

Biodiversity Discussion Paper to support the North Central Regional Catchment Strategy.

Conservation of biodiversity in the form of native vegetation, significant species and ecological communities is inextricably linked. The North Central region is one of the most highly cleared and fragmented landscapes on the continent and while the development of a productive and vibrant regional economy has resulted it is now crucial to protect and rebuild biodiversity assets into the future. This chapter recognises the need to integrate natural resource management actions at a range of scale to realise tangible outcomes for the distinctive regional elements of biodiversity in a way that supports and improves broader ecosystem processes.

Our vision

- **There is a reversal across the regional landscape of the long term decline in the quality and extent of native vegetation;**
- **Ecological processes are maintained and enhanced across the region;**
- **The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion, and**
- **There is no further preventable decline in the viability of rare or threatened species or ecological communities**

The biodiversity of North Central Victoria

The distinctive habitats of north-central Victoria reflect different bioregions, which 'capture' patterns of ecological characteristics in the landscape. Bioregions reflect underlying environmental features, are related to patterns of land use and can be used to identify the relationship between many natural resource based activities and biodiversity assets.

Native vegetation is important as it provides a range of vital ecosystem goods and services that underpin the health of the land and water, the flora and fauna, and the communities of the North Central region. These include:

Indirect economic benefits

Native vegetation provides environmental services, some of which provide indirect economic benefit. Biodiversity assets, particularly in forest areas/woodlands and in riparian zones assist in the provision of suitable water for drinking and other uses.

Heritage Values

Native plants and animals are an important part of the indigenous and non-indigenous cultural heritage of the region and their presence adds much to the value of landscapes.

Carbon Sequestration

Native forests and woodlands represent a substantial carbon "sink", which might otherwise contribute to greenhouse and climate change issues.

Direct Economic Benefits

A relatively small proportion of the indigenous biodiversity provides most direct economic benefits. Several native tree and shrub species are widely used in the production of timber, firewood and other forest products. Native pastures contribute to agricultural productivity in most dryland areas. Indigenous elements of the soil biota contribute to the health of soils and productive capacity of agricultural systems.

Impact of Ecological Systems Decline

The regeneration of habitat is an ecosystem service maintaining the natural asset that supports biodiversity. Decline of ecological systems (associated with native habitat) in the North Central region has occurred through a reduction in the extent and condition of many ecological communities, increased habitat fragmentation and exposure to a range of threatening processes. The current trajectory is still one of decline as the impact of past actions (e.g. clearance of native vegetation, overgrazing etc) is yet to be fully realized. For example species extinctions (e.g. woodland birds) are expected to still occur even if major landscape restoration is achieved over the next 20 years.

The original native vegetation of the region has undergone a dramatic decline in extent and quality since European settlement. Table 1 provides a summary of this depletion at a bioregional level. It can be seen that all bioregions have fared differently due to patterns of human land use, especially agricultural preferences for gentle landscapes and fertile soils.

Table 1: Extent of native vegetation for each bioregion within the North Central Region

Bioregion	Pre-1750 extent (ha)	Current extent (ha)	Proportion remaining (%)
Central Victorian Uplands	139,402	53,882	39
Goldfields	1,001,284	360,645	36
Murray Fans	147,585	28,956	20
Murray Mallee	202,685	13,242	6.5
Northern Inland Slopes	15,004	4,136	28
Victorian Volcanic Plain	162,165	9,471	5.8
Wimmera	424,912	19,628	4.6
North Central region	3,002,676	575,790	19.0

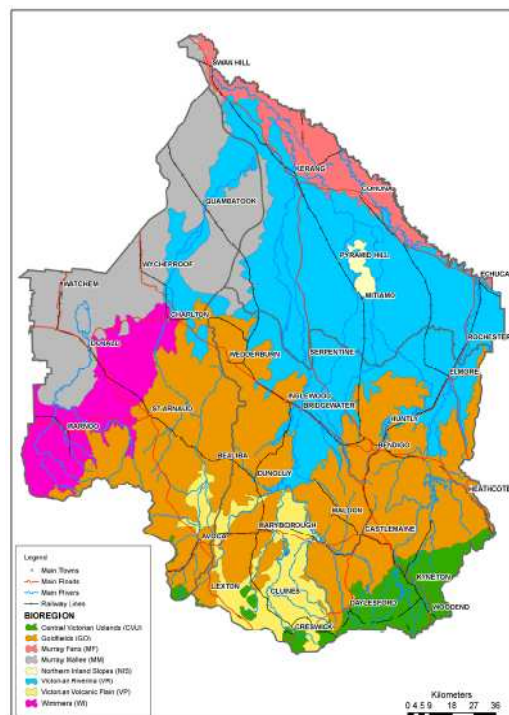
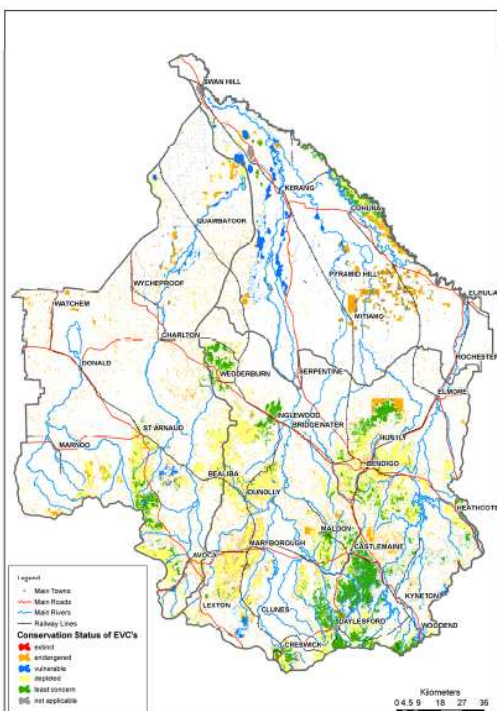
With the loss in native vegetation extent and quality since European settlement as a minimum our aspirational goal is to maintain current extent and condition of remnant habitat. Recent research in box-ironbark landscapes, using a case study approach shows evidence of a reversal in decline leading to an incremental increase in native vegetation extent in the order of 1-4% by 2020. Evidence for change in other bioregional landscapes or vegetation condition in general, is less clear.

Native vegetation is mapped as Ecological Vegetation Classes (EVCs), derived from land system (e.g. geomorphology, rainfall), vegetation structure, floristic information and other environmental information including aspect, fire frequency and ecological responses to disturbance. At a finer scale than bioregions, EVCs have been shown to be useful surrogates of biodiversity for birds, mammals and trees (but less so for invertebrates and reptiles.) In combination with the bioregions, the EVC classification system is an important tool for regional strategic planning as it provides valuable information about the level of depletion and threat status of different vegetation types. It can also inform the planning of on ground vegetation management activities and revegetation.

Conservation status of native vegetation is assigned according to a series of criteria which assess within a bioregion the level of rarity and threat to a given vegetation type, how degraded the remnants are and how secure is the land tenure. This allows a rating of the threat of extinction to be assigned to the EVC. This rating is the EVC's conservation status within the bioregion.

Figure 1: Conservation status of extant vegetation

Figure 2: Bioregions of the North Central Region



Threatened Species and Communities

A principal value of native vegetation is that it provides critical habitat for significant species and ecological communities, many of which are rare or threatened. The priority native vegetation assets identified above are associated with a high concentration of threatened flora and fauna – in fact the values of these threatened species are key drivers of the significance and relative priority of these areas. The North Central region is home to many threatened flora and fauna species, and a number of threatened ecological communities. All plants and animals, including threatened species have a range of values, including intrinsic and existence values in addition to their contribution to broader ecological processes. The conservation of biodiversity, and in particular threatened species, is an important part of protecting our natural heritage and maintaining sustainable, productive landscapes. Threatened species and communities are classified according to their conservation status, which may be applied at a range of scales from national, state to bioregional. At the national scale the conservation status of species is recognised by Environment Protection and Biodiversity Conservation (EPBC) Act. At a state scale species may be listed under the Flora and Fauna Guarantee (FFG) Act with conservation status assigned through advisory processes. Tables 1 and 2 provide a summary of conservation status at national and state scales. At the ecological community level there are a number of significant entities that have been recognised by listing using Commonwealth or State processes. For example, White Box-Yellow Box and Blakely’s Red-Gum ecological community, which has notable occurrences in the North Central region has been listed by the Commonwealth under the EPBC Act, while Northern Plains Grassland community has been listed under the FFG Act. In general terms threatened ecological communities are considered under the native vegetation and habitat asset theme.

Table 1: Conservation status summary - threatened fauna

EPBC Listing			
Extinct	Critically Endangered	Endangered	Vulnerable
1	1	5	10

FFG Listed	Extinct	Critically Endangered	Endangered	Vulnerable	Near Threatened	Regionally extinct	Data deficient
78	1	14	28	36	39	4	6

Table 2: Conservation status summary threatened flora

EPBC Listing			
Extinct	Critically Endangered	Endangered	Vulnerable
1	1	16	17

FFG Listed	Extinct	Endangered	Vulnerable	Rare	Poorly known
83	5	74	87	130	59

Condition of biodiversity

Vegetation condition is the state or configuration (composition, structure and function) of an ecosystem compared to the benchmark that is optimal for a particular benefit or purpose. The 2007 VCMC Catchment Condition report states for the North Central region ... “The condition of native vegetation in ‘largely intact’ landscapes is generally good, and the trends are that the condition is stable. However, the condition of native vegetation in ‘fragmented’ landscapes ranges from moderate to poor, with the trend in many areas still declining, except where specific interventions are being made. This appears to be particularly the case with native grasslands areas, where land use is changing from grazing to cropping, and the Box-Ironbark woodlands in central Victoria which are under pressure from various factors, including human settlement.” Despite an improvement in the availability and accuracy of data on native

vegetation condition over the past ten years it is not possible to provide a definitive statement of either current condition or trend at a regional or bioregional scale for the North Central CMA region.

For spatially explicit assets, such as those identified in this Regional Catchment Strategy it is possible to measure vegetation condition and indeed to set measurable goals for condition based on an understanding of benchmark states for particular ecosystems, the nature and extent of specific threats and an assessment of the technical and socio-economic feasibility of a given suite of actions designed to maintain or improve asset quality.

The condition of threatened species and ecological communities is perhaps best understood by consideration of their conservation status (see above). While the Actions for Biodiversity Conservation (ABC) database [see Appendix A] managed by DSE is able to provide substantial information about on-ground activities that are being undertaken for threatened species from year to year, there is limited information available on the status of populations. Species and communities status is generally therefore determined by modelling threats and habitat factors that have an impact on population status.

Threats and their impacts on biodiversity

Loss of habitat through clearing of native vegetation has been, and continues to be, a significant threat to biodiversity across northern Victoria. As well as the removal of woody vegetation, habitat loss also includes the conversion of grassland to crops or 'improved pasture', which although less obvious in terms of structural changes to the vegetation, is equally destructive. Historically, the agriculture and mining sectors were primarily responsible for broad-scale clearing. Foremost among contemporary motives for clearing are residential developments and agricultural intensification (e.g., for vineyards, olives, irrigation infrastructure and precision agriculture). Habitat loss decreases the resource base (i.e., food, shelter and mates) for individual animal species resulting in smaller populations with lower genetic diversity, increasing the probability of local extinction. Impacts on native plant species include their direct removal from the landscape and the viability of the remaining patches (Young and Clarke 2000). As the amount of habitat in a landscape decreases, fewer species are able to sustain viable populations, leading to a decline in species richness. Typically, clearing also decreases the diversity of vegetation types (ecosystem diversity) further reducing the number of species for which suitable habitat exists. Moreover, the most fertile parts of a landscape are often preferentially cleared resulting in landscapes that are not representative of the original vegetation composition.

Threat	Impacts
<ul style="list-style-type: none"> • Clearing for agriculture, urban or other uses • Global warming/rapid climate change • Weed Invasion • Over-grazing by stock, feral animals and native herbivores • Salinity • Soil disturbance • Habitat fragmentation and isolation • Alterations to natural fire regimes • Altered hydrology • Other invasive exotic species e.g. rabbits, hares, goats, pigs • Timber and firewood harvesting practices • Off-site effects of nearby land-uses 	<ul style="list-style-type: none"> • Loss of ecological resources • Reduction in species richness and diversity • Decline in habitat quality and condition • Decline in water quality • Loss of landscape function • Decline in soil health • Decline in landscape amenity and intrinsic value

Risks to threatened species are largely consistent with those identified for native vegetation and habitat, recognising that individual species face quite specific threats. At an individual species level detailed information on threats can be found in documents such as [Flora and Fauna Guarantee Action Statements](#) and [National Recovery Plans](#). DSE has developed the [Actions for Biodiversity Conservation \(ABC\) system](#) in which the actions in Action Statements are stored, the responsibility for undertaking actions are recorded and priorities for action set.

Rapid climate change is placing additional pressure on both individual species and whole ecosystems, posing a severe threat in its own right as well as exacerbating the effects of other existing threats. Any change to the local ecological niche of species may place them near the limits of their physiological tolerance. As a result, some species and ecological communities are at serious risk of decline or extinction this century. With both environmental and ecological factors changing, it may prove very difficult to maintain the current distribution and abundance of all species and communities.

Regional Priority setting

In developing biodiversity priorities for the region a range of data and information sources have been used, including ecological databases, expert opinion from ecologists and those with local knowledge together with modelling and decision support tools. Community knowledge of local assets, including their values, threats and condition has been a key consideration in the development of priorities. Many waterways assets were identified as part of the Asset identification process run with the community and regional stakeholders. These assets were mapped at various scales from small patches of bush and remnant vegetation through to large areas of public land. Most of these assets have been amalgamated to form the priority habitat areas shown below. The newly developed DSE tool NaturePrint has been used extensively in the identification and refinement of priority habitat areas.

An assessment has been made of the relationship between priority native vegetation assets and threatened flora and fauna (using NaturePrint and other relevant data) in order to determine the degree to which these habitat areas 'capture' priority threatened species assets. Appendix B demonstrates strong alignment for significant threatened fauna species.

As the number of species at risk grows, implementing individual species management programs has become increasingly challenging. While this method will still be necessary for some species, approaches that benefit a range of species (both threatened and those that may yet become vulnerable) will be preferred. The traditional approach of conserving species in their current locations and environments must be broadened to better encompass climate adaptation and the maintenance of ecosystems under changed conditions. This can be achieved through programs aimed at achieving broader, landscape-scale outcomes through threat mitigation and the maintenance of ecological and evolutionary processes. While recognising that all threatened species and communities are significant we have allocated a relative significance to assist with prioritisation and investment planning. A set of criteria were applied to all species identified through community and expert elicitation, Individual taxa were then allocated to categories of exceptional, very high, high and moderate significance. It is important to note that this method recognises that insufficient resources are available to carry out all possible conservation actions for all threatened species and that prioritisation is essential to focus effort on detailed analyses for a priority subset of high significance and high threat species where feasibility of conservation actions is greater. In doing so we recognise that planning and regulatory instruments will be used to assess and protect threatened species in conjunction with survey and monitoring work to improve our knowledge and understanding of condition and trends.

Figure 3 and Table 3 describe priority areas for native vegetation and habitat while Table 4 describes the priorities for threatened species. Significant threatened species of lower priority will also be the focus of conservation actions through targeted actions at the scale of priority native vegetation and habitat areas. The alignment of these species and habitat areas is shown in Table 5.

Figure 3: Priority native vegetation and habitat assets for the North Central region

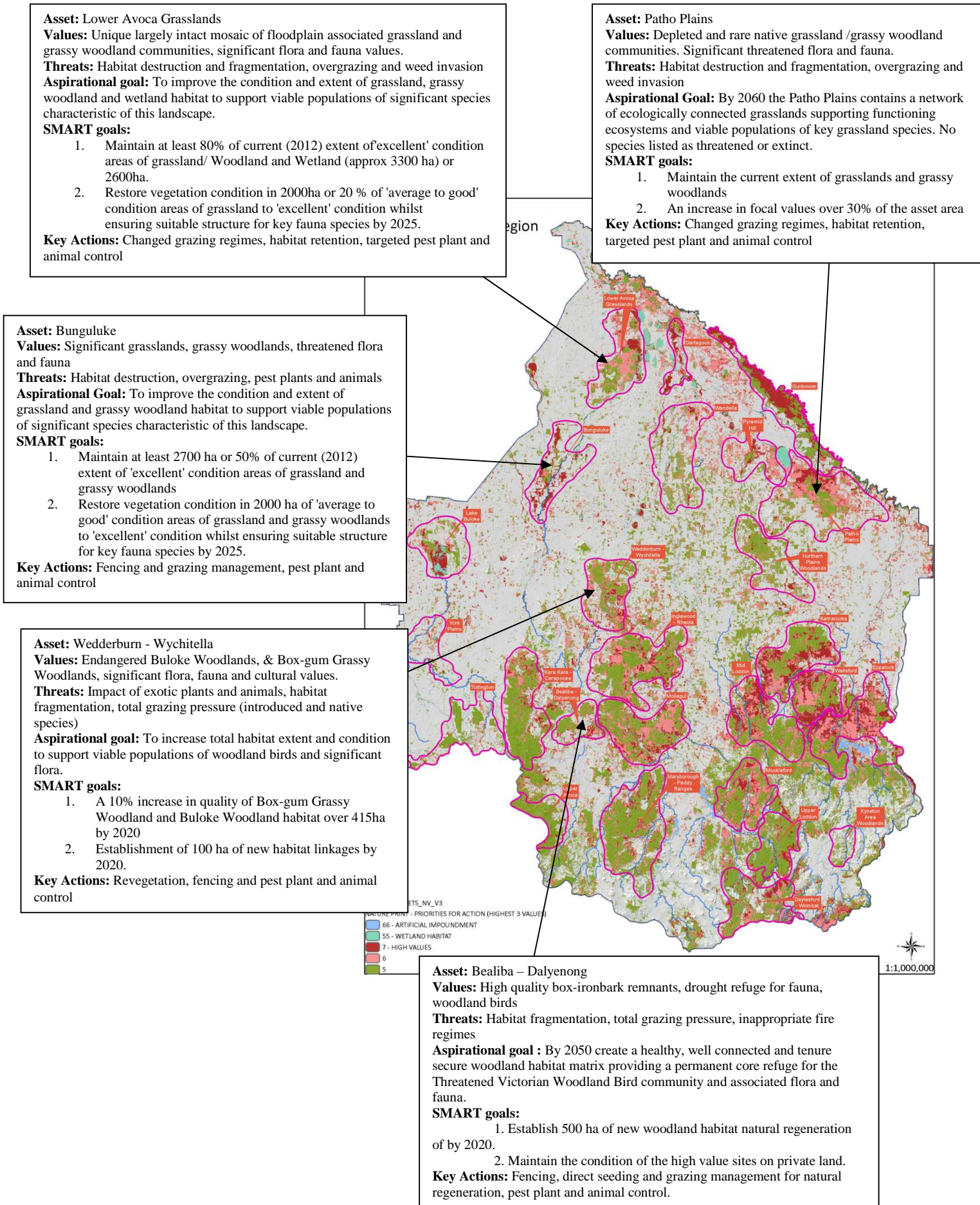


Table 3: North Central region native vegetation and habitat priorities.

Code	Bioregion	Priority Asset	Significance	Threat	Feasibility	Priority for detailed assessment
VR1	Victorian Riverina (and/or Northern Inland Slopes)	Patho Plains	Exceptional	High	High-Low	Medium ³
VR2		Pyramid Hill	High	Medium	High-Low*	Medium
VR3		Wandella	High	Medium	Medium-Low*	Low
VR4		Bunguluke	Very High	High	High-Medium	High
VR5		Bael Bael	Very High	High	High-Medium	High
VR6		Northern Plains Woodlands	High	Medium	High-Low	Medium
G1	Goldfields	Kamarooka	Very High	High	Medium-Medium	Medium
G2		Wellsford	High	Medium	Medium-Medium	Medium
G3		Eppalock	High	High	Medium-Medium	Medium ¹
G4		Wedderburn/Wychitella	Very High	Medium	High-Medium	High
G5		Muckleford	High	Medium	Medium-Medium	Medium
G6		Kara Kara - Carapooee	Very High	Medium	Medium-Medium	Medium ¹
G7		Moliagul	High	Medium	Medium-Medium	Medium
G8		Maryborough – Paddy Ranges	High	Medium	Medium-Medium	Medium
G9		Tottington	High	Low	High-Medium	Medium ²
G10		Inglewood - Rheola	Very High	High	Medium-Medium	Medium ¹
G11		Mid Loddon	High	High	Medium-Medium	Medium
G12		Bealiba-Dalyenong	High	Medium	High-Medium	High
G13		Upper Loddon	High	Medium	Medium-Medium	Medium
W1	Wimmera	York Plains	High	Medium	Medium-Medium	Medium
CVU1	Central Victorian Uplands	Daylesford - Wombat	High	High	Medium-Medium	Medium
CVU2		Upper Avoca	High	Medium	Medium- Medium	Medium
CVU3		Kyneton Woodlands	High	Medium	Medium-Medium	Medium
MF1	Murray Fans	Gunbower	Exceptional	High	Medium-Medium	High
MF2		Dartagook	High	High	Low-Medium	Medium
MM1	Murray Mallee	Lake Buloke	High	High	Low-Low	Low

¹ - Priority asset area with potential for cost-effective investment if focus narrowed

² - Potential for significant gain with relatively modest investment

³ - Asset of exceptional value worthy of detailed analysis

Table 4: Priorities for significant threatened species

Asset	Significance	Threat	Feasibility	Priority for detailed assessment	Alignment with Native vegetation/habitat priorities
Mclvor spider Orchid (<i>Caladenia audasii</i>)	Exceptional	High	Medium-High	High	
Robust Greenhood (<i>Pterostylis valida</i>)	Exceptional	Medium	Medium-High	High	
Southern Shepherd's Purse (<i>Ballantinia antipoda</i>)	Exceptional	High	Medium-Medium	Medium	
Eltham Copper Butterfly (<i>Paralucia pyrodiscus lucida</i>)	Very High	Medium	High-High	High	Muckleford, Upper Loddon
Pink Tailed Worm-lizard (<i>Aprasia parapulchella</i>)	Very High	High	Medium-High	High	Mid Loddon, Kamarooka
Spiny Rice-flower (<i>Pimelea spinescens</i>)	Very High	High	Medium-Medium	Medium	Muckleford, Patho Plains
Northern Golden Moth Orchids (<i>Diuris protena</i>)	Very High	High	Medium-High	High	
Bendigo Spider-orchid (<i>Caladenia</i> sp. aff. <i>fragrantissima</i> (Central Victoria))	Very High	High	Medium-High	High	
Murray Hardyhead (<i>Craterocephalus fluviatilis</i>)	Very High	Low	Medium-Medium	Medium	Various wetland assets
Plains-wanderer (<i>Pedionomus torquatus</i>)	Very High	High	Medium-Medium	Medium	Patho Plains, Bael Bael
Red-cross Spider-orchid (<i>Caladenia cruciformis</i>)	Very High	High	Medium-Medium	Medium	Kara Kara-Carapooee
Ridged Water-milfoil (<i>Myriophyllum porcatum</i>)	Very High	High	Medium-Medium	Medium	Patho Plains, Pyramid Hill
Turnip Copperburr (<i>Sclerolaena napiformis</i>)	Very High	Medium	Medium-Medium	Medium	York Plains
Lowly Greenhood (<i>Pterostylis despectans</i>)	Very High	High	Medium-Medium	Medium	
Small Scurf-pea (<i>Cullen parvum</i>)	Very High	High	Medium-Medium	Medium	Northern Plains woodlands
Golden Sun Moth (<i>Synemon plana</i>)	Very High	High	Medium-Medium	Medium	
Pale Sun Moth (<i>Synemon selene</i>)	Very High	High	Medium-Medium	Medium	
Yan Yean (Swamp) Leek-orchid (<i>Prasophyllum</i> sp. aff. <i>occidentale</i> F)	Very High	High	Medium-Medium	Medium	
Yellow-lip Spider-orchid (<i>Caladenia xanthochila</i>)	Very High	High	Medium-Medium	Medium	Inglewood-Rheola

Table 5: Relationship between native vegetation priorities and significant threatened species

Fauna Species	VR1	VR2	VR3	VR4	VR5	VR6	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	W1	CVU1	CVU2	CVU3	MF1	MF2	MM1	
Plains Wanderer																											
Brolga																											
Bush Stone-curlew																											
Grey-crowned Babbler																											
Barking Marsh Frog																											
Fat-tailed Dunnart																											
Hooded Scaly-foot																											
Curl Snake																											
Broad-shelled Turtle																											
Golden Perch																											
Intermediate Egret																											
Carpet Python																											
Diamond Dove																											
Blue-billed Duck																											
Eastern Great Egret																											
Freckled Duck																											
Glossy Ibis																											
Ground Cuckoo-shrike																											
Royal Spoonbill																											
Nankeen Night-heron																											
Striped Legless-lizard																											
Woodland Blind-snake																											
Swift Parrot																											
Common Dunnart																											
Barking Owl																											
Bibron's Toadlet																											
Chestnut-rumped Heath-wren																											
Little Bittern																											
Speckled Warbler																											
Painted Honeyeater																											
Brush-tailed Phascogale																											
Olive Legless-lizard																											
Bandy Bandy																											
Regent Honeyeater																											
Square-tailed Kite																											
Common Bent-wing Bat																											
Powerful Owl																											
Masked Owl																											
White-bellied Sea-eagle																											
Little Egret																											

Flora Species	VR1	VR2	VR3	VR4	VR5	VR6	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	W1	CVU1	CVU2	CVU3	MF1	MF2	MM1	
Red Swainson-pea																											
Buloke Mistletoe																											
Slender darling-pea																											
Chariot Wheels																											
Silky Swainson-pea																											
Annual Buttons																											
Downy Swainson-pea																											
Tough Scurf-pea																											
Hoary Scurf-pea																											
Winged Pepper-cress																											
Sikh's Whiskers																											
Small Milkwort																											
Bristly Greenhood																											
Kamarooka Mallee																											
Yellow-tongue Daisy																											
Ausfeld's Wattle																											
Whipstick Westringia																											
Dainty Phebalium																											
Velvet Daisy-bush																											
Jericho Wire-grass																											
Matted Flax-lily																											
Trailing Hop-bush																											
Goldfield's Grevillea																											
Late-flowered Flax-lily																											
Pale Flax-lily																											
Brilliant Sun-orchid																											
Clover Glycine																											
Golden Cowslips																											
Swamp Diuris																											
Trailing Hop-bush																											
Scented Bush-pea																											
Purple Diuris																											
Narrow Goodenia																											
Fryerstown Grevillea																											
River Swamp Wallaby-grass																											
Branching Groundsel																											
Purple Diuris																											

Policy context

Native Vegetation Management: A Framework for action (the Framework) was released in 2002. It was developed to implement the objectives of Victoria's Biodiversity Strategy and the Australia's Biodiversity Conservation Strategy 2010-2030. 'The framework' is the State Government's strategy to protect, enhance and revegetate Victoria's native vegetation. It:

- focuses on catchments as a whole;
- addresses critical issues on private land where native vegetation has been cleared or fragmented;
- provides a strong focus on protection and improvement of higher conservation significance vegetation; and
- provides a flexible but accountable approach for lower conservation significance vegetation, enabling landholders to move towards more sustainable land use options.

The Framework's main goal is *to achieve a reversal, across the entire landscape of the long-term decline in the extent and quality of native vegetation, leading to a net gain.*

At a catchment scale, Regional Native Vegetation Plans have been developed across all CMA regions to translate the state-wide aims and objectives of the framework to specific regional circumstances. This has been valuable in identifying the current extent and condition of native vegetation, nature and degree of threatening processes together with regional guidelines and approaches aimed at achieving "Net Gain". The approach advocated in the North Central Native Vegetation Plan (2005) remains relevant and appropriate for native vegetation and habitat conservation activities in the region. The Plan identified the following broad actions:

1. Protection of existing remnant vegetation
2. Management and enhancement of existing remnants
3. Rebuilding the viability, connectivity and integrity of native vegetation
4. Community Education and Awareness

Threatened species that are listed under State and Federal legislation, such as the FFG and EPBC Acts are afforded significant protection from actions that may affect their conservation. In this context they must be considered in cases where changes in land-use are considered, for example residential development affecting critical habitat.

A key action is therefore the provision of quality, up-to-date data on the known or likely occurrence of threatened species to agencies responsible for land and water management planning (e.g. Local Government, CMAs and Water Authorities). Tools such as the ABC database and NaturePrint can play a key role in ensuring that planning processes generate positive conservation outcomes for threatened species and their critical habitat.

Community participation

To achieve the goal of reversing the decline in biodiversity will require a supportive community. Hence, community education and building awareness is an integral part of protecting native vegetation, habitat and threatened species. An integrated approach to regional community education between all partners will build understanding and knowledge of biodiversity in ways that enables landholders and broader community to be active participants in conservation activities.

Many important areas of remnant habitat are located on private land and managing them for biodiversity generally relies on collaboration with private landholders. Without their cooperation, the best science-based planning will count for little. Sustained collaboration between landholders, community groups and agencies, with an understanding of their respective knowledge and aspirations has been a feature of native vegetation programs in the region for many years. Recognising local knowledge and tapping into the wisdom and experience of local networks is a key factor underpinning successful habitat conservation initiatives.

Discussion

There are a number of areas where future research and knowledge acquisition is required to improve the planning, implementation and evaluation of biodiversity management activities. In particular the following areas have been identified as a focus for the next 6 years.

- Better understanding about the condition of remnant vegetation across the region
- Ecosystem service valuation of the role of native vegetation and habitat
- Implications of broad scale revegetation/landuse change on regional and rural communities and farming systems
- Identifying and progressively refining rule sets which summarise relationships between habitat characteristics and key species that can be used to promote better understanding of the options for restoring native vegetation cover for biodiversity

- Thresholds for keystone species of flora and fauna
- Interactions between native vegetation and hydrogeological processes, carbon sequestration and water yield
- Role of remnant habitat in provision of ecosystem services at the paddock, property and subcatchment/landscape scale
- Best management practices for ecological communities
- Responses of flora/fauna and vegetation communities to a range of climate change scenarios
- Restoration ecology requirements for EVCs
- Role of fire and disturbance regimes for ecological communities

Threatened species are characterised by attributes such as rarity, they are sometimes ephemeral or cryptic and often exist as small, dispersed populations. For example threatened flora such as terrestrial ground orchids may only be visible from underground structures when seasonal conditions are favourable. A period of prolonged drought since the mid 1990s has seen an apparent decline in a number of these species. Species of mobile (e.g. Swift Parrot) or cryptic fauna (e.g. Pink-tailed Worm-lizard) require substantial expertise and survey effort to monitor population trends. For this reason our knowledge of many threatened species is deficient in areas including population size and viability, responses to management activities, re-establishment techniques and general conservation measures.

At an individual species level knowledge gaps are often well-documented in Recovery Plans and Action Statements although there is little knowledge of the cost and feasibility of protection of species, especially where they occur on private land.

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Appendix A – Description of some of the relevant tools for threatened species protection.

NaturePrint

NaturePrint is being developed by the Biodiversity and Ecosystem Services Division in DSE. NaturePrint is in relatively early stages of development. After further development, NaturePrint outputs will be made available to CMAs.

NaturePrint will include a spatial and temporal database of information relevant to:

- the range of biodiversity assets;
- their relative conservation status;
- their life history attributes (including reproductive and dispersal characteristics and tolerances of disturbances);
- the functional context of locations where assets occur (including ecological processes, threats and opportunities); and
- related long-term risk and feasibility scenarios (including climate change)

NaturePrint will bring together datasets on:

- distributions of species and their habitats;
- condition of these habitats;
- how species are likely to use and move through landscapes/seascapes;
- how threats to species are likely to operate at site and landscape scales; and
- where re-establishment of habitat and/or relocation of populations is likely to be useful and feasible.

NaturePrint will also provide improved tools and/or data products to assist CMAs to access this spatial biodiversity information. It will provide a framework to integrate the various data to identify spatial locations that are candidates for investments to protect biodiversity, based primarily of scientific criteria, rather than community preferences. Its outputs will include data layers that contain the results of integrated analysis of data in the NaturePrint system (i.e. results from an initial prioritization process to identify assets that are candidates for investment). CMAs might simply use those outputs, rather than necessarily having to use the system to undertake their own analyses. Outputs will be useful to understand the range of biodiversity values, threatening processes and the importance of ecosystem function.

It is intended that NaturePrint will express biodiversity conservation needs across a range of geographic scales (regional, landscape/seascape and local asset). The ultimate requirement is to develop the capacity to integrate across multiple species in space and time. It will be based on the best available data and sound science and will be developed in a transparent and inclusive process.

Initial development and the ongoing use of NaturePrint will be managed by experts using a range of datasets from a variety of sources. There will be regular updates of the datasets feeding into NaturePrint to ensure that the information is current and accurate. Access to NaturePrint will initially be staggered with the level of access based on the products maturity and user needs.

NaturePrint data layers can be used to help identify and describe assets in stage 1. NaturePrint data layers also provide spatially referenced data that describes the assets. This descriptive information would then be useful in stage 2 in the processes leading up to identifying candidate assets. In the future, NaturePrint may have processes for integrating information on assets that could be used in stage 2.

ABC Database

The Actions for Biodiversity Conservation (ABC) is a web-based information system developed and implemented by DSE. It is the primary means by which DSE accumulates knowledge about threatened species and communities in Victoria. It is used to track the progress of management actions documented in Action Statements prepared under the **Flora and Fauna Guarantee Act 1988** and in Recovery Plans prepared under the Commonwealth **Environment Protection and Biodiversity Conservation Act 1999**. The ABC currently holds information on more than 400 species and communities and over 14 000 management actions at approximately 2000 locations across Victoria. Reporting on threatened species and communities outcomes is a new feature currently being developed within the ABC.

Flora and Fauna Guarantee Act 1988

The flora and fauna conservation and management objectives are:

- to guarantee that all taxa of Victoria's flora and fauna other than the taxa listed in Schedule 1 can survive, flourish and retain their potential for evolutionary development in the wild
- to conserve Victoria's communities of flora and fauna

- to manage potentially threatening processes
- to ensure that any use of flora or fauna by humans is sustainable
- to ensure that the genetic diversity of flora and fauna is maintained
- to provide programs:
 - of community education in the conservation of flora and fauna
 - that encourage cooperative management of flora and fauna through, amongst other things, the entering into of land management cooperative agreements under the *Conservation, Forests and Lands Act 1987*
 - that assist and give incentives to people, including landholders, to enable flora and fauna to be conserved
- to encourage the conserving of flora and fauna through cooperative community endeavours.

Environment Protection and Biodiversity Conservation (EPBC) Act

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government’s central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance.

Transparent Algorithm for Threatened Species Importance (TATSPI)

The first stage is based on conservation status information. Score ratings for each category of status and weighted them in this order: National conservation status>Victorian FFG listing>DSE’s Advisory list rating (state conservation status).

The score rating for each category is as follows:

National Conservation Status (EPBC)	Score	FFG Status	Score	Victorian Conservation Status	Score
Extinct	6	Listed	6	Presumed extinct	11
Critically endangered	4	Nominated	4	Critically endangered	10
Endangered	3	Delisted	1.2	Endangered	8
Vulnerable	2	Invalid or ineligible	1.1	Vulnerable	6
Conservation dependant	1	No status	0	Rare	4
No status	0			Near threatened	3
				Poorly known	2
				Data deficient	1
				No status	0

The weighting of these conservation statuses is: 5 X [EPBCScore] + 2 X [FFGScore] + 1 X [VicAdvListScore]

The raw score is then presented as a percentage rating. This first stage score could be considered the Victorian priority for these species. The second stage is to estimate the responsibility that north central Victoria has for the conservation of the species. This has been estimated by reference to distribution maps and using the following ratings scheme.

North Central CMA Status Definition (north central Victoria’s contribution to, or responsibility for, conservation)	Score
Endemic - the taxon only occurs in North Central Victoria	1
Primary occurrence - the taxon primarily occurs in North Central Victoria	0.8
Significant - the taxon has a significant occurrence in North Central Victoria	0.4
Major - North Central Victoria is a major contributor to the conservation of this taxon	0.6
Range extension - although minor, the occurrence in North Central Victoria significantly extends the range of the taxon	0.3
Minor - the taxon has only a minor occurrence in North Central Victoria	0.1
Insignificant - the taxon's conservation is not significantly	0.01

dependant on its occurrence in North Central Victoria, nor is it a significant range extension	
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The priority score is then calculated by multiplying the Victorian priority score by the North Central CMA status score. This numeric priority score is then converted to the INFFER categoric rating via this rule set:

NCCMA Priority	INFFER categoric rating
> 80	Exceptional
> 35	Very High
> 15	High
15 or less	Moderate