearia suffruticosa	Clustered Daisy-bush		v	
Olearia tubuliflora	Rayless Daisy-bush		r	
Paracaleana disjuncta	Grampians Duck-orchid		e	L
Parietaria australis	Western Pellitory		r	
Pellaea calidirupium	Inland Sickle-fern		k	
Phebalium stenophyllum	Narrow-leaf Phebalium		r	
Philotheca angustifolia* subsp. *Montana	Narrow-leaf Wax-flower		v	
Philotheca difformis* subsp. *Difformis	Small-leaf Wax-flower		e	L
Philydrum lanuginosum	Woolly Waterlily		v	
Phyllanthus australis	Pointed Spurge		v	
Picris squarrosa	Squat Picris		r	
Pimelea hewardiana	Forked Rice-flower		r	
Pimelea linifolia* subsp. *Linoides	Slender Rice-flower		r	
Pimelea pagophila	Grampians Rice-flower	VU	v	L
Pimelea spinescens* subsp. *Spinescens	Spiny Rice-flower	CR	e	(L)
Platylobium alternifolium	Victorian Flat-pea		r	
***Poa labillardierei* var. (Volcanic Plains)**	Basalt Tussock-grass		k	
Podolepis muelleri	Small Podolepis		e	L
Pomaderris apetala* subsp. *Apetala	Grampians Pomaderris		r	
Pomaderris paniculosa* subsp. *Paniculosa	Inland Pomaderris		v	
Poranthera corymbosa	Clustered Poranthera		r	
***Prasophyllum* aff. *fitzgeraldii* B**	Elfin Leek-orchid		e	
***Prasophyllum* aff. *validum* B**	Woodland Leek-orchid		e	
Prasophyllum lindleyanum	Green Leek-orchid		v	X
Prasophyllum parviflorum	Slender Leek-orchid		v	X
***Prasophyllum* sp. aff. *fitzgeraldii* A**	Pink-lip Leek-orchid		e	L
***Prasophyllum* sp. aff. *validum* A**	Woodland Leek-orchid		e	
Prasophyllum suaveolens	Fragrant Leek-orchid	EN	e	L

Scientific Name	Common Name	EPBC	DELWP	FFG
Prasophyllum subbisectum	Pomonal Leek-orchid	EN	e	L
Prostanthera lasianthos* var. *subcoriacea	Grampians Christmas-bush		r	
Prostanthera saxicola* var. *bracteolate	Slender Mint-bush		r	
Prostanthera spinose	Spiny Mint-bush		r	
Pseudanthus ovalifolius	Oval-leaf Pseudanthus		r	
Psilotum nudum	Skeleton Fork-fern		v	X
Pterostylis aciculiformis	Slender Ruddyhood		k	
Pterostylis despectans	Lowly Greenhood	EN	e	L
Pterostylis diminuta	Crowded Greenhood		v	
Pterostylis lustra	Small Sickle Greenhood		e	L
***Pterostylis planulata* s.s.**	Grampians Rustyhood		r	
Pterostylis setifera	Bristly Greenhood		r	
Pterostylis smaragdyna	Emerald-lip Greenhood		r	
Pterostylis tasmanica	Southern Plume-orchid		k	
Pterostylis uliginosa	Marsh Greenhood		k	
Pterostylis* X *ingens	Sharp Greenhood		r	
Pterostylis* X *toveyana	Mentone Greenhood		v	
Ptilotus erubescens	Hairy Tails		v	L
Pultenaea benthamii	Bentham's Bush-pea		r	
Pultenaea costata	Ribbed Bush-pea		r	
Pultenaea daltonii	Hoary Bush-pea		r	
Pultenaea graveolens	Scented Bush-pea		v	L
***Pultenaea juniperina* s.s.**	Prickly Beauty		r	
Pultenaea luehmannii	Thready Bush-pea		r	
Pultenaea maidenii	Maidens Bush-pea	EX	x	
Pultenaea patellifolia	Mt. Byron Bush-pea		r	
Pultenaea reflexifolia	Wombat Bush-pea		r	
Pultenaea subalpine	Rosy Bush-pea		r	
Pultenaea victoriensis	Victoria Range Bush-pea		r	
Pultenaea williamsoniana	Williamson's Bush-pea	VU	r	X
Quinetia urvillei	Quinetia		r	
Radyera farragei	Desert Rose Mallow		v	
Ranunculus amplus	Lacey River Buttercup		r	
Ranunculus papulentus	Large River Buttercup		k	
Ranunculus sessiliflorus* var. *pilulifer	Annual Buttercup		k	
Ruppia tuberosa	Tuberous Tassel		k	
Rutidosis leptorhynchoides	Button Wrinklewort	EN	e	L
Rytidosperma dimidiatum	Tasmanian Wallaby-grass		v	
Rytidosperma monticola	Small-flower Wallaby-grass		r	
Sarcozona praecox	Sarcozona		r	
Schoenus carsei	Wiry Bog-sedge		r	
Schoenus laevigatus	Short-leaf Bog-sedge		k	
Schoenus nanus	Tiny Bog-sedge		r	
Schoenus sculptus	Gimlet Bog-sedge		r	
Schoenus turbinatus	Top Bog-sedge		r	
Senecio glabrescens	Smooth Fireweed		v	
Senecio hispidissimus	Sand Fireweed		r	

Scientific Name	Common Name	EPBC	DELWP	FFG
Senecio hypoleucus	Pale Groundsel		v	
Senecio linearifolius* var. *gariwerdensis	Fireweed Groundsel (Grampians variant)		r	
Senecio macrocarpus	Large-headed Fireweed	VU	e	L
Senecio psilocarpus	Swamp Fireweed	VU	v	
Sphaerolobium acanthos	Grampians Globe-pea		r	L
Sporadanthus tasmanicus	Branching Scale-rush		r	
Spyridium cinereum	Tiny Spyridium		v	
Spyridium daltonii	Grampians Spyridium		r	
Spyridium* X *ramosissimum	Branched Spyridium		r	
Stylidium ecorne	Foot Triggerplant		k	
Stylidium soboliferum	Grampians Triggerplant		r	
Swainsona behriana	Southern Swainson-pea		r	
Swainsona brachycarpa	Slender Swainson-pea		v	L
Swainsona swainsonioides	Downy Swainson-pea		e	L
Tetrarrhena turfosa	Smooth Rice-grass		r	
Thelymitra azurea	Azure Sun-orchid		v	
Thelymitra benthamiana	Blotched Sun-orchid		v	
Thelymitra bracteata	Lofty Sun-orchid		e	
Thelymitra epipactoides	Metallic Sun-orchid	EN	e	L
Thelymitra gregaria	Basalt Sun-orchid		e	L
Thelymitra inflate	Inflated Sun-orchid		v	
Thelymitra lucida	Glistening Sun-orchid		e	
Thelymitra luteocilium	Fringed Sun-orchid		r	
Thelymitra mackibbinii	Brilliant Sun-orchid	VU	e	L
Thelymitra malvina	Mauve-tuft Sun-orchid		v	
Thelymitra matthewsii	Spiral Sun-orchid	VU	v	L
Thelymitra orientalis	Hoary Sun-orchid		v	
Thelymitra* X *chasmogama	Globe-hood Sun-orchid		v	
Thelymitra* X *irregularis	Crested Sun-orchid		r	
Thelymitra* X *macmillanii	Crimson Sun-orchid		v	
Thomasia petalocalyx	Paper Flower		r	
Thryptomene calycina	Grampians Thryptomene		r	
Triglochin mucronata	Prickly Arrowgrass		r	
Triodia bunicola	Southern Porcupine Grass		k	
Utricularia uniflora	Single Bladderwort		k	
Viola seppeltiana	Tiny Violet		r	
Vittadinia cuneata* var. *morrisii	Fuzzy New Holland Daisy		r	
Vittadinia dissecta* var. *dissecta	Dissected New Holland Daisy		k	
Westringia glabra	Violet Westringia		r	
Wurmbea uniflora	One-flower Early Nancy		r	
Xanthorrhoea caespitose	Tufted Grass-tree		r	
Xanthorrhoea glauca* subsp. *Angustifolia	Grey Grass-tree		e	L
Xanthosia leiophylla	Parsley Xanthosia		r	
Xanthosia tasmanica	Southern Xanthosia		r	
Xerochrysum palustre	Swamp Everlasting	VU	v	L
Zieria oreocena	Grampians Zieria		r	

Appendix 4: Key ecological attributes, potential indicators and their ratings for Assets

Key ecological attributes of assets are those qualities of an ecological asset's biology or ecology that if missing or altered, would lead to the loss of that target over time. The tables below present Key Ecological Attributes of Assets, potential indicators for each ecological attribute and a first pass assessment their current state ('health') and our desired future state using;

(1) Available datasets,

(2) Best guess estimations.

Table 1. Key ecological attributes for Large intact dry forests and woodlands, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key attribute	Indicator	Poor	Fair	Good	Very Good
Fire regime	% burned; frequency burned; burn intensity[1]				
Condition	NVR2013_Cond2 (mean score)[2]			78.73	
Species composition	Viable populations of sugar gliders, phascogales, antechinus[3]//feral species populations or extent				
Local landscape connectivity	Connectivity index (NV2005_Conn10)[4]				95.32
Large-scale landscape connectivity					

Table 2. Key ecological attributes for River and Creek systems, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key attribute	Indicator	Poor	Fair	Good	Very Good
Riparian vegetation extent	% of 1750 Riverine Grassy Woodland[5]		26%		80%
Width of riparian vegetation	Index of Stream Condition (ISC) – Vegetation width[6]				
Connectivity	ISC – Riparian Fragmentation				
Deep pools	Number remaining wet in dry periods[7]			80% of historic average	

[1] Determine existing using state fire mapping databases and consult ecologists to determine appropriate fire regimes
[2] Mean condition value calculated using Vic Govt. NVR2013_Cond2 dataset – a modelled estimate of vegetation condition from Habitat Hectares and Landscape Context data.
[3] Species' surveys will likely be needed to determine species population baselines
[4] Mean connectivity value determined using Vic Govt NV2005_Conn10 dataset.
[5] Calculated using EVC mapping of 1750 and 2005 cover
[6] Analyses by GHCMA and GBCMAs have shown that the only suitable Index of Stream Condition metrics for target setting are vegetation width, fragmentation and vegetation overhang.
[7] Establish estimate of number of remaining wet pools through past dry periods through analysis of historical satellite imagery. ARI are currently undertaking this analysis.

Table 3. Key ecological attributes for Medium to small sized intact dry forests and woodlands on public land, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key attribute	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Size of patches	Area to perimeter ratio				
Fire regime	% burned; frequency burned; burn intensity[8]				
Condition	NVR2013_Cond2 (mean score)[9]		68.64		
Species composition	Population sizes of nested assets/indicator sp., potentially: Koalas, Lace monitors, Southern brown bandicoots, Long-nosed potoroo, Sugar gliders, Antechinus, Brush tailed phascogales, Squirrel gliders, and bats spp[10]				
Vegetation structure	Habitat hectares				
Local landscape connectivity	Fragmentation index[11]		90.49		

Table 4. Key ecological attributes for Woodlands and Forests on Private Land, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key attribute	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Area remaining	% of 1750 area of Plains Woodlands, Forests[12]		13%	30%	
Size of patches	Area to perimeter ratio				
Condition	NVR2013_Cond2 (mean score)[13]		68.04		
Structure	Number of tree hollows per ha[14]			8-10 per ha.	
Landscape connectivity	Fragmentation index[15]		88.17		

[8] Determine existing using state fire mapping databases and consult ecologists to determine appropriate fire regimes
[9] Mean condition value calculated using Vic Govt. NVR2013_Cond2 dataset – a modelled estimate of vegetation condition from Habitat Hectares and Landscape Context data
[10] Further consultation with ecologists to determine appropriate indicator species and desired population sizes; species surveys likely required for baseline information
[11] Mean connectivity value determined using Vic Govt NV2005_Conn10 dataset.

[12] Area remaining is that for the Plains Woodlands across the whole region, irrespective of land tenure (2005 EVC mapping) – does not include forest.

[13] Mean condition value calculated using Vic Govt. NVR2013_Cond2 dataset – a modelled estimate of vegetation condition from Habitat Hectares and Landscape Context data
[14] Survey and analysis of tree hollows density may be needed
[15] Mean connectivity value determined using Vic Govt NV2005_Conn10 dataset.

Table 5. Key ecological attributes for Native grasslands on private land, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key attribute	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Area remaining	% of 1750 area of Plains Grasslands[16]	1%	15%	30%	
Fire regime	Fire frequency[17]				
Condition	NVR2013_Cond2 (mean score)[18]		57.91		
Size of patches	Area to perimetre ratio				
Species composition	Viable populations of striped legless lizard and quail[19]				

Table 6. Key attributes Roadside vegetation and paddock trees, potential indicators of attributes and, where currently known, a rating of the current status of the indicator (yellow) and desired future status (green).

		Indicator rating			
Key ecological attribute	**Indicator**	**Poor**	**Fair**	**Good**	**Very Good**
Species composition	Habitat Hectares score				
Structure	- Age classes[20] - Density of paddock trees			Eg 10% under the age of 10 years?	
Size	- Area of roadside vegetation in good condition - Area of paddock treed landscape				
Landscape connectivity	Fragmentation				

[16] Calculated using EVC mapping of 1750 and 2005 cover of Plains Grasslands

[17] Determine existing using state fire mapping databases and consult ecologists to determine appropriate fire regimes. Native grasslands probably not receiving enough fire at present

[18] Mean condition value calculated using Vic Govt. NVR2013_Cond2 dataset – a modelled estimate of vegetation condition from Habitat Hectares and Landscape Context data

[19] Further consultation with ecologists to determine appropriate indicator species and desired population sizes; species surveys likely required for baseline information

[20] To assess whether recruitment is occurring assess tree height/ages on roadsides and in around paddock trees.

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