North Central
Native Vegetation Plan



NORTH CENTRAL
Catchment Management Authority

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The North Central CMA Native Vegetation Plan is Ministerially endorsed. The plan outlines the framework for native vegetation management in the North Central region, describes the strategic direction for native vegetation and includes the regional approach to Net Gain.

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The North Central Native Vegetation Plan is a revision and development of the North Central Regional Vegetation Conservation Strategy prepared by Elvyne Hogan in September 1997.

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The support and assistance of the Victorian Bushcare network has been instrumental in critically evaluating much of the content of this plan.

Foreword

The North Central Native Vegetation Plan represents a key development in the sustainable use of natural resources in the region. It recognises the vital contribution that native vegetation plays in maintaining the health of our catchments. Only 19 per cent of the region's original native vegetation cover remains, and the loss of native vegetation cover and quality is associated with many of the problems facing the region today including:

- Biodiversity decline
- Pest plant and animal proliferation
- Salinity
- Soil decline
- Waterway health and water quality decline

While the impact of past practices cannot be reversed, the community has recognised the need for a new approach to managing native vegetation and biodiversity. The plan outlines a clear and challenging vision. We need to protect and enhance the quality of our remnant vegetation, and we also need a major effort over the next 20 years to revegetate significant areas of the catchment. This effort will result in major landscape change and provide a sound base for building sustainable rural and regional communities. Many of the natural resource management issues in the region have resulted from the decline in native vegetation and the loss of biodiversity. The challenge is to capitalise on these natural assets as the basis for widespread landscape restoration and the foundation for productive and sustainable land use.

The plan recognises that significant native vegetation assets are found across the region. They range from the moist forests of the uplands through the box-ironbark ecosystem to the grassy woodlands and grasslands of the northern plains. These ecosystems contain many important natural values including a diversity of vegetation communities, flora and fauna – many of which are rare or threatened. Retention, protection, management and establishment of native vegetation across the region will deliver substantial long term benefits for biodiversity, soil health and water quality to future generations.

Successful native vegetation management is fundamental to sustainable use of natural resources. The North Central region plays a key role in the prosperity of the state, and dryland and irrigated agricultural industries are major contributors to the economic wellbeing of rural and urban communities. The plan recognises the need to balance economic, social and environmental imperatives to achieve sustainability.

This document provides the direction and key actions for native vegetation management in the region over the next three years. Putting the plan into practice will depend on the continuation of a strong partnership between government and the community. The region has a unique history of broad-based community involvement in natural resource management. While the North Central Catchment Management Authority has been responsible for producing this plan, we have done so in partnership with the stakeholders interested in these issues. The North Central Native Vegetation Plan represents a major contribution to advancing this partnership approach and belongs to the entire North Central Region.

I urge you to give this plan your full consideration, support and encouragement.

Ian MacBean
Chair
North Central Catchment Management Authority

Table of Contents

Executive Summary

1. Protection of Existing Remnant Vegetation

The highest priority of the North Central Native Vegetation Plan (NVP) is to protect existing remnant vegetation, particularly those vegetation communities that are highly depleted and subject to threatening processes.

Protection encompasses a range of activities ranging from legal agreements to construction of fences for grazing management.

It is not desirable to concentrate efforts only on rare or threatened species or communities as this allows depletion of other vegetation types creating further problems.

2. Management and Enhancement of Existing Remnants

Virtually all remnant vegetation in North Central region is substantially degraded.

Enhancement works range from re-introduction of missing species or habitat features to selective control of environmental weeds and pest animals.

Weed invasion is a major threat in all native vegetation communities leading to loss of native plant species as well as the fauna dependent on those plants. The integrity of priority vegetation communities is threatened by invasion from environmental weeds. In particular, a number of significant Box-Ironbark Ecological Vegetation Classes (EVCs), grassy woodlands, riparian ecosystems and wetlands are at risk of further degradation due to the impact of weed invasion. Pest animals, particularly rabbits, have a major impact on natural regeneration and vegetation establishment. An integrated approach to pest animal control and vegetation management programs will deliver substantial environmental and economic outcomes.

3. Rebuilding the Viability, Connectivity and Integrity of Native Vegetation

Clearing of native vegetation disrupts ecosystems and creates remnant ‘islands’ that are more susceptible to threatening processes such as weed invasion and feral animals. The viability of the region’s vegetation communities (and many flora and fauna species) requires networks and interconnections that link larger blocks of remnant vegetation. A “landscape approach” to vegetation management will ensure that multiple natural resource outcomes will be achieved.

A large-scale revegetation effort is required over the medium to long term to reverse the current trend of land, water and biodiversity decline in the region. The priorities for revegetation are:

- Promoting regeneration, using indigenous species, to increase the size and quality of existing remnants;
- Establishing vegetation links between existing remnants;
- Revegetating high recharge areas and waterways, including some wetlands, to help reduce salinity and protect water quality; and
- Developing and integrating productive tree (and other perennial vegetation) systems, including farm forestry, that provide significant benefits in carbon sequestration, run-off, watertable control and water quality.

4. Community Education and Awareness

The goal of reversing the decline in extent and quality of the native vegetation will require a supportive community.

Hence, community education is an integral part of implementing this plan as it is for the North Central Regional Catchment Strategy (RCS). This plan proposes an integrated approach to regional community education between all partners. This will ensure that the structures are in place to get the latest information on vegetation to the network of information providers in the region.

Implementation of the priorities in this plan will result in a landscape that is ecologically balanced, aesthetically pleasing and will contribute to improved land, water and vegetation quality that sustains our regional communities.

Map 1 North Central Catchment Management Authority Region

1. Introduction

1.1 Aim

This North Central NVP will provide a linkage and synergy between current efforts to improve the condition of natural resources in the region and the conservation and protection of native vegetation and biodiversity.

The aim of the North Central NVP is to protect, enhance and rebuild the native vegetation assets of the North Central region.

1.2 Background - History of Development of the Plan

Victorians have realised that the clearance and decline of native vegetation since European settlement has caused a substantial decline in the condition of other natural resources, the productivity of the land and irreversible losses of biodiversity.

In response to these problems, Native Vegetation Retention (NVR) controls were introduced in 1989 as an amendment to the State Section of the Planning Scheme. These controls were introduced to reduce the level of vegetation clearing in Victoria.

While these controls provide guidance at a statewide level through the 'Statewide Planning Policy Framework' and 'Particular Provisions' of the 'Victoria Planning Provisions', they do not allow for regional variations to be used in the application of the controls.

In 1996 the Department of Natural Resources and Environment obtained funding from the National Landcare Program, both State (Tree Victoria) and Federal (Natural Resources Management Strategy) sources to improve the focus and coordination of vegetation conservation in the former North Central Catchment and Land Protection (CaLP) Board Region. This resulted in the preparation of "A Vegetation Conservation Strategy for the North Central Catchment Management Authority Region" (Hogan 1997).

In 1997 the Victorian Government released the Victorian Biodiversity Strategy, which provided the context and direction for many of the actions outlined in the North Central NVP. The goals for biodiversity management were to ensure that in Victoria:

- There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a net gain with the first target being no net loss by 2001;
- The ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments are maintained and, where necessary, restored;
- The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion;
- There is no further preventable decline in the viability of any rare species or of any rare ecological community; and
- There is an increase in the viability of threatened species and in the extent and quality of threatened ecological communities.

The release in June 2002 of Victoria's Native Vegetation Management Framework established the strategic direction for the protection, enhancement and establishment of native vegetation across the state.

Communities of the North Central region have a history of positive action in relation to native vegetation management. Many landholders in the North Central region have recognised the value of conserving flora and fauna and of maintaining remnant vegetation as part of a sustainable agricultural system.

1.3 What the Plan Does

Native vegetation does not comprise all indigenous biodiversity but it is the fundamental resource without which we cannot sustain the majority of our native species. While acknowledging the other ecosystem services and functions it provides, we must realise that there is no substitute for the unique biodiversity-sustaining values of native vegetation.

Because of this, a primary concern of the North Central NVP is the management of native vegetation from a biodiversity conservation perspective.

The North Central NVP translates the policy objectives of the Victorian Framework to the specific circumstances of this region. The Framework sets the State context and reflects the National context for the North Central NVP. It also describes:

- The principles of Net Gain;
- The evaluation of native vegetation quality using the Habitat Hectare method;
- The hierarchy of protecting and enhancing significant values, seeking to avoid the need to remove native vegetation;
- How to minimise any necessary losses of native vegetation; and
- Off-set measures for any losses so that the outcome is a Net Gain.

The Framework addresses native vegetation management from a 'whole of catchment' perspective whilst focusing on private land where critical issues of past clearing and fragmentation exist.

The North Central NVP provides:

- A conceptual framework for understanding native vegetation assets and guiding our response to their management;
- A baseline to monitor the status of native vegetation;
- Regional guidelines for responsible and referral authorities in managing permit applications to remove, destroy or lop native vegetation;
- A framework for involving and supporting communities in activities that provides positive outcomes at a social, economic and environmental level;
- A reference for community groups; and
- Priorities for the allocation of funds by the North Central CMA, agencies and community groups.

The North Central NVP identifies:

- The current status of native vegetation assets in the North Central region;
- Threatening processes affecting native vegetation;
- Options to manage the threats to native vegetation;
- Gaps in knowledge and best management practices for native vegetation retention, regeneration and planting across the catchment;
- Priorities and targets for remnant vegetation asset protection, enhancement and rebuilding through revegetation;
- Potential projects to address these priorities; and
- Opportunities for linking other key natural resource management issues e.g. salinity, biodiversity, and climate change to positive native vegetation outcomes.

1.4 Vision

The national vision expressed by the Natural Resource Management Ministerial Council (2000) recognised the "inextricable link between the conservation of biodiversity and sustainable agriculture. Conservation of vegetation is neither an alternative land use nor an opportunity cost - it is an investment in natural capital, which underwrites material wealth. Conservation of biodiversity means much more than just protecting wildlife and its habitat in nature reserves. Conservation of native species and ecosystems, and the processes they support - the flows and quality of rivers, wetlands and groundwater, and soil structure and landscapes - are all crucial to the sustainability of primary industries."

The North Central NVP builds on the national vision and its implementation will ensure that:

- 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;
- There is no further preventable decline in the viability of rare or threatened species or ecological communities; and
- The resulting landscape will be ecologically balanced, aesthetically pleasing and will contribute to improved land, water and vegetation quality that sustains our regional communities.

1.5 Overview of the Region

The region of the North Central CMA covers approximately three million hectares or 13 per cent of Victoria. Extending from the River Murray in the north, to the central highlands in the south, the Mount Camel ranges forms the eastern boundary of the region while the internally drained Avon Richardson basin forms part of the western border (see **Map 1**). The region includes four major river catchments: Campaspe, Loddon, Avoca and Avon-Richardson.

Land Use

The North Central region has a regional population of over 200,000 people. Around 87 per cent of the region is freehold while approximately 13 per cent is public land, with much of this reserved and managed for specific purposes including regional, state and national parks, state forests, flora reserves and reference areas. Land use in the region is diverse, with agriculture the principal activity, utilising 65 per cent of the land. Other important land uses include forestry, mining, urban centres and "lifestyle" or small acreage holdings.

Climate

Rainfall ranges between about 300mm per year in the northwest and over 1200mmm per year in the southeast. Average daily temperatures in the north-west range from 15 to 31 degrees Celsius in January and from 4 to 14 degrees Celsius in July. In the far south, the temperatures range between 11 and 27 degrees Celsius in January and between 2 and 10 degrees Celsius in July.

Soils

Soils of the North Central CMA are diverse, having derived from five main types of underlying material: sedimentary, metamorphic, granitic or basaltic rock or deep unconsolidated sediments. Coupled with the influence of our climatic range, a complex mix of native vegetation types has resulted, encompassing over a thousand native species. Generally, the natural fertility of most our soils is low to moderate, and most are prone to degradation if mismanaged.

Sedimentary soils occur in the Central Victorian Uplands and Goldfields bioregions. They have poor structure and extremely low fertility; are very vulnerable to erosion, compaction, and induced acidity. Because much of these areas were unsuitable for agriculture, they retain substantial areas of native vegetation.
Metamorphic areas occur in the Central Victorian Uplands and Goldfields bioregions where granite has intruded into

sedimentary rock. Erosion has later resulted in steep hills of metamorphosed sediments. The soils that develop are of low to moderate fertility and generally shallow depth. Because of the steepness, there are still examples of native vegetation remaining on metamorphic country. If cleared of perennial vegetation, they are a potent cause of salinity down-slope. Metamorphic soils are very susceptible to weed invasion.

Granite soils occur in the Northern Inland Slopes, Goldfields and Central Victorian Uplands bioregions. They are of moderately low fertility and poor structure. In elevated areas granite soils dry out rapidly and are extremely susceptible to erosion. Waterlogging due to natural hard pans, induced acidity and weeds are also characteristic. Where rugged terrain has limited agricultural development, granite areas often still retain native vegetation.

Basalt soils are mainly found in the Victorian Volcanic Plains bioregion. They have a high natural fertility and are generally well suited to agriculture, so have been almost completely cleared of native vegetation. Basalt soils are not particularly prone to erosion.

Soils derived from unconsolidated sediments are primarily found in the Victorian Riverina and Murray Fans bioregions (alluvial soils), along with the Murray Mallee and Wimmera bioregions. Fertility of alluvial soils is moderate but structure is poor. In North Central Victoria, the flatter landscapes have been almost completely cleared of native vegetation. They are prone to weeds, salinity, erosion, compaction and waterlogging.

Agricultural Profile

The North Central region is agriculturally diverse, including irrigation areas, extensive dryland cropping and grazing regions, and areas characterised by intensive animal production industries and new and emerging agricultural commodities.

Extensive dryland farming includes sheep and cattle grazing, grains, legumes, oil seeds and hay crops. Irrigated agriculture is significant, particularly in northern areas where dairying, vegetable production and horticulture are practised.

There have been significant changes in land use in recent times with the advent of new intensive agricultural developments, including viticulture and olives. An influx of people onto small holdings that were previously used for dryland agriculture poses a challenge for conservation and protection of remnant vegetation.

Overall, the region contributes an estimated $656m, equivalent to 14.5 per cent of the value of agricultural output in Victoria. Despite this, the contribution of the region to state-wide agricultural output is decreasing - in 1990 the North Central region contributed 17 per cent of the state's production value.

These patterns of agricultural land use also reveal indicators of decreasing ongoing viability, especially considering commodity trends. Generally, the diverse patterns of agricultural production in the region's irrigation areas correspond with higher levels of enterprise viability. Equally, the dryland cropping areas of the region's west show higher levels of enterprise viability than the areas which are largely dependent on grazing, especially those which are experiencing population growth pressure.

Significantly, the average Estimated Value of Agricultural Output (EVAO) for the years 1990 to 1995 reveals that over 40 per cent of this output can be attributed to the irrigated areas of the region's north. Conversely, many of the areas that have undergone urbanisation and population growth show the highest value of output per hectare. Many of the predominantly cropping areas of the region's west have relatively high EVAO's for each property.

Apparent differences in the levels of enterprise viability relate to the split between the highly diverse areas in the north and those areas further up in the catchments that are characterised by a predominance of small grazing enterprises.

In 1996 over 60 per cent of agricultural enterprises in the region were considered 'small' and only 20 per cent were seen as viable to large operations. The bulk of these smaller operations were involved in industry sectors which are characterised by small profit margins, such as grazing for beef, sheep meat and wool production.

The industry sectors that are operating on a larger, more viable scale include the dairy industry, some cropping and mixed farming operations and horticultural enterprises. Intensive animal industries are also a strong component of the region's agricultural output.

The Avon-Richardson and Avoca catchments are characterised by a less diverse, but more viable agricultural sector than the other catchments. The northern irrigation areas reveal a high level of agricultural diversity and viability when compared to the southern regions, particularly the southern areas of the Loddon and Campaspe basins where population increase and reduced agricultural production have coincided.

Social Profile

The North Central region was home to over 200,000 people in 2001, almost 5 per cent of the Victorian population. Approximately 140,000 people lived in urban areas ranging in size from 102 persons in Marnoo, to almost 95,000 in urban Bendigo. The region also contains over 50 urban centres including Swan Hill, Echuca, Donald, Maryborough, Castlemaine, Daylesford and St Arnaud.

The population of the region is concentrated mainly in the southern areas of the region, including the Calder corridor. There is also a high population concentration on the River Murray corridor. In these regions, population growth in non-urban areas is a dominant component of population change.

As a whole, the region experienced a 2.5 per cent growth in population since 1996 which is higher than the average for the State and regional Victoria. Concurrently, the region's population is ageing, and the proportion of younger people remaining in the region is declining. This pattern of population change mirrors a statewide trend, one that is particularly marked in regional Victoria.

The Avon-Richardson and Avoca catchments are undergoing population decline, particularly in rural areas. The population of these areas is ageing, and the urban population of these catchments is increasing as a proportion of the total population. The Loddon and Campaspe Basins are undergoing rapid population growth, particularly in non-urban and urban fringe areas. Most of this growth has occurred within the Melbourne and Bendigo commuter areas.

Throughout the region, an increasing proportion of the population is becoming urban-based, or involved in urban economies. The proportion (and absolute numbers) of the population employed in the agricultural sector is decreasing, while employment in manufacturing, retail and health services is increasing.

Patterns of employment and income also vary across the region, with household incomes and employment levels generally higher in the northern and western areas.

Particular exceptions in the south are found in newly urbanising regions of the Melbourne commuter area. Here employment rates are significantly higher than the region as a whole.

The regional mean median household weekly income falls within the $500-599 income bracket, which is significantly below the state median of $800-899.

The highest median weekly household income of $700-799 was earned in the northern section of the Ballarat council and Campaspe Shire around Rochester, while the south-west of the region recorded the lowest median weekly incomes.

Threats

The region has a range of natural resource management challenges (see **Appendix 1**) which have been identified and tackled through a range of regional strategies and plans.

Major threats facing the region includes both irrigation and dryland salinity, water quality decline and groundwater contamination, soil acidification, erosion and soil structural problems, flooding and drainage, fragmentation and destruction of wildlife habitat and pest plant and animal infestations and proliferation. In addition, the viability of some agricultural industries is threatened. The region has some of the most severely salt affected areas in Victoria directly impacting on the Murray River.

Remedial Actions

Land management activities, such as revegetation and fencing of waterways, have occurred for some time in some areas, particularly the Loddon and Campaspe catchments, but have only recently commenced in the west of the region, where significant riparian areas in the Avon-Richardson catchment have recently been fenced.

There is an extensive network of community groups (approximately 160 Landcare and community groups) actively involved in addressing natural resource management issues across the region.

Map 2 Local Government Areas in the North Central Region

2. What are our Native Vegetation Assets?

The Conceptual Framework

Native vegetation is defined as vegetation composed of plant species indigenous to the area concerned. That is, the plants are those that grow or grew wild in the area before European settlement.

In North Central Victoria, all native vegetation is considered to be remnant vegetation whether it comprises a large block of bushland, scattered trees in a cultivated paddock, or a small area of native grass on a roadside.

The use of this term reflects the fact that the majority (81%) of the natural vegetative covering of this region has been destroyed since European settlement and the small amount remaining is more or less degraded.

In addition, because of the generally small patch sizes and fragmented nature of what remains, most of our native vegetation assets are subject to processes and pressures far different to those they evolved to cope with.

Our remnant vegetation is thus less resilient to disturbance and other pressures than it was when Europeans first arrived in North Central Victoria and encountered an intact, functioning ecosystem. As a consequence, old notions of how to manage native vegetation need to be revised.

Victoria has developed a conceptual framework that underpins modern conservation management of remnant native vegetation.

Remnant native vegetation assets in North Central Victoria are considered in different categories. These categories are:

Native Vegetation Communities

A remnant vegetation community may be defined as a collection of plants that grow in recognisable patterns. Remnant communities retain a range of life forms, species or ecosystem functions, especially the ability to regenerate. Vegetation communities support, and are supported by, plants as well as many other living species.

Scattered Trees

Scattered trees are defined as stands of naturally occurring indigenous trees that are no longer accompanied by the associated understorey or ground flora. They commonly occur within agricultural situations.

Large Old Trees

Large old trees are those that exceed size thresholds defined for a vegetation type and/or possess very high habitat values due to their size or age - for example, the presence of hollows.

Native Pastures

Native pastures are areas in which the species composition is largely indigenous and that retain regenerative functions but are significantly degraded or altered so as no longer to be considered to represent a remnant of a natural (pre-1750) community. Sometimes this kind of vegetation is called ‘anthropogenic’, meaning that it has developed in response to European activities.

2.1 Remnant Native Vegetation Communities

The conceptual framework for understanding remnant native vegetation communities and their conservation management is based on several recently developed constructs. (See **Glossary of terms** for formal definitions).

Bioregions are the geographical base unit for conservation management of both vegetation communities and indigenous flora and fauna species.

Ecological Vegetation Classes (EVCs) are used as the system of classification of native vegetation communities.

Assignment of Bioregional Conservation Status of EVCs are a measure of the extinction threat to the entire community.

The ‘habitat hectares’ method is an agreed system for assessing the condition of patches of remnant vegetation.

Assigning Conservation Significance to individual patches of remnant native vegetation is used as a measure of their value. This is based on a combination of its condition, status, size, EVC status and presence of threatened species.

These concepts are described below and referred to throughout the North Central NVP.

Bioregions

Biogeographic regions (bioregions) are defined as areas with common biological and geographical features.

Under a national framework (Interim Biogeographical Regionalisation of Australia - IBRA), bioregions are accepted in Victoria as the geographical planning unit for the management of biodiversity and native vegetation.

Bioregions 'capture' patterns of ecological characteristics in the landscape, providing a natural framework for recognising and responding to biodiversity assets and their relationship with natural resource based activity. 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.

The North Central region can be viewed through a bioregional perspective that describes the natural ecological boundaries of the area. Of the 27 Victorian terrestrial bioregions, parts of 8 are represented in the North Central region. These are the:

- Central Victorian Uplands
- Goldfields
- Murray Fans
- Murray Mallee
- Northern Inland Slopes
- Victorian Riverina
- Victorian Volcanic Plain
- Wimmera

The distribution of these bioregions is shown on **Map 5**. Summaries of the characteristics of each of the bioregions can be found from page 27 onward in this document. The Goldfields and Victorian Riverina combined make up more than 60 per cent of the region.

The original native vegetation of the region has undergone a dramatic decline in extent and quality since European settlement. **Table 2.1** provides a summary of this depletion at a bioregional level. It can be seen that bioregions have fared differently. This is due to patterns of human land use, especially agricultural preferences for flat landscapes and fertile soils.

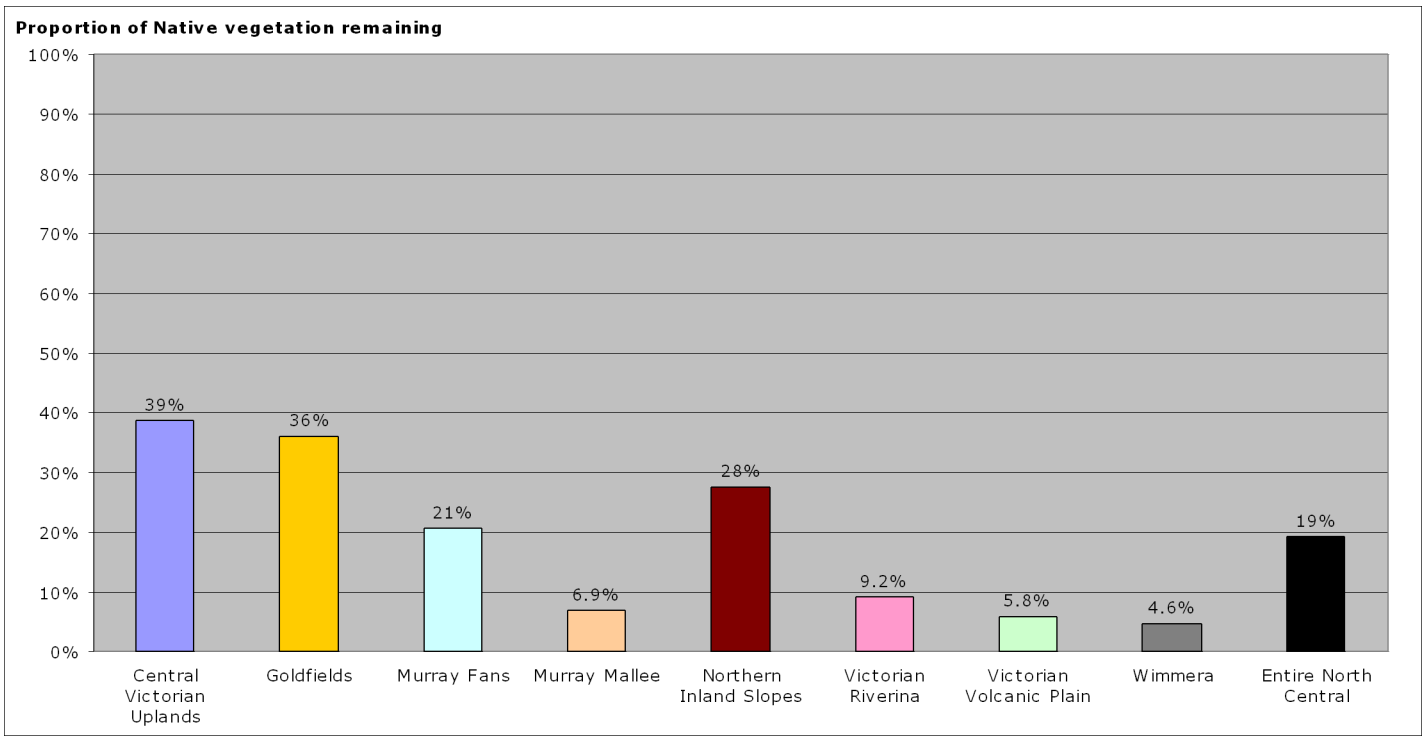
The North Central NVP recognises the need to conserve and protect native vegetation communities within and across bioregions. While some vegetation types are relatively 'well conserved' in parts of their range, adequate protection is required at a bioregional scale to ensure their long term viability, value for fauna and land and water benefits.

Although it is obvious from **Table 2.1** that north central Victoria's native vegetation is greatly depleted, a more detailed analysis of the situation is required for prioritising what and where action should be taken to reverse its long term decline. In Victoria, the current analytical framework is based upon 'Ecological Vegetation Classes' occurring in each of the Bioregions.

Table 2.1 Extent of remnant native vegetation for each bioregion within the North Central region.

Bioregion	Pre-1750 area (ha)	Current area (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 Riverina	908,094	83,494	9.2
Victorian Volcanic Plain	162,165	9,471	5.8
Wimmera	424,912	19,628	4.6
North Central region	**3,002,676**	**575,790**	**19.04**

Figure 2.1: Bioregional proportions of remaining native vegetation in North Central Victoria



Vegetation Communities and Vegetation Mapping

Native vegetation occurs in recognisably different 'communities'. Each occurrence of a community has attributes in common such as species composition, structure and position in relation to landforms.

Victoria's native vegetation communities have been described and mapped in a statewide program coordinated by the Department of Sustainability and Environment Flora and Fauna Program.

The classification system used is based on 'Ecological Vegetation Classes' (EVCs). EVCs are a fundamental tool for providing a more detailed picture of the condition of biodiversity across the region.

EVCs are mapped at a range of scales from 1:25,000 to 1:100,000 depending in part on whether detailed mapping of current vegetation or of pre-European patterns (pre-1750) is required. Pre-1750 mapping on cleared land is derived by modelling. It shows the extent of each vegetation community prior to European settlement.

Region-wide mapping of the current extent of vegetation is largely based on tree cover mapping derived from satellite imagery. 'TreeDen25' was captured at 1:25,000 scale.

The only reliable way to assess the current extent of treeless vegetation types such as grasslands is by detailed ground based mapping. Some of North Central Victoria, but not all, has now been mapped in this way.

The mapped extent and type of native vegetation has been combined with land tenure mapping to provide within each bioregion, the current extent of each EVC and the proportions that occur on public and freehold land. Depending on the tenure, public land can provide more security for native vegetation and this is taken into account in deriving an EVCs bioregional conservation status. See **Appendix 3** for more detail on this process.

There are almost 100 different EVCs or mosaics or complexes of EVCs mapped within North Central Victoria. **Appendix 5** lists them by bioregional occurrence and estimates the amount remaining in North Central Victoria in comparison to the year 1750.

Ecological Vegetation Classes

EVCs are 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. They describe local patterns of vegetation diversity but are not bioregion specific.

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 across the North Central region 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.

Our understanding of the quality of remnant vegetation is also based on the bioregional expression of EVCs. See **Appendix 5** for more detail.

Preferential patterns of land use also show up in the depletion of EVCs. This is due to a range of activities including agriculture, gold mining and urban development. Significant areas of a few EVCs remain as remnant native vegetation on both public and private land.

Bioregional Analysis Methodology

The appropriate planning unit for conservation of native vegetation and biodiversity at the scale of 50-100s of kilometres is the bioregion.

Conservation status 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 the land tenure is. 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.

The formal categories of conservation status are:

- Presumed Extinct
- Endangered
- Vulnerable
- Depleted
- Least Concern

See **Appendix 2** and **Appendix 3** for more details on bioregional EVC conservation status and its assessment. **Figure 2.1** shows that in every bioregion in North Central Victoria; virtually all EVCs are under severe threat of extinction. The majority is considered endangered and some are regarded as already bioregionally extinct. **Appendix 5**shows the results of the geographic analysis of the distribution of EVCs across the eight bioregions and the level of their depletion across land tenures.

Priorities for conservation management action at the regional scale are largely based on conservation status.

The value of an individual patch of vegetation is represented by its conservation significance. This is commonly derived from the conservation status of the type of vegetation coupled with the habitat quality of the patch, but also depends on the presence of threatened species or other factors. See **Appendix 4** for more detail.

Habitat quality is assessed using the 'Habitat Hectares' method. This scores the elements considered to comprise habitat (e.g. quantity of old growth trees, diversity and cover of understorey) against a 'benchmark' for the EVC in a bioregion. The benchmark is considered to be the fully 'natural condition'. That is, a condition that would support the full range of native species expected to inhabit a stand of vegetation of the particular type under natural circumstances. The benchmark represents the average characteristics of a mature and apparently long-undisturbed stand of the same vegetation type. See **Appendix 13** for further explanation.

Priorities for the protection of native vegetation across the region are determined by the conservation status of the vegetation community under consideration, along with the location of threatened flora and fauna. **Appendix 5** sets out the criteria for determining the regional conservation significance of native vegetation in the North Central region.

Landscape Analysis Methodology

Landscape ecology provides insights into the functions of native vegetation. The approach followed here is based on James & Saunders (2001) as this assists with target setting at the regional scale.

The landscape is categorised according to the proportion of native vegetation cover.

Table 2.2 Proportion of native vegetation remaining

Proportion of native vegetation	Landscape description
>70%	Intact
30-70%	Variegated
10-30%	Fragmented
<10%	Relict

Our management responses will differ according to the category of landscape. See **Appendix 6** for an outline.

Map 3 Conservation status of extant vegetation

Other Nati

The other three categories of native vegetation assets do not yet have such a formalised framework for their valuation. Because of this, a narrative approach is taken to describe their values.

2.2 Scattered Trees

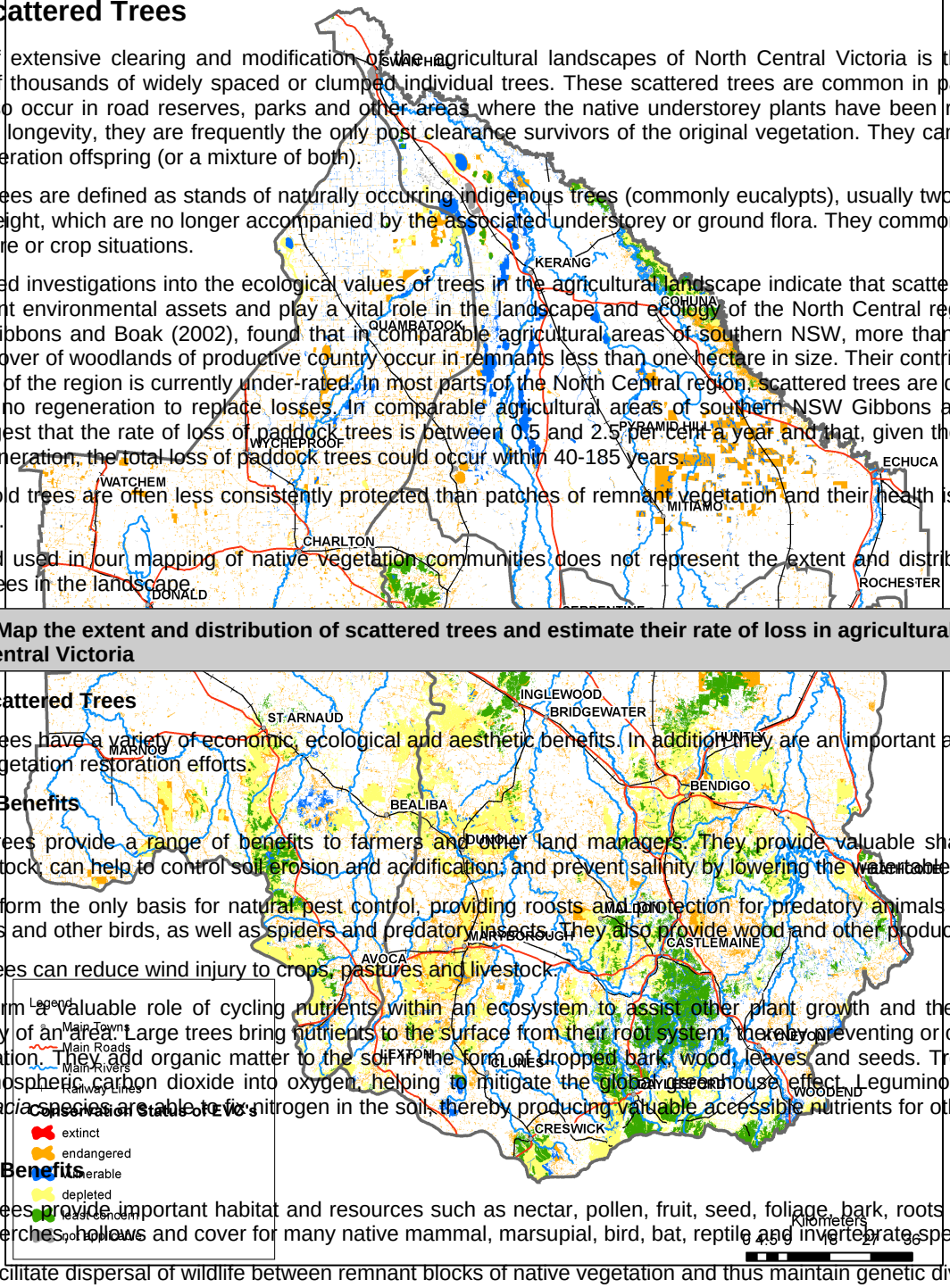
A legacy of extensive clearing and modification of the agricultural landscapes of North Central Victoria is the many hundreds of thousands of widely spaced or clumped individual trees. These scattered trees are common in paddocks, but may also occur in road reserves, parks and other areas where the native understorey plants have been removed. Due to their longevity, they are frequently the only post clearance survivors of the original vegetation. They can also be second generation offspring (or a mixture of both).

Scattered trees are defined as stands of naturally occurring indigenous trees (commonly eucalypts), usually two or more metres in height, which are no longer accompanied by the associated understorey or ground flora. They commonly occur within pasture or crop situations.

So far, limited investigations into the ecological values of trees in the agricultural landscape indicate that scattered trees are important environmental assets and play a vital role in the landscape and ecology of the North Central region. For example, Gibbons and Boak (2002), found that in comparable agricultural areas of southern NSW, more than half the remaining cover of woodlands of productive country occur in remnants less than one hectare in size. Their contribution to the ecology of the region is currently under-rated. In most parts of the North Central region, scattered trees are declining, as there is no regeneration to replace losses. In comparable agricultural areas of southern NSW Gibbons and Boak (2002) suggest that the rate of loss of paddock trees is between 0.5 and 2.5 per cent a year and that, given the current lack of regeneration, the total loss of paddock trees could occur within 40-185 years.

Scattered, old trees are often less consistently protected than patches of remnant vegetation and their health is usually more at risk.

The method used in our mapping of native vegetation communities does not represent the extent and distribution of scattered trees in the landscape.



Action 2.1 Map the extent and distribution of scattered trees and estimate their rate of loss in agricultural parts of North Central Victoria

Value of Scattered Trees

Scattered trees have a variety of economic, ecological and aesthetic benefits. In addition they are an important asset and focus for vegetation restoration efforts.

Economic Benefits

Scattered trees provide a range of benefits to farmers and other land managers. They provide valuable shade and shelter for stock; can help to control soil erosion and acidification; and prevent salinity by lowering the watertable.

They often form the only basis for natural pest control, providing roosts and protection for predatory animals such as bats, raptors and other birds, as well as spiders and predator insects. They also provide wood and other produce.

Remnant trees can reduce wind injury to crops, pastures and livestock.

Trees perform a valuable role of cycling nutrients within an ecosystem to assist other plant growth and the overall sustainability of an area. Large trees bring nutrients to the surface from their root system, thereby preventing or offsetting soil acidification. They add organic matter to the soil in the form of dropped bark, wood, leaves and seeds. Trees also convert atmospheric carbon dioxide into oxygen, helping to mitigate the global greenhouse effect. Leguminous trees such as *Acacia* species are able to fix nitrogen in the soil, thereby producing valuable accessible nutrients for other plant species.

Ecological Benefits

Scattered trees provide important habitat and resources such as nectar, pollen, fruit, seed, foliage, bark, roots and litter as well as perches, hollows and cover for many native mammal, marsupial, bird, bat, reptile and invertebrate species.

They can facilitate dispersal of wildlife between remnant blocks of native vegetation and thus maintain genetic diversity of flora and fauna between otherwise isolated blocks of habitat.

Trees that provide habitat for threatened wildlife species are an irreplaceable resource and are invaluable to the ecology of a region. These tend to be large old trees.

The habitat value of scattered trees is generally considered to increase with larger tree size (measured by trunk diameter or crown extent) as well as the number of nesting and roosting hollows. Proximity to other trees and remnant vegetation is also important.

The significance of scattered trees as remnant vegetation also depends on the extent of clearance in the local vicinity, and the extent to which the trees retain their original density. In general, the more extensively cleared an area is, the more significant the remaining trees become, and the closer the trees resemble their original density, the more likely they are to be considered significant remnants.

Large dead trees are also important for wildlife habitat, as their hollows and dropped branches provide shelter and food for many fauna species.

Aesthetic Benefits

In the North Central region, scattered trees frame the way in which we see the landscape. These trees help to define our image of the region and give the community a sense of place. They add beauty to an area, whether a single tree in a vast grassy pasture, or an ancient red gum tree towering over a waterway. Such trees have often featured in historical accounts, stories and paintings of the North Central landscape. Many of the remaining scattered trees in the North Central region have significance for local Aboriginal people, as ancient markers of sites and activities. Some trees within the region (both living and dead) still display scars from their use hundreds of years ago in the construction of shields and canoes.

Even where trees are sparsely distributed, landscapes within the North Central region would present a very different and less aesthetically pleasing picture without their remaining scattered trees.

Restoration Assets

Scattered trees are often highly valuable to the genetic diversity of areas within the North Central region because they may represent the last remaining stand of a particular naturally occurring species.

They can be used as a focus for revegetation, both as a source of seed or other propagules and as centres of revegetation planting taking place around and between the trees.

Immediately around scattered trees, improved microclimatic and environmental conditions can allow the regeneration and survival of plant species that cannot establish or persist on cleared land. Simply fencing and excluding stock from the area can lead to plant regrowth and a move towards a plant distribution closer to that originally occurring in the area.

Isolated trees in rural landscapes cannot be dismissed as having no role in conserving biological diversity and this importance should not be undervalued when assessing clearance applications (Hill *et al*. 1997).

2.3 Large Old Trees

Because of the history of vegetation clearance and forest use in the North Central region, large old trees are now a scarce resource, virtually irreplaceable in a human lifespan. They often present as widely scattered trees in agricultural areas, but they are now rare in public forests and reserves owing to the history of timber and firewood harvesting.

Value of Large Old Trees

Large old trees are an essential habitat for many fauna species. They are often richly endowed with hollows and offer other shelter opportunities for fauna. Many larger fauna species have evolved to only breed or shelter in hollows. Examples of these are owls, parrots, possums, tree goannas and gliders. In addition, large trees have been shown to provide rich food resources (compared to the equivalent amount of foliage cover provided by smaller trees). Ample evidence exists to conclude that tree size (and age) is an important contributor to the habitat value of individual trees. Studies in the Box-Ironbark ecosystem indicate that larger trees provide greater hollow availability and more reliable food resources (e.g. nectar, insects).

Therefore, there is a need for greater value to be placed on individual trees, particularly in fragmented and highly altered landscapes.

Large old trees provide important nodes for future remnant protection and revegetation efforts that will be required to maintain ecological function and land protection benefits to the regional landscape.

As for scattered trees, the aesthetic contribution of old trees to a sense of place is immensely important.

Threats

The massive loss of old habitat trees from the gold rush period onwards in North Central Victoria has greatly reduced populations of hollow dependent fauna. Some of these species, e.g. Tuans, are now threatened with extinction. Low numbers of large old trees is also thought to threaten the survival of other species such as the Swift Parrot that rely on copious nectar flows.

The rate of loss of native vegetation in the North Central region has declined markedly in recent years in line with statewide trends. The farming community in particular has recognised the important role that remnants of native vegetation communities play in maintaining biodiversity, mitigating the impacts of dryland salinity and improving water quality.

An emerging issue of serious concern is the incremental clearance of single trees, in particular large old trees (e.g. greater than 60cm diameter) from the rural landscape. This has been largely associated with intensification of agricultural land use and the emergence of new enterprises such as olive production, viticulture, new irrigation methods and semi-rural housing development.

Incremental losses also occur from rural tree decline or 'dieback' and old age. Coupled with the slow growth rates of trees in most of North Central Victoria and the lack of recruitment of paddock trees, the outlook for large tree dependent fauna is bleak, and the presence of any native trees in many parts of the agricultural areas is not assured.

Retention of large trees is vital. The value of a tree is considered to be proportional to its size. However, conservation of smaller sized mature trees is also extremely important, as these will be the next generation of large old trees.

Considerable research has been undertaken into the causes and effects of rural tree decline in Australian agricultural landscapes (e.g. Landsberg *et al.* 1990). While massive decline on the scale seen in some areas of Australia is not yet evident in the North Central region, anecdotal evidence suggests an emerging problem with potentially disastrous implications.

Grassy woodlands and Box-Ironbark forests of the region have suffered repeated infestations and defoliation by insects in recent times. Some tree species, e.g. Red and Brown Stringybark, Red Ironbark and Long-leaf Box, in some environments seem particularly vulnerable to die-back of isolated individuals or remnant patches in agricultural areas.

This often accompanies higher levels of soil nutrients resulting from pasture improvement or increasing grazing intensity and the associated loss of understorey vegetation, leading in turn to a decline in populations of insect eating birds.

Response to Threats

Until now there has been no clear regional approach to assessing the importance and value of these single large old trees. Many of the actions outlined in this plan are aimed at improving the viability of small remnants, characterised by the presence of large old trees.

See **Appendix 14** for our protection responses to clearing proposals. Our approach is based on the size of the old trees relative to EVC based benchmarks. The size is measured as the diameter over the bark at breast height.

2.4 Native Anthropogenic Vegetation Associations

In response to human activities some areas retain significant native vegetation but with a composition or structure that is different to the pre-European state. These are sometimes referred to as anthropogenic vegetation associations. Such areas have been regarded as less natural and therefore less valuable.

However, as discussed by Oliver *et al.* (2002), such vegetation may still provide significant habitat and resources for important components of the State's biodiversity and, importantly, are often capable of regenerating to a much higher level of habitat quality.

In North Central Victoria these areas are particularly valuable because:

- In heavily cleared North Central Victorian landscapes they constitute a significant proportion of the remaining country that retains any capacity for regeneration of the ground flora;
- They are both a model for future restoration efforts, and a source of propagation material to support such restoration. They are frequently the only areas in which restoration of greater floristic diversity is viable; and

- These areas can provide 'fast tracking' opportunities for revegetation to achieve our regional targets for restoration of native vegetation.

Because of North Central Victoria's need for large scale revegetation, these areas with high regeneration potential are valuable assets. This is because regeneration is cheaper and more effective than replanting, species that cannot be artificially propagated may regenerate and species not even apparent in the area can regenerate. Such areas have far more potential to become viable, self sustaining habitat patches than revegetation works on more degraded land. Woody vegetation is also necessary in most landscapes to reduce the salinity problem. These less-natural areas of native vegetation can be re-treed at far lower cost than exotic/weed dominated areas. Often 'natural' regeneration is a possibility. Even where trees are absent, this kind of country is well suited to low cost direct seeding of trees.

Sometimes the native vegetation present in altered environments is so suppressed by grazing or other pressures as to be virtually undetectable, or may only exist as seeds or other propagules. Yet, a number of case studies have shown that regeneration to surprising levels of diversity is possible, once the grazing or other pressures are reduced. At this stage, our ability to predict this regenerative capability is very limited.

Action 2.2 Develop research project to improve our ability to predict the regenerative capability of sites

In the meantime, under the precautionary principle, land of low biodiversity values should be considered to have the potential for improvement through regeneration processes unless there is clear evidence to the contrary, such as a history of ploughing.

Native Grass "Pastures"

There remain substantial areas of anthropogenic, native grass based pastures in North Central Victoria. These are located largely, but not exclusively in hill country and are used for grazing. Due to the limited technology and resources available, much of this type of country may be mapped as cleared; incorrectly indicating that native vegetation is absent.

Such areas have:

Biodiversity Value

- Native grasses comprise part of our biodiversity heritage and, like other indigenous species, need conservation management for their own sake.
- Native grasses, compared to exotic grasses, provide more habitat resources for a wider range of indigenous fauna species.
- The presence of native grasses often indicates areas that retain higher levels of indigenous plant biodiversity (i.e. of species other than the grasses) including soil crusts and soil microfauna.
- Areas of native grass are more likely (in comparison to exotic vegetation) to allow regeneration of other indigenous species and can thus retain the ability to regenerate to a more 'natural' state, both structurally and floristically.

Environmental Value

Native grasses provide environmental services by virtue of their (mostly) perennial life form. In contrast to annual exotic vegetation, they:

- Help reduce recharge to ground water in 'high recharge' environments, i.e. help reduce the salinity problem;
- Maintain vegetation cover over dry periods, reducing soil loss and soil structural decline; and
- Improve hydrologic properties of soil more than exotic perennial grasses according to recent South Australian research (Brown 2004).

Economic value

- Many native grass species are useful for grazing, and the best species are comparable to popular exotic pasture species in production, nutrition and palatability characteristics.
- Because native grasses are 'wild' they cost very little to maintain in comparison to many exotic pasture species.
- The indigenous herbaceous flora of such areas is mostly perennial, and supports productive grazing with no, or very low, levels of management inputs.

- Native grass species serve as a model from which more sustainable grazing systems could be developed.
- The productive, perennial grasses and other herbs are exactly what is called for in dryland salinity mitigation plans.

2.5 Why are These Remnant Vegetation Assets Important?

Native vegetation is important for the health of the land and water, the flora and fauna, and the people of North Central Victoria.

Native vegetation provides low cost or free ecosystem services such as protection from land degradation, particularly the scourge of salinity, cleaner air and water and pest control.

The value to us of these ecosystem services is incalculable. In addition, native vegetation has long been a direct source of useful products such as wood, pasture, food, fragrances and oils.

Native vegetation comprises the floristic part of our biodiversity asset and forms the habitat essential for the survival of most of our other native species. The 'bush' is the earth covering mantle that provides the unique Australian landscape, gives us our picnic grounds, surrounds us with birdsong and gives us a sense of place and relationship with the landscape.

In North Central Victoria, too much of the native vegetation has been lost. As a result, the land is being degraded, the quality of water resources is deteriorating, fauna is declining, and the unique character of the landscape is being lost.

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.

Indirect Economic Benefits

Native vegetation and other biodiversity assets provide 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.

Impact of Ecological Systems Decline

The regeneration of habitat is an ecosystem service maintaining the natural asset that supports biodiversity, which is important to humans in a range of ways. Decline of ecological systems (associated with native habitat) in the North Central region is manifested in the reduction in 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.

At present, the contribution of native vegetation, habitat and biota to ecosystem goods and services has not been independently quantified across the region, although research in Australia and overseas suggests that it is considerable (CSIRO 1996; Costanza and Folke 1997).

Preliminary evaluation and modelling has produced a notional annual figure of $54 million for the contribution of remnant habitat to ecosystem services across the North Central region.

What if Current Trends Continue?

North Central Victoria has already experienced and continues to experience the impacts arising from the loss of native vegetation. Some of these are irreversible.

These impacts include:

- Extinction of vegetation communities and flora species.
- Dramatic declines in population and geographic range of most of the indigenous flora and fauna species of North Central Victoria since European settlement.
- Extinction of vegetation dependent species (e.g. fauna species).
- Threat of extinction in Victoria of around 100 fauna species and 300 flora species recorded in North Central Victoria. See **Appendix 7** and **Appendix 8** for a complete list.
- Increased groundwater accessions and alteration to natural hydrologic cycles.
- Loss of ecosystem viability, regenerative ability and resilience.
- Increased erosion and sedimentation of waterways.
- Soil decline (structure, acidification, loss of biotic function).
- Reduced water quality.
- Weed invasion.
- Increased habitat fragmentation.
- Loss of structural habitat values.
- Loss of landscape amenity.

If this Net Loss trend is not reversed, we face the further loss of many ecosystem services currently provided by native vegetation and fauna and further declines in the quality of the environment.

The declining trend in extent and quality of native vegetation is due to the processes still threatening native vegetation.

These threats also impact on flora and fauna species by reducing their population, their geographic range and the recruitment of new individuals. If these threats are not addressed and impacts are not ameliorated, over time we will lose species locally, regionally and globally.

3. Threats to Native Vegetation

Native vegetation in North Central Victoria still faces severe threats to its survival. Some of these are unforeseen consequences of over clearance in previous centuries' (e.g. salinity), some are new and unprecedented (e.g. global warming) but most are the same human activities that brought about massive alterations to the North Central Victorian landscape in the nineteenth and twentieth centuries.

These threats overlap and are interrelated to some extent, e.g. overgrazing of livestock could be considered a subset of harvesting pressure. Soil disturbance, if severe enough becomes vegetation clearance. Threats may interact synergistically, e.g. work in Western Australia has shown that remnant vegetation can recover from soil disturbance or higher nutrient levels but not both in combination. Threats may cause both a direct impact and a cascade of indirect impacts. For instance, past clearing led to high saline watertables, which kills vegetation in low lying areas, that in turn increases fragmentation of vegetation; then pollinator species decline, which leads to reduced capability of regeneration.

Risk Analysis

The setting of priorities for management of threats is often dealt with via a 'risk analysis'. This process can provide valuable insights where each threat is assigned a probability of it occurring and a measure of the impact when it does occur. See the figure below for an example of a risk analysis matrix.

Figure 3.1 Example of risk analysis matrix

Impact / **Probability**	High	Moderate	Low
	Risk		
High	5 (highest)	4 (high)	3 (moderate)
Moderate	4 (high)	4 (high)	2 (low)
Low	3 (moderate)	2 (low)	1 (lowest)

With natural resource management generally and native vegetation in particular, the quantification of impact is difficult and the probability of many risks occurring is non-varying - they are already happening! Conventional risk analysis in these circumstances is less useful.

Nevertheless, in developing the above list of priority threats, an informal risk analysis has been conducted by contributors to this plan. In addition to taking account of the probability and degree of impact, consideration was also given to:

- The significance of the assets at risk;
- The spatial and time extent over which the threat operates;
- The reversibility of the impact;
- Our capacity to deal with the threat, including the costs of intervention; and
- The adequacy of our knowledge of what the impacts are or how to address the impacts.

See **Table 3.1** for further detail.

3.1 Further Clearing for Agriculture, Urban or Other Use

Compared to the peak during the late nineteenth and twentieth centuries, the rate of clearing in North Central Victoria is now relatively low.

At the time of writing, the rate of native vegetation clearance in North Central Victoria is unknown. To illustrate how important clearance control is, an estimated annual net loss of only 0.1 per cent of the existing vegetation asset would lead over 50 years to a cumulative loss of over 20,000 hectares.

Clearance of freehold land in agricultural areas is occurring to allow changes in farming practices or more intensive land uses. Clearance of public land is also occurring, especially on roadsides, due to firebreak construction and cropping. Ploughing breaks along roadsides can be of limited fire suppression value, and can promote annual weeds (i.e. high fuel loads) and erosion. Activities on roadsides are governed by the Road Management Act 2004 and the Planning and Environment Act 1987. Any proposed activities on roadsides should first be referred to the local council for advice, referral or permission.

With no mechanisms to minimise and offset clearance, intensive agricultural areas are eventually likely to become landscapes devoid of native vegetation and dependent fauna. Given the lack of adequate nature reserves in such country, further local and regional species and community extinctions are inevitable.

Urban clearance is associated with the larger towns, especially the rapidly growing urban and suburban areas around Bendigo.

Without intervention, much remnant vegetation on private land around growing urban centres will be lost. As public land reserves inadequately represent the more fertile and productive landscapes and their vegetation, these threatened communities and their dependent fauna would decline further.

Clearance of native vegetation to make way for human needs cannot be completely prevented.

This document exists to ensure we minimise the losses and adequately offset their impacts.

As vegetation clearance is generally an irreversible, permanent loss, action to protect native vegetation assets from the threat of clearance is the very highest priority recommended by this document.

3.2 Global Warming/Rapid Climate Change

Climate change has the potential to impact significantly on native vegetation in North Central Victoria. This is because the changes are predicted to be rapid (in evolutionary time scales) and because our remnant vegetation is so fragmented.

Global warming via the greenhouse effect is not the only cause of climate change. Recent research has identified massive native vegetation clearance as a cause of decreasing rainfall in the WA wheat-belt.

Without intervention, it is conceivable that the more viable remnants of native vegetation communities would change drastically, with species tolerant of or adaptable to the new climate dominating, and those intolerant and unable to adapt dying out. In fragmented landscapes, the less diverse remnants experiencing the same process may have no tolerant or adaptable species left. Globally, some predict the extinction of a quarter of all terrestrial species.

Because we don't have the capacity to significantly reduce the risk from global warming, or know how to protect our native vegetation assets, this document recommends our actions focus on large scale revegetation for multiple benefits i.e. to act as greenhouse gas sinks; to protect and rebuild native vegetation assets; and enable landscape linkages.

Action 3.1 Encourage research to monitor the regional impacts of global warming

3.3 Further Weed Invasion

Invasive exotic plants (environmental weeds) are widespread and pervasive throughout much of the remnant vegetation in North Central Victoria. For many vegetation communities, there are no longer any examples surviving that are relatively free of weed domination. Vegetation communities of waterways and naturally fertile or moist landscapes are particularly at risk. Floods along waterways create soil disturbance and then deliver water, nutrients and weed seeds (or other propagules) creating ideal conditions for weed growth. Over time, this process tends to reduce the entire waterway

to the ‘lowest common denominator’ of the weediest upstream section.

Destruction of ground layer vegetation, soil disturbance and altered patterns of runoff of nutrients or water all encourage weed growth.

Many of the existing environmental weed species present in the region have not yet achieved their potential geographical extent or population density.

With no control effort, these species will continue to proliferate and displace native vegetation. A good example is Bridal Creeper, present in the region mostly as scattered, small infestations, but having the potential to reach smothering proportions.

Gardening based on non-indigenous species has been responsible for introducing many species of environmental weeds into remnant vegetation and is expected to introduce more in the future. Garden and other refuse is still frequently dumped into bushland areas, increasing the weeds and creating conditions that favour their establishment.

With no control effort, more environmental weed species will be introduced to the region, weed domination will become more intense and more remnant vegetation areas will be invaded.

Managing existing weed invasions is expensive and adequate resources are not yet available except for the highest priority remnants. However, taking action to prevent further weed invasions of our native vegetation assets is extremely cost effective and is therefore one of the highest priorities recommended by this plan.

3.4 Grazing

In the agricultural parts of the region, a very high proportion of remnant vegetation is grazed by livestock.

Where present, rabbits and other feral or wild grazing animals increase the grazing pressure. Exclusion plots have demonstrated the high impacts of grazing by rabbits, other feral species and kangaroos and wallabies.

Remnant vegetation on public land is also subject to unsustainable grazing pressure.

Some vegetation types such as grasslands and grassy woodlands actually require grazing or other means of biomass reduction to maintain their quality. Without grazing, tussocks decline and weeds invade. While specific management information is scarce, it is assumed that periodic, ‘pulsed’ grazing is the most beneficial regime. In contrast, continuous grazing, or ‘set stocking’, even at relatively low intensities can lead to loss of palatable species and invasion of weed species replacing the grazed out natives.

Most other vegetation types are not well adapted to grazing. In these, grazing usually eliminates all but a few species from the understorey and weeds come to dominate the ground flora. Long lived species such as Eucalypts persist, but without changes to grazing management, insufficient recruitment occurs and eventually they too will decline.

Overgrazing, if severe or protracted enough can cause soil disturbance and even destruction of the native vegetation, i.e. can be considered vegetation clearance.

With no change to the grazing pressures on remnant vegetation, the extent and condition of native vegetation in North Central Victoria will continue to decline.

Protection of our native vegetation assets from the threat of unsustainable grazing is recommended as a high priority in this plan.

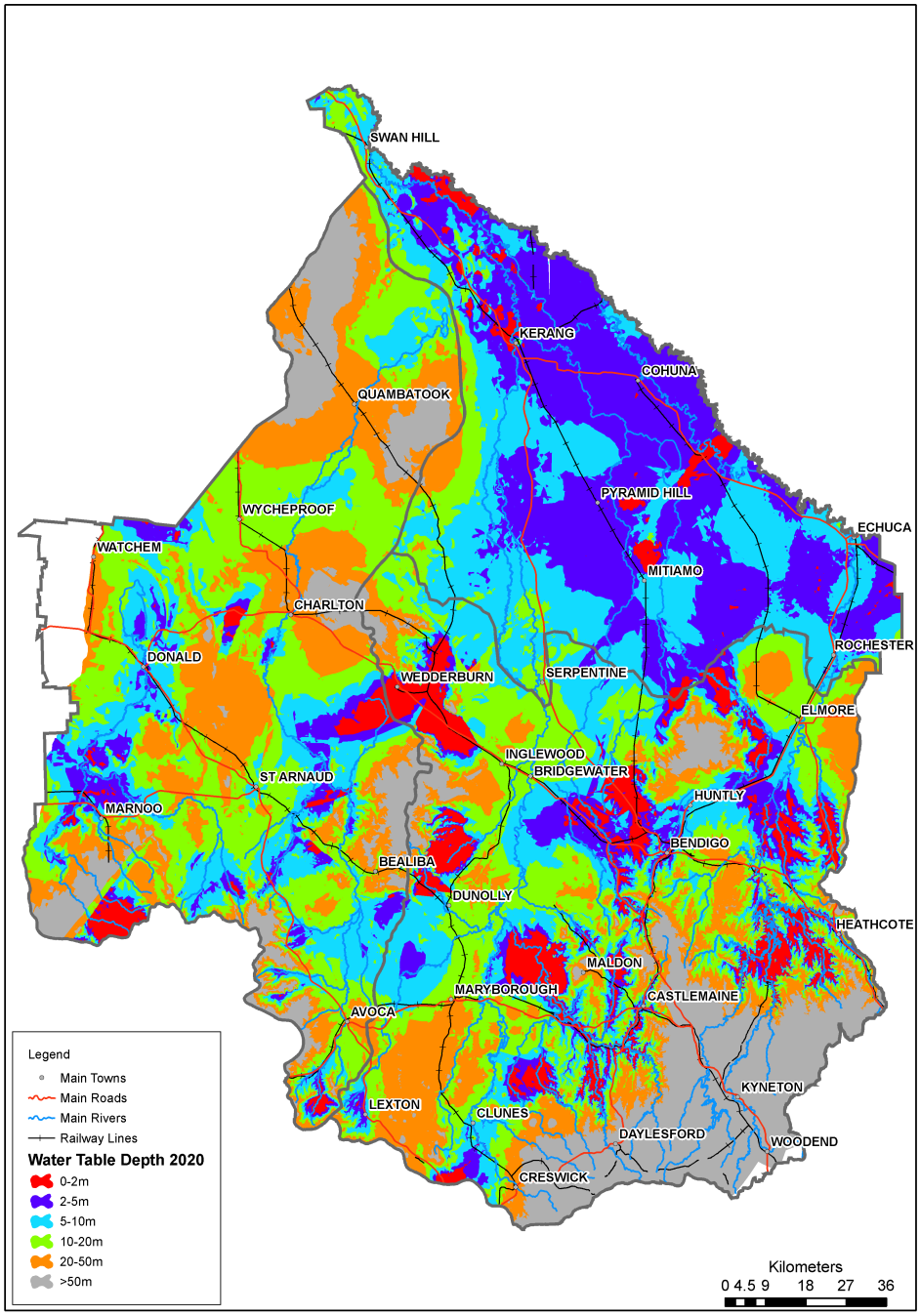
3.5 Salinity

Rising saline watertables threaten vegetation types of low lying country. Wetlands of the northern plains are particularly at risk with watertables already close to the surface. If no action is taken to protect these areas, we can expect the loss of the vegetation and the death of the wetlands as functioning habitats for most wetland dependent species. Some of these are international migratory species. They and the wetlands are ‘protected’ by multi-governmental agreements such as Ramsar, JAMBA and CAMBA etc.

Map 4 shows a forecast of the areas likely to be suffering from shallow, saline watertables by the year 2020.

Works to protect highly significant native vegetation assets from the impacts of salinity are recommended as one of the highest priorities by this document.

Map 4 Forecast depths to watertable in 2020



3.6 Soil Disturbance

(Disturbances not severe enough to be called vegetation clearance)

Some vegetation types or plant species may require some form of disturbance to allow regeneration. In fragmented or weedy landscapes, however, soil disturbance is usually extremely detrimental, as it destroys scarce native vegetation and provides long lasting opportunities for weed invasion. There are many examples of soil disturbance from the gold rush period of the late 1800s that have still not recovered.

Road making and development generally cause soil disturbance in remnant vegetation. These disturbances are almost universally not rehabilitated in a way that promotes the recovery of native vegetation. Exotic grasses (usually invasive species) are sown to stabilise the soil even though there are indigenous alternatives. Without better rehabilitation techniques, we can expect every occurrence of soil disturbance to lead to another loss of extent and quality of native vegetation.

Livestock trampling and vehicle traffic can be significant disturbances.

Protecting native vegetation from soil disturbance and ensuring appropriate rehabilitation following unavoidable soil disturbances are a priority under this plan.

3.7 Habitat Fragmentation and Isolation

The knowledge of the effects of habitat fragmentation and isolation on fauna is much more extensive than that for flora and vegetation. Nevertheless, it is known that compared to large remnants, small, isolated remnants of native vegetation are much less able to resist weed invasion, rural tree-dieback and other pressures. Some plant species are vulnerable to isolation and small population size. Pollination vectors may not be able to persist in fragmented landscapes. Without remedial action to offset fragmentation and isolation, we can expect further losses of flora and fauna species from the region and a further decline in the quality of the remaining native vegetation.

Taking action to reconnect and buffer isolated remnant native vegetation is recommended as a high priority by this document.

3.8 Alterations to Natural Fire Regimes

Fire is known to be essential for the health and renewal of some Australian vegetation types. Historical records show that Aborigines practised widespread burning, at least of the fertile, productive country. Less certain is the impact that the cessation (or resumption) of such burning practices would have on the health of our current remnant vegetation in North Central Victoria. It is known that grassy ecosystems (grasslands and grassy woodlands) benefit from occasional burning in other parts of Victoria, but there appears to be little documentation of the effects of fire on the vegetation communities of North Central Victoria.

There is some concern fuel reduction burns in public forests may have detrimental effects on vegetation condition and habitat values. As research into the effects of fuel reduction burning has only been carried out in the moister forests of the Central Victorian Uplands Bioregion, there is little known about the impacts on forests of other bioregions.

It is not known what effect the continuation of current burning regimes will have.

Research to fill these knowledge gaps is seen as a priority In the North Central Native Vegetation Plan.

3.9 Altered Hydrology

Wetland and waterway vegetation types have been severely damaged by alterations and diversions to natural patterns of water flow. Wetlands, including some of the internationally significant wetlands in the north of the region, have lost native vegetation values due to continuous inundation (too much water), diversion of flows away (too little water) or use as evaporation basins to reduce salinity impacts on agricultural land. Riparian forests along the Murray River are declining as flood waters have been diverted for human use away from the floodplain.

Construction of levee banks along waterways deprives floodplains and native vegetation of their natural water flows.

These impacts will continue unless appropriate environmental flows of water are implemented.

Restoration of more natural water flow regimes is a high priority in the North Central Native Vegetation Plan.

3.10 Other Invasive Exotic Species

Rabbits, hares, goats and pigs are all known to be wild in North Central Victoria. Rabbits are notorious for the damage their grazing and digging do to native vegetation. European Carp (and other exotic fish species) are widespread in waterways. Carp are said to devastate aquatic vegetation and even undermine river banks, causing collapse of mature River Redgums.

Pest bird species like Indian Mynas are expanding their range in North Central Victoria. This may impact on the condition of native vegetation as they displace indigenous hollow dependent fauna species.

Invertebrate pests also occur. In moist areas, the 'grazing' of exotic slugs is suspected of having an impact on orchid and other vulnerable flora species. European Honeybees reduce nectar, pollen, and nesting hollow resources. There is evidence that bees also reduce seed set of some native flora species adapted to bird pollination by harvesting the nectar without transferring any pollen.

Plant diseases such as Phytophthora can devastate native vegetation communities by eliminating susceptible plant families (e.g. Fabaceae) and species. Phytophthora is not known to have significant impacts in North Central Victoria, but with predicted affects of climate change, is expected to spread into this region.

Predator species like the fox and cat devastate populations of vulnerable indigenous fauna species. This may also have a flow-on impact on the condition of native vegetation.

With no improvement in control of feral species, we are likely to see further incremental declines in the quality and extent of native vegetation. As a regional community we have little capacity to manage some feral species, but where possible, protection of significant native vegetation assets from the impacts of invasive species is a priority. Research to fill the gaps in our understanding of current and potential impacts from feral species is also needed.

The prevention of further invasions of new species is a high priority.

3.11 Harvesting Practices

Timber and firewood harvesting from private and public land in North Central Victoria puts significant pressures on the habitat values of native vegetation. The major issues are the losses of older trees which comprise the better habitat resource for hollow dependent fauna and the removal of fallen timber. Fallen timber is a scarce wildlife resource that tends to be tidied up from farm land remnants for firewood use, to eliminate rabbit harbour or simply for appearance sake. Many of the threatened fauna species of the region are hollow dependent or rely on ground shelter and feeding opportunities provided by dead wood.

In parts of North Central Victoria, Mallee Eucalypts are mechanically harvested for Eucalyptus oil production. This prevents the re-establishment of habitat values and can reduce the floristic diversity.

If we can't reduce the impacts of our harvesting of biomass resources, we can expect to see further decline in the habitat quality of our native vegetation.

Minimising the impacts of harvesting on native vegetation assets is a priority of the North Central NVP.

3.12 Off-Site Effects of Nearby Land Uses

Some agricultural practices have detrimental impacts on remnant vegetation in farming areas.

High levels of nutrients in soils (from fertilizing or stock camping behaviour) and in run-off ('natural' or excess irrigation water) contribute to rural tree dieback, weed invasion and decline of waterway vegetation. Studies have shown (e.g. Loddon Water Quality/Nutrient Management Strategy) that the largest source of nutrients in waterways comes in the sediments eroded from agricultural land.

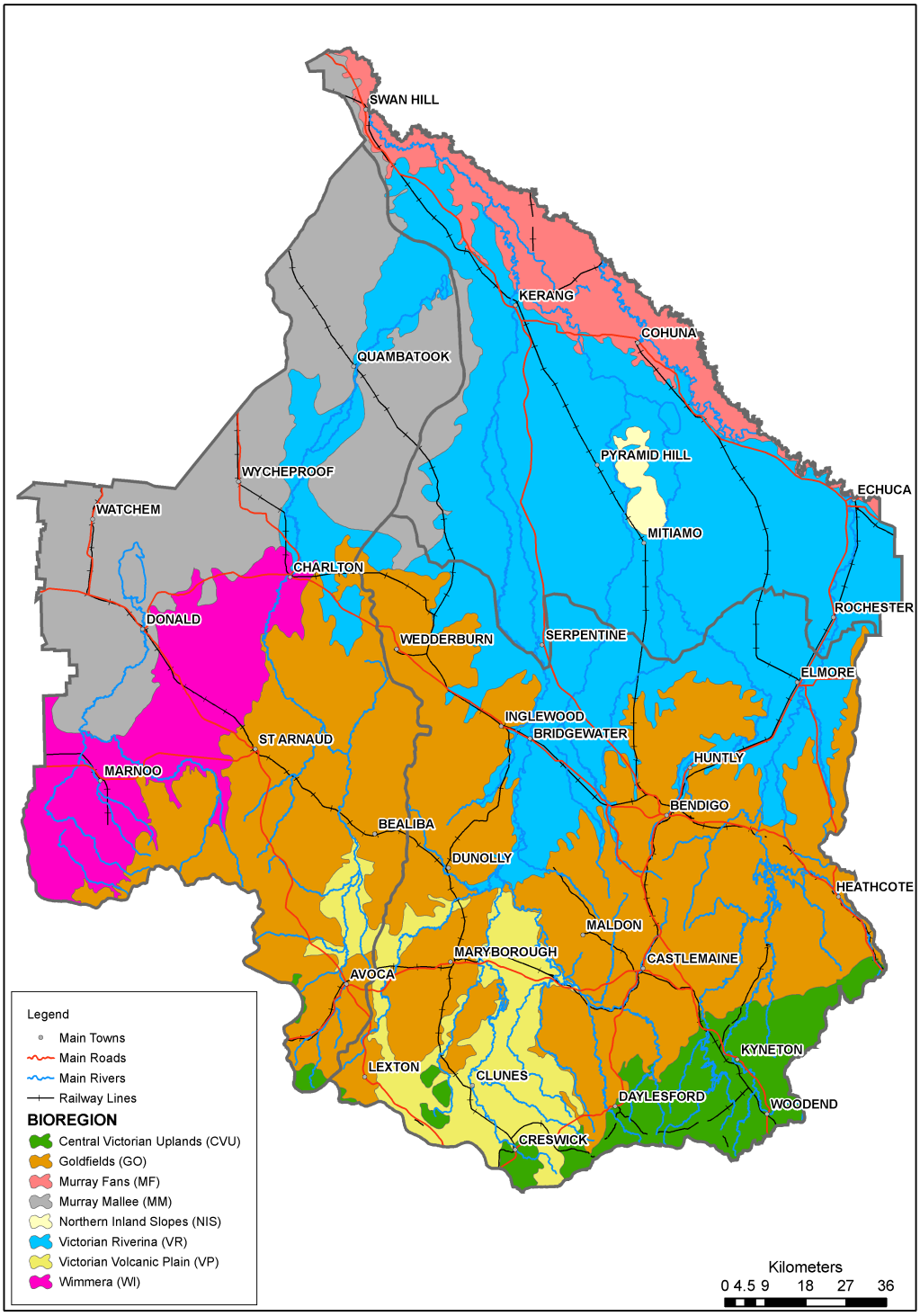
Pesticides can also be carried in run-off or spray drift.

If we can't reduce or eliminate these impacts, we can expect incremental losses of the extent and quality of native vegetation. Because of the highly threatened status of most native vegetation remaining in agricultural areas, these losses are severe and can push an endangered vegetation type to extinction.

Protection of significant native vegetation assets from the impacts of agricultural practices is a priority in the North Central NVP.

Table 3.1 Risk analysis of threats to native vegetation

Threat	Probability that impacts of threat will occur	Impact	Extent within total NC remnant veg	Significance of impact	Capacity to avoid	Irreversibility of impacts	Adequacy of knowledge?	Priority
Further clearing	high	very high	low	high	high	very high	high	VERY HIGH
Habitat fragmentation & isolation	high	moderate	high	high	moderate	moderate	moderate	HIGH
Further weed invasion	high	moderate	very high	high	low	low	moderate	HIGH
Salinity	high	very high	low	very high	low	high	high	HIGH
Altered hydrology	high	high	low	very high	moderate	low	moderate	HIGH
Excessive total grazing pressure and duration	high	moderate	high	high	low	moderate	high	HIGH
Harvesting practices	high	moderate	high	moderate	moderate	low	high	MEDIUM
Off-site effects	high	moderate	moderate	moderate	high	moderate	high	MEDIUM
Soil disturbance	high	high	low	high	moderate	moderate	high	MEDIUM
Fire regimes	high	moderate	moderate	moderate	moderate	moderate	very low	LOW
Climate change	high	moderate	very high	high	very low	moderate	very low	LOW
Feral animals	high	moderate	high	moderate	low	moderate	low	LOW


SWAN HILL
KERANG
COHUNA
QUAMBATOOK
PYRAMID HILL
WYCHEPROOF
ECHUCA
WATCHEM
MITIAMO
CHARLTON
ROCHESTER
DONALD
WEDDERBURN
SERPENTINE
ELMORE
INGLEWOOD
BRIDGEWATER
ST ARNAUD
HUNTLY
MARNOO
BENDIGO
BEALIBA
DUNOLLY
HEATHCOTE
MALDON
MARYBOROUGH
CASTLEMAINE
AVOCA
KYNETON
LEXTON
CLUNES
DAYLESFORD
WOODEND
CRESWICK
Legend
Main Towns
Main Roads
Main Rivers
Railway Lines
BIOREGION
Central Victorian Uplands (CVU)
Goldfields (GO)
Murray Fans (MF)
Murray Mallee (MM)
Northern Inland Slopes (NIS)
Victorian Riverina (VR)
Victorian Volcanic Plain (VP)
Wimmera (WI)
Kilometers
0 4.5 9 18 27 36

4. Bioregions and their Vegetation Communities

Consistent with a Victoria wide approach to bioregional planning, our analysis of the native vegetation in North Central Victoria looks at how much native vegetation remains now compared to its pre-European settlement extent (often called the pre-1750 extent).

The results of this analysis in North Central Victoria are presented in **Appendix 6.**

This section contains a brief overview of bioregions and their vegetation (EVCs) in North Central Victoria. The estimates of native vegetation remaining are all derived from extant EVC mapping. For more detailed information, see the bioregional overviews available from the Department of Sustainability and Environment web site (www.dse.vic.gov.au).

In addition to this approach, groups of EVCs are identified as significant within North Central Victoria for reasons of highly threatened bioregional conservation status, important values for habitat or landscape protection. These groups are identified and described in **Appendix 5.**

4.1 Central Victorian Uplands Bioregion

The Central Victorian Uplands bioregion is 1.2 million hectares in size. North Central CMA is responsible for the management of around one tenth of this area. In North Central Victoria, this bioregion is restricted to the higher rainfall areas in the far south of the catchment.

At the time of settlement, the bioregion was dominated by forests and woodlands. The dominant Ecological Vegetation Classes were Herb-rich Foothill Forest and Plains Grassy Woodland.

Substantial areas of the forest EVCs remain within this bioregion, plus significant remnants of Valley Grassy Forest. However, most remnant vegetation is confined to hilly areas on Ordovician sediments, while the flatter and more fertile, productive areas have been extensively cleared for agriculture.

Table 4.1 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion(%)
North Central	139,402	11%
Goulburn	523,208	43%
Port Phillip	166,685	14%
Corangamite	145,951	12%
North East	93,896	7.7%
Glenelg	81,383	6.7%
Wimmera	67,712	5.6%
Total	**1,218,237**	**100%**

Threats

The major threats to native vegetation in the Central Victorian Uplands include grazing, weed invasion, habitat modification as a result of timber harvesting (including firewood) and inappropriate fire regimes. Climate change and Phytophthora root rot have potential for serious impacts in the bioregion.

Loss of native vegetation along rivers and streams poses a threat to water quality and aquatic native species. The expansion in recent times of rural residential areas around regional centres has the potential for significant impacts (both positive and negative) on nature conservation values.

Stock grazing and weeds are also key issues for threatened flora and fauna species, which in this bioregion include Barking Owl, Brush-tailed Phascogale, Painted Honeyeater and Powerful Owl.

Reservation of the ecosystems of the bioregion is considered to be around 30 per cent adequate (Lowe *et al.* 2003).

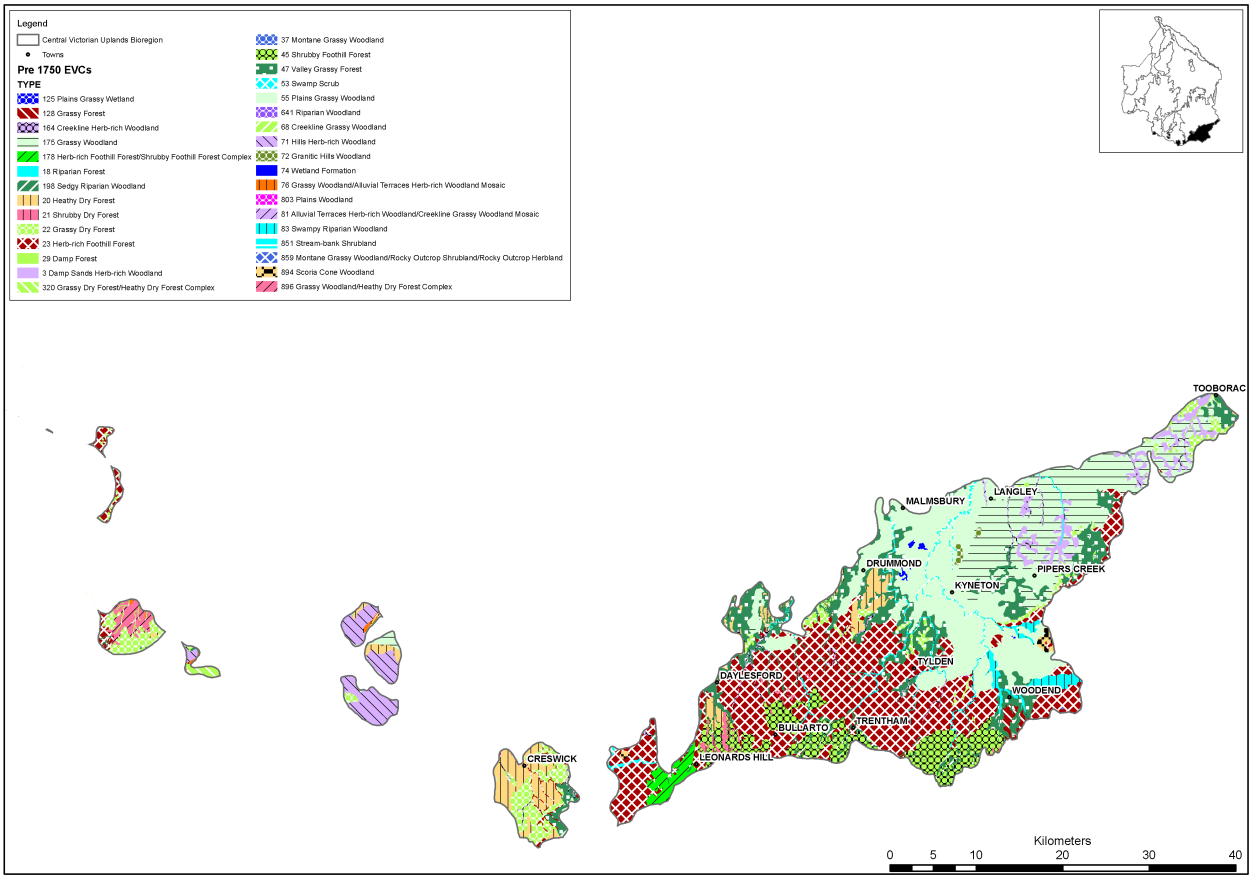
Therefore appropriate protection and management of private land is needed to provide ecological viability and integrity of populations, species and communities.

Table 4.2 Depletion of dominant* EVCs – Central Victorian Uplands Bioregion

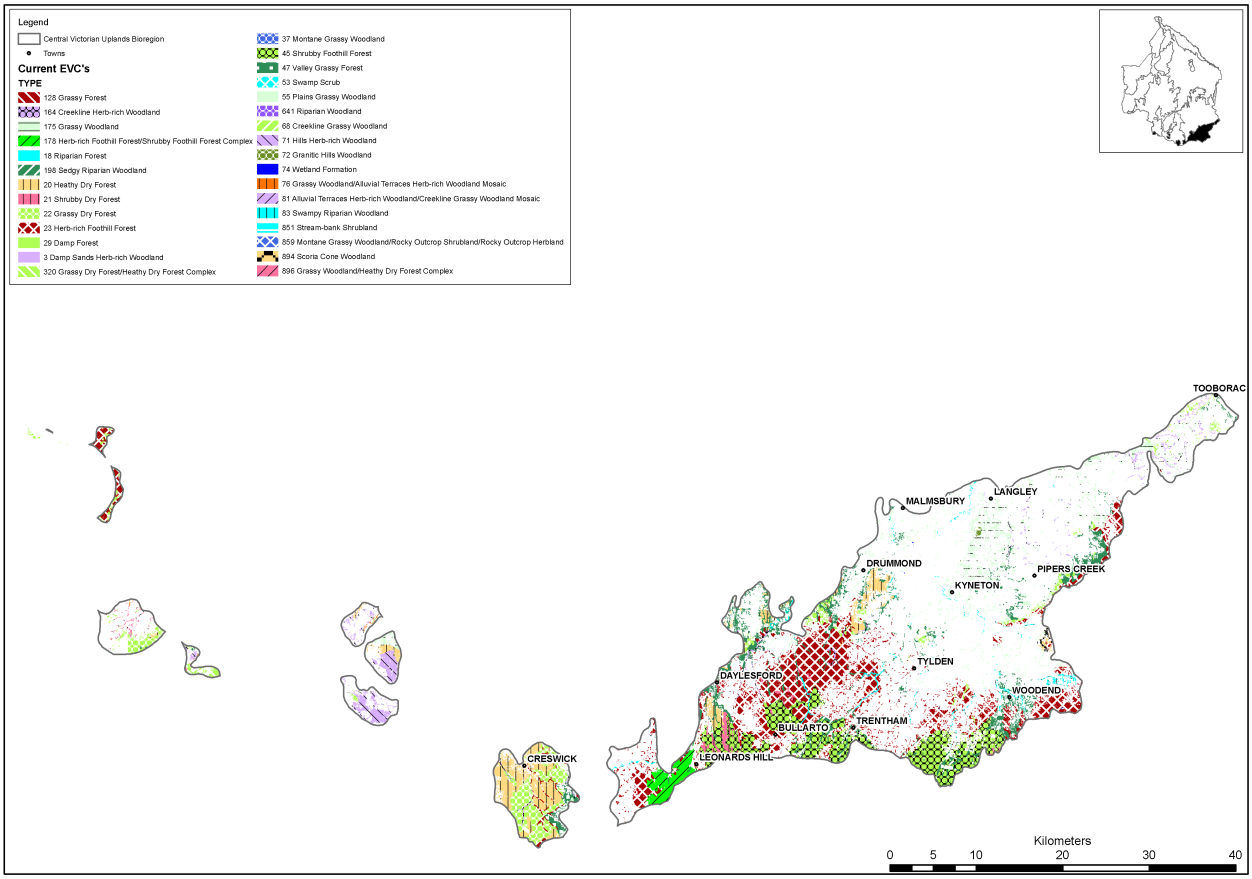
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Damp Sands Herb-rich Woodland	Endangered	3,295	490	15%
Grassy Dry Forest	Depleted	7,662	4,793	63%
Grassy Woodland	Endangered	18,476	2,310	13%
Heathy Dry Forest	Least concern	6,382	4,637	73%
Herb-rich Foothill Forest	Depleted	37,529	15,744	42%
Herb-rich Foothill Forest / Shrubby Foothill Forest Complex	Depleted	1,504	1,392	93%
Hills Herb-rich Woodland	Vulnerable	3,872	1,387	36%
Plains Grassy Woodland	Endangered	24,480	1,372	5.6%
Sedgy Riparian Woodland	Depleted	1,846	1,431	78%
Shrubby Foothill Forest	Least concern	9,256	8,009	87%
Swampy Riparian Woodland	Endangered	2,200	329	15%
Valley Grassy Forest	Vulnerable	15,749	5,225	33%
Other		7,159	2,795	39%
TOTAL		**139,410**	**49,914**	**36%**

*Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 6 Central Victorian Uplands pre-European Vegetation



Map 7 Central Victorian Uplands Extant Vegetation



4.2 Goldfields Bioregion

This bioregion forms a part of the New South Wales South Western Slopes IBRA region, which extends across the Murray River into Victoria. In Victoria, the Goldfields bioregion extends over 1.3 million hectares. The management of three quarters of it is the responsibility of North Central CMA.

The bioregion was originally covered with a mixture of drier forest and woodland types, mostly on relatively poor soils and includes the core of the Box-Ironbark ecosystem. Grassy Woodland and Box-Ironbark Forest EVCs dominated, but there were substantial areas of Heathy Dry Forest EVC and Low Rises Grassy Woodland./ Alluvial Terraces Herb-rich Woodland Mosaic.

It now supports fragmented native forests and woodlands. Clearing has been extensive in the more fertile Valley and Riverine Grassy Woodlands and has fragmented and disturbed much of the remainder. The gold rush era impacted particularly on the Box-Ironbark Forests that were felled for fuel and timber for the mines.

Table 4.3 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	1,001,284	76%
Goulburn	170,208	13%
Wimmera	137,975	10%
Glenelg	15,376	1.2%
Total	**1,324,843**	**100%**

Fragmented but considerable remnants of Box-Ironbark, Heathy Dry Forest and Grassy Dry Forest EVC occur within the bioregion. More than 50 per cent of other EVCs have been cleared for agriculture. Moderate proportions of Mallee and Dry Foothill Forest BVTs remain, mostly on public land outside conservation reserves.

Threats

Historic loss of habitat has already caused the loss of much biodiversity in the Goldfields. Habitat fragmentation and incremental vegetation loss continues to pose a threat to many species and communities within the Goldfields bioregion while weed invasion and clearing are continuing threats to vegetation. The decline of older trees on private land is also a threat to some fauna species in this bioregion. In some areas grazing is a serious issue threatening regeneration on both public and private land. Particular mining techniques, such as open-cut mining, permanently remove native vegetation. Others such as ‘doze and detect’ operations concentrate on alluvial deposits, where they cause substantial disturbance to the less common native vegetation communities that occur there.

Timber harvesting and firewood collection can modify extensive areas of forest on public and private land. Dryland salinity is a significant threat on low-lying areas across the bioregion as are ongoing threats from rabbits and environmental weed invasion on fertile areas adjoining farmland. The expansion in recent times of rural residential areas around regional centres has the potential for significant impacts (both positive and negative) on nature conservation values.

Broad-scale clearing and overgrazing in the foothills has led to erosion problems. This in turn leads to habitat loss (both terrestrial and aquatic) through increased groundwater recharge, rising watertables and salinity. While most private land is cleared, it still contains 30 percent of remnant vegetation that contributes substantially to the bioregion’s biodiversity.

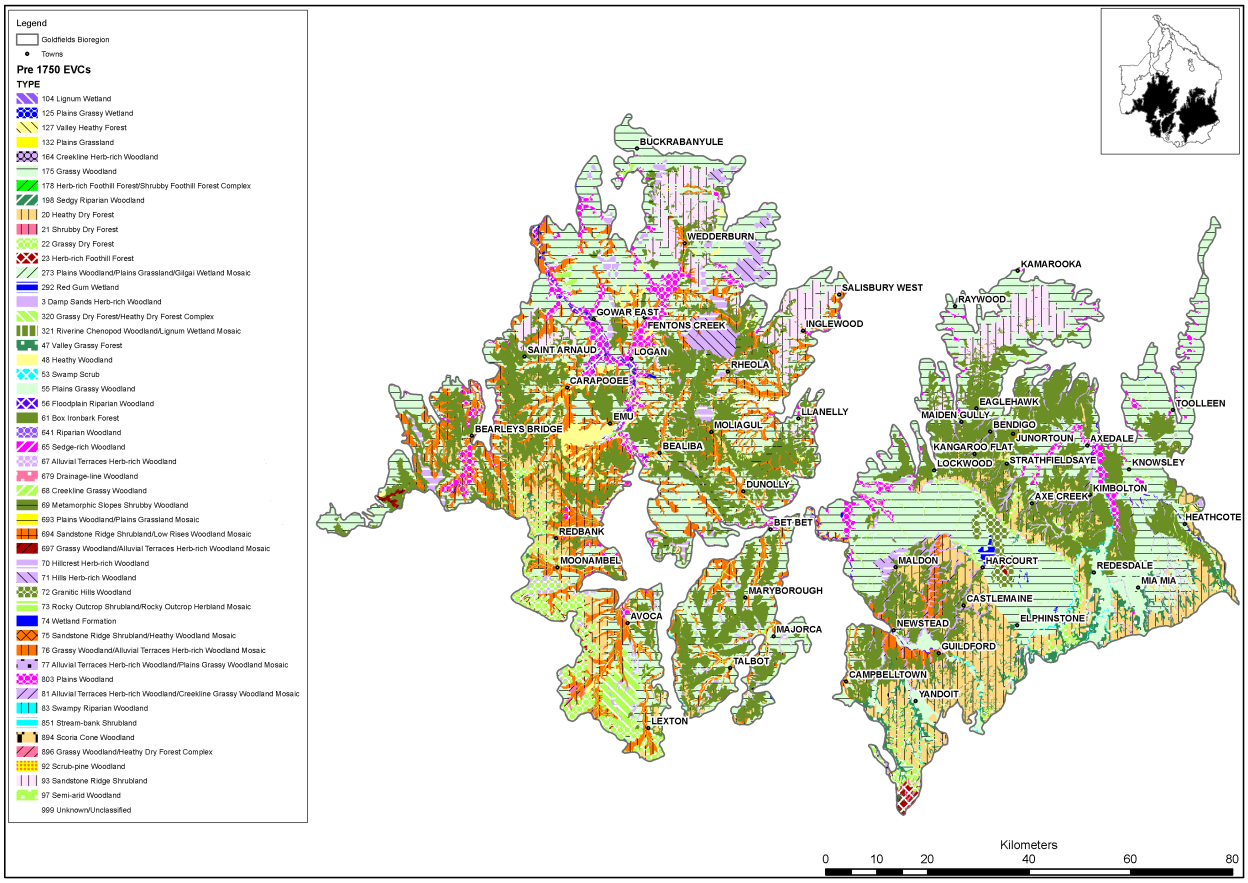
Stock grazing, loss of habitat, lack of ecological burning and introduced predators are also key issues for the more than 200 threatened flora species and 70 threatened fauna species recorded from the Goldfields bioregion, including Ausfeld’s Wattle, Golden Cowslips, Barking Owl, Painted Honeyeater, Striped Legless Lizard and Woodland Blind Snake. Pressures resulting from expansion of rural living zones in some areas of the Goldfields are also a factor influencing nature conservation values.

Table 4.4 Depletion of dominant* EVCs – Goldfields Bioregion

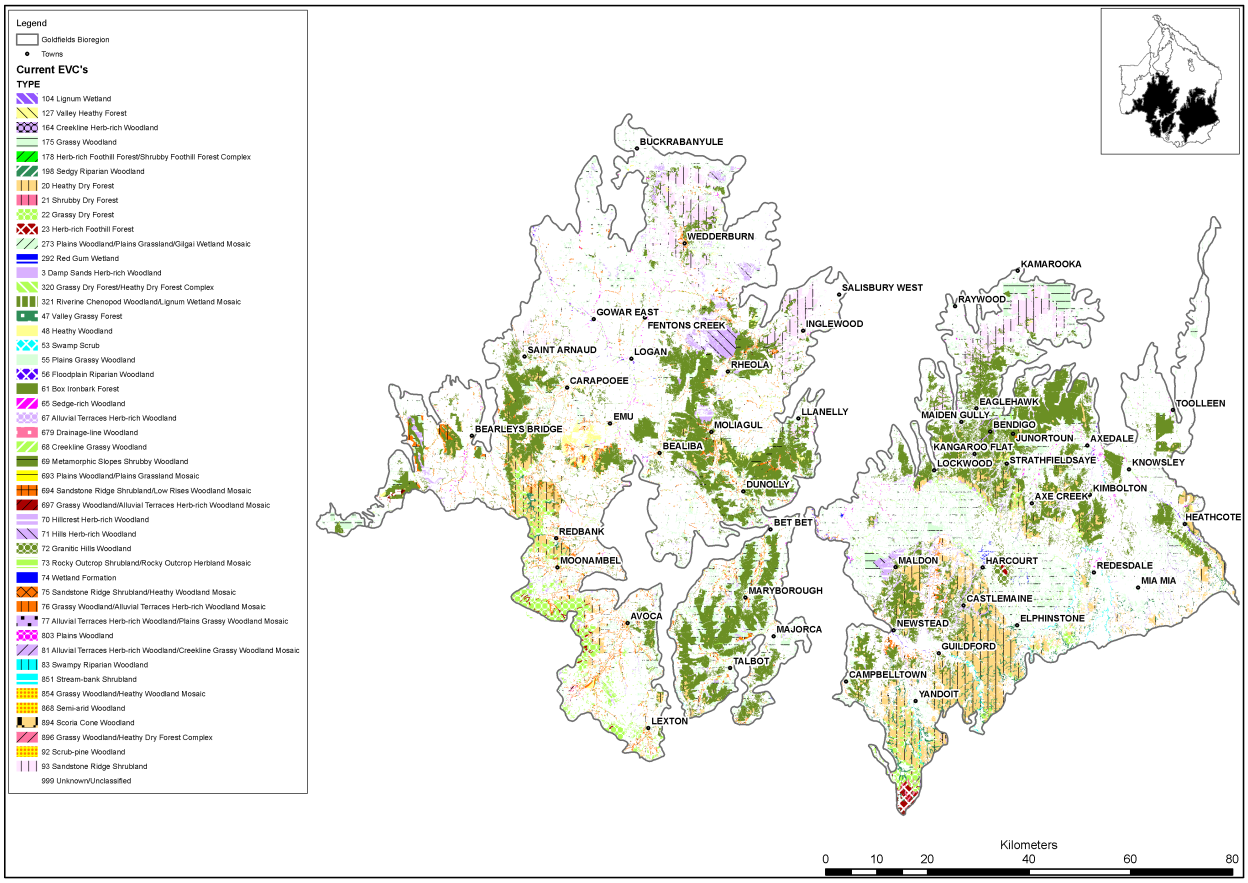
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Alluvial Terraces Herb-rich Woodland / Creekline Grassy Woodland Mosaic	Vulnerable	12,876	4,071	32%
Box Ironbark Forest	Depleted	246,680	148,378	60%
Creekline Grassy Woodland	Endangered	19,166	6,223	32%
Grassy Dry Forest	Depleted	31,586	19,641	62%
Grassy Woodland	Endangered	331,521	54,537	16%
Heathy Dry Forest	Least concern	78,549	52,064	66%
Heathy Woodland	Vulnerable	10,361	3,526	34%
Hillcrest Herb-rich Woodland	Depleted	12,386	4,825	39%
Hills Herb-rich Woodland	Depleted	10,988	4,960	45%
Low Rises Grassy Woodland / Alluvial Terraces Herb-rich Woodland Mosaic	Endangered	89,911	13,892	15%
Plains Grassy Woodland	Endangered	19,055	1,623	8.5%
Plains Woodland	Endangered	38,904	2,617	6.7%
Sandstone Ridge Shrubland	Least concern	41,984	23,955	57%
Valley Grassy Forest	Vulnerable	18,218	6,779	37%
Other		39,098	13,552	35%
TOTAL		**1,001,284**	**360,645**	**36%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion

Map 8 Goldfields pre-European Vegetation



Map 9 Goldfields Extant Vegetation



4.3 Murray Fans Bioregion

The Murray Fans bioregion extends both sides of the Murray River from Lake Mulwala to downstream of Swan Hill. A larger area occurs in NSW. Within Victoria, the bioregion extends over 420,770 hectares. North Central CMA is responsible for the management of one third.

Table 4.5 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	147,585	34%
Goulburn	265,121	61%
Mallee	22,309	5.1%
North East	162	0.037%
Total	**435,177**	**100%**

In places quite narrow, it extends 30-40 kilometres southward into Victoria along the Goulburn River and Broken Creek catchments and again broadens in the Gunbower district. The bioregion covers the margins of six separate drainage basins. These are Broken River, Goulburn River, Campaspe River, Loddon River, Avoca River and the Mallee.

The landscape is flat. In pre-European times the major environmental feature would have been the periodic flooding of most of the bioregion. Vegetation would have been predominantly Black Box woodlands such as Riverine Chenopod Woodland EVC, interspersed with significant areas of Chenopod Grassland EVC. The Riverine Forest areas were characterised by an open canopy of River Red Gums and a diverse herbaceous layer with occasional shrubs.

The Barmah Forest and Gunbower Island are the two most extensive tracts of River Red Gum forest in Victoria and are internationally significant wetlands. In the North Central region, Cemetery Forest and Johnson Swamp Wildlife Reserve wetlands in the bioregion are also recognised as being of national or international importance.

Grasslands would have been dominated by chenopods, grasses such as Curly Windmill Grass, and other herbaceous species.

While significant areas of the riverine forests remain as substantially native vegetation, the grasslands have virtually all been destroyed by agricultural land use.

Threats

The River Red Gum forests still existing have been intensively harvested since early settlement for timber products including sleepers, sawlogs and firewood. The composition and structure of the vegetation has been substantially altered resulting in a much younger, and in places denser, forest.

These changes have dramatically affected the diversity and abundance of fauna, particularly those that are hollow dependent. Changed flooding regimes and livestock grazing have also modified the vegetation structure and composition.

Continuing threats to remnant vegetation are posed by livestock grazing, weed invasions and altered hydrological regimes, which do not provide sufficient flooding of the Red Gum forests. Timber harvesting continues to impact on fauna which is dependent on hollows and fallen timber. Any grassland areas that remain are threatened by weed invasion and intensive land use, especially cultivation.

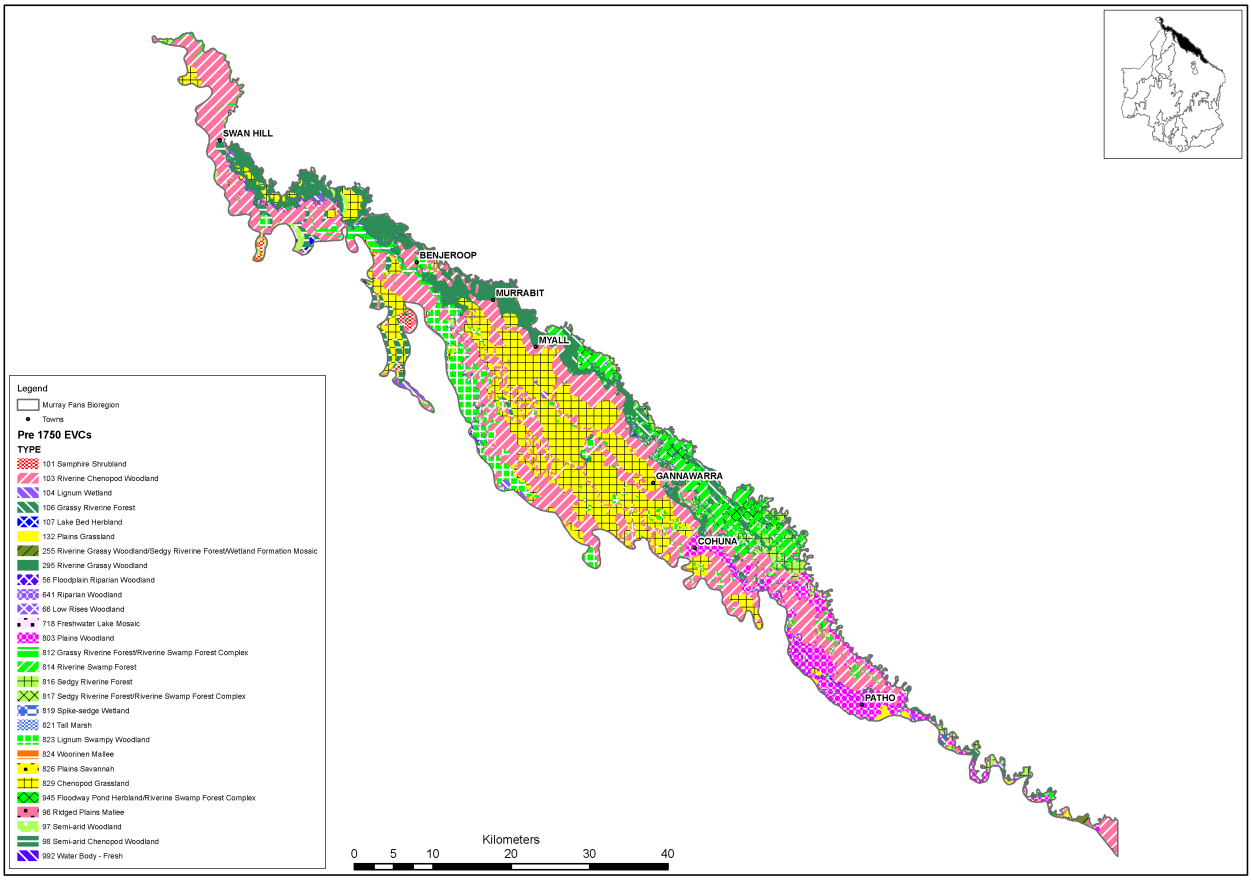
Some of the threatened species of this bioregion include Bush Stone-curlew, Grey-crowned Babbler, Squirrel Glider, Carpet Python, Golden Perch, Murray Cod, Mueller Daisy, Buloke Mistletoe, Slender Darling-pea, Small Scurf-pea and Yarran Wattle.

Table 4.6 Depletion of dominant* EVCs — Murray Fans Bioregion

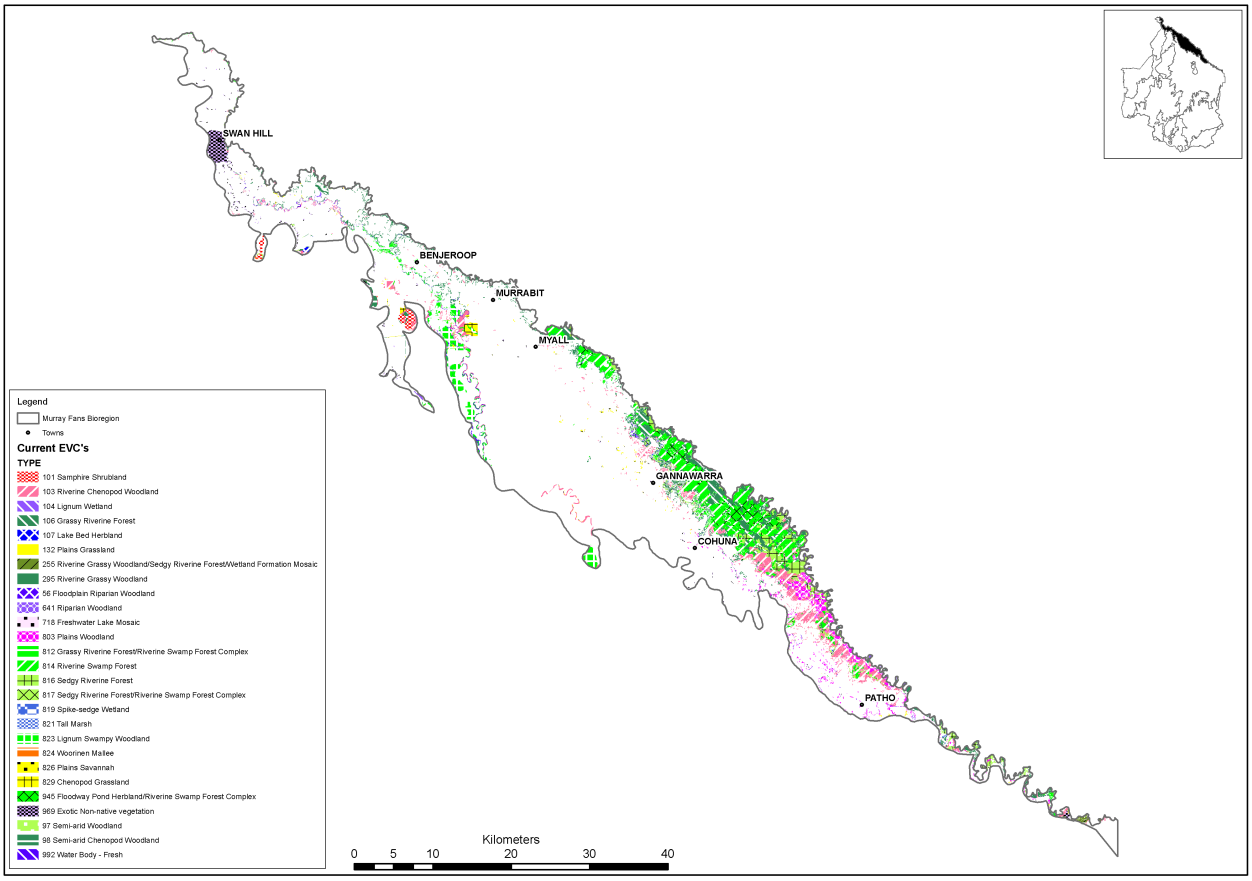
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Chenopod Grassland	Endangered	31,893	441	1.4%
Floodway Pond Herbland / Riverine Swamp Forest Complex	Depleted	1,999	1,918	96%
Lignum Swampy Woodland	Vulnerable	8,694	1,858	21%
Plains Woodland	Endangered	4,724	1,618	34%
Riverine Chenopod Woodland	Endangered	62,188	5,364	8.6%
Riverine Grassy Forest	Depleted	3,730	3,158	85%
Riverine Grassy Forest / Riverine Swamp Forest Complex	Depleted	1,508	319	21%
Riverine Grassy Woodland	Vulnerable	15,884	3,336	21%
Riverine Swamp Forest	Least concern	7,449	6,503	87%
Sedgy Riverine Forest	Depleted	3,155	2,707	86%
Other		6,362	1,735	27%
TOTAL		**147,585**	**28,956**	**20%**

⁎ Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 10 Murray Fans pre-European Vegetation



Map 11 Murray Fans Extant Vegetation



4.4 Murray Mallee Bioregion

The main block of the bioregion extends north from Charlton and Donald to the edge of the Murray River floodplain, near Lake Boga to Robinvale. A sizable eastern outlier is also located around the Boort area where the sandy dune fields rise slightly above the surrounding Victorian Riverina.

The landscape of the Murray Mallee Bioregion is dominated by the red-brown earths of the Woorinen Formation. Soils range in texture from sands to clays, with Gilgai clays occurring in some areas on low-lying plains.

Multi-stemmed mallee eucalypts are characteristic of the Mallee vegetation, with Ridged Plains Mallee and Woorinen Mallee dominating the North Central Victorian landscape. Common mallee species include *Eucalyptus incrassata, E. dumosa, E. gracilis, E. leptophylla, E. oleosa* and *E. socialis*. In the far north of the bioregion and in the southern half of the bioregion, where dunes are more weakly developed, a diverse mix of mallee, grassland, Pine Buloke Woodland, Belah Woodland, and Savannah Woodland occurred but these have been largely cleared for cropping and introduced pastures.

The bioregion generally has few surface water bodies due to highly permeable sandy soils and dry climatic conditions. Nevertheless it has some significant water features such as Lake Lalbert and within the North Central region, Lalbert Creek.

In Victoria, the bioregion covers three million hectares, but only a small proportion occurs in North Central Victoria.

Table 4.7 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	202,685	6.9%
Mallee	2,570,571	88%
Wimmera	148,181	5.1%
Total	**2,921,437**	**100%**

Multi-stemmed mallee eucalypts are characteristic of the bioregion, which dominate several communities. Vegetation communities associated with the area's better agricultural soils have been extensively cleared.

Within North Central Victoria, this bioregion has suffered very extensive clearing retaining only around 7 per cent of native vegetation. Roadsides and unused road reserves are particularly important in preserving remnant stands of native vegetation and providing corridors for the movement of wildlife.

Threats

The major threatening processes in the Murray Mallee Bioregion include inappropriate fire regimes, soil erosion, altered water regimes of watercourses and floodplains, salinity and overgrazing by kangaroos in parks and reserves.

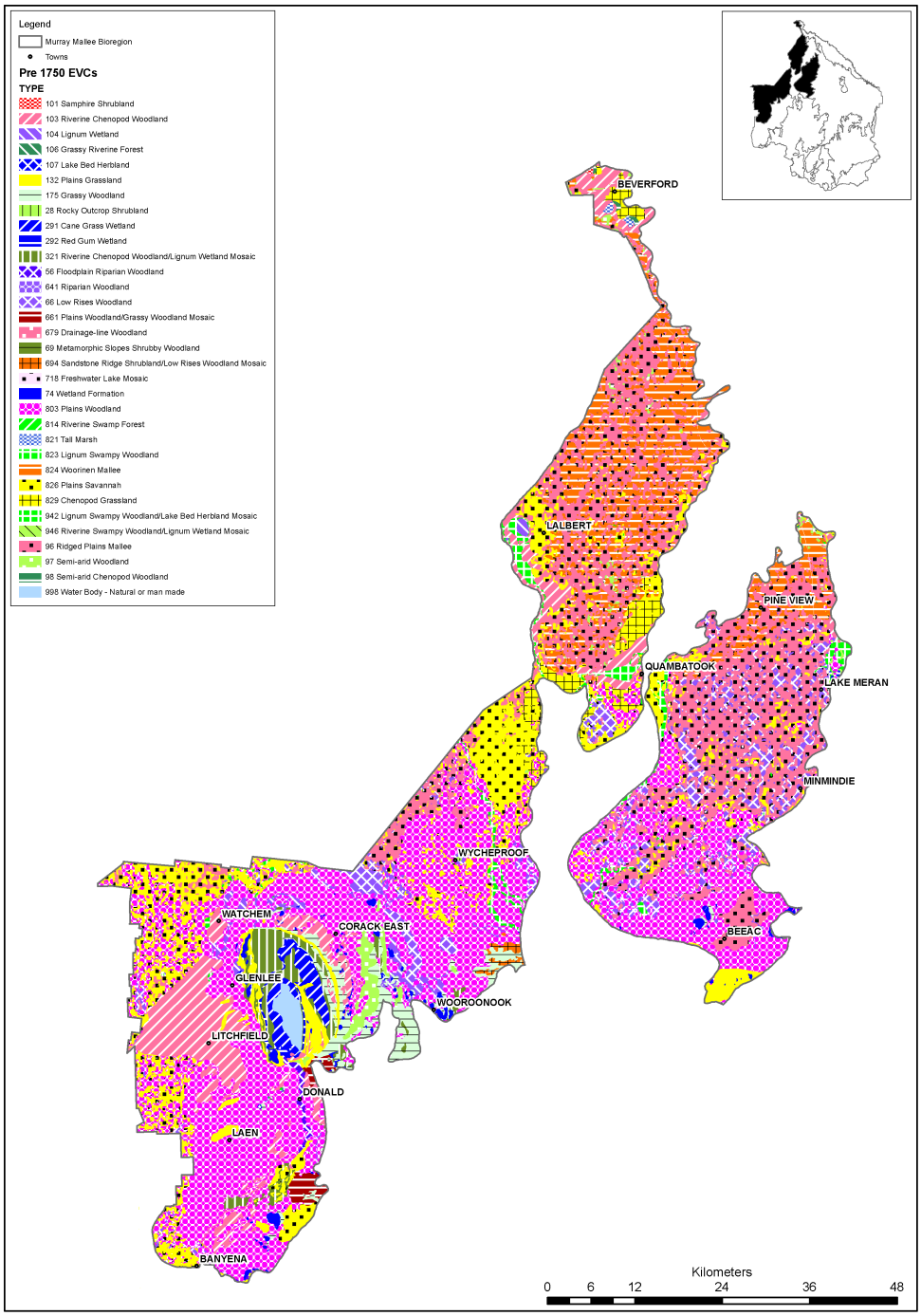
Stock grazing, grazing by kangaroos and rabbits and environmental flows are also key issues for threatened flora and fauna species, which in this bioregion, include Weeping Myall, Plains Spurge, Winged New Holland Daisy, Narrow Duckweed and Bush Stone-curlew, Carpet Python and Barking Owl.

Table 4.8 Depletion of dominant* EVCs – Murray Mallee Bioregion

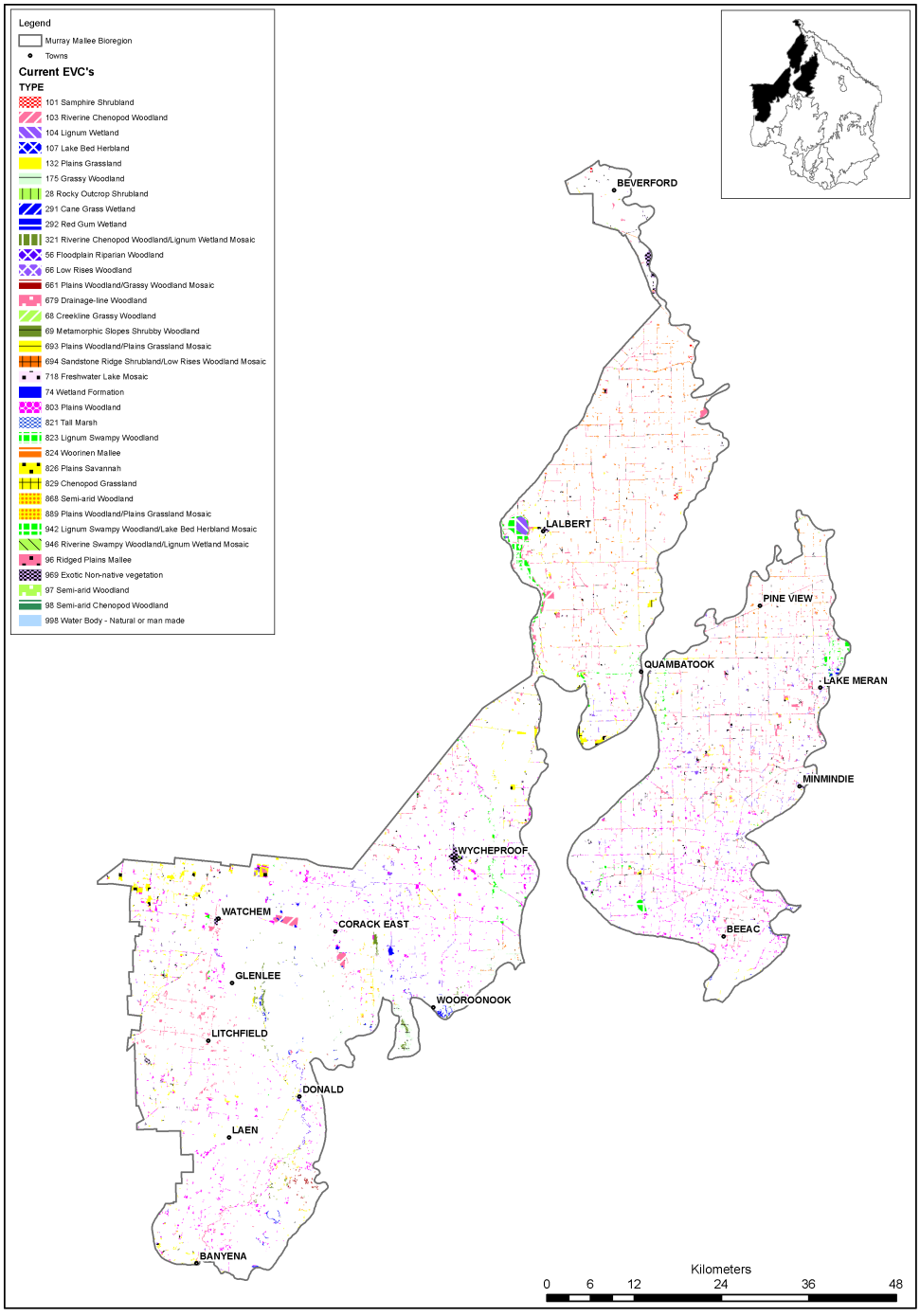
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Lignum Swampy Woodland	Depleted	2,615	1,365	52%
Low Rises Woodland	Endangered	17,636	1,162	6.6%
Plains Savannah	Endangered	13,340	803	6.0%
Plains Woodland	Endangered	18,779	1,181	6.3%
Ridged Plains Mallee	Endangered	96,190	5,256	5.5%
Riverine Chenopod Woodland	Depleted	5,170	796	15%
Semi-arid Woodland	Vulnerable	2,953	136	4.6%
Woorinen Mallee	Vulnerable	41,816	1,755	4.2%
Other		4,186	788	19%
TOTAL		**202,685**	**13,242**	**6.5%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 12 Murray Mallee pre-European Vegetation



Map 13 Murray Mallee Extant Vegetation



4.5 Northern Inland Slopes Bioregion

This bioregion forms a small part of one of the New South Wales South Western Slopes Interim Biological Regions of Australia, which extends across the Murray River into Victoria. In Victoria, the bioregion extends over half a million

hectares, but only a tiny proportion occurs in North Central Victoria. North Central's Terrick Terrick area forms an outlier of the broader bioregion and thus forms an important link in the overall conservation of this important ecosystem.

In the North Central region, this bioregion is characterised by an area of Grassy Woodland around Terrick Terrick. While this bioregion comprises only a small proportion of the overall regional biodiversity, several species of flora and fauna are found near the southern limits of their range, including the Carpet Python.

Threats

Key threatening processes in this bioregion include weed invasion and the impact of introduced predators.

Table 4.9 Bioregional extent across CMAs

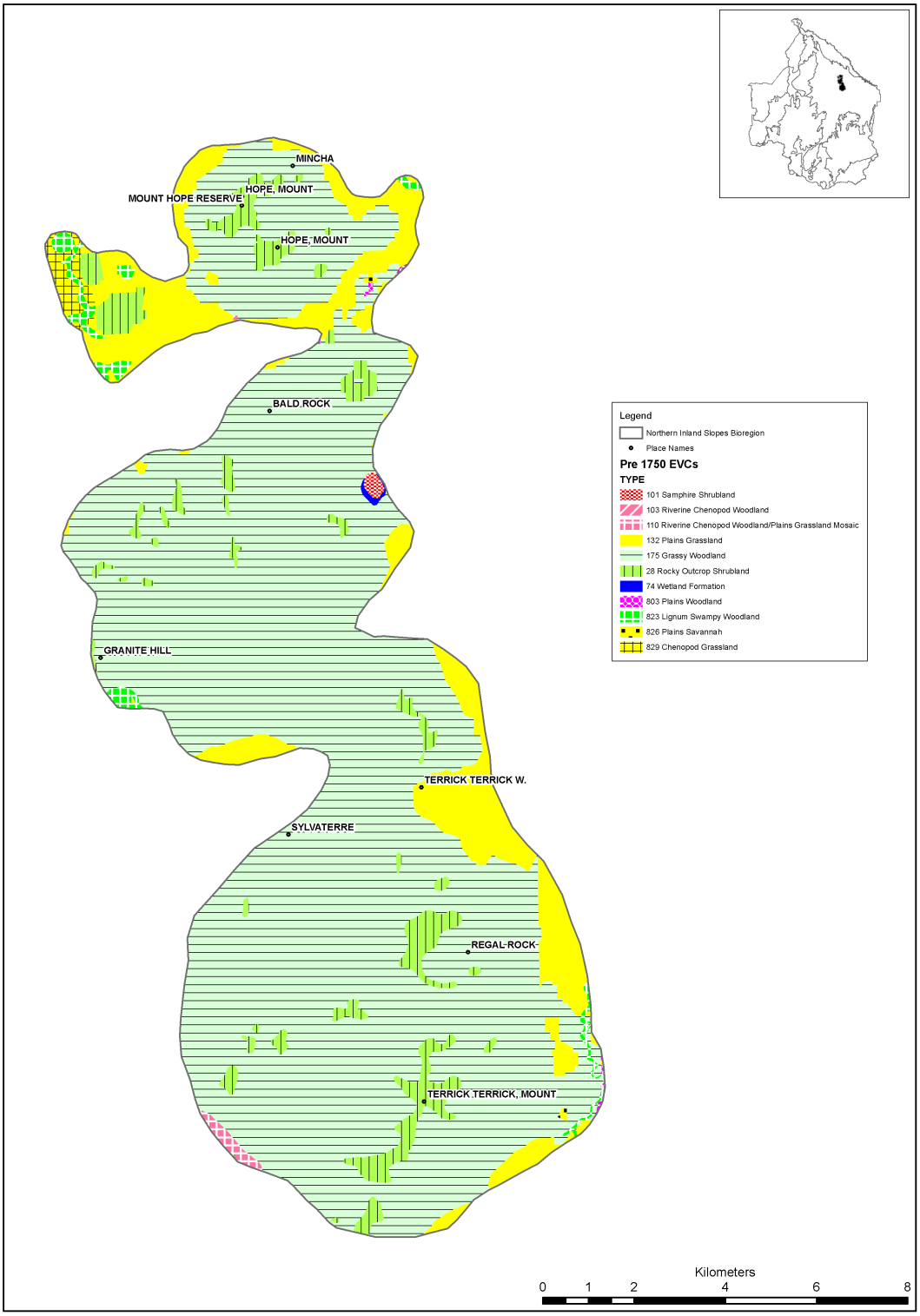
CMA	Extent CMA (ha)	Proportion
North Central	15,004	2.6%
North East	458,528	81%
Goulbourn	92,794	16%
Total	**566,236**	**100%**

Table 4.10 Depletion of dominant* EVCs – Northern Inland Slopes Bioregion

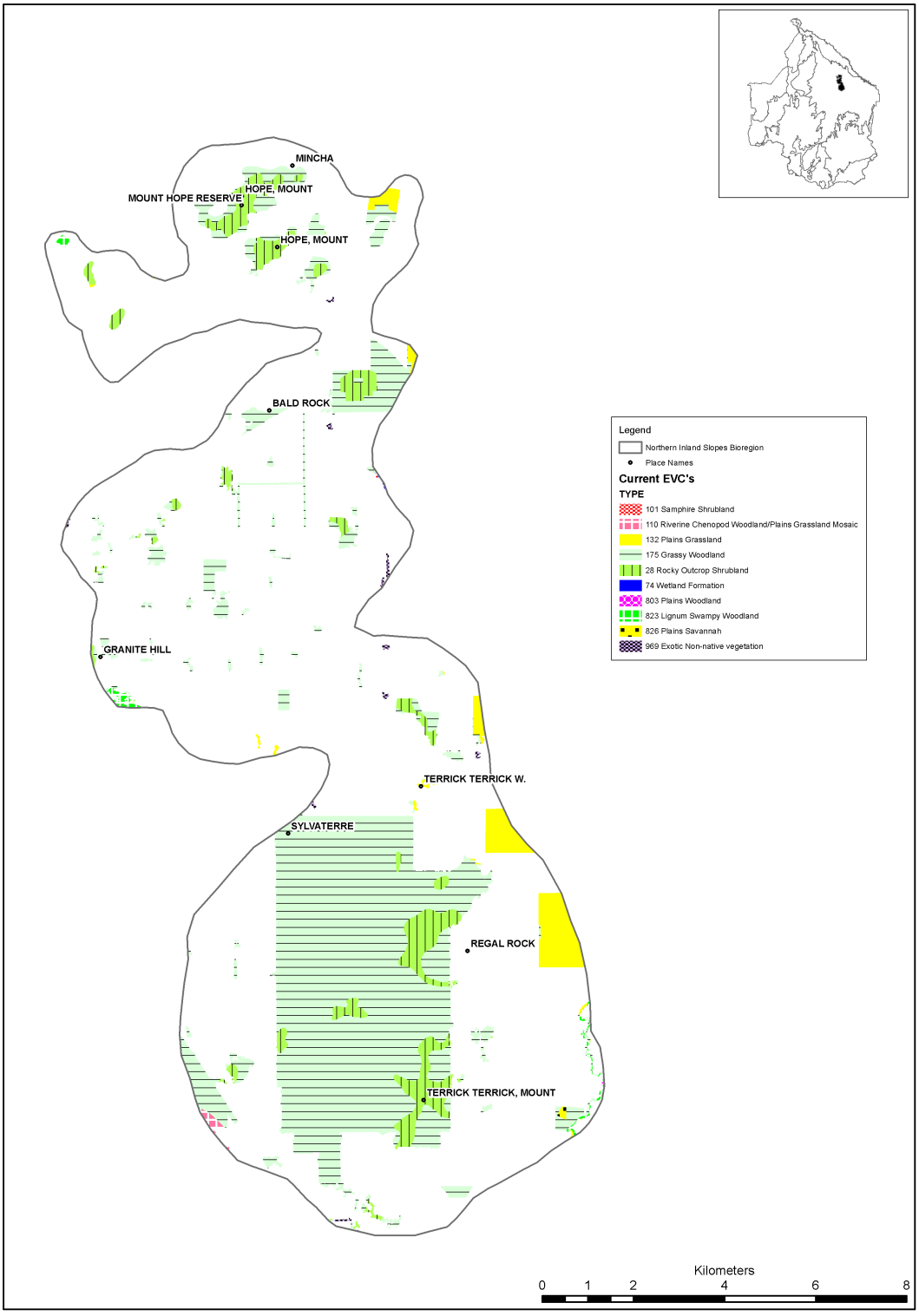
`Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Grassy Woodland	Endangered	13,222	3,311	25%
Lignum Swampy Woodland	Vulnerable	175	111	64%
Plains Grassland	Endangered	638	111	17%
Rocky Outcrop Shrubland	Vulnerable	818	520	63%
Other		150	68	45%
TOTAL		**15,004**	**4,121**	**27%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 14 Northern Inland Slopes pre-European Vegetation



Map 15 Northern Inland Slopes Extant Vegetation



4.6 Victorian Riverina Bioregion

The Riverina bioregion is characterised by flat to gently undulating land on recent unconsolidated sediments with evidence of former stream channels. Nearly two million hectares in size within Victoria, the bioregion extends even further in southern NSW. In Victoria, the bioregion extends over three CMA regions with North Central CMA responsible for management of nearly one half.

Table 4.11 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	908,059	48.0%
Goulburn	749,634	39.6%
North East	233,185	12.3%
Total	**1,890,878**	**100.0%**

Additional land systems include wide floodplain areas associated with the major river systems of North Central Victoria: the Loddon, Avoca and Campaspe.

A major environmental feature of the bioregion is the Kerang Lakes system in which several internationally significant wetlands are Ramsar listed. Agriculture is the dominant land use with irrigated agriculture an important component across the north of the bioregion.

Plains Woodland and Plains Grassland EVCs were the predominant vegetation communities in the bioregion. The Woodlands are characterised by low density tree cover with an understorey of scattered shrubs and a well developed grassy layer. Grassland EVCs are dominated by Wallaby and Spear Grasses with a rich mixture of herbs from the daisy, saltbush and pea families.

The vegetation of the Riverina Bioregion is one of the most depleted in the state, with only around 9 per cent of the area remaining in native vegetation cover.

The species rich Grasslands and Woodlands that once covered much of this bioregion are now restricted to small but significant areas of public and private land. Major threats to the condition and viability of native vegetation in this bioregion include salinity, rising watertables, alteration to soil and water nutrient balance, habitat fragmentation, grazing and changed hydrological regimes (affecting rivers and wetlands).

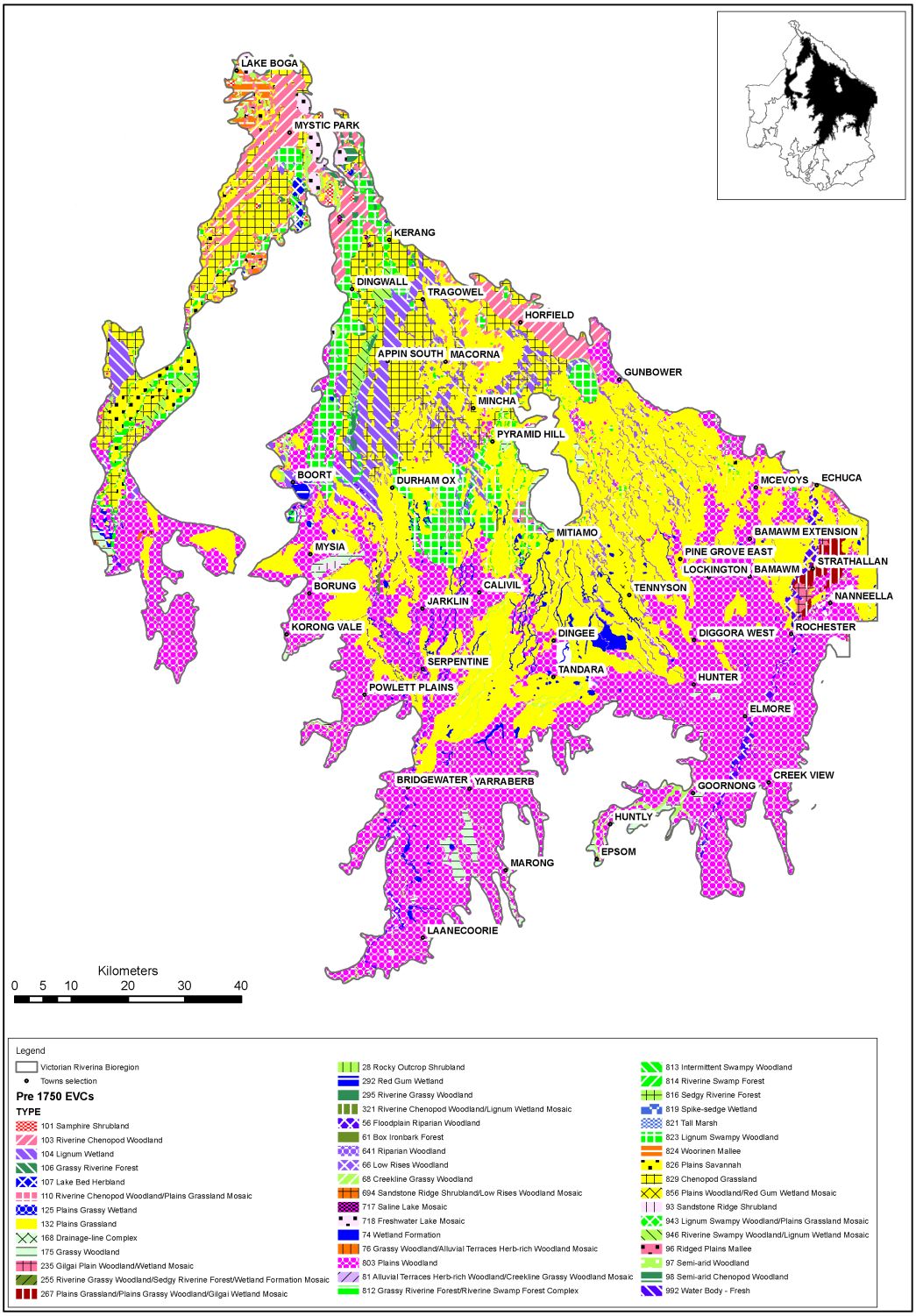
Stock grazing, loss of habitat, environmental flows, introduced predators and weeds are also key issues for threatened flora and fauna species, which in this bioregion include Yarran Wattle, Dwarf Amaranth, Buloke Mistletoe, Downs Flat-sedge, Swamp Buttercup, Slender Darling Pea, Red Swainson-pea, Black Falcon, Bush Stone-curlew, Ground Cuckoo-shrike, Little Bittern, Painted Snipe and Plains Wanderer.

Table 4.12 Depletion of dominant* EVCs – Victorian Riverina Bioregion

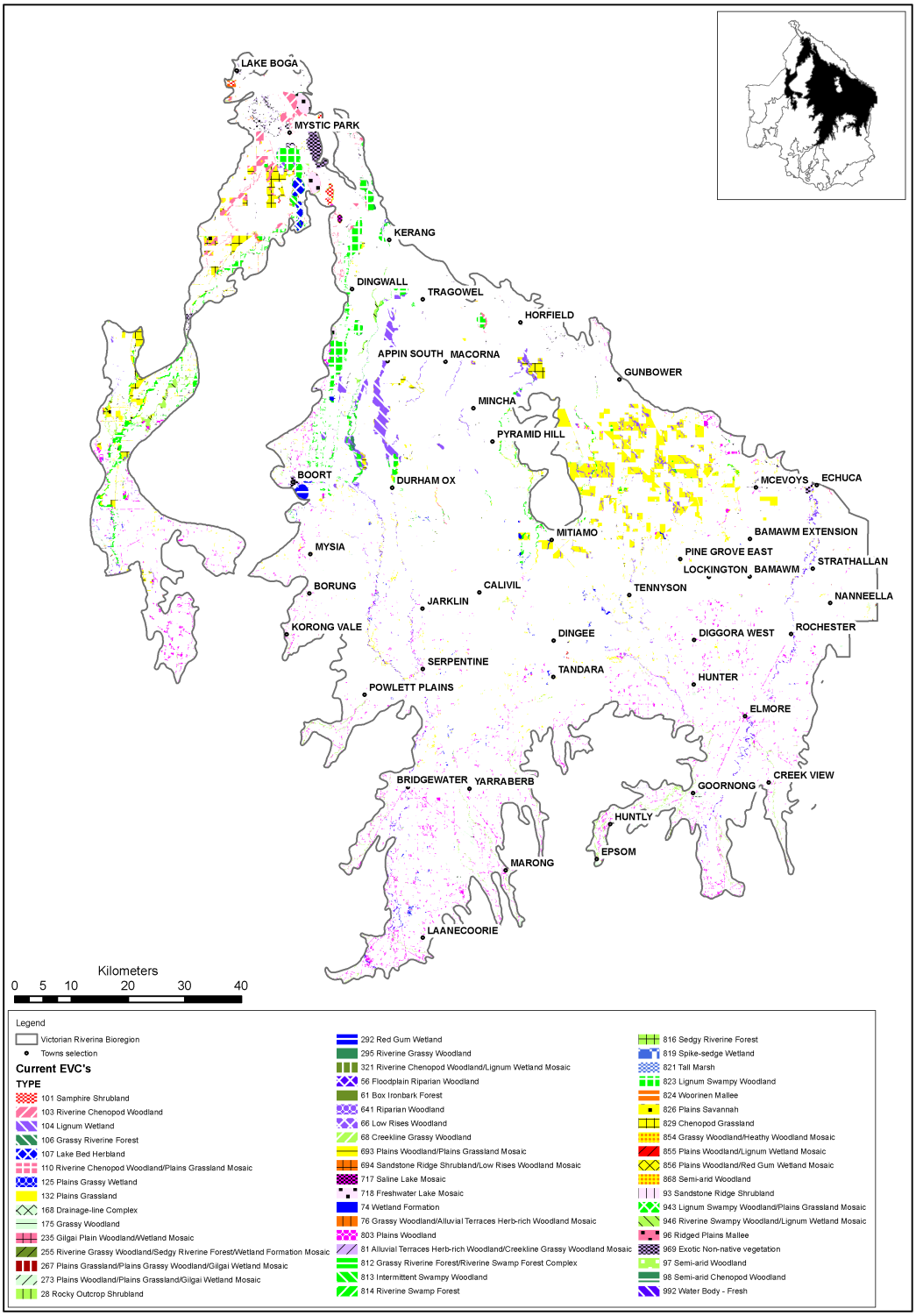
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Chenopod Grassland	Endangered	76,279	6,264	8.2%
Grassy Woodland	Endangered	14,654	347	2%
Lignum Swampy Woodland	Vulnerable	37,991	12,594	33%
Lignum Wetland	Vulnerable	47,539	8,526	18%
Plains Grassland	Endangered	263,082	17,744	6.7%
Plains Savannah	Endangered	13,683	1,410	10%
Plains Woodland	Endangered	335,708	4,962	1%
Riverine Chenopod Woodland	Depleted	29,794	4,432	15%
Wetland Formation	Endangered	14,018	923	6.6%
Other		63,347	13,983	22%
TOTAL		**896,095**	**71,185**	**7.9%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 16 Victorian Riverina pre-European Vegetation



Map 17 Victorian Riverina Extant Vegetation



4.7 Victorian Volcanic Plain Bioregion

This bioregion is characterised by open grassland areas, patches of open woodland, stony rises denoting old lava flows, the low peaks of extinct volcanoes and scattered lakes. The major land use is agriculture, especially sheep and cattle grazing and cropping.

Nearly two and a half million hectares in size, only 7 per cent of this bioregion occurs in North Central Victoria.

Table 4.13 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	162,196	6.9%
Glenelg	1,225,541	52%
Corangamite	665,450	28%
Port Phillip	302,191	13%
Wimmera	2,375	0.10%
Total	**2,357,753**	**100%**

In North Central Victoria, Plains Grassy Woodland EVC was the most extensive vegetation type in this bioregion, but there was a diversity of other EVCs including relatively large numbers of small wetlands. The woodlands were characterised by low density tree cover, scattered shrubs and a diverse and rich herbaceous layer often dominated by Kangaroo Grass. Due to the fertile soil and favourable climate, only about 6 per cent of native vegetation remains in this bioregion due to vegetation clearance and intensive human utilisation of the land.

Ten nationally threatened plant species have been recorded from the North Central portion of this bioregion, including the Spiny Rice-flower, Hairy Anchor Plant and Clover Glycine. Forty threatened fauna species (state level) have been recorded, including the nationally threatened Striped Legless Lizard.

The loss of native vegetation cover constitutes the major threat to flora and fauna in the Victorian Volcanic Plain. In addition, expansion of cropping and exotic pasture establishment into areas of native pasture, tree dieback and incremental tree loss are serious threats to remaining assets. Weeds and other introduced pests are also significant threats.

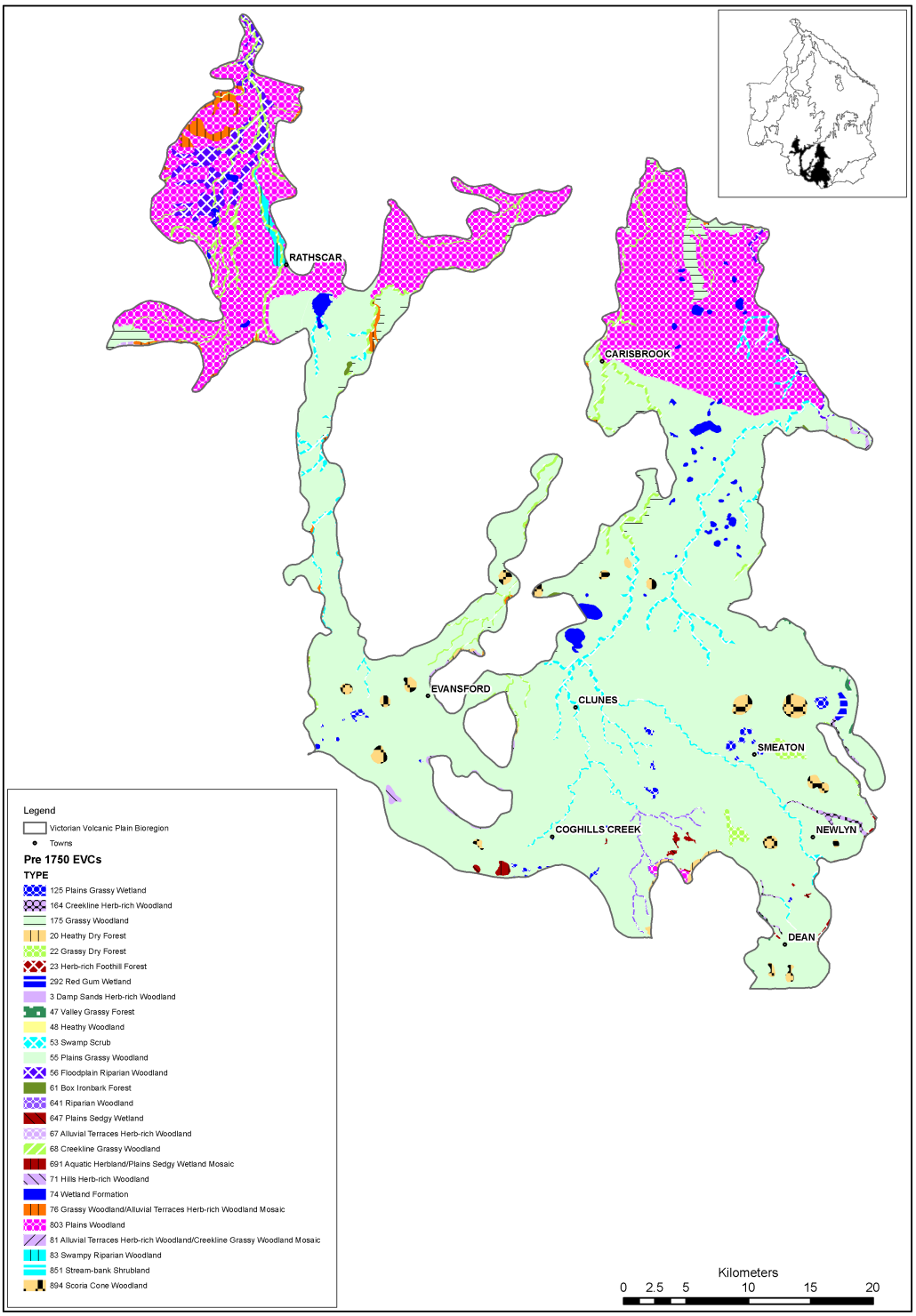
Loss of native vegetation along rivers and streams poses a threat to water quality and aquatic native species. Stock grazing and weeds are also key issues for threatened flora and fauna species. Inappropriate tree planting into grassland remnants is a potentially damaging activity.

Table 4.14 Depletion of dominant* EVCs –Victorian Volcanic Plain Bioregion

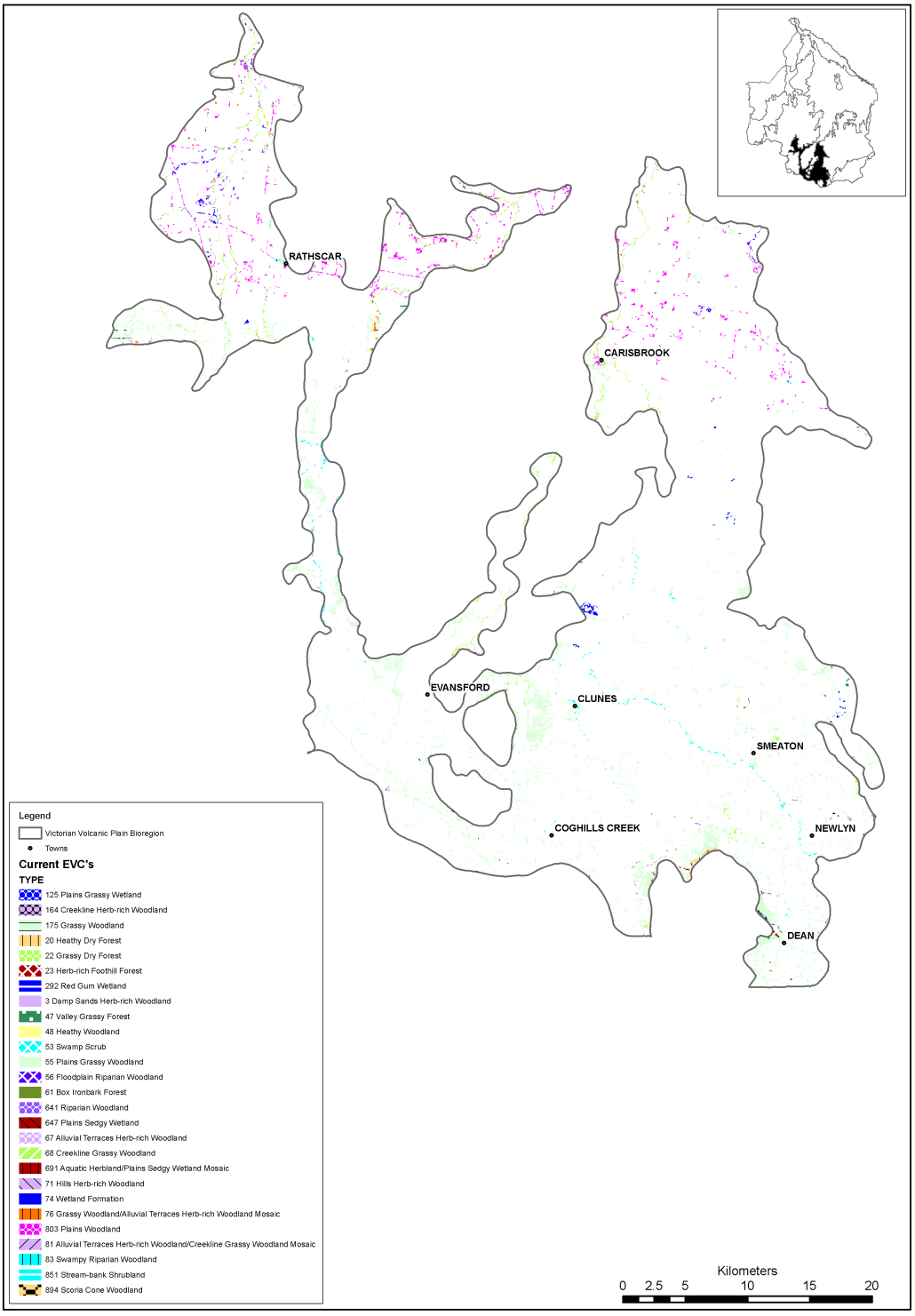
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Creekline Grassy Woodland	Endangered	4,330	1,014	23%
Floodplain Riparian Woodland	Endangered	2,482	246	9.9%
Grassy Woodland	Endangered	3,040	334	11%
Plains Grassy Woodland	Endangered	103,778	5,503	5.3%
Plains Woodland	Endangered	37,357	1,354	3.6%
Swamp Scrub	Endangered	3,175	261	8.2%
Other		8,033	759	9.4%
TOTAL		**162,196**	**9,471**	**5.8%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 18 Victorian Volcanic Plain pre-European Vegetation



Map 19 Victorian Volcanic Plain Extant Vegetation



4.8 Wimmera Bioregion

This bioregion consists of flat to gently undulating plains extending over one and a half million hectares in Victoria. North Central CMA is responsible for the management of a little more than one fifth.

Table 4.15 Bioregional extent across CMAs

CMA	Extent within CMA (ha)	Proportion
North Central	424,912	21%
Wimmera	1,484,195	74%
Mallee	81,033	4.0%
Glenelg	24,937	1.2%
Total	**2,015,078**	**100%**

In North Central Victoria, only around four percent of native vegetation remains in the Wimmera bioregion. As with the adjoining Murray Mallee bioregion, vegetation associated with the better agricultural soils has been extensively cleared.

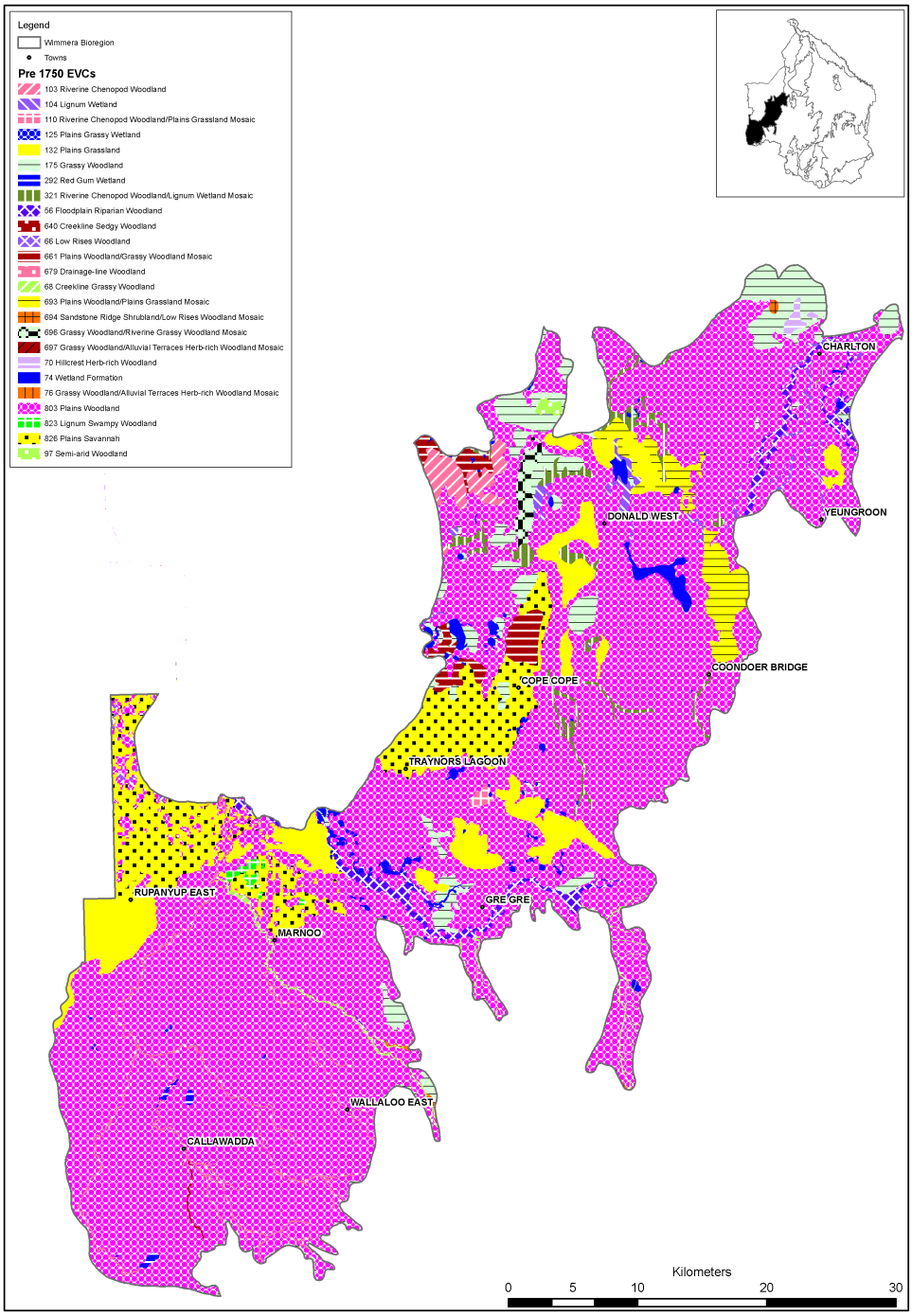
These include Grassland, Plains Grassy Woodland, Wimmera Mallee, Woodland, Slender Cypress-pine, and Buloke and Belah Woodlands. The major threatening processes in the Wimmera Bioregion are clearing and invasion by introduced grasses into remnants. Other threats include inappropriate tree planting into remnants, drift from aerial spraying, expansion of irrigation, and stock grazing without replacement of senescent trees. Threatened species recorded from the north central portion of the Wimmera Bioregion include Turnip Copperburr, Bow-lip Spider-orchid, Swamp Diuris, Australian Bustard, Barking Owl and Bush Stone-curlew.

Table 4.16 Depletion of dominant* EVCs– Wimmera Bioregion

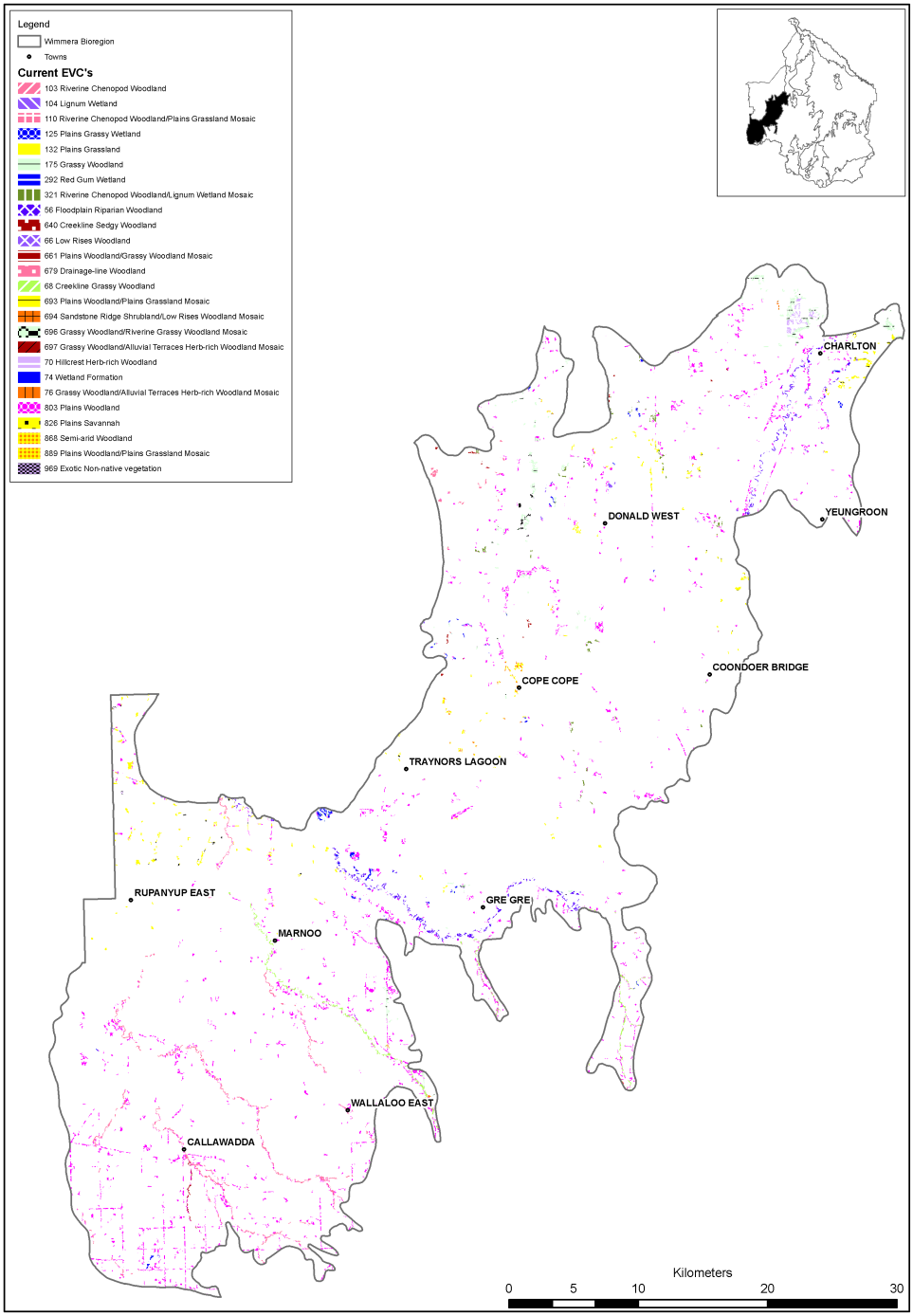
Ecological Vegetation Class	Conservation Status	Pre-1750 area (ha)	Current area (ha)	Proportion remaining
Floodplain Riparian Woodland	Endangered	4,468	787	18%
Grassy Woodland	Endangered	19,386	916	4.7%
Lignum Wetland	Endangered	5,482	381	7.0%
Low Rises Woodland	Endangered	6,074	346	5.7%
Plains Grassland	Endangered	23,163	423	1.8%
Plains Savannah	Endangered	41,544	1,870	4.5%
Plains Woodland	Endangered	252,865	8,405	3.3%
Plains Woodland / Low Rises Grassy Woodland Mosaic	Endangered	4,405	170	3.9%
Riverine Chenopod Woodland	Endangered	23,756	1,633	6.9%
Riverine Chenopod Woodland / Lignum Wetland Mosaic	Endangered	10,910	539	4.9%
Wetland Formation	Endangered	4,874	422	8.7%
Other		27,986	2,847	10%
TOTAL		**424,912**	**18,741**	**4.4%**

* Dominant EVC = occurred over>1 per cent of North Central Victorian extent of bioregion in 1750

Map 20 Wimmera pre-European Vegetation



Map 21 Wimmera Extant Vegetation


Legend
Wimmera Bioregion
Towns
Current EVC's
103 Riverine Chenopod Woodland
104 Lignum Wetland
110 Riverine Chenopod Woodland/Plains Grassland Mosaic
125 Plains Grassy Wetland
132 Plains Grassland
175 Grassy Woodland
292 Red Gum Wetland
321 Riverine Chenopod Woodland/Lignum Wetland Mosaic
56 Floodplain Riparian Woodland
640 Creekline Sedgy Woodland
66 Low Rises Woodland
661 Plains Woodland/Grassy Woodland Mosaic
679 Drainage-line Woodland
68 Creekline Grassy Woodland
693 Plains Woodland/Plains Grassland Mosaic
694 Sandstone Ridge Shrubland/Low Rises Woodland Mosaic
696 Grassy Woodland/Riverine Grassy Woodland Mosaic
697 Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic
70 Hillcrest Herb-rich Woodland
74 Wetland Formation
76 Grassy Woodland/Alluvial Terraces Herb-rich Woodland Mosaic
803 Plains Woodland
826 Plains Savannah
868 Semi-arid Woodland
889 Plains Woodland/Plains Grassland Mosaic
969 Exotic Non-native vegetation
CHARLTON
DONALD WEST
YEUNGROON
COONDOER BRIDGE
COPE COPE
TRAYNORS LAGOON
RUPANYUP EAST
GRE GRE
MARNOO
WALLALOO EAST
CALLAWADDA
Kilometers
0
5
10
20
30

5. What can we do?

5.1 Vegetation Management Activity Options

The activities or options to improve the status of native vegetation are described below. While our priorities are Protection, Enhancement, Rebuilding, there is overlap between all three of these terms. For example, revegetation abutting an existing patch of vegetation could be considered to enhance the viability and neighbourhood aspects of its habitat quality. The revegetation could also protect the remnant from threats arising in the surrounding landscape. Therefore, this plan does not rigidly classify our management options into one or the other category.

Nevertheless, it is useful to define:

- Protection activities as those that protect existing native vegetation from threatening processes;
- Enhancement activities as those that restore missing elements of habitat quality to existing native vegetation; and
- Rebuilding or revegetation activities as those that rebuild native vegetation extent by the re-establishment of native plants in areas where there are none remaining.

Many of the actions for vegetation management confer direct benefits for threatened flora and fauna species. Detailed information on the occurrence of threatened species according to land tenure has been compiled through the Bioregional networks. This information has led to the development of priorities for management responses aimed at conserving these species. Refer to Bioregional plans for further details.

5.2 Public Authority Management Agreements

These are agreements between public authorities that have a role in managing public land (e.g. V-Line, VicRoads) and the DPI/DSE. The agreements specify how native vegetation and/or threatened species will be protected and managed on a site.

Buffering Surrounding Incompatible Land Uses with Revegetation

Where management of land near to vegetation remnants cannot be changed to prevent impacts on the vegetation, 'buffering' the remnant with new vegetation may be able to reduce the impacts. Impacts from excessive exposure to wind, run-on water, pesticide use or weed invasions can be absorbed to some extent by a vegetated buffer. For maximum biodiversity benefit, the vegetation of the buffer should be indigenous. However, non-invasive non-indigenous vegetation (e.g. farm forestry plantations) may also provide appropriate buffering services.

Conservation Covenants

Covenants are legally binding instruments placed on titles to land, specifying how the land should be managed. In Victoria, a major role of the Trust for Nature is to assist landholders to covenant their land to ensure retention of nature conservation values for perpetuity.

Fencing

Fencing is a major practical tool for controlling access to remnant native vegetation. Constant livestock (and grazing wildlife) access is one of the most common degrading impacts on native vegetation in North Central Victoria.

Identify High Value Remnants

Identifying the remnants of native vegetation with higher conservation significance is an essential first step towards the protection of our native vegetation asset. Some of this work can be done 'in bulk' by remote sensing coupled with EVC mapping, but in most cases, ground level surveys are needed. This is particularly the case with tree-less vegetation such as grasslands.

Implement Management Plans

The development and implementation of Management Plans for areas of significant vegetation is a crucial way to ensure protection of natural values. Management Plans are frequently developed for Public Land assets but implementation is often impeded by lack of funds.

Incentives for Protection

Australia has a long history of incentives to destroy native vegetation. This is now starting to be reversed. Rate rebates for freehold land management for nature conservation have been introduced in three shires in North Central Victoria. In one example, the rebate is 100 per cent of rates for covenanted land, less for environmental 'good works' on other land.

Other incentives need to be devised.

'Market-Based' Mechanisms

During 2001, a trial was undertaken of Bush Tender, a new mechanism, based on a competitive auction process, for establishing management agreements with landholders. The Bush Tender trial aimed to increase the level of landholder participation in active native vegetation management and to target biodiversity priorities in a cost-effective manner.

Improve Environmental Management Performance of Adjoining Land

Land uses adjacent to native vegetation assets can adversely impact on natural values. In many cases, the impacts can be reduced by improved management that recognises the value of protecting native vegetation. Environmental Management Systems (EMS) is an approach to continuously improving environmental performance. EMS is under trial for some agricultural enterprises in North Central Victoria.

Information/Community Education

Without a supportive community, a diffuse resource like native vegetation cannot be protected and the aims of this strategy document will not be achieved. Before the community can be supportive, it needs to be aware of the values and the dire conservation status of native vegetation and it needs to be provided with information about how to change the situation.

Sustainable, Conservation-Compatible, Economic Use of Assets

The most effective way to build a community of support for the protection of native vegetation is to have a constituency of people who derive some economic benefit from its good conservation management. Such stakeholders could be sustainable forestry operators, firewood cutters, eco-tourism businesses, apiarists and graziers.

A 'Land Bank'/Revolving Fund for Land Purchase

The Land Bank is a proposal from local government to purchase (or exchange for other land) land of conservation significance that is under threat of destructive development. The land's conservation values would be protected by reservation or later re-sale with a conservation covenant.

The Trust for Nature operates a 'revolving fund' through which land of conservation significance is purchased and later sold with a conservation covenant on the title.

Management Agreements

There are legal instruments for creating voluntary management agreements that bind landholders to specified management of land. These can be of various durations.

Planning Scheme Powers

The powers of planning schemes under the Planning & Environment Act can provide very significant protection for native vegetation. Developments are assessed through a permit system that is informed by overlay maps and supporting documents, including this one. Municipal strategic statements indicate the policy directions of local government. These and planning schemes are reviewed regularly. It is essential to convey the most up to date mapping of native vegetation assets and conservation planning principles to local government.

Reservation

Reservation of very high conservation significance stands of native vegetation is an important step in protecting native vegetation values. Reservation means changing the tenure of the land to a flora reserve, state park or similar, where there is more security of tenure for native vegetation and wildlife. A Comprehensive, Adequate and Representative (CAR) reserve system is proposed under the National Forest Policy.

- Comprehensive refers to the inclusion within protected areas of samples of each of the ecosystems discernible at the bioregional scale.
- Adequate refers to how much of each ecosystem should be included within a protected area network in order to provide ecological viability and integrity of populations, species and communities.
- Representative is comprehensiveness considered at a finer scale, and infers that the variability within ecosystems is sampled within the reserve system.

Restore Ecosystem Functions/Resource Flows

In many cases, restoring ecosystem functions will be essential to the protection of remnant native vegetation. Providing environmental flows of water along waterways and into wetlands is the only way to ensure that their native vegetation will survive long term. Restoring a hydro-geological/salt balance is the only long term solution to the threat from rising saline watertables.

Grazing Management

Management of grazing by both stock and native fauna needs to be managed to ensure that existing remnants can be enhanced and restored. Many vegetation communities benefit from strategic grazing patterns. There are significant opportunities to work with landholders and ecologists to better understand and describe grazing management in North Central Victoria.

Implement Best Management Practices for Native Vegetation

Identification of and dissemination of practical techniques for conservation management of remnant native vegetation is vital.

Pest Control

Activities that create a lasting reduction in pest plant or animal populations can protect native vegetation from their destructive impacts. Apart from fencing to exclude pest animals, regular control measures, introduction of biological controls, strategic environmental weed eradication efforts are all examples of activities that can enhance the viability of native vegetation remnants or flora species.

Revegetation

Revegetation is an important response to the heavy losses of native vegetation in North Central Victoria. Although retention of existing native vegetation is the most cost effective and highest priority action, many parts of our region have already lost much of its native vegetation cover and suffer reduced ecosystem services as a result. Re-establishment of deep rooted, perennial vegetation is needed to address many environmental problems. Using native vegetation can address these issues plus restore habitat to support other species.

For restoration of biodiversity and ecosystem function, revegetation is most effective when located to add to existing habitat and to link isolated patches of remnant vegetation. Researchers in landscape ecology are developing rules of thumb for prioritising revegetation works in fragmented and relict landscapes.

In addition to the focus on re-building native vegetation communities, revegetation may be undertaken for other reasons. In the past, such revegetation was not guided by landscape ecology considerations and usually made little contribution to conservation goals.

This plan promotes revegetation for multiple benefits by using EVC specific best management practices.

Flora

Revegetation for flora diversity often means focussing on the ground layer vegetation. In most vegetation formations it is the most diverse and numerous and is under the most threat from weed invasion. The current highest priorities for conservation work (grassy ecosystems) are composed mostly of ground storey plants. This kind of revegetation is closely allied to bush regeneration techniques. In North Central Victoria there are a few key people experimenting with ground flora revegetation.

Fauna

Revegetation for fauna conservation must consider how best to supply those resources that support healthy fauna populations and facilitate their movement. Plants provide food, shelter and breeding sites for fauna, but so far, we are only aware of a few of the specific plant-fauna associations. Specialist fauna advisers are assisting the process of targeting revegetation to critical habitat areas.

Enhancing Existing Farm Production

Commonly, revegetation is undertaken to grow shelterbelts to reduce wind stress on livestock, crops and pastures.

Another way native vegetation assists farm production is by providing habitat for the organisms that help control agricultural pests. For instance, insectivorous birds and predatory invertebrates can play a major role in controlling insects.

Salinisation

Dryland salinity is caused by insufficient plant water use in the landscape, particularly in high recharge areas that usually have shallow soil overlaying permeable bedrock. Land that is threatened by salinisation may be targeted by revegetation with native vegetation that is able to effectively use available water. Land with saline discharge may be best targeted with revegetation by salt tolerant plants.

Erosion

Erosion can be caused by the flow of water or by wind. The root systems of native vegetation help bind soil against erosive forces. Revegetation is therefore very useful in combating stream bank erosion. Native plants can also reduce water erosion by effectively using the available water thus making less available for soil saturation and subsequent run off.

Waterlogging

Waterlogging is another plant water use issue. Revegetation of the catchment above a waterlogged zone can reduce the amount of water flowing into the problem area. If this is not possible, revegetation with native plants tolerant of wet conditions will be useful in using water at the problem site.

Soil Acidification

Deep rooted, perennial native vegetation reduces soil acidification by using water and by cycling nutrients from deep in the soil back to the surface.

Weed Invasion

Native vegetation can be used to help exclude weeds from a site. Plant characteristics that are useful for out-competing weeds are those with fast growth, dense foliage, and the ability (once they have reached mature size) to overtop the target weeds. Also useful in the fight against weeds are those species that readily and prolifically regenerate. Native vegetation buffer strips are an important method of protecting remnant vegetation stands while limiting the spread of some environmental weeds. Revegetation for weed control has much in common with bush regeneration concepts.

Land Rehabilitation

Some land uses like gravel extraction or surface mining leave behind very little vegetation and often grossly alter the soil structure or leave no soil. While the lack of suitable soil can be a severe problem, the lack of competing vegetation can mean there is little or no need for weed control. Revegetation methods for land rehabilitation on such sites will be quite different to those for most farmland revegetation.

Greenhouse Effect and Climate Change

Native vegetation has the potential to act as a ‘carbon sink’, removing greenhouse gases from the atmosphere. Modelling of climate change scenarios suggest significant impacts on the regional climate over the next 20 years. A regional response to climate change based on the establishment of native vegetation sinks has the potential to provide multiple benefits for other issues such as salinity, water quality and biodiversity. As carbon trading gathers momentum, there is the potential for significant private and public investment in native vegetation in our region. Currently a low figure of $10 per tonne, and a high figure of $20 per tonne of carbon, or $35 to $70 per hectare, is proposed for vegetation planted after 1990 that fixes carbon. ‘Carbon pooling,’ where government or companies can own carbon fixed by environmental plantings, is being encouraged. Companies able to demonstrate that they are making significant moves to reduce their overall emissions will be eligible to claim an offset and access the greenhouse credit pool (Landcare Australia Annual Report, 1999).

Direct Farm Production

Many products can be obtained directly from native vegetation, including pasture, timber, oils, tannin and bush tucker. The very successful Australian grazing industry was entirely dependent on native vegetation pastures in the early years of development and still is in much of regional Australia.

Farm Forestry – Market Driven Revegetation

Farm Forestry in the North Central region involves the strategic integration of native vegetation into existing farm enterprises for both products, such as wood and timber, and environmental objectives. Farm Forestry primarily focuses on the establishment and management of trees on previously cleared agricultural land, and is a growing opportunity for

the community to integrate economic and environmental objectives. Farm Forestry represents one of the few productive land use options that offers long term protection and enhancement of native vegetation.

Farm Forestry therefore provides a means of levering investment into revegetation for a combination of products and services, and provides an opportunity to address specific processes threatening the regions vegetation communities. It provides a cost effective, market driven means of revegetation and has the capacity to provide a significant extension to current revegetation efforts.

Farm Forestry in the North Central region comprises a large diversity of species and enterprises designed to address a range of environmental, economic and social objectives. Typically environmental objectives are compromised to meet economic objectives. However farm forestry has the potential to contribute to all of the region's priorities for vegetation management.

The design of farm forestry systems may allow for, but are not usually driven by biodiversity objectives, which may limit the direct ecological value of the system.

However, farm forestry plantations create analogous environmental processes and therefore provide many of the ecosystem services provided by indigenous vegetation. Through alterations to microclimate, the cycling of nutrients and increased interception and use of water, farm forestry systems can help restore ecosystems and improve the long-term viability of existing native vegetation communities.

Plantations established adjacent to, and in association with remnant vegetation can deliver significant benefits by providing increased connectivity of patches of remnant vegetation and shelter to other plants and animals from weather extremes, predators and threatening ecological processes such as salinity and weed invasion.

Farm Forestry systems also often yield wood and timber products providing and alternative source of firewood, fencing and structural timbers decreasing the pressure created by wood utilisation from remnant vegetation.

In comparison to traditional crops and pasture, Farm Forestry offers a means of improving interconnections between remnants and the mobility of fauna.

Market driven revegetation is increasingly being acknowledged as a cost-effective approach to large-scale revegetation. Large-scale revegetation projects need to consider optimising social benefits as well as delivering environmental outcomes. Farm Forestry builds a commercial component into revegetation by delivering marketable products such as fibre, wood, timber, biofuel, and carbon sequestration.

Farm Forestry systems can be effective in containing, suppressing and displacing weeds through changes in microclimate, increased competition for resources, and restriction of wind-borne seed dispersal.

Farm Forestry provides a commercial aspect to revegetation. This 'profit motive' is increasingly being recognised as crucial to improving landholder participation, increasing the scale, and accelerating the rate of revegetation.

Inappropriately designed Farm Forestry systems have the potential to threaten the structural and genetic integrity of remnant native vegetation through genetic pollution and invasion.

As outlined previously, this plan sets the scene for large-scale revegetation effort over the next 30 years. In terms of salinity control alone, major revegetation of upper and middle catchment areas will be required to reduce groundwater recharge and reverse the current trend of rising watertables.

Priority areas for revegetation under the National Action Plan for Salinity and Water Quality are being determined for the North Central region on the basis of a number of criteria including:

- Land management units with high recharge/run off capacity. 'High priority' land management units for the region are the Metamorphic Ridges, Sedimentary Hills, Sedimentary Rises and the Greenstone Range;
- Potential to ameliorate the impact of salinity and water quality on significant biodiversity assets; and
- Potential to contribute to sustainable production systems.

5.3 Assumptions

On-ground native vegetation management is a complex undertaking. As we increase our understanding of ecological processes, actions to improve the extent and quality of native vegetation are becoming more sophisticated and successful. Management actions are designed to improve the condition/extent and conservation significance of remnants by reducing the impacts of threats.

However, the range of on-ground actions we are currently capable of is quite limited with local conditions generally critical in governing the achievement of intended outcomes.

Table 5.1 Major on-ground activities that are undertaken across the region

Vegetation Management Action	Projected outcome	Assumptions
Protective fencing to reduce grazing pressure (including changed grazing regime)	Increase in quality and extent of remnant. Area outside remnant will regenerate if grazing is managed. Note: Other interventions may be required for some vegetation types.	1 ha stock grazing managed = 1 ha quality improved by 5 per cent in first 10 years. Allowing regeneration, decreasing weed invasion (stock bringing in and nutrients in manure), increasing litter. Grazing to be managed for conservation outcomes. Other grazing must also be managed e.g. rabbits, hares and macropods if a problem.
Weed control	Increase in condition of remnant. Removal of weeds allows regeneration. Area managed increases extent only where outside existing remnants, managed to allow regeneration and adjacent to a seed source.	1 ha managed = 1 ha quality improved by 5 per cent over 10 years. Removes competition, allows regeneration, improves floristic integrity. Only weeds threatening ecological values contribute to this goal.
Revegetation (increasing extent)	Increase in extent	Expect 5 per cent improvement over 10 years. Next to a remnant could be a buffer or a corridor.
Rabbit control	Area managed improves quality by 5%.	Expect increased regeneration, litter and understorey recruitment. The spread of weeds will decrease. Expect 5 per cent improvement over 1st ten years where other grazing is also managed.
Understorey enhancement	Increase in condition	Expect 10 per cent improvement if enhancement carried out according to relevant EVC benchmarks. If revegetation within remnant is greater than 50 per cent of the total area of remnant, then the entire remnant benefits. If revegetation occurs next to a remnant, then the area improved equals the area of revegetation plus the remnant (provided they are under the same management regime.
Ecological thinning	Increase in condition	Expect 10 per cent improvement if combined with appropriate site management or site has regeneration potential.
Ecological burning	Increase in condition Increase in extent – if adjacent to existing remnant	Expect 10 per cent improvement if combined with appropriate site management or site has regeneration potential.

In addition to on-ground actions, a number of assumptions related to community capacity, knowledge base and regulatory issues have been made in the development and scoping of this plan. Further work is required to better understand regional trends and the implications of socio-economic factors in achieving the goals and targets articulated in this plan.

Table 5.2 An overview of some of the socio-economic factors

Issue	Assumption
Incomplete knowledge of vegetation condition	Vegetation condition mapping/survey across the region will lead to better targeting of vegetation enhancement and restoration efforts.
Incomplete knowledge of fauna requirements	Research to understand thresholds for key fauna species (e.g. mammals and woodland birds) will improve strategic revegetation planning.
Climate change	Strategic revegetation and enhancement at a landscape and regional scale will improve viability of flora, fauna and ecological communities enabling adaptation to a range of climate change scenarios.
Agricultural terms of trade	Decline in agricultural terms of trade will offer opportunities for landholders to access alternative markets for carbon and ecosystem services. This in turn will drive landscape scale restoration.
Increased regulatory requirements	This will reduce legal and non-legal clearing of native vegetation. Needs to be coupled with incentive programs and EMS to improve community acceptance.

5.4 Knowledge Gaps

The development of the Plan has revealed a number of areas where future research and knowledge acquisition is required to improve the planning, implementation and evaluation of vegetation management activities. In particular the following areas have been identified as a focus for the next three 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 key species of flora and fauna;
- Interactions between native vegetation and hydro-geological processes, carbon sequestration and water yield;
- Role of remnant habitat in provision of ecosystem services at the paddock, property and sub-catchment/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; and
- Role of fire and disturbance regimes for ecological communities.

5.5 Adaptive Management Approach

The North Central Native Vegetation Plan is based on best available understanding and knowledge. In the development of the Plan, community aspirations and capacity together with the objectives of State and Federal Government objectives have integrated to produce the vision, goals and targets for the region.

Assumptions that underpin this strategic approach to native vegetation management within an integrated natural resource management framework will be tested through research, monitoring and evaluation.

Adaptive management is based on a continuous cycle of planning, implementation, monitoring, evaluation, review and improvement. The region is well placed with excellent benchmark information on biodiversity assets and comprehensive mapping of actions undertaken though native vegetation, biodiversity, salinity and waterway projects over the past five years. This information will serve as a basis for evaluation of existing projects that will inform future investment, planning and actions associated with the implementation of this plan.

6. What We Plan to Do

6.1 The Victorian Approach to Native Vegetation Management

Net Gain Goal

Successful implementation of this plan depends on the development of a mechanism that accommodates the need for rational ongoing development without compromising the principle of Net Gain.

The Net Gain principle has been developed to help achieve the goals of the Victorian Biodiversity Strategy (DNRE 1997), and in particular:

'There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain.'

The definition of the Net Gain principle for native vegetation and habitat is:

- Net Gain is the outcome for native vegetation and habitat where overall gains are greater than overall losses and where individual losses are avoided where possible. Losses and gains are determined by a combined quality-quantity measure and over a specified area and period of time. Gains may be either required offsets for permitted clearing actions or as a result of landholder and Government assisted efforts that are not associated with clearing.

This goal for native vegetation can best be achieved by having a 'whole of landscape' perspective, encompassing all tenures, and is most usefully informed by catchment-wide and bioregion-wide understandings of native vegetation processes and values.

The approaches to meeting this goal also recognise the primary importance of existing native vegetation, particularly in terms of irreplaceable natural assets and cost-effective delivery of ecosystem services. We also need to ensure that these perspectives are part of the complementary policies that drive our salinity, water quality, biodiversity, land protection and greenhouse programs.

Assessing Net Gain

Assessment of Net Gain is determined by the use of the quality-quantity accounting system (habitat-hectares) developed by DPI/DSE and described in the Victoria's Native Vegetation Management Framework (DNRE 2002) for Achieving Net Gain in Planning Decisions.

The habitat quality component of habitat-hectares is modelled on the basis of commonly accepted indicators for native vegetation condition and viability. Use of the habitat-hectares accounting system will facilitate the establishment of a complete picture of the native vegetation asset against which incremental losses can be evaluated. The number of habitat hectares equals the habitat quality score multiplied by the area (in hectares) of the remnant stand.

The broad approach to putting Net Gain into practice aims for:

- Use of quantitative contextual information to guide decisions and report outcomes;
- More consistency and certainty in planning by enabling proponents of large developments to calculate, at the feasibility stage, whether mitigation works are feasible and to estimate their cost;
- The ability to link across areas and scales and to provide a whole of landscape view;
- Mechanisms that are simple to understand and to deliver by natural resource planners and managers that are typically not specialists in conservation ecology;
- Robust results; and
- Mechanisms that apply efficiently, equitably and transparently.

A detailed discussion of the Net Gain principles can be found in **Appendix 13.**

These principles (which have been developed as part of a statewide framework) form the underlying approach to the development of priorities and actions outlined in this plan. A fundamental premise underpinning these principles is that

maintenance of native vegetation extent and quality will conserve biodiversity more effectively than any other means.

To improve biodiversity, conservation values will require more than just retention of existing assets. Enhancement works and revegetation will be needed and will also improve the quality of soil and water resources and protect land. However, revegetation cannot recreate the complexity of native vegetation communities that have co-evolved over millennia. Therefore, better conservation and management of existing remnant vegetation are the first priorities in achieving the goal of this plan.

Principles

1. **Retention and management of remnant native vegetation is the primary way to conserve the natural biodiversity across the landscape.**

All native vegetation has value; an adequate proportion of each type must be managed principally for conservation.

a) All viable habitats and populations of threatened communities and species should be protected through voluntary or regulatory means.

b) Biodiversity values are not restricted to threatened vegetation communities. An adequate proportion of each non-threatened vegetation community must also be managed principally for conservation.

c) Large natural areas of remnant vegetation are of fundamental importance for nature conservation and are irreplaceable. All other things being equal, large remnants are inherently more valuable than small patches that total the same area.

d) Natural is best; restoration of an asset through revegetation or re-introduction is unlikely to return the asset to its original condition with all of its inherent ecological processes and resilience.

e) Restoration should be targeted to areas which maintain natural resilience and restoration efforts should harness natural resilience.

2. **The conservation of native vegetation and habitat in a landscape and the maintenance of healthy catchment processes are mutually dependent.**

a) Maintaining ecological processes provides productivity, salinity control, water quality and other land management benefits.

b) Native vegetation management strategies must be integrated with land protection and resource use strategies, including productive agricultural practices, for both long-term success and for ensuring that land and water protection outcomes are achieved.

3. **The cost of vegetation management should be equitably shared according to benefits accrued by the landholder, community and region.**

a) All land managers and land owners have a responsibility to retain native vegetation.

b) Public resources are to be directed to increasing the extent of native vegetation or to enhancing the quality of native vegetation through appropriate management.

c) Public resources are to be used to facilitate voluntary actions by landholders and for shared investment in enhancing vegetation of conservation importance.

4. **A landscape approach to planning native vegetation management is required. Goals for native vegetation management will be based on bioregions, or sub-units of bioregions, within the Catchment Management Authority region. Priorities for vegetation management should be specific for each bioregion and catchment.**

a) Multiple patches of the same vegetation community should be retained or enhanced across their geographic range.

b) The landscape context of remnants is determined by their location and this affects their conservation significance.

Action priorities

Priorities for action to conserve biodiversity are driven by the conservation significance of the biodiversity asset.

Conservation significance is attributed to native vegetation communities, native species of plants (and animals, natural wetlands and rivers) according to the rarity of the asset type and its naturalness or natural condition. Regional investments will be driven by these priorities in the following ways:

- Protection – reservation, covenants, management agreements, statutory planning and fencing;
- Enhancement – management by controlling threats, natural regeneration and re-introduction of missing elements, e.g. understorey; and
- Restoration – revegetation to create corridors, buffers, patches of habitat, reintroduction of individual plants and animals into depleted populations.

Within a given vegetation type and for habitat of equal value, priority will be assigned as follows:

- Protection of remnant vegetation (e.g. reservation, covenants, management agreements);
- Management of existing remnants (e.g. fencing, grazing management, weed control, maintenance of the hydrological regime, revegetation for buffering, promoting/enhancing natural species and/or structural and/or age class and/or size class diversity);
- Enhancement of degraded remnants;
- Enhancement of viability, connectivity and integrity through recreation of habitat (e.g. buffers and corridors, including riparian revegetation);
- Revegetation for land degradation mitigation works;
- Re-creation of isolated areas of habitat; and
- Revegetation works of lower order than above.

Within the above hierarchy, consideration will be given to the:

- Contribution to protection or enhancement of land and water resources;
- Viability of existing or proposed vegetation and habitat;
- Feasibility of the proposed actions (probability of success, need for ongoing management); and
- Benefits in relation to the cost of the project.

Outcomes

Reversing the long-term decline in the extent and quality of native vegetation in accordance with the principles and approaches outlined in this plan will make a significant contribution to achieving the following outcomes:

Biodiversity

The ecological processes and the biodiversity dependent on terrestrial, freshwater and marine environments are maintained and, where necessary, restored.

The present diversity of species and ecological communities and their viability is maintained and improved across each bioregion.

There is no further preventable decline in the viability of any rare species or of any rare ecological community.

There is an increase of the viability of threatened species and in the extent and quality of threatened ecological communities.

Land and Water Quality

Improvements in land and water quality due to the restoration and protection of ecological processes within catchments.

Reduction in the impact of secondary salinity on the State's land and water resources by increasing vegetation cover and reducing groundwater recharge.

Improvements in water quality due to the interception of nutrients in surface runoff.

Climate Change

Enhanced amelioration of the impact of climate change by significantly increasing Victoria's carbon sinks through revegetation and regeneration.

Increased carbon sinks and provision of a range of other benefits through the development and expansion of private forestry in a way that complements native vegetation retention.

6.2 The North Central Regional Policy & Strategic Planning Context

The North Central CMA covers the Avoca, Loddon, Campaspe and Avon-Richardson catchments, and is responsible for:

- coordinating all natural resource managers in the North Central region;
- identifying and assessing catchment needs and preparing strategies for implementation;
- developing integrated catchment management guidelines;
- advising on catchment priorities, activities and budget allocation for State Government natural resource management agencies; and
- promoting community awareness and understanding of natural resource management, conservation and rehabilitation.

The North Central RCS includes strategic actions for biodiversity conservation that will reduce greenhouse gas emissions, contribute to a regional approach for tackling climate change and facilitate the inclusion of Environmental Management Systems in farming operations.

The North Central RCS (CaLP Board 1997) was prepared to guide better management of our natural resource assets such as soil, water and remnant vegetation. A review of the condition of natural resources of the region identified a number of key issues including biodiversity decline. This has led to the development and implementation of an integrated range of programs to tackle these issues. The Biological Diversity program underpins the implementation of the directions set out in this Native Vegetation Plan and is supported by allied programs including salinity, waterways and water resources, soil health, pest plants and animals and regional development as highlighted by the North Central RCS.

The goal of the *Salt Action: Joint Action* strategy (Victorian Government 1988) was to manage the salinity of land and water resources throughout Victoria in order to maintain and, where feasible, to improve the social well-being of communities, and the environmental quality and productive capacity of the regions. The ten-year target was to prepare regional salinity plans and salinity management plans for all sub-regions with salinity problems. Salinity Management Plans were prepared for the Avoca, Avon-Richardson, Campaspe, and Loddon Dryland catchments, plus five sub-catchment plans in irrigation areas to the north of the region. These are currently being implemented. A review of these plans is also being undertaken as part of the renewal of the North Central RCS.

Whole of Catchment Plans have been prepared for each of the region's four catchments. The purpose of these plans is to integrate all major strategies and priorities of the North Central CMA at a catchment level. The Whole of Catchment Plans and associated implementation schedules provide measurable objectives and a mechanism for assessing performance.

A Farm Forestry Action Plan has been developed for the North Central region. The plan outlines a framework for action to accelerate widespread integration of farm forestry into existing farming systems and provide for a supportive environment for the region's timber processing and value-adding industry to prosper.

The North Central RHS has been developed for the region. This strategy recognises the importance of native vegetation and biodiversity in waterway health and sets strategic directions that are coherent with the direction of this Native Vegetation Plan. River Health Plans are in the process of development and/or implementation for the region's catchments. These strategies provide a focus for activities that address issues impacting on waterway health on the

major rivers of the region.

In recent times the North Central region has recognised the importance of greenhouse issues and climate change. This has led to the development of a Climate Change Action Plan based on the establishment of native vegetation to act as a carbon sink. Development and implementation of this plan as a means of securing investment in native vegetation for multiple natural resource management outcomes has the potential to be a major influence in the region over the next 10 years.

The draft 'Management Prescriptions for the Control of Timber Harvesting in Native Forests within the Bendigo Forest Management Area' (FMA) provides guidelines for management of some environmental issues in operational aspects of commercial harvesting for timber products in native forests at the coupe level within the Bendigo FMA.

The Environment Conservation Council has recently completed an investigation of public land use in the Box-Ironbark country of North Central Victoria. Final recommendations for the balanced future use and development of public land in this ecosystem were adopted in November 2001. Significantly these recommendations included the establishment of a number of new parks and reserves such as the Greater Bendigo National Park, St Arnaud Range National Park and a National Heritage Park at Castlemaine.

The recommendations point the way to a 'whole of landscape' approach that will ensure integrated planning and management across public and private land. These recommendations confirm the directions set out in this Native Vegetation Plan.

Many of the actions recommended in this Native Vegetation Plan have already been identified in existing regional approaches to resource management issues. Native vegetation management is recognised as a cornerstone for tackling issues of salinity, waterway health, water quality, soil health, pest plant and animal proliferation and regional development.

This plan is consistent and supportive of relevant Commonwealth and State policy and planning processes. At a Commonwealth level principles and actions are outlined in the:

- National Framework for Management and Monitoring of Australia's Native Vegetation (ANZECC 1999);
- National Strategy for Ecologically Sustainable Development (ESD) (1992);
- Environment Protection and Biodiversity Conservation Act (1999); and
- National Action Plan for Salinity and Water Quality (2001).

At a statewide level, a number of key policies and strategies are reflected which provide statewide context and support for the overall intent and direction of this plan. These include:

- Victoria's Biodiversity Strategy (1997);
- Growing Victoria Together (2001);
- Our Forests, Our Future (2002);
- Victoria's Greenhouse Strategy (2002); and
- Victoria's Salinity Management Framework – Restoring our Catchments (2001).

See **Appendix 10** for detailed information on the regional, state and Commonwealth policy context.

The North Central Native Vegetation Plan therefore plays a key link between other management strategies and plans for the region in articulating a consistent and multifaceted approach to vegetation management that will provide multiple natural resource outcomes.

6.3 The North Central Approach to Native Vegetation Management

Until funding of native vegetation management programs is substantially increased, we have to contend with limitations to our abilities to achieve on-ground outcomes. In these circumstances, we must prioritise our actions to where they will make the most effective contribution.

In North Central Victoria, the Net Gain goal will be achieved by implementation programs characterised by:

- continued effort to avoid clearing, with an improved focus on the most significant native vegetation;
- active management aimed primarily at improving the quality of existing remnants;
- long term commitment by landholders and all levels of government to the management task;
- developing understanding by landholders of the need for extensive revegetation; and
- increasing the capacity of landholders and rural communities to undertake vegetation protection and revegetation works.

Aim

In line with the Victorian Biodiversity Strategy and Victoria's Native Vegetation Management Framework, the North Central Native Vegetation Plan aims to reverse the decline in the extent and quality of native vegetation across the region, leading to a Net Gain.

Priority 1: Protection of Existing Remnant vegetation

The highest priority of the North Central NVP is to protect existing remnant vegetation as this is fundamental to conserving the biodiversity of the region. The protection of rare species alone is not adequate, as it does not prevent the continued creation of further rare species through habitat depletion (Frood and Calder 1987).

Achieving this target will require that incremental loss of native vegetation through development (e.g. clearing for activities such as subdivision and regional development) and unavoidable 'natural' processes of decline (i.e. the loss of large old trees in the agricultural landscape) is accompanied by complementary actions that lead to an overall gain in vegetation extent and quality across the region.

Framework

The approach to protection of native vegetation depends on the type of remnant.

Protection of Native Vegetation Communities

If the remnant vegetation retains enough diversity of composition, structure elements or function, it is considered a vegetation community.

Our priorities for action to protect native vegetation from threats are set by the conservation significance of a patch of vegetation. The Victorian Framework formalises this for protection from clearance proposals and for providing for offsets for permitted clearing.

Applications to clear native vegetation must be considered in a bioregional context to ensure that all vegetation communities are adequately conserved across the bioregion. The decision making process uses EVCs as the fundamental unit for achieving Net Gain. A set of statewide principles has been developed to provide a framework for achieving Net Gain (see **Appendix 13**).

Net Gain in North Central Victoria

In North Central Victoria, actions that may influence native vegetation extent and quality will be expected to achieve an overall 'Net Gain'. The approach to achieving Net Gain at the regional and statewide levels is set out in **Table 6.1.**

In addition to minimising the loss of native vegetation, substantial positive action to protect vegetation from threats is required. At the time of writing, we cannot map the priority of remnant vegetation at regional or bioregional scales as conservation significance information can only be obtained by on-site assessment of remnant vegetation condition.

Until conservation significance mapping becomes available, conservation status is generally accepted as the major means of priority setting at broad scales.

In addition, landscape ecology considerations presented in James & Saunders (2001) mean that in heavily cleared areas (those with less than 30 per cent native vegetation remaining) all remnant vegetation is needed for landscape protection and biodiversity conservation purposes.

Due consideration must be given to this principle in prioritising our actions to protect, enhance and rebuild our native vegetation estate.

Table 6.1 Reflecting Conservation Significance in Overall Outcomes for Net Gain

Conservation Significance	Extent of existing native vegetation	Gains in habitat quality-quantity	Net outcome
Very High	no losses	substantial gains	substantial net gain
High	losses minimised	moderate gains	net gain
Medium	losses minimised	some gains in medium term	no net loss
Low	some losses	some gains in longer term	short term loss longer term no net loss
TOTAL			reversal of decline (change from net loss to net gain)

Where clearance of native vegetation is permitted, the net gain approach requires that these losses are more than balanced by gains in native vegetation quality and extent elsewhere. These 'offsets' to the losses are calculated according to procedures set out in **Appendix 14.**

Protection of Scattered Trees

Where the diversity of composition of a remnant is very low and only trees are present, the remnant may be considered to be 'scattered trees'.

We are aiming for a reversal across the entire landscape of the long term decline in the extent and quality of native vegetation leading to a Net Gain (see both the Biodiversity Strategy and the Native Vegetation Management Framework).

The first action priority is to gain better management of scattered trees for environmental, social and economic benefits. Nevertheless, regulating the clearance of scattered trees in the landscape by providing a protection and offset (by recruitment) system will still be necessary.

Principles

- Any offset protection and recruitment system should reflect the true value of the trees in their mature form.
- Any offset should lead to a net gain that improves the condition of the environment.
- Any offset agreement should not lead to permanent environmental costs resulting from the delay before the offset actions yield environmental benefits.
- Quality assessment of scattered trees should fit within the framework for Achieving Net Gain in Planning Decisions.

Victoria's Native Vegetation Management Framework provides guidance in dealing with the loss of scattered trees and describes minimum standards for determination of offsets where scattered trees are permitted to be cleared as part of a planning permit.

The Victorian Framework has a system (see **Appendix 14**) for calculating offsets for permitted clearance of old trees. This system is a minimum standard to be applied statewide. The framework allows for regional increases above this minimum.

In North Central Victoria, the critical state of remnant vegetation in agricultural areas and the reasons outlined above could justify a substantially larger protection and recruitment offset. This plan will use the Victorian minimum provisions in order to achieve consistency across CMA boundaries, but proposes that the minimum offset provisions be reviewed in the near future to assess the appropriateness of offsets.

Action 6.1 Review scattered tree minimum offset provisions in 2007

Appendix 14 provides a guide to determining off-set measures for clearance of scattered trees.

Protection of Old Trees

Large trees (measured relative to EVC based benchmarks) are now much reduced from their former extent in North Central Victoria. Because tree growth is extremely slow in most of the region and in agricultural landscapes there is little scope for replacement with new generations, they are considered an essentially non-renewable resource. The value of old trees and hence the degree of protection accorded is considered to be proportional to their size, categorised according to the following table.

Table 6.2 Categorizing large old trees

Old Tree size category	Diameter relative to benchmark
Very large	≥ 1.5
Large	1—1.5
Medium	0.75—1.0
Smaller	≤ 0.75

See **Appendix 14** for offset provisions for clearance of old trees.

Protecting Private Native Vegetation Undergoing Harvesting or Ecological Thinning

This section refers to the harvesting of naturally-established native forest on private land. A clear distinction is made with Farm Forestry (or Agroforestry) where harvesting is of plantations created for timber production purposes on already cleared land.

The harvesting of naturally-established native forest has environmental consequences but clearly has a different level of impact to permanent clearing.

For equity across land tenures, the approach to harvesting activities on private land will be similar to the approach on public land.

However, an important difference with respect to environmental factors at the landscape scale is that private land timber stands are often neither as large in area nor as surrounded by extensive areas of other forest as stands on public land, and so there are often more limited options for 'buffering' the impacts of harvesting in time and in space. That is to say, in more fragmented landscapes, disturbances from timber harvesting are less likely, or slower, to recover their habitat quality than in more intact landscapes. Thus, more effective conditions than those in the Public Forest Management Prescriptions will be necessary for harvested private forests to achieve similar outcome to the public forests.

Compared to large public estate forests then, it is reasonable to expect greater efforts towards achieving net gain when offsetting losses due to timber harvesting on private land, and as public forests in North Central Victoria are themselves relatively highly fragmented, all privately owned forest in our region is in this category even where contiguous with public estate forests.

Consistency with the Net Gain approach means that utilisation of native vegetation for timber products (e.g. selective harvesting, harvest and regeneration) on private land must be part of a sustainable forest management approach and will only normally be permitted in Low and Medium conservation significance categories.

Under the Native Vegetation Retention Controls (NVR) all timber harvesting operations require a permit. Permits are obtained from local Shire offices.

In places there are combinations of conservation status and quality of vegetation that result in a Very High or High Conservation Significance rating, but harvesting is currently allowed on public land under certain conditions (e.g. silviculture prescriptions).

On private land with the same conservation characteristics within the same bioregion, harvesting (followed by regeneration) can only be permitted if no other criteria on the site warrant a Very High or High rating (e.g. threatened species). However, the amount of harvesting will need to be determined on a site by site basis, taking into consideration the need to buffer the impact of harvesting in time and in space, i.e. achieve a Net Gain.

At the time of writing, in North Central Victoria, public forest timber harvesting:

- is illegal for Red Gum or Yellow Box in the Goldfields Bioregion;

- of Black Box is being phased out in the Murray Fans and Murray Mallee Bioregions;
- does not legally occur in the Riverina Bioregion; and
- does not practise clear felling.

Within North Central Victoria, the Murray Mallee, Victorian Riverina, Wimmera and Victorian Volcanic Plain bioregions all retain only very low coverage of native vegetation. Within the Northern Inland Slopes Bioregion, cover on private land is also very low.

In these bioregions with little remnant vegetation, harvesting of native vegetation is not considered appropriate and will not be permitted except where proponents can demonstrate that the harvesting will bring about an improvement in the total habitat condition (scored using the habitat hectare approach).

Large Old Trees

The Framework refers to "where large old trees are included in the harvest area, mitigation will be determined on a case-by-case basis ensuring sufficient seed and habitat trees for regeneration of the forest values". This determination should depend on the relative abundance of large old trees on adjacent land.

In North Central Victoria, large old trees are such a scarce resource that their harvesting will generally not be supported.

However, application of public land prescriptions for retained habitat trees may be appropriate if the harvesting causes a loss of small proportions. If the large old trees in the harvest area represent a significant proportion of those in the adjacent lands then higher levels of retention (than those on public land) would be appropriate.

Isolated Remnants

An isolated remnant does not have the same potential to support as great a diversity of native species as a large treed area. They are also at greater threat from degrading processes such as weed invasion, but isolated remnants still provide important flora and fauna habitat in rural landscapes.

The Framework attempts to maintain conservation values of these remnants where "private land is not substantially contiguous with the public forest estate", by requiring "a higher level of mitigation to be specified in regional Native Vegetation Plans." These will be developed in the North Central Ecological Enhancement Thinning Guidelines, via ascale of landscape context thresholds.

Appendix 14 summarises the offset criteria for harvesting timber from naturally established native forest on private land.

Buffering in Time and Space

The Framework requires that consideration be given to buffering timber-harvesting operations in 'time and space'. To achieve this, smaller and isolated remnants can only be considered for timber harvesting with different requirements and will be assessed on a case by case basis. Also, in applications for timber harvesting, a suitable number of trees in all size classes must be retained within the proposed harvesting area. These are described in **Appendix 14.**

Sustainable Management Approach

The NVR Controls require that harvesting must be in accordance with the Code of Forest Practice.

Harvesting must also comply with the relevant Forest Management Prescriptions. In North Central Victoria, applications to harvest timber must use the North Central Forest Care Kit to ensure compliance with the Code and prescriptions. This kit will require that applicants consider long-term planning as part of their application as well as environmental aspects.

Action 6.2 The North Central Forest Care Kit will be developed to assist harvesting proponents comply with the Code of Forest Practice

Ecological Thinning

The Environment Conservation Council Final Report for the Box-Ironbark region has recommended that Ecological Thinning be conducted in public conservation reserves. There is currently little research done in this area, but some experimental thinning is being carried out in reserves in the region. Some private landholders are requesting to ecologically enhance their properties for biodiversity by thinning.

Action 6.3 The North Central Ecological Enhancement Thinning Guidelines will be developed to help landholders as well as Shire and DPI Officers when assessing applications to thin natural stands of timber

Threatened Species

No trees are to be harvested in areas known to provide refuge for any threatened species.

Using Buffers to Protect Remnant Vegetation from Off Site Threats

Protecting and enhancing the values of remnant native vegetation often involves mitigating the effects of off-site impacts. These impacts result from a range of land uses which are potentially degrading to the quality and viability of the nearby remnants. In cases where the nature of nearby land use is being fundamentally altered; for example, with a change from dryland grazing to irrigated horticulture there may be deleterious impacts on the biodiversity values of adjacent remnant vegetation. This may involve nearby riparian vegetation, roadsides or other remnants. Within the context of the North Central Native Vegetation Plan, maintaining the quality of areas of remnant vegetation with significant conservation values is a high priority.

Where changes in neighbouring land use have the potential to degrade the value of remnant vegetation, the establishment of buffer strips between the two areas can protect against these losses, maintaining or even enhancing the conservation values of the remnants.

Buffers are defined as zones of native vegetation that are strategically established between areas of remnant vegetation and adjacent agricultural land, to protect the environmental values of the remnants.

Buffers have traditionally been developed to protect stream water quality and have not given due weight to the intrinsic values of riparian vegetation. Most stream buffers have been developed for timber harvesting operations where potential impacts include sediment transport and deposition, altered temperature and light regimes, reduced organic material input, and altered stream flow. These parameters and the efficacy of buffers have been recently reviewed (Dignan *et al*. 1996, Davies and Lane 1995). In a comprehensive study focusing on Victorian conditions, Dignan *et al*. (1996) examined the evidence for determining buffer widths. While emphasising the site-specific nature of buffers and cautioning against a universal width, the authors found that a 30m buffer is adequate for mitigating most impacts on water quality generated from timber harvesting operations.

These buffer widths however do not account for protecting many of the values of the riparian environment, which include depleted or threatened plant communities, riparian dependant fauna and habitat corridors.

The functional aspect of a buffer is to intercept, absorb and sustain impact. The present standard of 30m appears adequate to intercept and absorb some physical impacts (as above) but many other impacts have not been considered. These include a range of factors with potentially serious consequences for flora and fauna, for example weed invasions, nutrient-related dieback of trees, floristic changes in vegetation and increased predation by feral animals (e.g. foxes). These have been treated in a number of studies concerned with edge effects and the processes of habitat change (Hobbs 1989; Hester & Hobbs 1992; Bennett 1990; Cale & Hobbs 1991).

The level of confidence that a 30m buffer can protect flora and fauna values is further diminished by the lack of data on the sustainability of these systems over time. It may then be appropriate to determine the buffer width with regard to the conservation significance of adjoining vegetation, with wider buffers required to protect areas of higher conservation significance, for example, roadsides with endangered EVCs and of high vegetation quality. With this in mind, a gradational approach has been taken to the development of recommended buffer widths required to protect the conservation values of remnant vegetation (see **Table 6.3**) It is acknowledged proposed increases in buffer width may appear to be somewhat arbitrary, but they should be considered minimal, for example in the important context of retaining core habitat within vegetated corridors (see various papers in Saunders and Hobbs 1991). Several authors in the latter volume also contend that edge effects tend to dominate forest corridors of around 30 m.

It is recognised that applying a single buffer width to a heterogeneous landscape is problematic. While an increase to 50m is generally conservative for the long-term protection of highly significant vegetation communities and flora and fauna, there are likely to be instances where this is clearly inadequate. For example, protecting significant waterbird feeding and roosting habitat or where salinised groundwater is close to a wetland (Davies and Lane 1995).

For some situations it will be important to consider several factors prior to determining the appropriate buffer width. These would include:

- biological significance;
- sensitivity of wildlife;
- erosion or ground water hazard; and
- development of aspects including type, scale and position.

Determination of buffer width and design should be seen as an integral component of responses to land use changes. Significant potential exists for a collaborative approach between proponents and regulatory/advisory agencies such as DPI/DSE and Local Government. The establishment of appropriate vegetated or protective buffers between areas of significant native vegetation and adjoining land uses will ensure a sustainable outcome for both biodiversity assets and regional development.

The table below sets out recommendation for buffer widths using a scale based on the conservation significance of adjacent vegetation.

Table 6.3 Proposed buffer widths based on conservation significance

Conservation significance of adjacent vegetation	Proposed buffer width
Very High	50m
High	40m
Medium	30m
Low	20m

Protecting 'Less-Natural' Native Vegetation

The current Victorian system for assessing conservation significance of remnant vegetation communities is partly based on comparison of a site against a 'benchmark' for the vegetation type. The habitat hectare benchmark is based on what the vegetation community is thought to have been like in a 'mature and apparently long undisturbed' state and includes aspects of biodiversity composition, structure and function.

In North Central Victoria, there is concern that sites that retain high reproductive function (i.e. the potential to regenerate to a higher habitat quality over time) but currently lack visible composition and structural benchmark features may not be valued sufficiently under the Victorian framework.

Some features of habitat quality are more important than others when considered in a long term context. The ability to regenerate is more difficult to recover than the ability to regrow structural attributes such as logs or ground litter.

A common example in North Central Victoria is where a forest or woodland site has lost all woody vegetation through clearance and/or grazing, but still retains predominantly native ground flora composition, including soil crusts and only has few, low threat weeds present. Experience has shown that such sites can readily regenerate after removal of grazing pressure to a more floristically and structurally diverse state with little other input. Re-introduction of missing species is also comparatively straightforward.

Under the Victorian framework system, such a site would score poorly in comparison to the benchmark (particularly if current grazing pressure means there is no evidence of regeneration) and may therefore not be adequately protected from clearance proposals. These kinds of sites are sometimes not even recognised as native vegetation by the floristically less aware.

Because of their low cost, high regeneration potential, such sites are valuable assets for the net gain goal in North Central Victoria. This value needs to be reflected in their conservation significance.

Action 6.4 Review guidelines for habitat scoring to assess whether the regeneration potential of North Central Victorian sites is adequately taken into account

At this stage, sites that have few and uncompetitive weeds, that appear to have never been ploughed, or not for many years, that retain largely native vegetation or retain soil crusts should be flagged for closer examination of their regenerative potential and greater consideration given to their value as potential habitat restoration sites. Such sites can legitimately be considered by responsible authorities to be of higher conservation significance than the standard Victorian framework methodology indicates.

Priority 2: Management and Enhancement of Existing Remnants

Much of the remnant vegetation in North Central Victoria is in poor condition due to the continued impact of threatening processes as previously outlined. Despite this, most remnants have the capacity to improve in quality with management interventions and enhancement actions.

These include improving recruitment by controlling grazing and pests, re-introducing missing understorey elements and reducing environmental weeds. (Other aspects such as the content of old growth trees take many decades to improve.)

Prioritisation of enhancement works must take account of the condition of remnant vegetation as well as its conservation significance.

Native vegetation in better condition is, by definition, less in need of enhancement works. In contrast, our ability to permanently improve habitat condition of low quality remnant sites is severely limited. Thus, prioritising works to remnant vegetation in the middle range of habitat condition is considered most appropriate.

Our net gain priorities for enhancement work then are as shown in **Table 6.1.**

These include:

- promotion of regeneration by removing or reducing the factors that prevent regeneration e.g., grazing pressure, pest plants and animals;
- restoration of appropriate vegetation structure and composition, e.g. 'ecological' thinning of denser t han appropriate eucalypt growth;
- re-introducing missing key structural and floristic elements, e.g. shrubs and ground flora;
- restoration of appropriate fire and ecological thinning regimes; and
- re-introduction of missing fauna where biological science shows this to be viable and helpful to vegetation quality.

Although the history of enhancement works in Australia is relatively short, the successes of systems like the 'Bradley Method' (Bradley 1988) and its adaptation by the NSW National Trust have inspired exploratory work in North Central Victoria. These systems were developed to deal with the devastating weed invasions in remnant urban bushland areas. Several guiding principles have been established by the NSW work. The three most important are:

- Work from the areas of best condition outwards to the more degraded areas of a native vegetation remnant;
- Make minimal disturbance (as this generally exacerbates weed problems); and
- Let the rate of regeneration of native vegetation dictate the rate of weed control work.

These appear valid in the so far limited range of North Central conditions tested, but native vegetation remnants in agricultural areas face different threats to those in urban areas. In addition, the cost of intensive enhancement works as practised in urban areas is unaffordable over the scale of our region. Nevertheless, as the future of our vegetation management will be focussed on enhancement works, the philosophies and principles of these systems may have much to offer.

The scientific community has also become involved in investigating management of native vegetation. Advances in management practices and techniques should be adopted as more information becomes available.

Development and implementation of Best Management Practices (BMPs) for a range of EVCs is a key tool that will assist landholders in improving the quality of remnants. DPI/DSE Flora & Fauna staff are compiling Victoria-wide EVC based benchmarks for the purposes of vegetation condition assessments. BMPs will initially make use of these as guides for enhancement actions for remnant vegetation. To better support enhancement actions, these benchmarks may need to be made more comprehensive and adapted to North Central Victorian conditions.

Control of threatening pest plants and animals within remnant vegetation is a high priority.

Pest plants have been identified as a key issue across the North Central region. Weed invasion is a major threat in all native vegetation communities leading to loss of native plant species as well as the fauna dependent on those plants. This leads to a reduction in biodiversity (Frood and Calder 1987; Carr 1988; Carr in Foreman and Walsh 1993). The threat appears to be greater in higher rainfall areas and in the lower parts of the landscape, i.e. riparian and wetland

communities and the open forests in the south of the catchments.

The integrity of a number of priority vegetation communities are threatened by invasion from environmental weeds. In particular a number of significant Box-Ironbark EVCs, Grassy Woodlands and Wetlands are at risk of further degradation due to the impact of weed invasion.

Weed invasion is commonly associated with disturbance such as fire, soil erosion and grazing (Gullan 1988; Carr in Foreman and Walsh 1993). Management and amelioration of disturbance factors is critical to protection and conservation of remnant vegetation.

The North Central Region Weed Action Plan has identified new and emerging weeds (such as Bridal Creeper) as a focus for action in the catchment.

Rabbit management is a key priority of the North Central RCS for North Central Victoria. Browsing from rabbits and other introduced herbivores has the capacity to significantly damage significant remnant vegetation, natural regeneration and compromise revegetation efforts.

Natural Resource Protection guidelines have been developed for the region to provide advice on ensuring that the applications of rabbit control methods are sensitive to environmental values.

Priority 3: Rebuilding the Viability, Connectivity and Integrity of Native Vegetation through Re-creation of Habitat

While reservation is vital, and most of the vegetation communities identified in this plan are inadequately reserved, it is insufficient to rely on the reserve system to protect the vast diversity of species and ecosystems within the region.

To ensure the viability of many of our native flora and fauna, large areas are necessary to conserve genetically viable populations. Networks and interconnections are also required to link the larger blocks of remnant vegetation allowing movement of fauna.

Increasing the size of patches of remnant habitat is well known to increase species diversity and has a positive influence on recolonisation and extinction rates (MacArthur and Wilson 1963; Lambeck 1999; Freudenberger 1999).

Research in conservation biology has shown that there are thresholds in patch size that determine habitat suitability for some fauna species. In principle, the larger the patch size, the more species are present.

Increasing connectivity in the landscape using corridors and stepping stones of habitat reduces the impact of fragmentation and provides a greater ability for flora and fauna populations to withstand catastrophic events (Goldfields Bioregional Plan 2002; Fahrig and Merriam 1985; Bennett 1999). Enabling the movement and interbreeding of species enhances their chance of survival in adverse conditions. Rivers and streams make natural corridors and can provide high quality habitat. Protecting and enhancing native vegetation along waterways also helps prevent erosion, filter runoff and maintain water quality.

Roadsides are important areas of remnant vegetation and in many areas of the region they represent the last significant fragments of the original vegetation communities. These areas, generally linear in nature, provide suitable habitat for many fauna species and although they may be sub-optimal habitat for others they provide movement corridors for many more species. Significant fauna species, including the Grey-Crowned Babbler and Tuan, are frequently found in roadside vegetation.

It is generally accepted that revegetation as currently practised produces low quality vegetation in the short term (e.g. over the lifetime of this plan's management action targets 10-20 years). Therefore, our goal of achieving substantial net gain for very high significance vegetation will be most quickly achieved through new 'greenfield' revegetation where it abuts existing vegetation and enhances the viability and neighbourhood aspects of habitat quality.

Our priorities for revegetation will therefore be directed towards surrounding and connecting existing vegetation according to its conservation significance and its landscape context (size, shape, position).

Where possible vegetation management actions should recognise opportunities to:

- create "nodes" of habitat at intersecting roads and fence-line corridors;
- link streamside vegetation with roadside vegetation;
- vegetate ephemeral gully lines that extend out from forest blocks and link into roadside, or other remnant, vegetation; and

- aim for diversity of structure and species, rather than just trees.

Priority 4: Community Education

Our vision is for the North Central community to be aware of the goals, principles and concepts of the Native Vegetation Plan, and to be actively involved in the implementation of the plan.

Effective community participation in native vegetation issues is recognised as a key component of implementing North Central RCS. Consultation with the community helps identify key native vegetation management issues early in any decision making process, and leads to the development of management measures to achieve better native vegetation protection outcomes.

Given the limited resources available to actively manage the natural environment, the community is also a particularly valuable resource for the implementation of many on ground activities through voluntary efforts. This provides added benefits to the community by fostering a strong sense of ownership, pride and local community spirit as the community works collectively toward common goals.

A well-informed and active community with skills and knowledge in managing native vegetation can be a powerful catalyst towards a sustainable future. Awareness of native vegetation is particularly important. On one level, the general knowledge and understanding of native vegetation issues throughout the community can be enhanced through education. At the next level, the skills and expertise of those participating in on-ground activities can be enhanced through training. Increasing the community's knowledge and understanding of native vegetation issues, through education, can lead to increased levels of participation.

The target groups for native vegetation community education in the North Central region include local government, utilities, government agency staff, environment groups (such as Trust for Nature), primary school students and teachers, secondary school students and teachers, school councils, university staff and students, farmers, Landcare groups and the general public.

North Central Vegetation Forum

The North Central Vegetation Forum comprises representatives from the North Central CMA, DSE/DPI (Catchment Services and Flora & Fauna), Greening Australia Victoria, Landcare Groups, Local Government, Trust for Nature and community representatives.

The Forum has an important on-going role in complementing the implementation of the North Central Native Vegetation Plan and initiating collaborative projects. One current project that illustrates the high level of cooperation in the region involves the North Central CMA, DPI/DSE, Trust for Nature and twelve community groups implementing a World Wildlife Fund project for threatened species.

General Native Vegetation Education

Native vegetation education (as a component of community education) is provided in a number of ways by a wide range of organisations. The major agency responsible for native vegetation education at the national level is Environment Australia. At the State and local level, DPI/DSE is the key provider of information for the general public. Greening Australia, Trust for Nature, the Gould League and Local Government also have important community education initiatives relevant to the North Central region.

The challenge for the North Central CMA and its key partners is to identify relevant programs in the region, assess the most appropriate way to involve target groups and to determine the gaps in native vegetation education ' to help focus future resources. The current information available covers a range of native vegetation issues that affect the general community at a regional, national and global level. This information includes:

- biodiversity and native vegetation;
- native vegetation as habitat;
- the role of native vegetation in salinity management;
- native vegetation and air quality;
- native vegetation and water quality;
- the role of native vegetation in managing land degradation;

- native vegetation for shelter and wind breaks;
- seed collection, tree planting, direct seeding;
- native vegetation as part of sustainable agriculture;
- the role of native vegetation in reducing greenhouse gases;
- native vegetation and farm forestry;
- weed management and establishing native vegetation;
- fencing and establishing native vegetation;
- the importance of understorey;
- the importance of native grasses; and
- native vegetation as part of Environmental Management Systems.

Specific information targeting key native vegetation issues for the general public is available through many non-profit and private organisations, either free of cost or through a subscription. Some of the more active organisations include:

- Greening Australia Victoria;
- Natural Resources Conservation League (particularly web-based education materials);
- Gould League;
- ENVIRONS Australia;
- Landcare Groups;
- Victorian Farmers Federation;
- Trust for Nature;
- Conservation Volunteers Australia (including Green Corps);
- Field Naturalists Clubs;
- Society for Growing Australian Plants;
- Australian Conservation Foundation;
- World Wildlife Fund for Nature;
- Environment Victoria; and
- Friends of the Box Ironbark Forest.

North Central CMA's Role in Native Vegetation Education

The North Central CMA in partnership with DPI/DSE has an important coordinating role for local Landcare and community groups regarding native vegetation. This includes initiating native vegetation education programs and projects to carry important messages on biodiversity to the broader community and target audiences, including:

- agency staff (DPI/DSE, DSRD);
- landholders;
- residents;
- tourists;
- local industry, particularly the plant nursery industry, greenhouse and oil mallee industries;
- council staff and elected representatives;
- contractors, developers and utilities; and

- Indigenous and ethnic communities.

There is a wide range of techniques for biodiversity education, including interactive and non-interactive methods. Increasingly, participatory activities are being utilised and interpretation, including signage, guided walks, ranger-guided activities, excursions for schools, education stalls at show days and shopping centres. More traditional education includes brochures and other published material for distribution through different local outlets and mail- outs. Research has shown that rather than overly prescriptive or technical approaches, material with options to empower and involve the community work better.

Marketing and promotion of local biodiversity programs, such as incentive schemes, requires an education component. The concept of biodiversity will also be marketed by DPI/DSE and North Central CMA to local communities and target groups through distribution via local and regional media, particularly newspapers, radio and TV.

Education also begins within the North Central CMA with the potential to strongly influence policy and organisational commitment to implementing conservation objectives. Workshops, seminars and training are all options, as well as learning from others through case studies that promote and celebrate success stories.

New property owners with limited or no previous land management experience (e.g. lifestyle bush blocks and hobby farmers) and other new residents (e.g. those living in close proximity to bushland) are particularly important target groups. Information kits with follow-up face to face 'extension style' support can strongly influence responsible management.

Education has great potential to be integrated with incentives programs, planning and regulation, community on-ground projects, and conservation volunteer programs. As with other tools, valuable partnerships with local government and other agencies, especially on a regional basis, can enable education campaigns to be more effective and sustainable.

Some industry sectors also contribute to native vegetation education. For example, ALCOA supports environmental education through initiatives such as the Warrambeen Landcare Centre, used regularly by Greening Australia Victoria to run native vegetation training workshops (not located in the region).

In addition to the partners listed on the previous page, the North Central CMA works closely with the following organisations to facilitate training in native vegetation management:

- Creswick School of Forestry;
- VCAH Glenormiston; and
- Parks Victoria.

Current training courses include the 'Remnant Vegetation Workshop Series' (Victorian Landcare Centre), 'Northern Plains Field Days' (DPI/DSE and Trust for Nature), and 'Trees in Rural Landscapes' – a course comprising 10 one-hour sessions per month (run by the Victorian Landcare Centre and DPI/DSE). These will be complemented by a new course for Landcare Coordinators.

In addition, a Box-Ironbark ecology course organised by DSE has been running since 1998. Monitoring the number and make-up of participants in each of these courses will be one way of monitoring the development of expertise in the region.

Local Community Native Vegetation Education

Through successful native vegetation education, the local community can begin to understand the issues from the personal level through to a local, regional, national and global perspective. People can then appreciate the importance of individual responsibility and action in achieving a sustainable future.

The Bushcare program is one initiative that aims to increase the awareness of issues relevant to the local environment. Community members are encouraged through such initiatives to participate in group activities and take ownership of the management of their native vegetation.

The media is an important source of information for the community, and the North Central CMA can educate the community through existing outlets such as local papers and newsletters.

A collective database of native vegetation information, news and issues for the region would be a valuable source of information for the community. This could also include a list of upcoming community environmental events.

Native Vegetation Education for Local Government

Effective local level native vegetation education requires well-informed Local Government employees. Training Local Government employees can give better results with native vegetation management. Councils can be more effective in responding to native vegetation inquiries and concerns from the community and community groups, based on their improved understanding.

Training for Local Government employees should include the Councillors and staff to improve overall knowledge in native vegetation management. This knowledge should flow through to the community in the form of local community initiatives, such as the Environment Grants Program and native vegetation protection rate rebates offered by the City of Greater Bendigo, and the shires of Buloke and Mount Alexander.

Councils can play a leading role by training parks and gardens employees in bushland management, 'trees for residents' programs and planting indigenous plants in public parks and gardens. Some Councils already encourage and fund employees to participate in native vegetation training courses. This could be extended to funding positions in the 'Landcare for Educators Course' run at the Victorian Landcare Centre in Creswick.

Fire

Managing the future impact of fire will involve close liaison between the North Central CMA, Country Fire Authority, DPI/DSE and local government, through Municipal Fire Prevention Plans. Municipal Fire Prevention Committees must be involved in planning large-scale revegetation projects. The impact of land use change and increases in vegetation cover leading to increased fuel loads must be considered in light of community safety.

Monitoring and Evaluation

The extent of community involvement is difficult to quantify at this stage, as there are few complete registers of existing groups and their respective memberships. The number of schools participating and interested in programs such as Waterwatch is increasing. The agencies and organisations responsible for these programs maintain records and mailing lists of participating individuals and groups.

Access to more recent major grant schemes, namely Natural Heritage Trust funding, has provided significant opportunities and scope to expand environmental projects throughout the region. There is also a range of funding opportunities for community groups at the State and Local Government level.

The State Government and Local Government have a role to play in education and awareness, and the continued establishment of incentives is an important factor in achieving a high level of success. These incentives demonstrate that the community can make a positive contribution toward native vegetation management. There are several programs in the region that provide skills and training for the community through a variety of organisations such as:

- TAFE
- Greening Australia, Victoria.

Market Research

Regular assessment of a cross-section of community attitudes and behavioural responses can help determine the effectiveness of native vegetation education programs. Known market research surveys (Scarlet Consulting 2001) provide an important benchmark for community attitudes.

6.4 Local Action Plans

Biodiversity Action Planning

The Regional Native Vegetation Plans pave the way for effectively targeted local action that will achieve the best integration of the objectives for native vegetation retention and revegetation. At the next spatial scale down from regional plans, Biodiversity Action Plans (BAP) will use a structured approach to identifying priorities and mapping significant areas for biodiversity conservation at the landscape scale. Native vegetation biodiversity priorities identified in the Native Vegetation Plans are included in the BAP and supplemented by other biodiversity priorities (e.g. threatened species, wetlands and river health). Using existing information on biodiversity assets and current understanding of species requirements for habitat within the local landscape, BAP identifies the best options for restoring native vegetation to recover biodiversity. These options can be mapped with related information on land and/or water protection and land use potential to enable local communities to visualise how sustainable landscapes can be achieved.

This approach allows the knowledge of local communities to be used in applying the priorities identified in this plan. The Department of Sustainability and Environment is undertaking research to support effective planning at the local landscape scale.

Biodiversity Action Planning aims to:

- conserve indigenous biodiversity by maintaining viable examples of the range of ecosystems that occur naturally across the region;
- encourage a more strategic approach and shift in public expenditure toward the protection, restoration and ongoing management of priority biodiversity sites; and
- achieve community support for landscape planning for biodiversity and the conservation of strategic assets in rural landscapes.

The North Central Region has been pioneering the application of bioregional planning to the implementation of biodiversity actions since 1999.

Bioregional plans have been developed for the Goldfields, Victorian Riverina, Murray Fans, Northern Inland Slopes, Murray Mallee and Victorian Volcanic Plains, Wimmera and Central Victorian Uplands bioregions. These documents each consist of a strategic overview together with local landscape ‘zone’ plans within each bioregion. They provide a detailed summary of biodiversity assets, threats and priority setting process for actions to inform local BAPs.

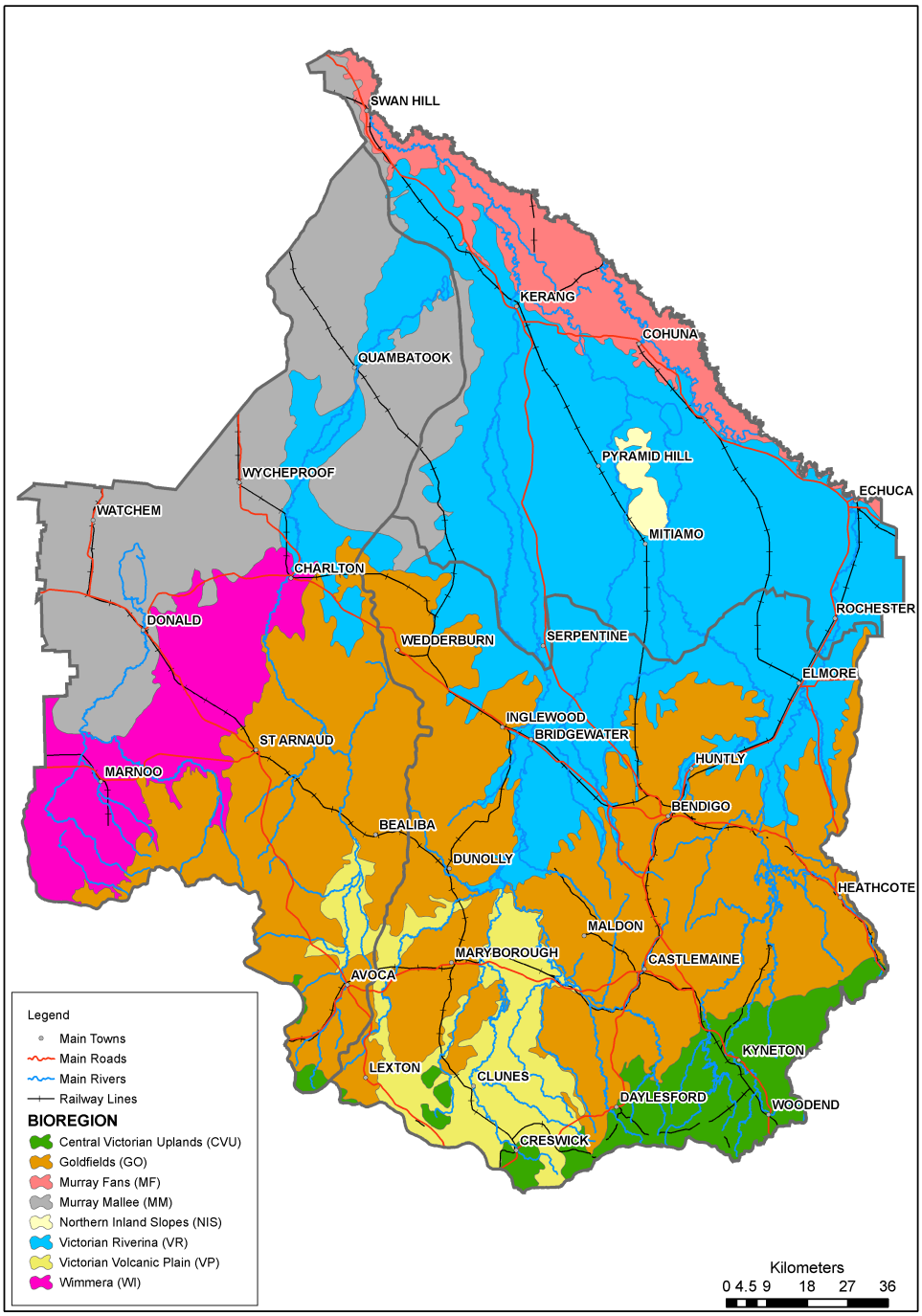
The use of Geographical Information Systems (GIS) enables local communities to better visualise biodiversity assets at a range of scales, from the property to sub-catchment level. This has led to more informed planning and targeting of actions at the local level to support catchment wide objectives. Combined with field work involving bird surveys and vegetation quality assessments local communities are building a clearer picture of their priorities and opportunities for improving native vegetation and nature conservation outcomes.

In the Goldfields bioregion Biodiversity Action Planning has successfully involved the land managers, community groups and a range of organisations to develop Local Action Plans that provide strategic direction for on ground works that produce biodiversity, salinity and water quality outcomes.

Landcare Action Plans (LAPs)

Landcare Action Plans (LAPs) are designed to allow Landcare groups to focus and prioritise their actions for the next five years. The actions may encompass not just on-ground works, but also activities that raise community awareness of natural resource management issues and build community capacity. Action plans should serve to increase community enthusiasm and energy through building the Group's effectiveness.

Map 22 Bioregional planning zones



Waterway Action Plans

A Waterway Action Plan (WAP) is a planned approach to waterway management at a local level focusing on a single creek or sub-catchment system. It provides a detailed outline of priority actions to undertake along specific streams within a given timeframe, e.g. five years.

The North Central CMA has developed a Regional River Health Strategy and River Health Plans for each of the four catchments in the region. A Waterway Action Plan translates the priorities and recommendations from these broader strategies to a local implementation level.

A Waterway Action Plan involves the thorough analysis of the current condition of the sub-catchment. This includes information on the following:

- Stream form;
- Riparian Ecosystems;
- Aquatic Ecosystems;
- Hydrology;
- Water Quality; and
- Heritage.

Integrated NRM Planning at a Local Level

A range of planning processes are appropriate at the local community level. BAPs, LAPs and WAPs are strong tools that:

- Assist local communities in the development and implementation of projects;
- Improve understanding of assets and threats; and
- Identify opportunities for on-ground actions that meet local aspirations and produce multiple outcomes.

As our understanding of integrated catchment management matures, it is envisaged that these planning processes will be integrated at a range of scales from the local to sub-catchment/landscape to regional.

6.5 Roles of Key Agencies and Groups

Commonwealth Government

The Commonwealth Government provides funding for vegetation retention and enhancement and the protection of rare or threatened species through agencies such as the Murray-Darling Basin Commission (MDBC), Environment Australia and Agriculture, Forestry and Fisheries Australia (AFFA). Funding for activities related to vegetation and biodiversity conservation is directed through the National Heritage Trust (NHT) in partnership with the State Government.

The National Action Plan for Salinity and Water Quality (NAP) which commenced in 2001 heralds a new approach to the way we manage and invest in natural resources to deliver improved salinity and water quality benefits involving integrated catchment management and regional planning. The North Central Native Vegetation Plan represents a key regional component of actions to meet one of the major goals of the NAP – “to prevent, stabilise and reverse trends in salinity, particularly dryland salinity, affecting the sustainability of production and conservation of biological diversity”.

Current NHT programs for the region include the National Landcare Program, National Reserve System Program, Farm Forestry Program, Endangered Species Program and the National Wetlands Program. These programs are delivered through the ‘One-Stop-Shop’ process, which enables community groups, agencies and regional organisations to access funding for environmental and natural resource management initiatives. The extension of the Natural Heritage Trust is aligned with the direction of the NAP providing for integrated regional delivery of natural resource management programs focusing on Bushcare, Landcare and Rivercare.

State Government

The State Government provides funding for managing natural resources through a range of programs including Growing Victoria's Greenhouse Sinks, Bush Tender, Second Generation Landcare, the Good Neighbour program and the Land

Protection Incentive Scheme. These programs deliver significant investment in native vegetation management across the NCCMA region. In recent times coordinated program delivery has focused on developing and implementing projects that provide multiple benefits for salinity and biodiversity. A partnership approach between DPI/DSE and the North Central CMA has allowed more effective and targeted on-ground actions based on bioregional planning principles.

Department of Primary Industries (DPI)/Department of Sustainability and Environment (DSE)

The role of DPI/DSE is to:

- Provide extension advice about wetland and remnant vegetation management, catchment management, revegetation and farm forestry;
- Contribute to assessments of referred permit applications under Section 55 of the Planning and Environment Act (1987) and providing advice under Section 52;
- Ensure the protection of native vegetation through reservation in conservation reserves, education (e.g. Land for Wildlife scheme) and by enforcing legislation including the Flora and Fauna Guarantee Act (1988);
- Monitor the impact of salinity and salinity mitigation works on significant wetlands and remnant vegetation;
- Work with local government to assess and map sites of significance for each shire area; and
- Manage State Forests for a range of values including timber production, recreation and biodiversity.

North Central Catchment Management Authority

The North Central CMA provides policy and direction to manage the natural resources of the region over five-year periods, through the North Central Regional Catchment Strategy (RCS).

The priorities of the North Central RCS are to:

- Protect and improve the region's natural assets for multiple local and downstream benefits;
- Strengthen region-wide community ownership and participation in decisions related to on-ground activity; and
- Recognise and promote the value of biodiversity in sustaining productive landscapes.

Regional funding will be directed to manage the key natural assets identified by the RCS:

- Biodiversity;
- Climate;
- Community;
- Cultural heritage;
- Dry (non-irrigated) land;
- Irrigation land;
- Public land;
- Water resources; and
- Waterways and wetlands.

The North Central CMA has established three catchment implementation groups: Loddon-Campaspe Dryland, Avoca and Avon-Richardson Dryland and Loddon-Campaspe Irrigation, to help put the North Central RCS into action.

Parks Victoria

Parks Victoria manages Victoria's network of national, state, regional and metropolitan parks and other conservation reserves, as well as many significant cultural assets. Through the development and implementation of management plans for these reserves, Parks Victoria plays a key role in protection of native vegetation communities and flora and fauna across the landscape. Parks Victoria has a major role in the management of significant landscape assets such as the Box Ironbark ecosystem and Ramsar wetlands in the north of the region.

Local Government

Local Government is central to resource management and regional planning. Its role can include:

- determination of land use and regulation of land use activities;
- providing mechanisms in the planning scheme to protect biodiversity;
- administering Native Vegetation Retention controls, often in consultation with DPI/DSE;
- management of public land such as road reserves;
- applying the Code of Forest Practice to forests on private land;
- providing incentives to encourage appropriate land management;
- facilitation of community activities (e.g. Friends groups);
- having areas of conservation significance mapped for the planning scheme to ensure their protection;
- preparing Natural Resource Conservation Strategies and Roadside Management plans;
- community education; and
- State of the Environment reporting.

There are 15 Local Government authorities associated with the North Central region. They include Ballarat, Buloke, Campaspe, Central Goldfields, Gannawarra, Greater Bendigo, Hepburn, Loddon, Macedon Ranges, *Mitchell, Moorabool,* Mount Alexander, Northern Grampians, Pyrenees, and Swan Hill.

N.B. Those in italics have only a small proportion of their area within the North Central region. **Map 2** provides an overview of Local Government areas in the North Central region.

Supporting Local Government

Local government, in collaboration with DPI/DSE, has a pivotal role in implementing mechanisms to ensure net conservation gains are clearly demonstrated by proponents before clearing of native vegetation occurs.

Local Government has a statutory responsibility for considering planning permits to clear native vegetation.

This requirement places a significant potential burden on the responsible local authority to assess the nature and significance of native vegetation that is subject to an application to clear. In many cases the skills for assessment do not reside with Local Government, thus creating potential for uninformed decision making.

A further issue may arise where proponents of a development are unaware of the requirements that need to be met for a permit to be issued to clear native vegetation. It is in the interests of all to improve channels of communication that allow certainty and clarity for responsible authorities, developers and the general community in relation to clearance of native vegetation.

Improved support needs to be provided for Local Government in the form of:

- training for local staff in assessment of NVR applications;
- provision of detailed mapping products that show the location and characteristics of vegetation communities, including conservation significance; and
- development of community awareness materials that outline the process for assessing NVR applications, opportunities for achieving net gain and guidelines for achieving net gain in planning decisions.

Non-Government Organisations and Community Groups

Greening Australia Victoria (GAV) has the goal of sustainable resource management through the establishment, conservation and management of native vegetation. Greening Australia plays a key role through provision of technical support in the implementation of native vegetation projects across the region.

Trust for Nature (Victoria) works with the community to protect significant bushland through public appeals and a revolving fund and with landowners to covenant land of high conservation value, provide management advice and run field days on habitat management.

Indigenous Organisations

A number of Indigenous organisations, including the Dja Dja Wrung Aboriginal Association (Bendigo), Ballarat and District Aboriginal Cooperative, Goolum Goolum Aboriginal Cooperative (Horsham), Njernda Aboriginal Corporation and Swan Hill and District Aboriginal Cooperative, have important roles to play in the management of vegetation in the North Central region.

Landcare (and other) Groups

Over 160 community Landcare groups help care for the land in this region. Landcare groups carry out on-ground works to protect existing remnants, revegetate degraded areas and integrate native vegetation into agricultural systems. They also raise awareness of good land management practices at the local level through field days, information sharing and the establishment of demonstration sites.

The Victorian Farmers Federation supports Landcare and provides information to the farming community.

Conservation Volunteers Australia provides assistance with labour at a nominal cost for conservation works on both private and public land.

Field Naturalists Clubs provide valuable knowledge and skills particularly with respect to the local flora and fauna and sites of significance. Field Naturalists also play an important role in ensuring that significant areas are conserved.

The Society for Growing Australian Plants has a valuable role to play in educating the community and encouraging the use of native plants.

Local Environment and Friends Groups are important in raising awareness of local issues and protecting sites of significance.

Sporting groups, such as the Victorian Field and Game Association and fishing groups, can contribute to protecting sites of value and raising awareness of issues and threats.

6.6 Cost Sharing Principles for Plan Implementation

Communities in the North Central region have been addressing natural resource management issues in a coordinated and integrated fashion for many years. In particular, regional communities were quick to identify the threats posed by rising watertables, salinity and declining water quality in the development of salinity management plans.

The successful implementation of many aspects of these plans provides a solid foundation for furthering the partnership between all levels of government and community in vegetation management actions.

The development of salinity management plans in the North Central region identified key actions including protection and enhancement of remnant vegetation, strategic revegetation and reduction of threatening processes as fundamental to maintaining agricultural productivity and social cohesion.

This plan acknowledges the strong spirit of community consultation and cooperation that has been built over many years in tackling the challenges of land degradation and moving towards better natural resource management.

The community, especially those people who depend on the health of the native vegetation in their area, do not wish to be seen as part of the problem of loss of biodiversity, but as part of the solution. Involving and supporting communities in activities that lead to better management of biodiversity will ensure that regional development provides positive outcomes at a social, economic and environmental level.

Young (1996) argues that a mix of policy instruments should be created that are capable of harnessing community participation in biodiversity conservation. He proposes that a package of arrangements (including tax incentives, compensatory payments, rate rebates etc.) to conserve biodiversity will be successful in motivating people if it is focused and delivered at the local level.

In the past regulatory mechanisms and instruments have been applied by government for the community, landowners and resource users to accept and use, or reject and ignore. This plan advocates the strengthening of a partnership approach between individuals, the community and policy makers to find innovative and sustainable solutions to what are often conflicting resource use issues.

Existing responsibilities in land management are defined by legislation and policies (Binning and Young 1998) and by what is generally accepted as reasonable and fair within a region or community (Industry Commission 1997a, b or c). The term 'duty of care' is used to explain these responsibilities.

Successful implementation of this plan will require significant investment of resources by both government and the community in activities to protect and enhance native vegetation. Determining where these resources will be invested and the nature of cost sharing between stakeholders poses a major challenge to the regional community. Past actions that have led to the loss and degradation of native vegetation should not be attributed to current land managers in determining who pays for remediation. It is widely accepted that the wider community is the major beneficiary of actions that protect and restore native vegetation. Private land managers already make significant contributions, in both land and resources, to activities that extend beyond the 'farm gate'.

Considerable research has been undertaken in recent times into the formulation and application of cost-sharing principles for natural resource management. These studies demonstrate that successful programs depend on identifying the public and private benefit accruing from a range of remedial actions. Cost sharing principles have been established for a range of environmental works in the region, including salinity, waterway protection, soil conservation, pest plant and animal control and nutrient management. Many of these works also have significant benefits for vegetation protection and biodiversity conservation.

Implementing native vegetation works will often have multiple benefits that accumulate over time. These benefits are likely to accrue without being recognised, and this has the potential to undermine the equity of cost share arrangements with land managers and between programs. A system that recognises the cumulative impact of native vegetation works would allow for more equitable cost-share arrangements (Draft Goulburn Broken Native Vegetation Management Strategy 1999). Promotion of equity and rational cost share arrangements that reflect the extent of private and public benefit is a key challenge for the future.

In developing a cost sharing approach this plan advocates that the following elements should be applied to native vegetation management (Parigi 1998).

- Do not provide government payments to landholders to meet existing legal requirements, such as those specified under the Native Vegetation Retention controls;
- If legal requirements are shifted to a higher threshold, one-off payments to landholders are justified to encourage compliance with the new requirements;
- Ongoing payments to landholders are justified when it is in the community interest to secure the continuing management of vegetation by a landholder, over and above current legal requirements;
- Any payments to landholders should be made subject to a guarantee that vegetation will be protected in the long term;
- In order to reduce costs to government, payments to landholders which have caused unintended declines in vegetation should be identified and removed with a view to subsidising activities which protect native vegetation whilst achieving land protection objectives; and
- Resource allocation decisions should be made within the context of this Native Vegetation Plan.

New approaches to the restoration and management of native vegetation have emerged in recent years. In particular the role played by native vegetation in providing ecosystem services has been identified as a key area for development of new cost-sharing arrangements that have the potential to radically shift the current approaches.

Protection of remnant vegetation and re-establishment of trees and other vegetation are fundamental to restoring the full set of ecosystem services across rural landscapes (James & Saunders 2001). Quantification of the multiple benefits of native vegetation will build a new approach to cost sharing arrangements. Market based mechanisms such as the Bush Tender, which was successfully trialled in the North Central region during 2001 have enabled the refinement of biodiversity based cost sharing mechanisms. The incorporation of other benefits including salinity, water quality and greenhouse promises to yield much greater gains in vegetation management by private landholders and the farming community.

7. Targets for Native Vegetation in North Central Victoria

A key aim of the North Central NVP is to set pragmatic and achievable targets and milestones for protection, enhancement and restoration of native vegetation.

In the development of accredited natural resource management plans, all regional bodies must conform to the National Framework for Natural Resource Management Standards and Targets. This can be found at the following website (http://www.nrm.gov.au/publications/standards/index.html).

The outcomes sought by this plan for native vegetation and biodiversity match or will contribute to the national framework's desired outcomes. Those most relevant to native vegetation and biodiversity are:

- biodiversity and the extent, diversity and condition of native ecosystems are maintained or rehabilitated;
- populations of significant species and ecological communities are maintained or rehabilitated;
- ecosystem services and functions are maintained or rehabilitated; and
- sustainable production systems are developed and management practices are in place, which maintain or rehabilitate biodiversity and ecosystem services, maintain or enhance resource quality, maintain productive capacity and prevent and manage degradation.

Under the National Framework, three tiers of regional targets are described. These are:

- (optional) long-term aspirational goals (50+ year time frame);
- medium term resource condition targets (10-20 year time frame) (required); and
- short term (1-5 year time frame) management action or capacity building targets (required).

The National Framework specifies the matters over which regional plans must set targets in order to be accredited. For resource condition targets, the relevant[1] matters for target are:

- native vegetation communities' integrity; and
- significant native species and ecological communities.

For management action targets, the relevant matters for target are:

- critical assets identified and protected; and
- improved land and water management practices adopted.

These targets will be refined regularly over time through a cost benefit analysis.

7.1 Matters for Targets

Integrity of Native Vegetation Communities

Changes in extent and diversity are to be measured by these indicators:

- extent (ha) and distribution of each vegetation community (a North Central Victorian bioregional EVC baseline is now established);and
- extent (ha) and distribution of each priority vegetation community.

Our priorities are highly threatened (endangered and vulnerable) bioregional EVCs or any others that are important, for example for maintaining biodiversity, habitat for threatened species, land or special habitat protection or other landscape values. These are identified in Chapter 8.

For example:

- The proportion remaining of each native vegetation type measured as a percentage of the pre-European extent

1 Other matters are dealt with in other North Central Catchment Management Authority plans covering river health, water quality, pest management, etc.

(A North Central Victorian baseline of pre-1750 bioregional EVC mapping is now established).

Change in condition is to be measured by this indicator:

- The proportion of each (bioregional EVC) vegetation community that is estimated to be in specified habitat condition classes.

Significant Native Species and Ecological Communities

In North Central Victoria, bioregional planning is the process where more detailed species conservation planning is undertaken. This plan will only set broad, region wide targets.

In North Central Victoria, the 'significant' communities are those with high conservation status; however there are too many of these to deal with individually in this plan. 'Guilds' or groupings of EVCs of special concern have been developed to assist dealing with common issues across EVCs. The EVC guilds are grouped on common attributes like conservation status and vegetation structure or because of their importance for, e.g. habitat for threatened species, land or special habitat protection or other landscape values. These guilds are defined in Chapter 8.

7.2 Target Setting Process

The development and refinement of these targets has been conducted in consultation with a range of stakeholders during the review of the Draft North Central Native Vegetation Plan and renewal of the North Central RCS. They represent a benchmark for monitoring and evaluation of the Plan and the success of endeavours to integrate native vegetation management across a range of NRM issues.

Further discussion is warranted to emphasise the rationale behind the selection of North Central Victorian targets.

Targets for vegetation extent

Increase native vegetation cover to 30 per cent of the region.

The figure of 30 per cent arises from several sources. James & Saunders (2001) cite theoretical and empirical studies that show the rate of loss of species and ecosystem integrity is more rapid below this threshold.

Nationwide research by Birds Australia (2000) indicates that at less than 30 per cent of native vegetation cover, native bird species' populations decline dramatically and many species disappear. Bird populations are considered sensitive and easily measurable indicators of broader ecosystem health (apart from our responsibility to conserve bird populations for their own sake).

Evidence of thresholds for ecosystem function is more scanty, but research into hydro-geological processes by Hatton *et al*. (1996) has shown that around 30 per cent of the high rainfall uplands of the southern Murray Darling Basin (in North Central Victoria this is the Central Victorian Uplands and the Goldfields Bioregions) will need to be in tree cover to stabilise groundwater levels. Their estimate is that significantly more than this proportion (perhaps 50%) will be needed under tree cover to actually lower groundwater below the currently unacceptably high levels.

The 30 per cent threshold is considered applicable at scales from regional down to landscape or even (large) property scales. That is, below 30 per cent native vegetation cover, loss of species and ecosystem functioning accelerates at all these scales.

To achieve 30 per cent of native vegetation cover may seem a daunting task, but this is a conservative goal that may in fact still be insufficient to move the region to a sustainable state.

What can we expect if thirty percent vegetation cover is achieved?

The achievement of the 30 per cent vegetation cover goal will help ensure that the current trend of decline in the condition of land, water and biodiversity resources of the region is reversed and provides the base for more sustainable use of these resources into the future. Current resource management issues of concern in the region including salinity, biological diversity, soil health, water quality, waterway health, pest plants and animals will all benefit from the increase in native vegetation cover from the current 19 per cent to 30 per cent by the Year 2030.

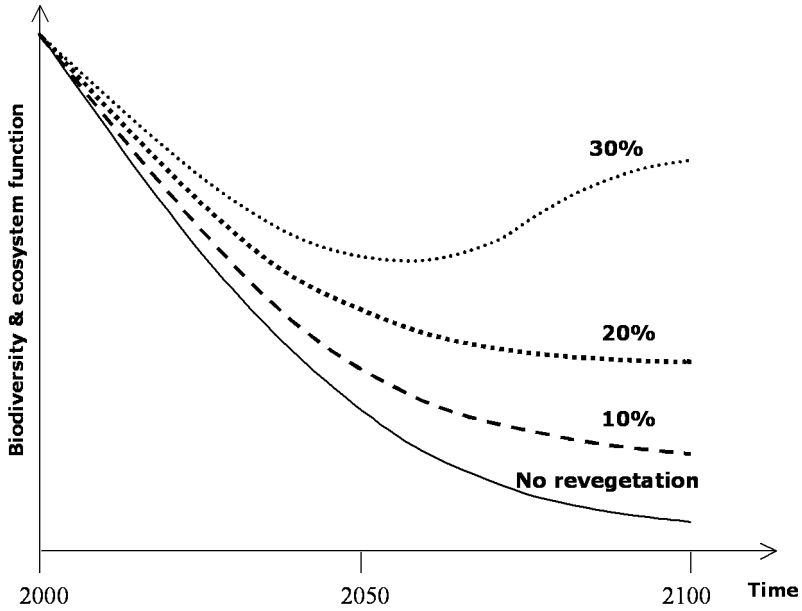
James & Saunders (2001) claim a worldwide consensus amongst landscape ecologists on the principles relating habitat loss to ecosystem function and species decline, but point out there is as yet little ability to prescribe specific solutions or predict the outcomes. Nevertheless, they suggest that for a landscape of only 5 per cent vegetation cover (e.g. the Wimmera Bioregion in North Central Victoria) "in the time taken to establish 30 per cent vegetation cover, and for it to

mature into functioning ecosystem patches, ecosystem functions may slump but recover in the long term. Some species may be lost but the overall functioning of the landscape will be dramatically improved. Thus, some species that have previously disappeared from the catchment are likely to re-establish if populations persist in neighbouring regions."

To achieve the 30 per cent goal requires an increase in current vegetation cover of 325,014 ha (from 575,789 ha to 900,803 ha). If apportioned bioregionally, this figure would be closer to 400,000 ha (see **Table 7.1**).

To regain native vegetation cover means re-instating natural spatial patterns of vegetation communities as well as their structure and composition. The most effective way to do this will be via protection, enhancement and expansion, through natural regeneration, of existing remnant vegetation. However, for most vegetation types there is insufficient remnant vegetation available to regenerate up to the 30 per cent target. Hence, revegetation at a massive scale will be needed.

The current rate of revegetation and regeneration in the region is far too low to attain the 30 per cent target in the foreseeable future. A scaling up of investment in vegetation management is required, as is a sea-change in current land use practice. This may seem a daunting task, but the evidence indicates that this target is a conservative goal that may in fact still be insufficient to move the region to a sustainable state.



Adapted from James & Saunders (2001)

Figure 7.1 Predicted response to revegetation of a 5 per cent vegetated landscape
Figure7.1 Predicted response to revegetation of a 5 per cent vegetated landscape

Table 7.1 Bioregional revegetation outlook

Region within North Central CMA	Area (ha)	Area of native vegetation remaining (ha)	Proportion of native vegetation remaining	Revegetation needed to reach 30 per cent cover	30 per cent of region

Region within North Central CMA	Area (ha)	Area of native vegetation remaining (ha)	Proportion of native vegetation remaining	Revegetation needed to reach 30 per cent cover	30 per cent of region
Central Victorian Uplands	139,339	53,882	39%	—	(41,802)
Goldfields	1,002,983	360,736	36%	—	(300,895)
Murray Fans	147,555	30,397	21%	13,869	44,267
Murray Mallee	202,625	14,045	6.9%	46,743	60,788
North Inland Slopes	15,004	4,136	28%	365	4,501
Victorian Riverina	908,094	83,494	9.2%	188,934	272,428
Victorian Volcanic Plain	162,165	9,471	5.8%	39,179	48,649
Wimmera	424,912	19,628	4.6%	107,845	127,473
Totals	**3,002,677**	**575,789**	**19%**	**396,935**	**—**
North Central CMA	**6,005,354**	**1,151,578**	**19%**	**325,014**	**900,803**

Table 7.2 Context for goals and targets

Matters for target	Native vegetation communities' integrity	Significant native species and ecological communities
National outcomes sought	Maintain or rehabilitate the extent, diversity and condition of native ecosystems.	Maintain or rehabilitate populations of significant species and ecological communities.
Regional Goals / Aspirational Targets	Increase native vegetation cover to 30 per cent of the region.	Populations of threatened native plant and animal species will be restored to viable levels.
	Increase the coverage of all EVCs to at least 15 per cent of their pre-1750 distribution.	Threatened vegetation communities will increase in extent and improve in quality to achieve a net gain.
	Increase the extent and condition of all EVCs above self sustaining thresholds (to restore ecosystem function).	-
	Increase the extent of endangered and vulnerable EVCs to at least 15 per cent of pre-European extent by 2030	-
Regional Resource Condition Targets	Increase native vegetation coverage to 20 per cent of the region by 2030.	Improve the quality and coverage of all vulnerable or endangered EVCs and any others with less than 15 per cent of pre-1750 distribution by 10 per cent (as measured by habitat ha) by 2013.
Corresponding RCS target	RCT BD 4	RCT BD 1
	Improve the quality of 90 per cent of existing (2003) native vegetation by 10 per cent by 2030.	Maintain or improve existing viable populations of significant threatened flora species from 2004.
Corresponding RCS target		RCT BD 2
		No further bioregional extinctions of flora species or vegetation communities from 2004.
Corresponding RCS target		RCT BD3

Re-establishment of native vegetation cover at regional or bioregional scales alone will not by itself, protect and conserve the region's biodiversity. Conservation planning on the basis of vegetation communities is also required.

Ecological Vegetation Classes are the basis of our system of managing vegetation diversity (and are a surrogate for total indigenous biodiversity). EVCs must also be protected, enhanced and rebuilt to a greater extent to ensure that the intent of this plan is achieved.

Increase the coverage of all EVCs to at least 15 per cent of their pre-1750 distribution

The National-State Regional Forestry Agreement (RFA) process has identified retention of 15 per cent of forest vegetation communities as an agreed absolute minimum threshold for sustainability (though this assumes they exist in large, relatively intact blocks). This then is a reasonable first stage target for restoration of heavily cleared vegetation communities.

Analysis of the geographical extents of current and pre-1750 EVCs in vegetation of North Central Victoria shows that there are 36 mapped EVCs with less than 15 per cent coverage and that 159,000 ha of new vegetation will be required to bring them up to 15 per cent cover (see table below).

Table 7.3 North Central EVCs with less than 15 per cent of pre-1750 extent

Mapped EVC	1750 Area (ha)	Extant Area (ha)	Proportion Remaining	Revegetation for 15% recovery
Plains Grassland / Gilgai Plain Woodland / Wetland Mosaic	4,825	21	0.44%	702
Gilgai Plain Woodland / Wetland Mosaic	1,751	16	0.89%	247
Cane Grass Wetland	4,112	41	1.0%	575
Aquatic Herbland / Plains Sedgy Wetland Mosaic	102	1.0	1.0%	14
Plains Woodland / Plains Grassland / Gilgai Plains Woodland / Wetland Mosaic	969	10	1.1%	135
Plains Woodland / Lignum Wetland Mosaic	1,250	18	1.4%	170
Plains Grassy Wetland	704	12	1.7%	94
Plains Sedgy Wetland	138	2.4	1.8%	18
Semi-arid Woodland	11,383	407	3.6%	1,300
Plains Woodland / Low Rises Grassy Woodland Mosaic	4,405	170	3.9%	491
Plains Woodland	688,356	28,729	4.2%	74,525
Woorinen Mallee	42,626	1,863	4.4%	4,531
Rocky Outcrop Shrubland / Herbland Mosaic	746	35	4.7%	77
Riverine Chenopod Woodland / Lignum Wetland Mosaic	11,478	581	5.1%	1,141
Plains Woodland / Red Gum Wetland Mosaic	1,034	52	5.1%	103
Ridged Plains Mallee	100,338	5,560	5.5%	9,491
Sandstone Ridge Shrubland / Low Rises Woodland Mosaic	1,228	68	5.6%	116
Plains Grassy Woodland	147,313	8,498	5.8%	13,599
Plains Savannah	68,590	4,086	6.0%	6,202
Drainage-line Complex	736	45	6.1%	66
Chenopod Grassland	108,879	6,740	6.2%	9,592
Low Rises Woodland	25,813	1,633	6.3%	2,239
Plains Grassland	288,707	18,385	6.4%	24,921
Wetland Formation	21,145	1,544	7.3%	1,628
Riverine Chenopod Woodland / Plains Grassland Mosaic	1,345	101	7.5%	101
Semi-arid Chenopod Woodland	6,072	467	7.7%	444
Low Rises Woodland / Riverine Chenopod Woodland Mosaic	929	73	7.9%	66
Lignum Swampy Woodland / Plains Grassland Mosaic	1,412	134	9.5%	78
Valley Heathy Forest	196	19	9.6%	11

Mapped EVC	1750 Area (ha)	Extant Area (ha)	Proportion Remaining	Revegetation for 15% recovery
Riverine Chenopod Woodland	120,907	12,226	10.1%	5910
Alluvial Terraces Herb-rich Woodland / Plains Grassy Woodland Mosaic	187	19	10.2%	8.9
Plains Woodland / Plains Grassland Mosaic	3,624	373	10.3%	171
Scoria Cone Woodland	2,420	263	10.9%	100
Swamp Scrub	4,330	536	12.4%	113
Grassy Woodland / Heathy Dry Forest Complex	1,819	257	14.1%	16
Damp Sands Herb-rich Woodland	3,304	490	14.8%	5.4
Totals	**1,683,177**	**93,477**	**5.6%**	**159,000**

Targets for vegetation quality

As yet, there is not enough information on regional vegetation quality available to build a baseline, nor to estimate the trend in condition. Hence, only interim Resource Condition Targets (RCTs) can be suggested in this plan.

Once vegetation condition modelling information is available, the North Central CMA will iteratively develop RCTs that meet the needs for restoration of native vegetation within foreseeable economic and social constraints.

The targets provide a focus for native vegetation management with an emphasis on gains in extent and quality of remnant vegetation (Ecological Vegetation Classes). Additional targets for threatened species, wetlands and river health are being developed through Bioregional Planning processes and renewal of the North Central CMA RCS.

The plan acknowledges the continuing efforts of landholders to improve the condition and extent of remnant vegetation through mitigation of threatening processes such as overgrazing, weed invasion and pest animal proliferation. The development of best management practices (BMPs) for native vegetation is an effective tool for achieving significant conservation and allied resource management gains. The rate of adoption of BMPs is recommended as an effective way of gauging progress towards EVC targets in this strategy.

The following input, or management action targets are therefore also proposed:

Table 7.4 Management Action Targets from the North Central RCS

RCS Code	Description	Priority	Responsibility	Timeframe
BD3	Encourage commercial nurseries to limit the sale of plants with environmental weed potential.	High	North Central CMA	Ongoing
BD6	Identify areas supporting high conservation significance native vegetation that is threatened by sub-division and peri-urban development, fragmentation and tree decline, salinity and other processes. Develop and Implement Biodiversity Action Plans for these areas by 2006.	High	North Central CMA, DPI/DSE, Local Government	2006
BD7	Develop vegetation and environmental protection overlays (VPO/EPO) for priority threatened species and communities in all local government areas by 2006. Negotiate with local government to ensure planning schemes are amended by 2006 to protect high conservation value native vegetation. Ensure that an outcome of all future development activities (from 2003) is a net gain in remnant vegetation coverage.	High	North Central CMA, Local Government	2006
BD8	Provide financial support to landholders wishing to protect, enhance and rebuild remnant vegetation. Run annual Bush Tender auction process in biodiversity priority areas.	High	North Central CMA, DSE	Ongoing
BD9	Promote the adoption of recommended management practice for remnant vegetation. Ensure that all remnant vegetation of endangered, rare or vulnerable EVCs and all populations of endangered, vulnerable or threatened native and fauna species are managed according to recommended practice by 2010.	Medium	North Central CMA, DPI/DSE	2010
BD10	Establish Public Authority Management Agreements (or similar environmental management arrangements) to ensure appropriate management of important sites of remnant vegetation on smaller blocks of public land (e.g. cemeteries and rail reserves) and public land managed by rural and urban water authorities.	Medium	North Central CMA, DSE, Water Authorities	Ongoing
BD11	Identify ecologically significant roadsides. Develop and implement roadside management plans for all local government areas by 2008.	High	North Central CMA, Local Government	2008
BD12	Undertake assessments of threats to biodiversity from all existing and new programs and major projects under RCS, using Victorian biodiversity risk mitigation protocols, from 2003.	High	North Central CMA, DSE/DPI	Ongoing
BD13	Develop and implement appropriate fire management regimes to sustain ecological processes in key private land native vegetation remnants by 2008.	Medium	DSE/DPI, North Central CMA	2008

RCS Code	Description	Priority	Responsibility	Timeframe
BD14	Develop and implement region vegetation extent and condition monitoring program for remnant vegetation patches on private land by 2004. Review resource condition targets for biodiversity based on initial assessment by 2005.	High	North Central CMA, DPI	2004/2005
PL9	Avoid development of any new utility corridors on roadsides supporting significant native vegetation from 2003.	High	DSE/DPI, Local Government, VicRoads	Ongoing
PL8	Apply net gain principles for native habitat on public land, for all infrastructure, mining, extractive industries and other developments from 2003.	High	DSE/DPI, VicRoads, Local Government	Ongoing
PL10	Develop appropriate resource condition targets for large public land areas and appropriate monitoring program by 2004.	High	DSE/DPI, North Central CMA	2004
DL13	Develop and implement regional EMS process, linked to RCS, dryland salinity and other key action plans, to demonstrate adoption of sustainable land use and management practice by 2005. Negotiate local government support for adoption of EMS via rating system by 2005.	High	DPI, North Central CMA, Local Government	2005
DL10	Develop guidelines for sustainable management of rural residential land by 2005. Guidelines should address biodiversity, salinity, groundwater and surface water resource management, water quality, river health, pest plant and animal and farming practice.	High	North Central CMA, DPI, DSE	2005
CH5	Establish management agreements for all significant cultural heritage sites in areas where on-ground works under the RCS are to be undertaken. Agreements to be between North Central CMA, landholders, heritage authorities and, for Indigenous sites, traditional owners.	High	North Central CMA	Ongoing

Table 7.5 Native Vegetation Plan Management Action Targets

Veg Plan No	Description	Priority	Responsibility	Partners	Timeframe
NVP1	Establish a Biodiversity Reference Group to advise the CMA on priorities for implementing and monitoring this NVP and continuing to conserve biodiversity in the region.	High	North Central CMA	TFN, GAV, DSE/DPI, Local Government	2003
NVP2	Encourage landholders and the community to use incentive schemes for protection of native vegetation and promote other cost effective means to enhance and better manage existing remnants (e.g. market based instruments, Bush Tender, conservation covenants and land stewardship schemes).	High	North Central CMA/ DSE/DPI	TFN, Local Government Landcare, Community Groups, Landholders	Ongoing
NVP3	Investigate the establishment of a 'Land Bank' to facilitate land purchase.	Medium	North Central CMA	DSE/DPI	2007
NVP4	Work with the Victorian Farmers Federation, landholders and Landcare groups to improve awareness of the value of remnant vegetation.	High	North Central CMA/ DSE/DPI	VFF, Landholders, Landcare	Ongoing
NVP5	Work with local government to identify and protect areas of remnant vegetation, especially vegetation communities of high conservation significance, through planning schemes and other mechanisms.	High	DSE/DPI	Local Government, North Central CMA	Ongoing
NVP6	Protect remnant vegetation and revegetate areas that contribute high recharge to groundwater and salinity problems.	Medium	North Central CMA/ DSE/DPI	Landholders, Landcare	Ongoing
NVP7	Ensure that other land and water management programs (i.e. salinity, river health, pest plants and animals) are integrated with vegetation protection/management activities.	High	North Central CMA	DSE/DPI	Ongoing
NVP8	Support the development and implementation of BAPs in partnership with DSE/DPI, local communities and relevant land managers.	High	North Central CMA/ DSE/DPI	TFN, Local communities, Land Managers, Local Government	2003
NVP9	Encourage research to better understand how to evaluate the regenerative capacity of land and develop guidelines for better assessment of the significance of sites that retain regenerative potential but lack composition and structural biodiversity features.		North Central CMA/ DSE / /GAV	Universities	2004 onwards
NVP10	Support the implementation of the North Central Weed Action Plan to target areas of significant native vegetation and biodiversity values.	High	North Central CMA, DSE/DPI	Landcare, Community Groups, Landholders	2005
NVP11	Support the implementation of the Rabbit Action Plan for North Central Victoria to ensure that the impact of rabbits on areas of environmental value is minimised.	High	North Central CMA, DSE/DPI	Landcare, Community Groups, Landholders	Ongoing
NVP12	Support the implementation of projects that encourage natural regeneration as a means of enhancing the quality of remnant vegetation.	High	North Central CMA, DSE/DPI	Landcare, Community Groups, Landholders	Ongoing
NVP13	Develop information products to support community and agency workers to better manage native vegetation. Specifically, publish to the world wide web the revised and updated North Central	High	North Central CMA, DSE/DPI	Landcare, Community Groups, Landholders TFN, GAV, Local Government DSE/DPI,	Ongoing 2005

Veg Plan No	Description	Priority	Responsibility	Partners	Timeframe
	Revegetation guide. This should include: an increased range of information profiles of north central plant species; EVC descriptions; EVC based condition benchmarks; characteristic flora lists; lists of plants suitable for revegetation; an inventory of native vegetation education resources; a list of funding sources for vegetation management; a collective database of native vegetation information, news and issues for the region.			GAV, TFN, Landholders, Landcare	
NVP14	Prepare strategic restoration plans using Bioregional Planning principles to: • Link larger blocks of vegetation, especially along waterways and high recharge areas and add to existing conservation reserves. • Focus on riparian areas and the Box-Ironbark ecosystem for the development of networks and corridors. • Ensure the design and width of corridors or linkages allows faunal movement and protection. • Target revegetation to increase the size of existing remnants by at least 20 per cent across the region. • Establish vegetation links between existing remnants (100ha per year). • Revegetate high recharge areas and waterways, including wetlands, to help reduce salinity and protect water quality (500ha per year). • Support the development and integration of productive tree systems, including farm forestry, that provide significant benefits in terms of carbon sequestration, run-off, watertable control and water quality (1000 ha per year). • Ensure that major revegetation projects are based on the use of a wide range of locally indigenous species (in accordance where appropriate with the relevant EVC benchmarks). • Encourage the use of cost effective methods of revegetation, especially direct seeding. • Support the establishment and operation of regional community seedbanks to coordinate the provision of indigenous seed for revegetation works. • Support the integrated use of indigenous native vegetation in projects that aim to reduce the impact of land degradation issues (i.e. stream protection, erosion, run-off, soil health, salinity control).	High	North Central CMA, DSE/DPI	DSE/DPI, Landcare, GAV, TFN, Local Government, West RFA Sawlog Farming	Ongoing
NVP15	Facilitate a strong on-going partnership with: DSE/DPI, Indigenous communities, and local government staff in delivering native vegetation	High	North Central CMA	DSE/DPI, Indigenous Communities, Local Government	Ongoing

Veg Plan No	Description	Priority	Responsibility	Partners	Timeframe
	community education to identified target groups.				
NVP16	Develop a community education plan including a targeted campaign on native vegetation through regional print and electronic media.	High	North Central CMA	DSE/DPI, TFN, GAV, Media	2005
NVP17	Document success stories and recognise best management practice in native vegetation management.	High	North Central CMA	DSE/DPI, Landcare, GAV, Landholders, Media	Ongoing
NVP18	Provide best practice native vegetation management training for public and private land managers, via whole farm planning for primary producers	High	North Central CMA, DSE/DPI	Local Government, GAV, FarmBis, Birchip Cropping Group Landcare, DSE/DPI, GAV, VicRoads, VicTrack, Freight Australia, DOI	Ongoing
NVP19	Integrate native vegetation and biodiversity management principles into extension services being provided by government staff and industry representatives.	High	North Central CMA	DSE/DPI, Landcare, FarmBis, Birchip Cropping Group	Ongoing
NVP20	Publicise community initiatives such as the Environment Grants Program and native vegetation protection rate rebates offered by the City of Greater Bendigo, Shire of Buloke and Mount Alexander Shire.	High	North Central CMA	DSE/DPI, Local Government	Ongoing
NVP21	Support community groups in environmental works by publicising available programs, providing subsidies for costs involved with training and providing facilities for workshops and training activities.	High	North Central CMA	DSE/DPI, Community Groups	Ongoing
NVP22	Facilitate the establishment and management of a Landcare machinery loan system to community groups involved in environmental works.	Medium	North Central CMA	DSE/DPI, Local Government, Community Groups	2005
NVP23	Establish baseline info on community awareness of native vegetation and biodiversity issues.	High	North Central CMA		2005
NVP24	Incorporate cultural heritage considerations into Best Management Practice for revegetation (to ensure heritage sites not disturbed by works).	High	North Central CMA		2005
NVP25	All areas of endangered, rare or vulnerable native vegetation (determined by bio-regional conservation status of its Ecological Vegetation Class) and all areas of private land that contain populations of endangered, vulnerable or threatened flora and fauna will be managed according to best management practices.		North Central CMA		2010
NVP26	90 per cent of existing native vegetation cover is managed according to best management practices.		North Central CMA		2010

In achieving NVP25 and NVP26, priority will be determoined according to its conservation significance.

The North Central RCS and other action plans (e.g. waterways and wetlands) should be referred to for further management action targets relating to biodiversity management. Actions specific to vegetation communities are covered in Chapter 8.

8. Priority Vegetation Communities

Following the Victorian approach, this plan considers vegetation communities as entities that need conservation management. At a regional scale, bioregional conservation status is a measure of the priority needed for action to address the threat of extinction of vegetation communities.

In North Central Victoria there are far too many highly threatened EVCs to address individually in this plan. Bioregional plans will need to be referred to for more information.

However, many EVCs have commonalities across bioregions, including their conservation status and management issues. In addition there are vegetation types that are of special concern. This may be so because they were so widespread and characteristic of North Central Victoria and now under high threat of extinction, because they exist mainly in North Central Victoria and we have a high degree of responsibility for their conservation, or because they play a vital and irreplaceable role as specialised habitat or in protecting natural resources.

The following table lists the major vegetation groups and the priority allocated to them in North Central Victoria.

Table 8.1 Vegetation groups in the region

North Central Group	Victorian EVC Group	No of Communities of each Conservation Status	1750 Extent (ha)	Extent Remaining (ha)	Proportion Remaining	North Central Responsibility	North Central Priority
Grasslands	Grasslands	3 endangered	466,177	29,212	6.3%	High	Very high
Plains Woodlands	Plains Grassy Woodlands or Forests	14 endangered 2 vulnerable	872,716	38,835	4.4%	High	Very high
Riparian/ Riverine	Riparian Forests or Woodlands	1 endangered 2 vulnerable	1,331	626	47%	Moderate	Very high
	Riparian Scrubs or Swampy Shrubs & Woodlands	4 endangered 3 vulnerable 3 depleted	9,876	2,070	21%	Low	Very high
	Riverine Grassy Woodlands or Forests	8 endangered 7 vulnerable 9 depleted 1 least concern	300,930	65,782	22%	High	Very high
			312,138	68,478	22%	Moderate	Very high
Wetlands	Wetlands	1 extinct 9 endangered 3 vulnerable 2 depleted	92,790	16,975	18%	High	Very high
Other Woodlands	Heathy Woodlands	1 vulnerable 1 depleted	16,227	6,964	43%	Low	High
	Herb-rich Woodlands	5 endangered 4 vulnerable	25,249	7,443	29%	Moderate	High
	Lower Slopes or Hills Woodlands	7 endangered 1 vulnerable 2 depleted	551,484	90,110	16%	Moderate	High
			592,960	104,517	18%	Moderate	High
Box-Ironbark Forests	Box Ironbark Forests or dry/lower fertility Woodlands	1 endangered 2 vulnerable 1 depleted	253,005	150,372	59%	High	High
Mallee	Mallee	3 endangered 4 vulnerable 3 least concern	186,827	31,534	17%	Low	Moderate
Foothill Forests	Dry Forests	1 endangered 4 vulnerable 4 depleted 3 least concern	218,895	123,425	56%	Low	Low
	Wet or Damp Forests	1 least concern	17	17	100%	Low	Low
			218,912	123,442	56%	Low	Low
Others of small pre-European extent	Rocky outcrop or escarpment Shrubs	2 vulnerable	1,742	591	34%	Low	Low
	Salt-tolerant and/or succulent Shrublands	2 least concern	1,620	1,137	70%	Moderate	Low
	Montane Grasslands, Shrublands or Woodlands	2 vulnerable	10	5.9	57%	Low	Low
			3,372	1,734	51%	Moderate	Low

See **Appendix 5** for more detail on figures of pre-1750 and current extent and bioregional conservation status.

8.1 Grasslands

In North Central Victoria all grassland EVCs are endangered in all bioregions.

Table 8.2 Proportion remaining of grassland EVCs

Map Unit Description	Status in North Central Victoria	1750 (ha)	Extant (ha)	Proportion remaining
Plains Grassland	Endangered	288,707	18,385	6.37%
Plains Savannah	Endangered	68,590	4,086	5.96%
Chenopod Grassland	Endangered	108,879	6,740	6.19%
		466,177	**29,211**	**6.2%**

Native grasslands are areas covered with grasses and other low growing plants but with few or no trees (GERG 1995). Many grassland remnants only exist on private land, roadsides, railway reserves, cemeteries and other small isolated sites with different species surviving in different locations depending on the history of management. Sites occurring on private land have generally been grazed, while sites occurring on roadsides and rail reserves may have a history of regular burning. The most species rich remnants tend to occur on sites such as rail reserves which have a history of burning (Stuwe and Parsons 1977). Some form of disturbance, either burning or strictly regulated grazing, seems to be necessary to retain the species diversity of these sites.

None of these grassland communities are adequately reserved. The current estimate of the area of native grasslands remaining in the North Central region is 29,211ha which is only 6 per cent of their former extent. This figure is based on recent survey work in the north and west of the region and includes grasslands in various states of degradation. Very few grassland remnants retain a high proportion of their original diversity.

To adequately conserve the range of flora and fauna species making up this varied ecosystem, all significant remnants must be conserved and degraded remnants will need to be retained and restored.

Grassland EVCs occurred over around 466,000ha (or 16 per cent) of North Central Victoria pre-1750. See **Appendix 6** for more detail on extent and tenure and bioregional conservation status. **Map 23** shows the extent of grassland EVCs in 1750 and **Map 24** their current extent.

In all grassy systems, the structure of the understorey is important. The ground layer structure would normally be a mix of grass tussocks, soil crust covered ground, a variety of perennial and annual herbs (particularly chenopods in our northern grasslands), lichens, occasional fallen timber and cracks in the ground. In southern grassy ecosystems, many plant and animal species are thought to be dependant on the presence of inter-tussock spaces. Management of grassy sites should aim to maintain or enhance structure. Historical management practices must be taken into account when making decisions. For example, it would be inappropriate to introduce a fire regime to a site which has a history of grazing and vice versa. It is important to note that excluding stock grazing permanently may not be appropriate for these ecosystems. Rather, periodic pulse grazing may be an appropriate conservation tool for some sites.

Although grassy ecosystems are highly threatened, most of the grass species themselves are not. It is the plants and animals which live in the spaces between the tussocks which are threatened. Twenty of the twenty-one species of vertebrate animals that are no longer present in Victoria occurred in grassy ecosystems (DCE 1992a, b or c). Grassy ecosystems across Victoria contain 40 per cent of the State's extinct and threatened vertebrate fauna. Fourteen animals regarded as rare or threatened with extinction in Victoria depend on grassy ecosystems habitat, two of these being Nationally significant. The Plains Wanderer, regarded as Vulnerable, is a small ground-dwelling bird of sparse native grasslands (Baker-Gabb 1995). The Striped Legless Lizard (*Delma impar*), also Vulnerable, requires dense native grasslands. The Hooded Scaly-foot, which is critically endangered in Victoria and listed under the Flora and Fauna Guarantee Act, has been recorded in Black Box Woodlands and recently on grassland near Mitiamo that would previously have supported Black Box (Foreman 1996a).

Birds dependent on mature grassy woodlands of the North Central region for their survival include the Regent Honeyeater (Endangered Nationally, critically endangered in Victoria and listed under the Flora and Fauna Guarantee Act), the Bush Stone-curlew and Grey-crowned Babbler (both endangered in Victoria and listed under the Flora and Fauna Guarantee Act). A number of important indicator species including the Hooded Robin, Red Capped Robin, Diamond Firetail and Speckled Warbler have experienced significant decline in recent years. While not yet considered to be endangered, the decline of these woodland-dependent species highlights the need to take immediate action to conserve grassy woodlands. The Bandy Bandy, a burrowing snake, is near threatened in Victoria and listed under the Flora and Fauna Guarantee Act. The Bandy Bandy feeds entirely on blind snakes which themselves have become rare as their habitat has disappeared due to cultivation (DCE 1992a, b or c). The Eastern Barred Bandicoot once occurred throughout the volcanic plains grassland area but is now extinct in this region being restricted, in Victoria, to open woodlands around Hamilton (Kirkpatrick *et al.* 1995). Other significant fauna are listed in **Appendix 5.**

These EVCs face the following threats. (Refer to page 888 for generic information about each threat). The text below lists issues specific to the grassland EVCs:

- Further clearing for agriculture, urban or other use

Across South-eastern Australia, perhaps the greatest threat to the survival of lowland grassy ecosystem remnants on freehold land is conversion from grazing land use to cropping (often following declines in grazing economic returns). (Kirkpatrick *et al.* 1995) has shown that a combination of cultivation/ploughing and application of fertiliser rapidly eliminates almost all native species from native grasslands.

Much of the public land estate of grasslands occurs on linear (road and rail) reserves. Here, the main threats arise from municipal and utility use of cultivation or herbicides to reduce fuel loads instead of slashing or burning. In addition, firebreak ploughing by landholders (extremely widespread in North Central Victoria) destroys native grassland remnants and undermines the viability of adjoining unploughed remnants over a very large proportion of the remaining roadside remnants.

- Global warming/rapid climate change
- Further weed invasion
- Poorly managed and unsustainable grazing

Under-grazing may threaten the maintenance of good structure and diversity of native grasslands. As yet, little is known of what optimum regimes are for North Central Victorian grasslands.

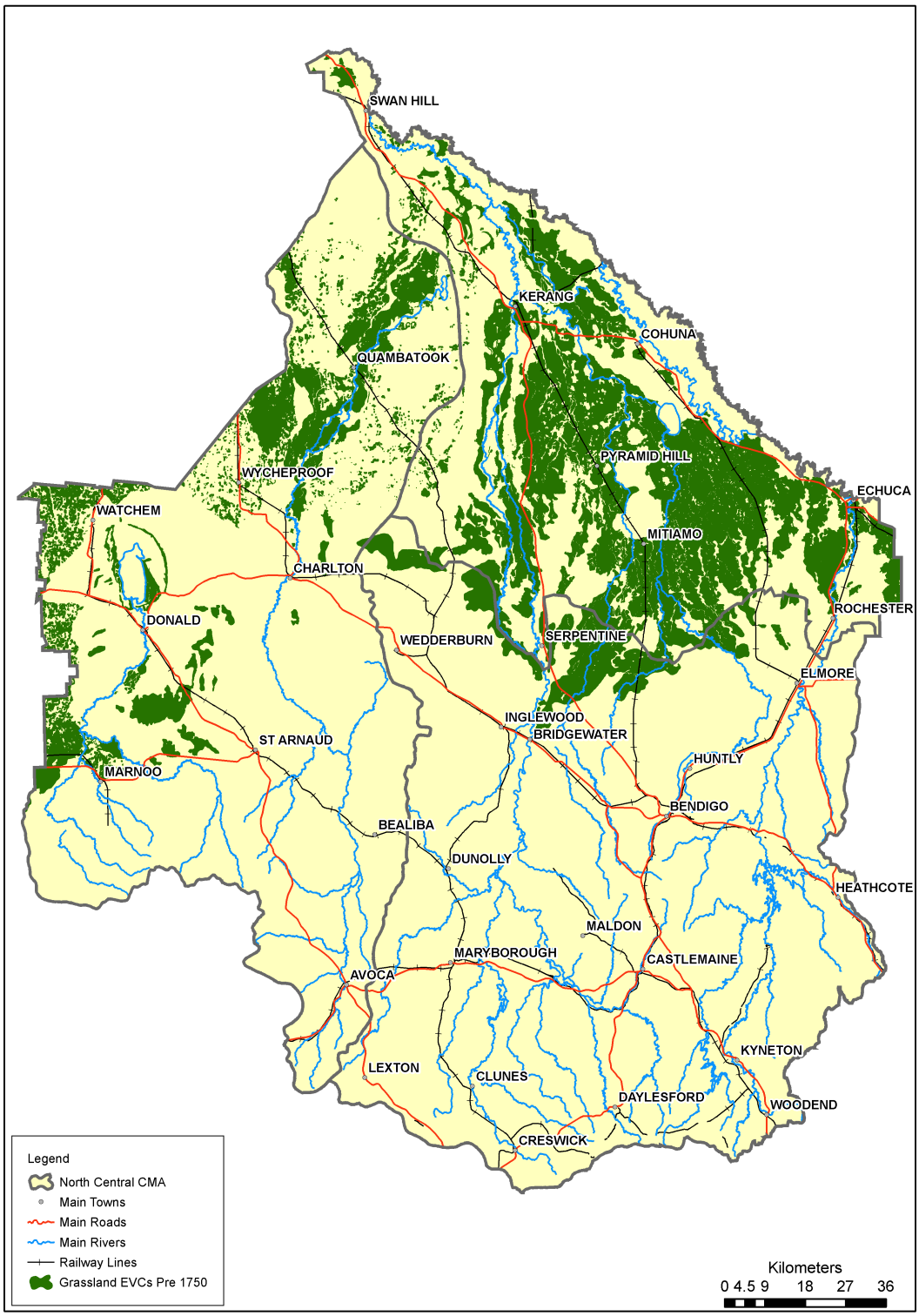
- Salinity

Increasing salinity reduces grassland diversity as salt-sensitive species are replaced by a few salt-tolerant species. Grasslands are however, less at threat from rising watertables than adjoining vegetation types of drainage lines, wetlands and other low lying areas.

- Soil disturbance
- Habitat loss and fragmentation
- Alterations to natural fire regimes
- Altered hydrology
- Off-site effects of nearby land uses, and
- Additional threats to native grasslands.

Tree planting into native grassland areas may be well intentioned but is potentially devastating. Preparatory work may involve herbicide use, cultivation or ripping which are all destructive activities in grasslands. As trees grow, not only is the grassland structure altered, increased shading and competition for other resources can also alter the composition of the grassland flora.

Map 23: 1750 Extent of grassland EVCs



Map 24: Current extent of grassland EVCs

Detailed floristic community mapping has not been undertaken for native grassland areas across the region. However a number of floristic groups are recognised.

The Northern Plains and Western (Basalt) Plains Grassland Communities are recognised as amongst the most endangered vegetation communities in Victoria (NRE 1996) and are listed as threatened communities under the Flora and Fauna Guarantee Act (1988).

Northern Plains Grasslands

Any remnant grassland identified as a Northern Plains Grassland is of high conservation value. This would include any grassland located on the Northern Plains with high native species diversity and low in weediness (Foreman pers. comm. 1996). A draft Action Statement has been prepared for this threatened community.

At present 34 plant species regarded as rare or threatened with extinction in Victoria occur, or occurred, on Northern Plains grasslands. The Turnip Bassia (*Sclerolaena napiformis*) and Red Swainson Pea (*Swainsona plagiotropis*) are considered nationally significant.

Western (Basalt) Plains Grasslands

This community occurs on the flat, volcanic plains west of Melbourne where the cracking clay soils inhibit the growth of trees. Only tiny remnants persist in the NCCMA region. These grasslands are dominated by tussock-forming grasses with Kangaroo Grass (*Themeda triandra*) being the major species in drier locations, and Common Tussock-Grass (*Poa labillardieri*) dominating on the wetter sites. These grasslands frequently have high species diversity comprising Wallaby Grasses (*Austrodanthonia* sp.) Spear-grasses (*Austrostipa* sp.) and many flowering herbs.

Thickets of Tree Violet (*Hymenanthera dentata*) and occasionally the rare Anchor Plant (*Discaria pubescens*) occur in sheltered gorge-like valleys (e.g. Barfold Gorge). The Nationally Vulnerable Clover Glycine (*Glycine latrobeana*) also occurs n this community (Foreman and Walsh 1993; McDougall and Kirkpatrick 1994; Barlow 1996).

Wimmera Plains Grassland

Grasslands in the Wimmera support a range of tussock grasses such as Kangaroo Grass, Spear Grasses, Wallaby Grasses and Spider Grass (*Enteropogon acicularis*) and many small herbs, often with bright showy flowers (Scarlett *et al*. 1992; N. and J. Marriott 1996).

The Southern Wimmera Grassland is either tussock grassland dominated by Spear Grass or herbland dominated by Lemon Beauty-heads (*Calocephalus citreus*). Only ten hectares of this community survives and none is adequately protected.

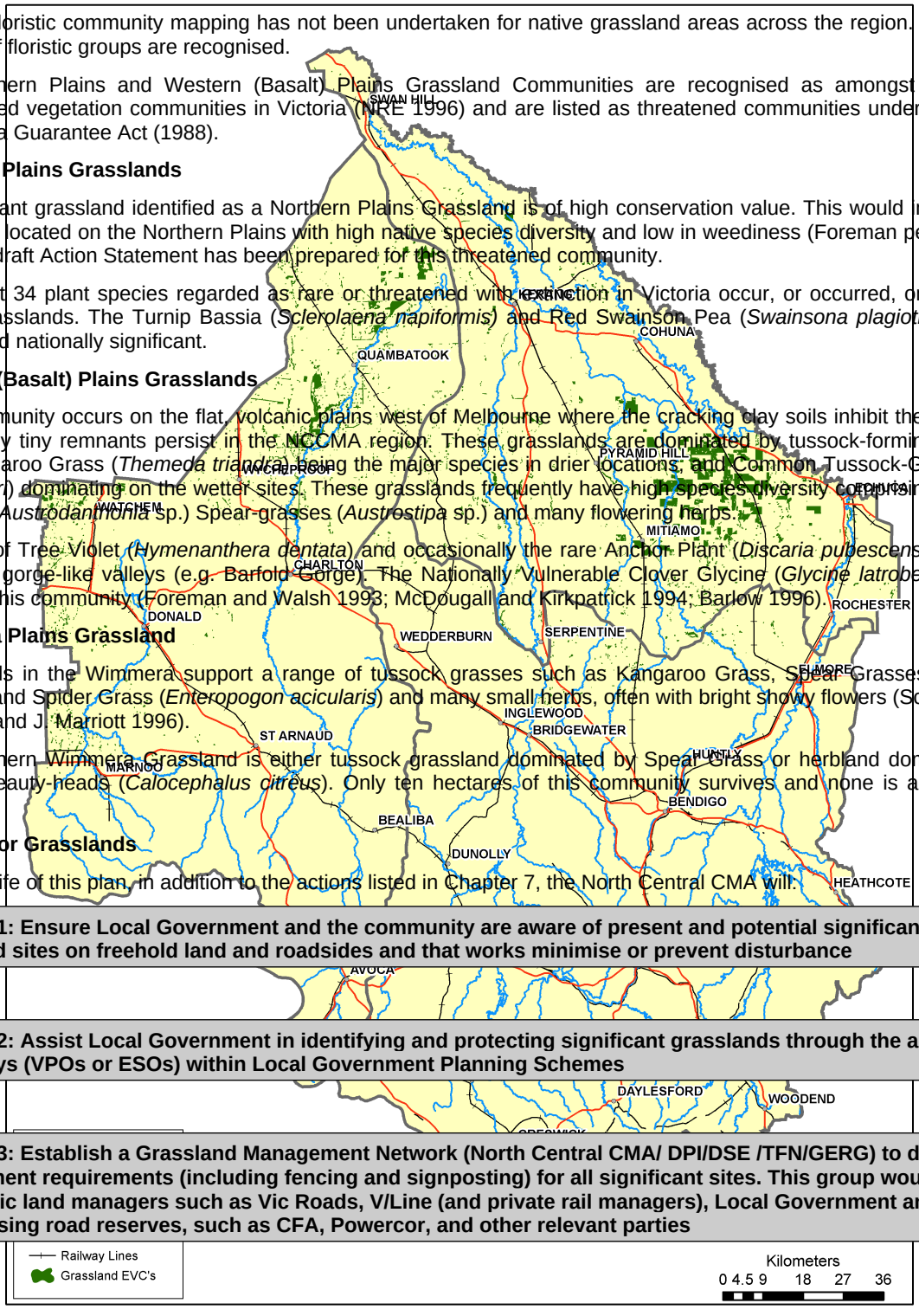
Actions for Grasslands

Over the life of this plan, in addition to the actions listed in Chapter 7, the North Central CMA will:

Action 8.1: Ensure Local Government and the community are aware of present and potential significant grassland sites on freehold land and roadsides and that works minimise or prevent disturbance

Action 8.2: Assist Local Government in identifying and protecting significant grasslands through the application of overlays (VPOs or ESOs) within Local Government Planning Schemes

Action 8.3: Establish a Grassland Management Network (North Central CMA/ DPI/DSE /TFN/GERG) to define management requirements (including fencing and signposting) for all significant sites. This group would liaise with public land managers such as Vic Roads, V/Line (and private rail managers), Local Government and other groups using road reserves, such as CFA, Powercor, and other relevant parties



Action 8.4: In conjunction with DPI/DSE, TFN, Parks Victoria and Local Government establish a target area of Northern Plains grassland to be protected by a combination of private ownership and public grassland reserves. Reservation or protection will be achieved through a number of mechanisms including land purchase, covenanting, leasing and rate rebates

Action 8.5: Support the development and implementation of an EMS approach to management of native grasslands

Action 8.6: Promote the ecotourism potential of grassy ecosystems

Action 8.7: Increase the knowledge base of grassy ecosystem remnants in upper catchment areas (i.e. basalt plains near Clunes, Moolort etc)

Action 8.8: Ensure that major land use changes (i.e. new irrigation developments) identify potential extent and impacts on native grassland sites

Support research to improve management practices for grassy ecosystems, particularly the role of fire.

Auspice and support the North Central Roadsides Conservation Taskforce to improve conservation outcomes for grassy remnant native vegetation on roadsides.

8.2 Woodlands of the Plains

In North Central Victoria Woodlands of the Plains include 14 bioregionally endangered EVCs and two vulnerable. Plains woodlands EVCs occurred over around 870,000 ha (or 29%) of North Central Victoria in pre-European times.

The table below lists the woodlands of the plains EVCs and their mosaics and complexes mapped in North Central Victoria.

Table 8.3 Woodlands of the plains EVCs

Map Unit Description	Cons Status in North Central Victoria	1750 (ha)	Extant(ha)	Proportion remaining
Plains Woodland	endangered	688,356	28,729	4.2%
Plains Grassy Woodland	endangered	147,313	8,498	5.8%
Semi-arid Woodland	endangered in Riverina/ vulnerable elsewhere	11,383	407	3.6%
Semi-arid Chenopod Woodland	vulnerable in Murray Mallee, endangered elsewhere	6,072	467	7.7%
Plains Grassland / Gilgai Plain Woodland / Wetland Mosaic	endangered	4,825	21	0.44%
Plains Woodland / Low Rises Grassy Woodland Mosaic	endangered	4,405	170	3.9%
Plains Woodland / Plains Grassland Mosaic	endangered	3,624	373	10%

Map Unit Description	Cons Status in North Central Victoria	1750 (ha)	Extant(ha)	Proportion remaining
Gilgai Plain Woodland / Wetland Mosaic	endangered	1,751	16	0.89%
Plains Woodland / Lignum Wetland Mosaic	endangered	1,250	18	1.4%
Plains Woodland / Red Gum Wetland Mosaic	endangered	1,034	52	5.1%
Plains Woodland / Plains Grassland / Gilgai Plains Woodland / Wetland Mosaic	endangered	969	10	1.1%
Low Rises Woodland / Riverine Chenopod Woodland Mosaic	endangered	929	73	7.9%
Pine Box Woodland / Plains Woodland Mosaic	endangered	802	0	0.0%
Sand Ridge Woodland	endangered	3	0	0.0%
		872,716	**38,835**	**4.4%**

The overwhelming majority (96%) of this group of vegetation then and now is made up of just the two closely related EVCs Plains Woodland and Plains Grassy Woodland.

According to VicRFASC (2000) the majority of Plains Grassy Woodland occurs on fertile, flat or gently undulating country and is very characteristic of basalt plains. Most of these plains have a rainfall of 550-650mm per annum. The canopy consists of open woodland often dominated by Red Gum *Eucalyptus camaldulensis*. The ground-layer is dominated by Kangaroo Grass *Themeda triandra* with a diversity of grasses and herbs including Common Everlasting *Chrysocephalum apiculatum*, Yam Daisy *Microseris scapigera*, Scaly Buttons *Leptorhynchos squamatus* and Blue Devil *Eryngium ovinum*. In higher rainfall areas (over 700mm) such as around Creswick or Tylden, the overstorey may be dominated by Swamp Gum *E. ovata* and Candlebark *E. rubida*, The lowest rainfall areas often have a canopy of Grey Box E*. microcarpa* and/or Yellow Gum *E. leucoxylon* with a ground layer dominated by Wallaby *Austrodanthonia spp*. and Spear Grasses *Austrostipa spp*. Other common herbaceous species include Windmill Grass *Chloris truncata*, Common Wheat-grass *Elymus scabra*, Weeping Grass *Microlaena stipoides*, Kidney-weed *Dichondra repens*, Flax-lilies *Dianella spp.*, Saloop Saltbush *Einadia hastata*, Small-leaved Clematis *Clematis microphylla* and the shrubs Varnish Wattle *Acacia verniciflua*, Golden Wattle *A. pycnantha*, Tree Violet *Hymenanthera dentata* and Sweet Bursaria *Bursaria spinosa.*

According to Cheal *et al.* (2003) Plains Woodland occurs in low-lying (70-130m ASL) areas within former drainage systems on heavy soils plains in areas receiving <600mm rainfall per annum. The soils are fertile, sometimes seasonally waterlogged, mostly silty, loamy or clay topsoils, with heavy subsoils. The habitat is not subject to flooding, though can include low-lying seasonally waterlogged areas.

Grassy or sedgy woodland to 15m tall (typically dominated by *Eucalyptus largiflorens* in the north western part of its range) with large intertussock spaces potentially supporting a range of annual or geophytic herbs adapted to low summer rainfall, with low overall biomass.

The overstorey comprises box eucalypts (especially *Eucalyptus largiflorens*, but also *microcarpa, E. melliodora*) and Buloke *(Allocasuarina luehmannii*), with scattered *Acacia acinacea* in the understorey.

In most remnants, shrubs are a minor component, but it is considered that the abundance and diversity of the shrub layer has generally been reduced in diversity by grazing.

Other rarely encountered shrubs include *Acacia oswaldii, A. pycnantha, Dodonaea bursariifolia, Hakea leucoptera, Pittosporum phylliraeoides, Exocarpos strictus, Myoporum montanum, M. platycarpum* subsp. *platycarpum, Eutaxia microphylla, Astroloma humifusum* and *Lissanthe strigosa*. Species of Austrodanthonia and Austrostipa and a diversity of small chenopod (saltbush) species dominate a grassy ground-layer. Main dominants in the ground-layer include *Austrodanthonia setacea, Austrostipa scabra* subsp*. falcata, Austrodanthonia geniculata, Elymus scaber, Poa sieberiana* and *Enneapogon nigricans* or with associated species including *Eragrostis dielsii, Enteropogon acicularis* and a diverse range of small chenopods, mainly *Maireana* spp. (*Maireana enchylaenoides, Maireana decalvans*), *Atriplex* spp. (*Atriplex semibaccata, Atriplex eardleyae, Atriplex pseudocampanulata, Atriplex lindleyi*), *Enchylaena tomentosa* and *Einadia nutans*. In relatively intact sites, a range of forbs and sedges can be found such as *Acaena echinata, Convolvulus angustissimus, Solenogyne dominii, Wurmbea dioica, Schoenus apogon, Thysanotus patersonii, Enchylaena tomentosa,* and *Calocephalus citreus.* Small ephemeral depressions support *Amphibromus nervosus* and *Eleocharis* spp. with a

range of small herbs indicative of ephemeral wetlands within gilgai terrain, or otherwise seasonally waterlogged soils. Broader-scale wetland and species indicative of more sustained or deeper inundation are typically absent.

The habitat of this EVC is now largely modified and few relatively intact remnants persist.

Very few relatively intact examples of Plains Woodland persist due largely to clearing for cereal cropping. In addition, the EVC is poorly represented in conservation reserves and restricted public land examples are typically reduced in indigenous species as a consequence of heavy grazing. Consequently, any relatively intact examples on lightly grazed private land are of major conservation value for both the plant community and potentially a range of threatened species that formerly occurred within the vegetation type. Similarly, the Lignum-dominated plant communities of the ephemeral minor drainage-lines that traversed these landscapes have also become virtually extinct. Relatively intact remnants of Plains Woodland (and if present associated small wetlands) often include a wide range of VROT species. See **Appendix 5** for more detail on figures of pre-1750 and current extent and bioregional conservation status. Map **25** shows the extent of these EVCs in 1750.

The most significant threats to Woodlands of the plains include the following: (Refer to page 20 for more information about each threat).

- Further clearing for agriculture, urban or other use including for fence line replacement or maintenance. Firebreak ploughing destroys most of the ground flora in woodland remnants and reduces the viability of adjoining unploughed remnants;
    - Poorly managed and unsustainable grazing. Overgrazing by stock, rabbits, kangaroos prevents regeneration and reduces diversity. Droving stock on non designated areas can damage important roadside remnants;
- Rising watertables and salinity. Areas from which deep-rooted native grasses and grassy woodlands have been over- cleared are among the most salt-affected in Victoria (LCC 1988);
- Habitat loss and fragmentation is extreme in this vegetation type;
- Harvesting practices, including removal of fallen timber removes scarce habitat elements;
- Lack of regeneration due to a number of factors including overgrazing, weeds and inappropriate fire regimes;
- Soil disturbances such as cultivation severely degrade native grasslands and grassy woodlands. Firebreak ploughing destroys most of the ground flora in Grassy Woodland remnants and reduces the viability of adjoining unploughed remnants. Roadworks frequently damage roadside remnant vegetation;
    - Weed invasion following soil disturbances, particularly when this is accompanied by changes in soil fertility;
- Off-site effects of nearby land use practices such as burning of stubble, pesticide spray drift, soil nutrient changes and altered hydrology have significant negative impacts on woodland remnants; and
    - Inappropriate use of herbicides for roadside weed control amongst native vegetation.

Actions for Woodlands of the Plains

Over the life of this plan, in addition to the actions listed in Chapter 7, the North Central CMA will:

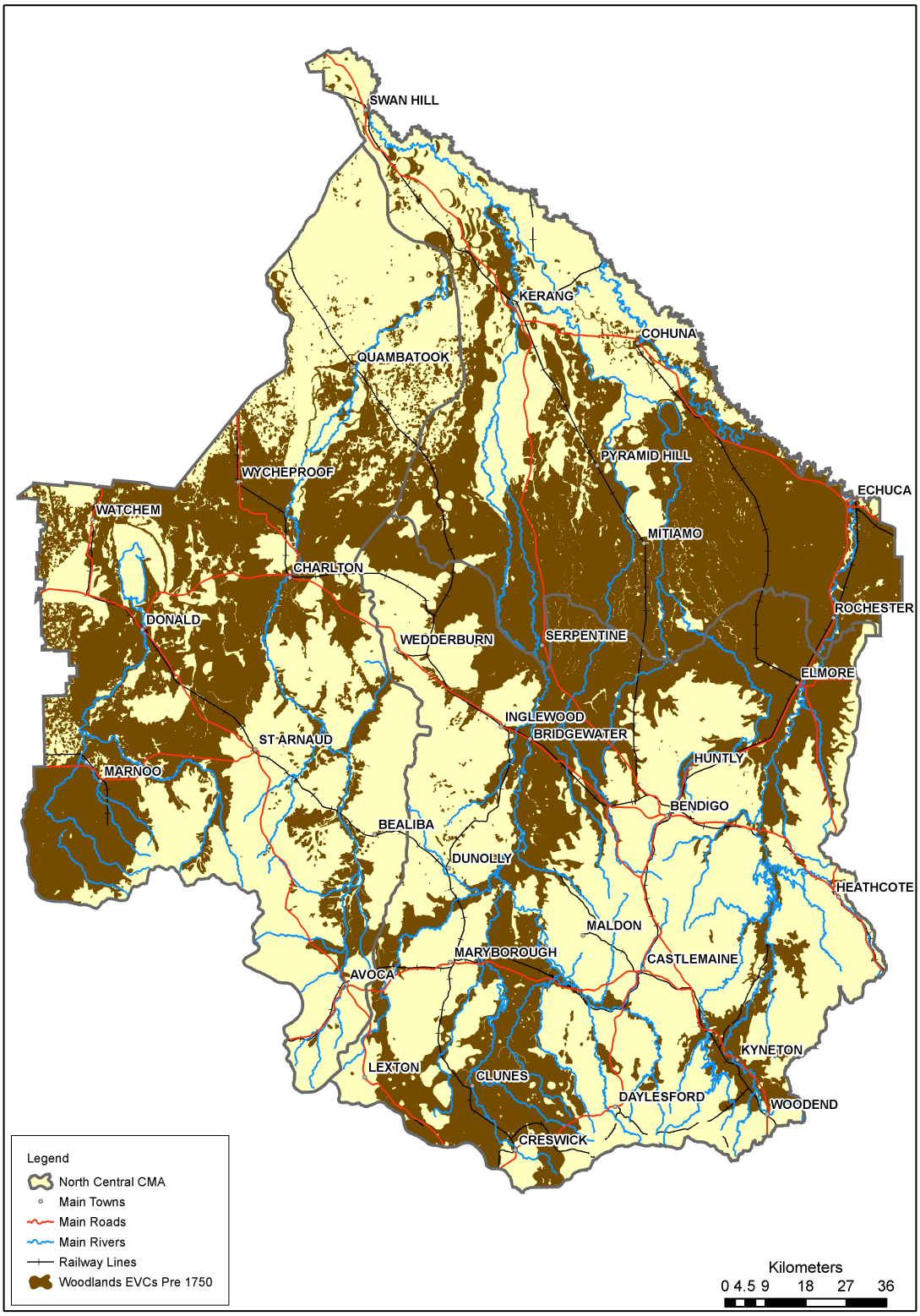
Action 8.9 In conjunction with DPI/DSE and Parks Victoria establish a target area of woodlands occurring on plains to be protected by a combination of private ownership and public reserves. Reservation or protection will be achieved through a number of mechanisms including land purchase, covenanting, leasing, rate rebates and market based approaches (e.g. Bush Tender)

In the Wimmera and Murray Mallee bioregions, woodlands included associations of Mallee Eucalypts, Cypress Pine and Buloke or Belah. Understoreys range from shrubby to grassy or herbaceous. A rare association of Dumosa Mallee (*E. dumosa*), Black Mallee Box (*E. porosa*) and Slender Cypress Pine (*Callitris preissii*) occurs at one site in the Avon-Richardson Catchment on Pinks Road reserve east of Lake Buloke (Heron *et al*. 1991).

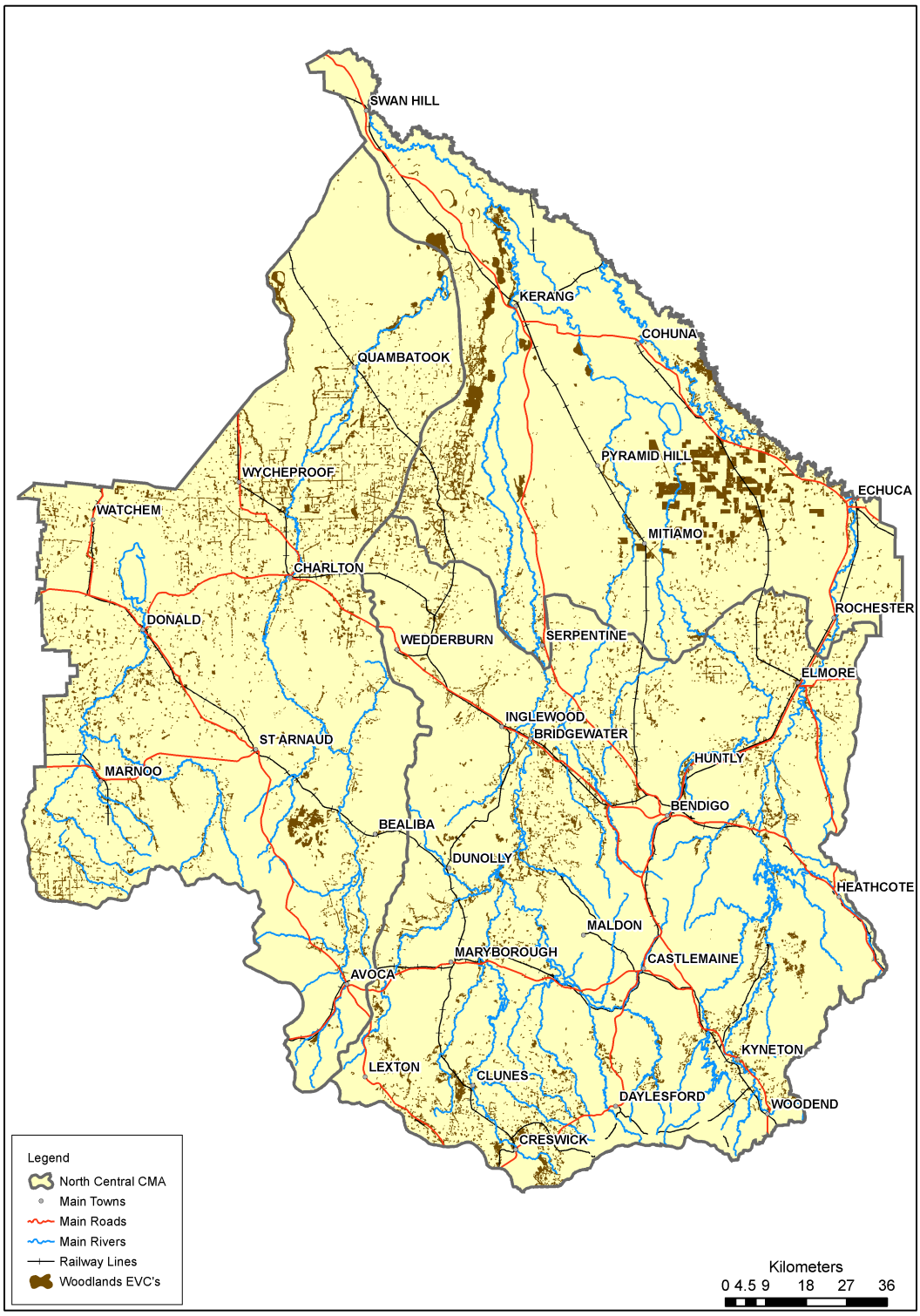
This vegetation type is highly depleted across the region with only 0.3 per cent remaining. Of this a significant proportion is found on private land and roadsides. The linear nature of many of these sites renders the vegetation community vulnerable to weed invasion and soil disturbance. Detailed survey of a number of sites has been undertaken by DPI/DSE (Diez and Orr 1999). This information provides advice on best management practices for these and a range of other vegetation communities in the Wimmera and Murray Mallee bioregions.

Action 8.10 Support the completion of survey and mapping of Wimmera & Mallee woodland remnants and improve the accessibility of information arising from this work to the broader community

Map 25: 1750 Extent of woodlands of the plains EVCs



Map 26: Current extent of woodlands of the plains EVCs (Tree25)



8.3 Riparian/Riverine Vegetation

Riparian vegetation is that associated with rivers and streams. Riverine vegetation also encompasses the flood plains of the major rivers of the region, i.e. the catchments of the Loddon, Campaspe, Avoca and Avon-Richardson rivers. Native vegetation associated with these major rivers and their tributaries is a much more significant component of the habitat of the region than indicated by its extent. It also has a crucial role in protecting waterways and maintaining water quality.

Riverine and riparian EVCs occurred over around 312,138ha (or 10.4%) of North Central Victoria in pre-European times but are now reduced to 22 per cent of their former extent. **Table 8.4** lists the riverine and riparian EVCs and their mosaics and complexes mapped in North Central Victoria.

Riverine Chenopod Woodland was the dominant (39%) EVC of this group, but 90 per cent of it has now been cleared from North Central Victoria.

According to Cheal *et al.* (2003) Riverine Chenopod Woodland was widespread along the River Murray downstream from Gunbower and major Wimmera drainage lines, and Loddon River floodplains on heavy clay soils on the highest of riverine terraces within or on the margins of riverine floodplains (or former floodplains). Under natural conditions it would have received only infrequent incidental shallow flooding from major events.

Riverine Chenopod Woodland consists of mostly low woodland, (~15m but up to 25m) in mature stands and is dominated by an overstorey of *Eucalyptus largiflorens* (and in some areas *Eucalyptus microcarpa*) with a characteristic saltbush dominated understorey. Common species include *Einadia nutans, and Enchylaena tomentosa* var. *tomentosa, Atriplex nummularia* and other shrubby chenopods (e.g. *Maireana* spp., *Atriplex* spp., *Rhagodia spinescens* and at the uppermost limits, *Pachycornia triandra).*

In relatively intact examples the understorey is shrubby-grassy and can be rich in annual species. Other shrubs include *Eremophila bignoniiflora, E. maculata* and *E. divaricata*; also *Acacia* spp. - variously *including A. stenophylla, A. hakeoides* and *A. salicina*. Small locally elevated areas can have a mixture of *Eucalyptus largiflorens* and *Melaleuca lanceolata.* The woody species *Alectryon oleifolius* subsp. *canescens* and *Callitris gracilis* subsp. *murrayensis* can be sparsely present in some drier sites.

Many areas are severely disturbed by grazing and have a high proportion of introduced grasses. *Austrodanthonia setacea* and *Setaria jubiflora* are the only common native grass species although *Austrostipa scabra* subsp. *falcata* may be present. *Disphyma crassifolium* is often conspicuous, and (in relatively undisturbed examples a soil crust of non-vascular species often provides substantial cover). Other ground-layer species include *Eragrostis dielsii, Sclerolaena diacantha, Crassula* spp., *Calandrinia* spp., *Atriplex leptocarpa* and *Atriplex lindleyi.*

A diverse range of ephemeral/annual herbs and semi-shrubs may occur (e.g. *Calotis hispidula, Spergularia* sp. 3, *Atriplex leptocarpa, Brachyscome ciliaris, Bulbine semibarbata, Calocephalus sonderi, Crassula spp., Einadia nutans, Lepidium* spp., *Plantago cunninghamii, Sida corrugata, Marsilea drummondii, Senecio glossanthus, Goodenia* spp.).

Relatively intact remnants of Riverine Chenopod Woodland are extremely rare due to modification through grazing and reduced incidence and extent of flooding. Large *Atriplex* spp., notably *Atriplex nummularia* have declined greatly as a consequence of grazing in most former habitats. Remnants of the habitat (e.g. around small lakes) can also be vulnerable to salinisation. These modifications include reduction of diversity, notably loss of shrubby species, increases in abundance of species from drier habitats and reduction in the vigour of the structural dominant. In some areas grazing and desiccation have resulted in woodland vegetation with a grassy understorey, typically dominated by *Austrodanthonia setacea* (or sometimes *Austrostipa scabra* subsp. *falcata*) and introduced annuals. In such situations a component of more resilient chenopod species is usually present.

The open grassy communities of Black Box can be of extremely high botanical importance and should be protected from damage by over grazing (Frood and Calder 1987). Many botanically important areas of this community are included in Wildlife Reserves and need to be managed for protection of flora.

Black Box woodlands have been greatly reduced by clearing for agriculture as they occur on the heavy soils suited for cropping. Remnant stands are likely to have been modified by timber cutting or grazing.

They provide important habitat for a variety of fauna. Many parrots use Black Box hollows for nesting habitat, while a range of insects, reptiles, mammals and amphibians are dependent on these woodlands for feeding and breeding habitat.

The other riparian and riverine communities are very diverse, ranging from the dry country in the north of the region to

Manna Gum (*E. viminalis*) dominated vegetation in the high rainfall areas to the south of the region. These communities occur along rivers, stream banks and drainage lines. In addition, minor drainage lines through other vegetation types often support unique floristic communities not mapped at the EVC scale.

These vegetation communities have often been reduced to disturbed fragments. Regionally, most creeklines with remnant native vegetation retain only a canopy of River Red Gum over a ground flora of introduced forbs and grasses.

Relatively intact riparian vegetation is of great importance wherever it occurs (Frood and Calder 1987). Fortunately, some large blocks of riparian/floodplain vegetation are found on public land including Appin Forest, Wandella Forest, Leaghur Forest and Gunbower Forest.

Riparian vegetation is among the most depleted and poorly reserved of ecosystems in lowland Victoria, particularly sedge-grassy communities of minor drainage lines.

Native vegetation in riparian and drainage line areas is generally a much more productive wildlife habitat than non-riparian areas. This is due to their position in the landscape, consequently deeper soils and greater nutrient and moisture availability. A vitally important but largely unrecognised role of riparian areas is their ability to provide viable habitat refuges and resources for fauna during drought, such as flowering and nectar flow. These drought refuge areas often provide links to areas of native vegetation higher in the landscape (e.g. Box-Ironbark forests) which are critical for fauna that require access to a mosaic of habitats for their survival.

Riverine woodlands, associated with the Murray and lower Loddon floodplains, are frequently utilised for grazing and for timber production in Gunbower State Forest. Past cutting practices have resulted in changes to the age and structure of woodlands so that the giant veteran Red Gums are now rare in most areas. The understorey of regularly flooded woodland areas is dominated by grasses or sedges, with wattles (e.g. *Acacia stenophylla*) sometimes present (Frood and Calder 1987).

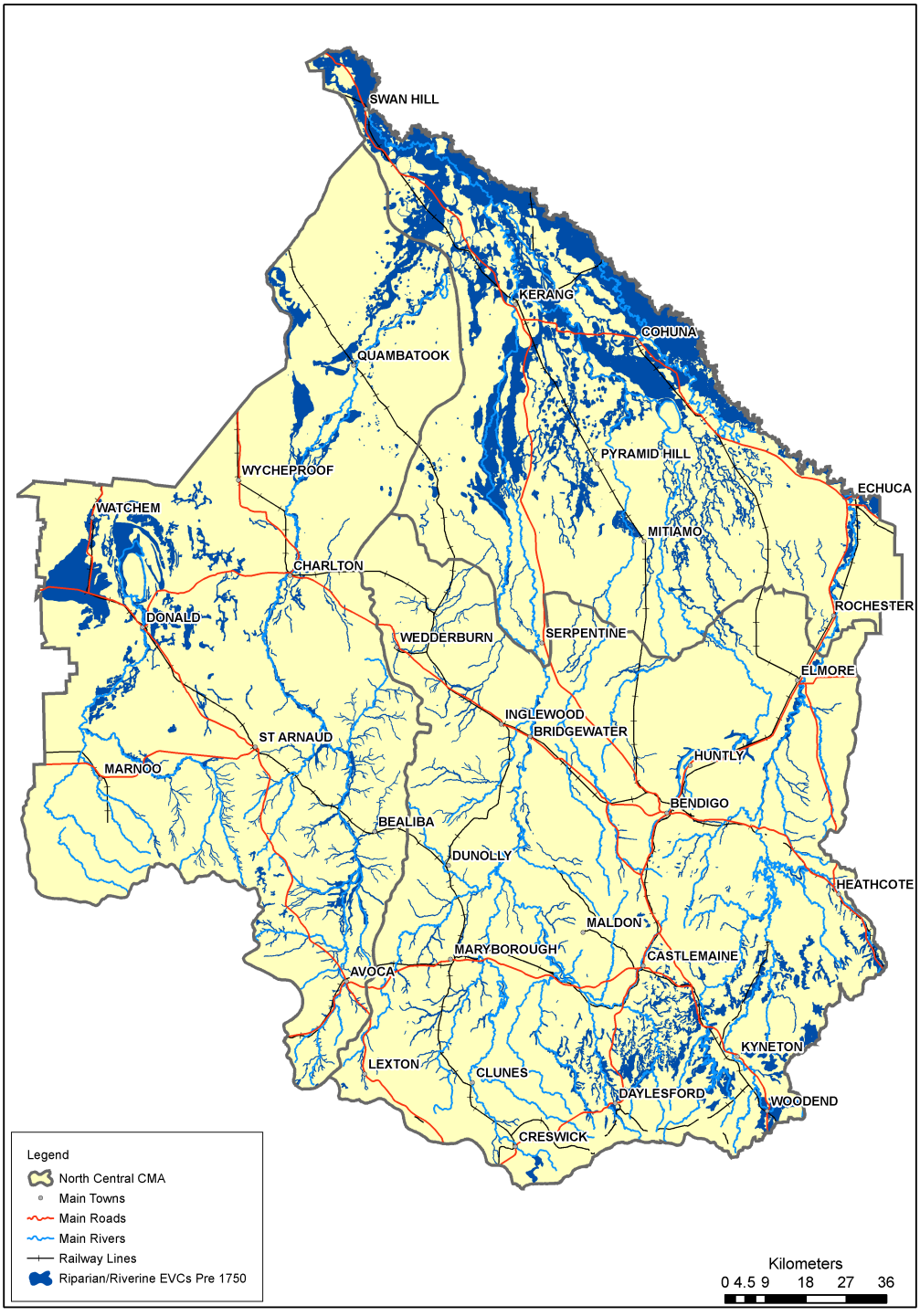
Threats to Riparian / Riverine Vegetation

The most significant threats include:

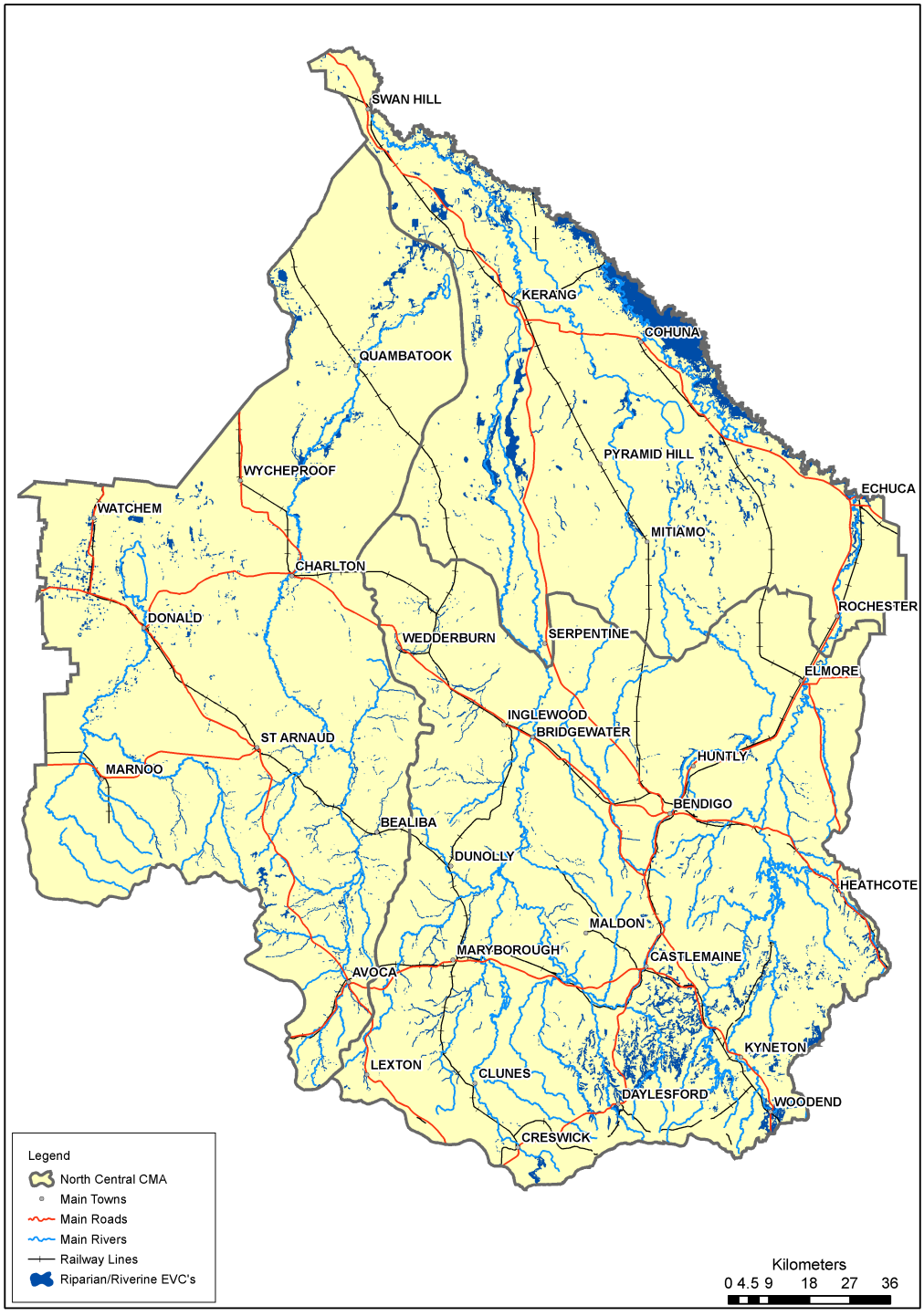
- Changing water regimes that lead to lack of water or permanent or frequent inundation. This can lead to a decline in vegetation condition and environmental values;
- Riparian / riverine vegetation inevitably receives all the water borne impacts from adjoining land uses. High nutrient levels from stock manure or fertiliser runoff severely impacts on the condition of riparian communities and promotes growth of exotic plants and algal blooms;
- Weed infestation is a very widespread form of degradation. (Flooding causes disturbance and introduces exotic seeds making floodplain and riparian communities highly susceptible to weed invasion);
- Willows (and other invasive woody exotic species) exclude other vegetation and exacerbate erosion as well as changing the path of streams or blocking their course;
- Excessive grazing, trampling and pugging by stock and feral animals (rabbits, pigs, goats) leads to loss of native understorey species, lack of regeneration and contributes to weed invasion, erosion and reduced water quality;
- Salinity control schemes may cause severe local land salinisation (e.g. community drains accessing groundwater). Saline groundwater in the root zone causes the decline, and frequently the death, of native trees and shrubs;
- Firebreak ploughing destroys most of the ground flora in Riverine Chenopod Woodland remnants and reduces the viability of adjoining unploughed remnants;
- Alluvial mining, particularly in the Box-Ironbark ecosystem, is often associated with gullies and creeks containing the large old trees on deeper soils. Mining generally involves the complete removal of all vegetation and topsoil. In those circumstances, rehabilitation would take many decades to return these communities to a near natural state. Most ground flora species are not restored with the rehabilitation techniques currently used;
- Greatly reduced numbers of veteran habitat trees are a limiting fauna resource in Redgum forests; and
- Development of facilities for recreational uses, such as tracks, toilet blocks, parking areas for day visits, campsites all impact on riparian vegetation and increase the level of pollution, weed invasion and fertility.

The development of an overarching Victorian River Health Strategy provides a management framework for communities and agencies to make decisions on improving the state of our river systems. It clearly identifies the key role of native vegetation in contributing to the ecological health of rivers, managed within healthy catchments. River health strategies for each of the major river systems in the region will provide the local direction and guidance for major efforts to restore riparian ecosystems.

Map 27: 1750 Extent of riparian & riverine EVCs



Map 28: Current extent of riparian and riverine EVCs



Actions for Riparian / Riverine Vegetation

Over the life of this plan, in addition to the actions listed in Chapter 7, the North Central CMA will:

Action 8.11 Monitor public land along water frontages for management of native vegetation and weed control. Where appropriate renewal of lease should be dependent on landholder agreement to enhance native vegetation cover

Action 8.12 Continue to encourage the re-use of irrigation water to minimise damage caused by drainage to forest areas

Action 8.13 Work with DPI/DSE and Water Authorities to develop management plans for the major rivers to ensure an appropriate balance is struck between environmental values and other uses.

Action 8.14 Identify possible riparian projects and support the development of funding applications that aim to protect and restore riparian areas

Action 8.15 Review procedures for calculating conservation significance to take into account the high wildlife productivity of riparian vegetation

Table 8.4 Riparian/Riverine EVCs

Map Unit Description	Status	1750 (ha)	Extant (ha)	Proportion remaining
Riverine Chenopod Woodland	Endangered in Murray Fans, Wimmera, Depleted in Murray Mallee and Riverina	120,907	12,226	10%
Lignum Swampy Woodland	Depleted in Murray Mallee, Vulnerable elsewhere	63,981	16,388	26%
Creekline Grassy Woodland	Endangered	33,248	9,585	29%
Floodplain Riparian Woodland	Vulnerable in Riverina, Endangered elsewhere	20,485	3,937	19%
Riverine Grassy Woodland	Vulnerable in Murray Fans, Depleted in Riverina	16,621	3,485	21%
Riverine Chenopod Woodland / Lignum Wetland Mosaic	Endangered in Wimmera, Depleted elsewhere	11,478	581	5.1%
Riverine Swamp Forest	Least concern	7,511	6,533	87%
Riverine Swampy Woodland / Lignum Swamp Mosaic	Vulnerable	5,825	1,301	22%
Riverine Grassy Forest / Riverine Swamp Forest Complex	Depleted	4,889	2,560	52%
Swamp Scrub	Endangered	4,330	536	12%
Riverine Grassy Forest	Depleted	3,828	3,211	84%
Sedgy Riverine Forest	Depleted	3,168	2,715	86%
Stream-bank Shrubland	Vulnerable in Central Vic Uplands, Endangered elsewhere	2,889	1,133	39%
Swampy Riparian Woodland	Endangered	2,658	400	15%
Drainage-line Woodland	Endangered	2,352	637	27%
Sedgy Riparian Woodland	Vulnerable in Goldfields, depleted in CVU	2,019	1,552	77%

Map Unit Description	Status	1750 (ha)	Extant (ha)	Proportion remaining
Lignum Swampy Woodland / Plains Grassland Mosaic	Endangered	1,412	134	9.5%
Riverine Chenopod Woodland / Plains Grassland Mosaic	Vulnerable in Riverina, Endangered elsewhere	1,345	101	7.5%
Riparian Woodland	Vulnerable in Murray Fans, Endangered elsewhere	1,148	448	39%
Drainage-line Complex	Endangered	736	45	6%
Sedgy Riverine Forest / Riverine Swamp Forest Complex	Depleted	440	342	78%
Intermittent Swampy Woodland	Depleted	275	231	84%
Riverine Grassy Woodland / Riverine Sedgy Forest / Wetland Mosaic	Vulnerable in Murray Fans, Depleted elsewhere	202	137	68%
Riparian Forest	Vulnerable	183	178	97%
Lignum Swampy Woodland / Lake Bed Herbland Mosaic	Vulnerable in Riverina, Depleted elsewhere	125	60	48%
Creekline Sedgy Woodland	Endangered	81	22	27%
Riverine Swampy Woodland	Vulnerable	3	0	0%
	Totals	**312,138**	**68,478**	**22%**

8.4 Wetlands

Wetlands are one of Victoria's most vulnerable and threatened ecosystems due to a history of drainage, use as irrigation storages, cultivation and the onset of salinity.

Wetlands are classified according to water depth, duration of inundation, salinity and dominant vegetation (Corrick and Norman 1980). The wetland types found in the region are described in Allan *et al*. (1993) and listed in **Table 8.6**. For mapping purposes three categories have been used:

- Shallow freshwater;
- Deep freshwater; and
- Saline.

This classification system does not provide conservation status, so priorities for action cannot be as easily set. However, some wetland EVCs have been described. **Table 8.5** lists the wetland EVCs and their mosaics and complexes mapped in North Central Victoria.

Shallow Freshwater includes Shallow Freshwater Marshes and Freshwater Meadows which have been the most severely affected by draining.

Wetlands are of biological importance wherever they occur (Frood and Calder 1987). Wetlands are among the most productive ecosystems on earth, providing nutrient recycling, trapping sediments and containing a diverse range of living organisms. Wetland vegetation includes reeds, rushes, sedges, various herbs, lignum, saltbushes and other shrubs as well as River Red Gums and Black Box. This vegetation provides important habitat for many animals especially waterbirds. Lignum is under represented in Victorian Wetland Reserves (ANCA 1996).

Two major wetland systems in the North Central region are listed under the Ramsar Convention on Wetlands of International Importance. These are the Kerang Lakes system (totalling 104 wetlands) and the Gunbower Forest. The Kerang Lakes system is facing an extreme ecological crisis through degradation from salinity and by their use as part of irrigation drainage schemes. Australia is a signatory to the Ramsar Convention and therefore has an obligation to protect these internationally significant wetlands. Australia is also a signatory to the Japan and China Migratory Bird Agreements (JAMBA and CAMBA) that commit us to conserving the habitats supporting these migratory birds.

A number of other significant wetland sites are recognised in the region. These are listed in A Directory of Important Wetlands in Australia 3rd ed. (2001) and include such important areas as Tyrrell Creek, Tang Tang Swamp, Merin Merin

Swamp, Long Swamp and Lake Buloke.

Salinity Management Plans for the region include recommendations for the protection and rehabilitation of wetlands. A high priority is to reduce the environmental effects of salinity on wetlands in areas where the watertable is less than 1-2m below the surface. Implementation of Loddon and Campaspe Water Quality Strategies will encourage the use of re-use systems that help prevent the inflow of nutrient rich water to wetlands. Information and management strategies can be found in the Wetlands Conservation Program for Victoria (1988), Lugg *et al*. (1989) and Davies (1994a and b).

A number of rare or threatened fauna are dependent on wetland communities including the Brolga, the Blue-billed Duck and the Freckled Duck.

Threats to Wetlands

Changing water regimes is caused by over-extraction of water from feeder streams, tree clearing, irrigation and drainage schemes, levee banks along waterways and damming of wetlands. Either lack of water or permanent inundation can cause vegetation to die or prevent regeneration.

Rising groundwater and salinisation are major problems affecting the quality and reducing the diversity of native vegetation associated with wetlands.

As (generally) the lowest points in the local landscape, wetlands receive run-off from all the surrounding land uses. Thus wetlands are extremely sensitive to poor environmental management.

Changing water quality caused by run-off from urban or agricultural land can carry high levels of nutrients, sediment, pesticides and other chemicals and/or salt, leading to changes in vegetation communities and wetland biota.

Overgrazing, especially by stock, changes the condition or species composition of natural vegetation and can compact and otherwise change the soil.

Weed invasion: disturbance due to stock grazing or cultivation can lead to weeds becoming established and competing with native vegetation. Wetlands are particularly vulnerable as many introduced weeds are adapted to high moisture levels but lack the pests and diseases that keep them in check.

European Carp cause increased turbidity and consequent loss of aquatic vegetation (CFL 1988). Other introduced naturalised fish species in the Murray Darling system include Redfin (European Perch), Tench, Roach, Brown and Rainbow Trout, Crucian Carp, Goldfish, Mosquito Fish and Weather Loach (Sinclair 2001).

Drainage of wetlands - the small, temporary, freshwater wetlands such as Shallow Freshwater Marshes and Freshwater Meadows are especially at risk.

Actions for Wetlands

Over the life of this plan, in addition to the actions listed in Chapter 7, the North Central CMA will:

Action 8.16 Support the completion and implementation of Management Plans for the internationally recognised environmental values of Kerang Lakes and Gunbower Island

Action 8.17 Encourage the management of water regimes that ensure water is provided to high value wetlands in the volume, quality and seasonal patterns that approximate natural conditions or that maintain or enhance existing conservation values as per Lugg *et al.* (1989) and KLAWG (1992)

Table 8.5 Wetland EVCs

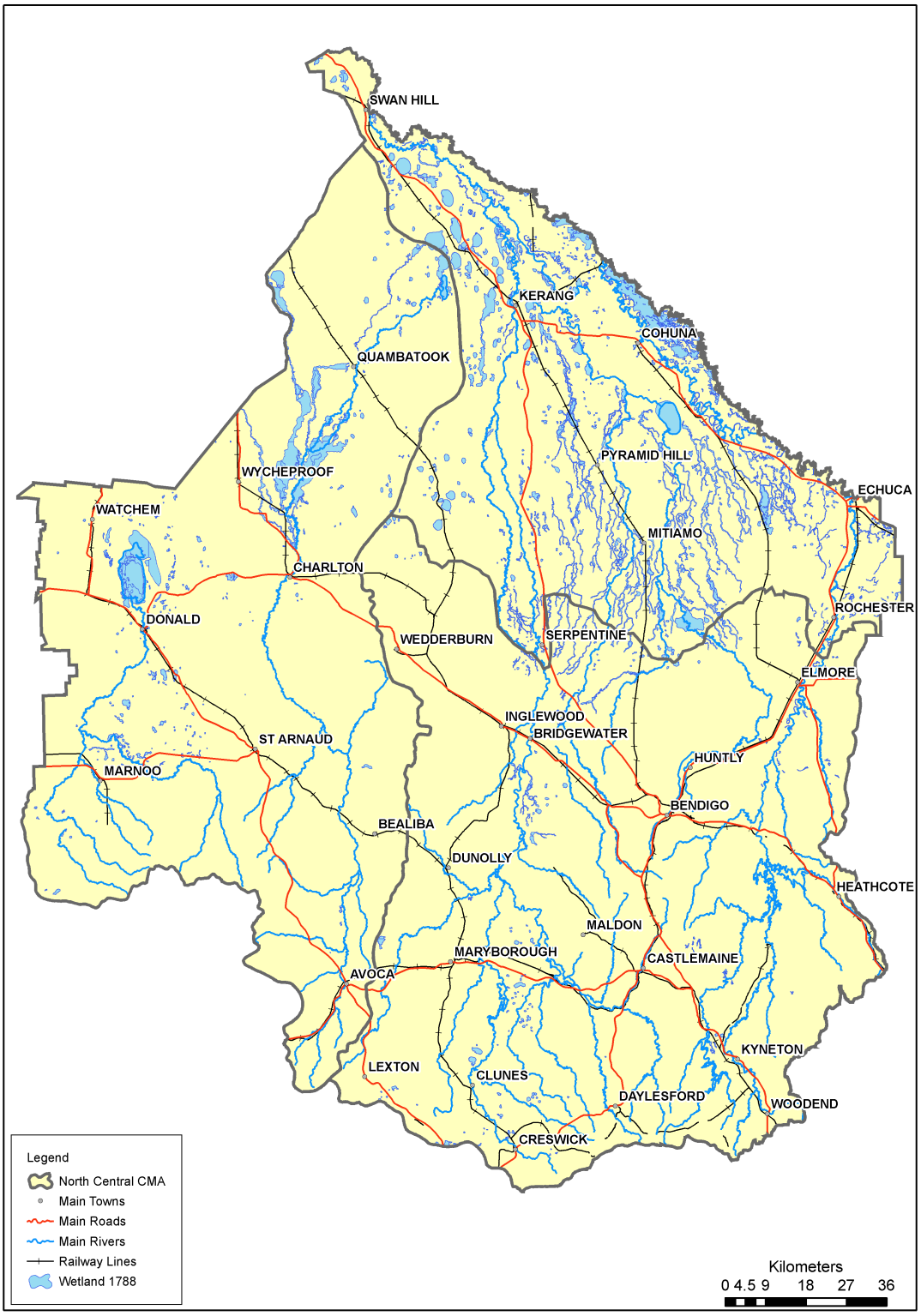
Map Unit Description	Status in north central Victoria	1750 (ha)	Extant(ha)	Proportion remaining
Lignum Wetland	Endangered in Wimmera, Vulnerable elsewhere	270,800	46,469	17%
Wetland Formation	Endangered	126,871	9,266	7.3%
Red Gum Wetland	Vulnerable in Wimmera, Endangered elsewhere	15,518	4,907	32%
Freshwater Lake Mosaic	Vulnerable	8,439	3,108	37%
Cane Grass Wetland	Endangered	4,112	41	1.0%
Lake Bed Herbland	Depleted	3,839	3,308	86%
Plains Grassy Wetland	Endangered	3,522	58	1.7%
Floodway Pond Herbland / Riverine Swamp Forest Complex	Depleted	1,999	1,918	96%
Tall Marsh	Endangered	1,238	319	26%
Spike-rush Wetland	Endangered	865	237	27%
Plains Sedgy Wetland	Endangered	138	2.4	1.8%
Aquatic Herbland / Plains Sedgy Wetland Mosaic	Endangered	102	1.0	1.0%

Table 8.6 Wetland Types

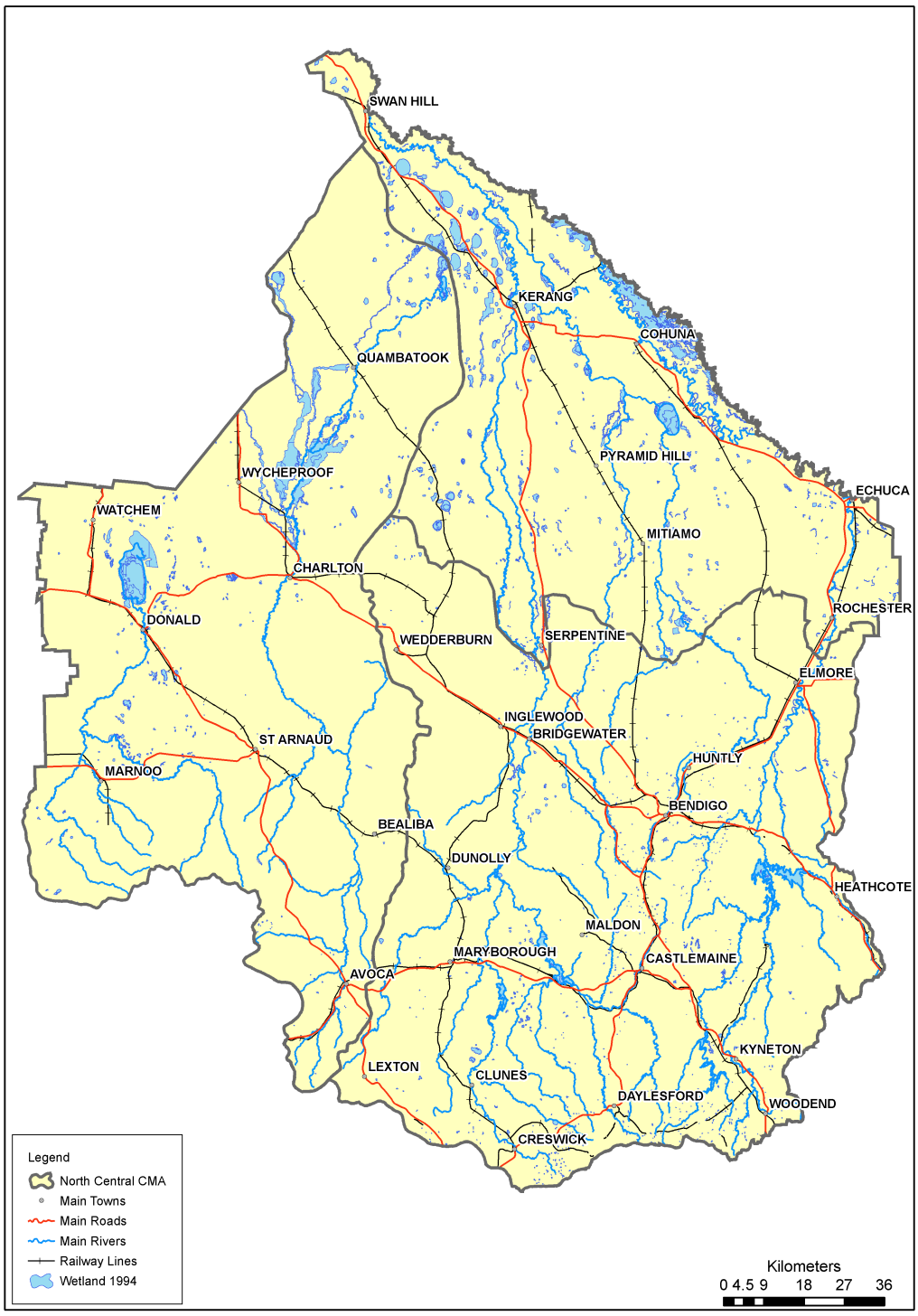
Vegetation Communities	Main threats	Conservation Status	Examples
Freshwater Meadow	Alteration to water regimes; salinity; drainage; grazing; weeds	53 per cent of pre-European extent left; poorly reserved (<10%)	Gunbower Island State Forest, Frogmore Swamp Bells Swamp. Wandella State Forest, Tragowel Swamp
Shallow Freshwater Marsh	Drainage; salinity; weeds; cultivation	34 per cent of pre-European extent left; <20 per cent reserved	Town Swamp, Tang Tang Swamp
Deep Freshwater Marsh	Alteration to water regimes; salinity	32 per cent of pre-European extent left; well reserved	Third Marsh, Lake Buloke Lake Yando, Woolshed Swamp
Permanent Open Freshwater	Alteration to water regimes; Carp; increasing salinity	91 per cent of pre-European extent left; <40 per cent reserved	Lake Bael Bael (State Game Reserve)
Semi-permanent Saline	Increasing salinity; grazing	70 per cent of pre-European extent left; <20 per cent reserved	Fosters Swamp
Permanent Saline	Increasing salinity; grazing	100 per cent of pre-European extent left; <40 per cent reserved	Cullens Lake, Lake Tutchewop (Wildlife Reserve)

Source: as described in Foreman (1995); LCC (1983); NRE (1996).

Map 29: 1788 extent of wetlands



Map 30: 1994 extent of wetlands


SWAN HILL
KERANG
COHUNA
QUAMBATOOK
PYRAMID HILL
WYCHEPROOF
ECHUCA
WATCHEM
MITIAMO
CHARLTON
ROCHESTER
DONALD
WEDDERBURN
SERPENTINE
ELMORE
INGLEWOOD
BRIDGEWATER
ST ARNAUD
HUNTLY
MARNOO
BENDIGO
BEALIBA
DUNOLLY
HEATHCOTE
MALDON
MARYBOROUGH
CASTLEMAINE
AVOCA
KYNETON
LEXTON
CLUNES
DAYLESFORD
WOODEND
CRESWICK
Legend
North Central CMA
Main Towns
Main Roads
Main Rivers
Railway Lines
Wetland 1994
Kilometers
0 4.5 9 18 27 36

9. Monitoring, Evaluation and Reporting

Historically, programs monitoring native vegetation and biodiversity assets have been inadequate in providing information on specific regional trends. North Central Victoria needs to be able to monitor the condition of native vegetation and biodiversity and record specific management impacts. This is needed to determine whether we are making a difference through the implementation of the North Central RCS and the various strategies, plans and sub strategies (including this document) relating to native vegetation and biodiversity. This information is important for funding bodies and the catchment community looking at the efficiency of programs and our progress against targets.

Monitoring must be over a network of sites that cover a range of ecological communities within a number of bioregions and must be able to report on a range of spatial scales and temporal scales.

We need to monitor targets set for asset condition. Progress will be the measure of asset condition relative to the benchmark established and the target.

In North Central Victoria, the North Central RCS planned monitoring program will cover the following asset classes:

- Native Vegetation;
- Native Species (includes Fauna & Threatened Species);
- Wetlands; and
- Rivers and Streams.

To prepare for this, a framework for monitoring native vegetation and biodiversity will be developed. This will:

- document and analyse existing monitoring practices in relation to native vegetation and biodiversity in the North Central CMA;
- develop a standardised format for a native vegetation and biodiversity monitoring framework aligned with other asset class monitoring frameworks used in Victoria; and
- develop practical ways to gather, record and use the information collected from the monitoring that, where possible, fit in with existing processes.

The Framework will report on options for storage and management of data which allow for access by authorised users in varied geographical locations, export and import of data from other related databases, and archiving of data.

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11. Abbreviations

ACF	Australian Conservation Foundation
Ag.Vic.	Department of Agriculture Victoria
AROT	Australian Rare or Threatened Species
BAP	Biodiversity Action Plans
BVT	Broad Vegetation Types
ECC	Environment Conservation Council
EVC	Ecological Vegetation Class
FFG	Flora and Fauna Guarantee
FNC	Field Naturalists Club
FVC	Floristic Vegetation Community
CAMBA	China-Australia Migratory Bird Agreement
CFA	Country Fire Authority
CHW	Central Highlands Water
CLPR	Centre for Land Protection Research
CMA	Catchment Management Authority
CNR	Department of Conservation and Natural Resources
DEM	Department of Energy & Minerals
EA	Environment Australia
GAV	Greening Australia Victoria
GERG	Grassy Ecosystem Reference Group
GIS	Geographic Information System
GMW	Goulburn Murray Water
IC	Implementation Committees
IFFA	Indigenous Flora and Fauna Association
JAMBA	Japan- Australia Migratory Bird Agreement
LAP	Landcare Action Plans
LFW	Land for Wildlife
LPIS	Land Protection Incentive Scheme
MDBC	Murray Darling Basin Commission
MPE	Ministry for Planning and Environment
MPV	Minerals and Petroleum Victoria
North Central CMA	North Central Catchment Management Authority
NLP	National Landcare Program
NHT	Natural Heritage Trust
NRE	Natural Resources and Environment
NVP	Native Vegetation Plan
NVR	Native Vegetation Retention controls
RFA	Regional Forest Agreement
RMA	River Management Authority
RMU	Resource Management Units
SMP	Salinity Management Plans
TFN	Trust for Nature (Victoria)
UNCED	United Nations Conference on Environmental Development
VFF	Victorian Farmers Federation
VF&GA	Victorian Field and Game Association
VNPA	Victorian National Parks Association
VRAC	Victorian Roadsides Advisory Committee
VROT	Victorian Rare or Threatened Species
WAP	Waterways Action Plan

12. Glossary of terms

Biodiversity	The variety of all life-forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part.
Bioregions	Biogeographic areas that capture the patterns of ecological characteristics in the landscape or seascape, providing a natural framework for recognising and responding to biodiversity values.
Broad Vegetation Types (BVT)	A classification that provides a simplified view of vegetation based on land system or biophysical attributes (such as geology, rainfall, elevation, soil type and landform). Each broad vegetation type will contain a mixture of EVCs, often in a recognisable pattern, however any one EVC can occur in more than one BVT.
CAMBA	Chinese-Australian Migratory Bird Agreement
Ecological Vegetation Class (EVC)	A type of native vegetation classification that is described through a combination of its floristic, life form, and ecological characteristics, and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities (i.e. a lower level in the classification that is based solely on groups of the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
Habitat-hectare	A site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type.
JAMBA	Japanese-Australian Migratory Bird Agreement
Net Gain	Over a specified area and period of time, losses of native vegetation and habitat, as measured by a combined quality-quantity measure (habitat-hectare), are reduced, minimised and more than offset by commensurate gains.
Regional (or catchment) management scale	Refers to areas ranging from tens to hundreds of kilometres across, and involves the co-ordination of processes to engage the broad range of landholders, organised interest groups and government agencies. A perspective at this level facilitates medium to long term strategic planning for sustainable land and water management, and for conservation reserve systems.
Landscape scale management	Refers to areas from several kilometres to tens of kilometres across, usually involving a number of properties and individual land managers. At this level, consideration can be given effectively to differences in native vegetation type, coverage and quality, including spatial configuration and connectivity of habitats, and other factors influencing biodiversity and land protection in the local landscape.
Patch (or block) scale management	Relates to a discrete stand of native vegetation usually within a single rural property, and focuses on the size, shape and location of the patch and on the type(s) of vegetation. This level permits useful insight into how to best protect or enhance the value of patches as habitat and/or for land protection.
Site scale management	Refers to highly localised activities that may influence the characteristics of vegetation occurring within or adjacent to a patch. Such activities include planting, direct seeding or regeneration of vegetation, as well as weed control or thinning in established vegetation.

13. Appendices

Appendix 1 Condition of the North Central Catchment Management Authority Area

Issue	Major causes	Extent/impacts
DRYLAND SALINITY	Geology & removal of perennial vegetation from	Currently 30,390 ha of dryland affected by salinity with another 140,000 ha at high risk of salinisation.

Issue	Major causes	Extent/impacts
	high recharge areas and replacing with annual pastures and crops.	Approximately 204,000 tonnes of salt each year is exported from the North Central dryland region into the Murray River increasing the rivers salinity by 18.9 EC at Morgan in South Australia. Total identifiable cost of salinity in the dryland region is $7.3 million per annum.
IRRIGATION SALINITY	Geology & traditional irrigation practices such as over watering, poor drainage, clearing of perennial vegetation and replacing with annual pastures and crops.	Currently 62 per cent of all the irrigated land in the region is salt affected. Currently salinity in the irrigation areas reduces potential production by 15 per cent and annual loses are predicted to rise to 25 per cent in the future if nothing is done.
BIODIVERSITY DECLINE - REMNANT VEGETATION	Clearing of native vegetation, habitat loss and fragmentation, salinity, rising watertables, livestock grazing and cultivation.	Only 12.7 per cent of the vegetation that existed prior to European Settlement remains in the Region. Of the 11 broad vegetation types (BVTs), four have less than 6 per cent of their original cover remaining.
BIODIVERSITY DECLINE – RIPARIAN COMMUNITIES	Weed invasion, flooding and floodplain management, excessive grazing, saline groundwater and instream flows, irrigation and alteration of water regimes and flows changing the natural water levels, alluvial mining, and recreational purposes along streamsides.	Riparian vegetation is among the most depleted and poorly reserved ecosystems in the region, particularly sedge-grassy communities on minor drainage lines. Only 7 per cent of the rivers and streams are in good to excellent condition with 31 per cent being in moderate condition and 61 per cent are in poor to very poor condition.
BIODIVERSITY DECLINE – WETLAND DEGRADATION	Drainage, alteration of water regimes and flows, excessive grazing, cultivation, weed invasion, carp, rising groundwater tables and salinity.	There has been a 47 per cent reduction in the extent of freshwater meadows, 66 per cent of shallow freshwater marshes and 68 per cent of deep freshwater marshes since European settlement. Many of the lakes and wetlands in the north of the region are becoming highly saline and ephemeral, resulting in an increase in the area and number of semi permanent and permanent saline wetlands.
BIODIVERSITY DECLINE FLORA AND FAUNA	Clearance of native vegetation, habitat loss and fragmentation, livestock grazing and cultivation, weed	There are 75 endangered and rare fauna species and 112 flora species that are rare or threatened on a national, state or regional level. Flora and fauna species are still reducing in number and range, whilst the clearance of native vegetation is still exceeding the rate of native

Issue	Major causes	Extent/impacts
	invasion, pest animals e.g. foxes, dogs and cats, Rabbits and hares	vegetation establishment.
SOIL ACIDIFICATION	Agricultural practices have accelerated the rate of acidification. The leaching of nitrates beyond the root zone. Applying nitrogenous fertilisers and incorporating legumes into pastures has increased the level of soil nitrate. The removal of nutrients in grain and animal products particularly hay have also contributed to increase soil acidification.	Soil acidity is a major issue in the upper reaches of the North Central region. The problem is largely associated with dryland farming areas, particular grazing zones above 500mm rainfall. Overall 31 per cent of the region soils are either moderately, strongly or extremely acidic. In particular in the Loddon and Campaspe where nearly 50 per cent of their soils are in these categories.
SOIL EROSION	Large scale clearing of native vegetation, gold mining activities and agricultural activities such as over grazing and cultivation. In addition drought and high grazing pressure from rabbits have denuded the vegetation cover.	The impacts of soil erosion on the region are, loss of productive topsoil, loss of soil nutrients and organic matter, damage to private and public utilities, water deterioration in town water supplies, rivers, streams and wetlands and increased farm costs and decreased financial returns. Over 682,000 ha or 22 per cent of the region suffers from either moderate to severe sheet and rill erosion. Over 837,000 ha or 27 per cent of the region suffers from either moderate to severe gully and tunnel erosion.
SOIL STRUCTURE DECLINE	Soil structure decline is caused by direct physical alteration of the soil aggregates due to agricultural practices like cultivation, excessive grazing, land levelling, rolling, traffic of farm equipment, land clearing and replacing native vegetation with annual crops and pastures. It also results from changes in soil chemistry and hydrological processes on a large scale, such as acidification, salinisation and waterlogging.	Poor soil structure results in surface crusting, compaction layers or hard pans and a low aggregate stability. This causes reduced water infiltration and percolation, increased waterlogging and drainage problems, reduce aeration and root development and plant growth. The impacts of poor soil structure decline include reduced water use efficiency of crops and pastures, reduced irrigation efficiency, reduced crop and pasture yields, soil erosion, salinity and flooding, higher production costs and possible limitation of the diversity of crops and pasture species that can be grown. The North Central region has more than 52 per cent of its soils rated as having severe structural problems, while another 19 per cent have moderate structural problems.
WATER QUALITY DECLINE	Alterations to water regimes and flows i.e.	Only 7 per cent of the rivers and streams are in good to excellent condition with 31 per cent being in moderate

Issue	Major causes	Extent/impacts
	interfering with the natural flows of water, salinity, carp, soil erosion, sedimentation, livestock grazing and access to waterways, drainage from urbanisation, and nutrient loads from agriculture and mining.	condition and 61 per cent are in poor to very poor condition. The deterioration in stream quality impact upon biodiversity of riparian and aquatic flora and fauna, thus impacting on the environmental, recreation and economic values of waterways. The region has the highest incidence of blue-green algae in the State and this is causing widespread concern regarding its effect on health, agriculture and industry.
FLOODING	Increased runoff due to removal of perennial vegetation, increasing urbanisation, alteration to surface catchment e.g. drainage lines, laser grading, banking, siltation of watercourses and reservoirs reducing storage capacity, higher watertables.	More runoff is now being produced and floods are increasing in frequency, duration and size throughout the region. The impacts of floods on the region are damage to infrastructure and services e.g. roads, loss of livestock, crops, farm infrastructure e.g. fences, soil erosion and siltation that degrade and reduce land capability. It has a serious impact on farm viability. Flooding is a major issue along the Bullock Creek, Bendigo Creek, and the entire lower Loddon and lower Avoca floodplain areas. It is also a major issue affecting the Echuca and Swan Hill urban areas.
POOR DRAINAGE	Infrastructure construction such as roads, railways, levee banks, irrigation systems. Poor soil structure, high watertables, siltation of waterways and storages and pest weed growth in waterways. Inadequate drainage systems in place.	The main extent of poor drainage is on the irrigation areas of the region. The impacts are waterlogging that reduces or destroys crop and pasture production, increased accessions to the watertable that results in salinity, loss of ecologically valuable features and habitat such as remnant vegetation that is suited to drier conditions plus structural damage to roads buildings and other infrastructure.
PEST PLANT INFESTATION	Agriculture is the principle source of most environmental weeds. Through the movement of livestock, the distribution of contaminated fodder (both hay and grain), transported by machinery along roadsides e.g. graders, gravel etc. Wind, water and animals such as foxes and birds are also causes of infestations.	Currently there are 75 different noxious weeds throughout the region. The highest concentrations of introduced plant species in Victoria is in the northern parts of the state, with over 25 per cent of flora being non-indigenous.
PEST ANIMAL PROLIFERATION	Introduction by humans, adapted to climate and conditions, lack of predators and natural controls, agriculture providing a food source	Foxes and rabbits are the main pests on land while carp is a major pest in waterways of the region. They compete with and prey on native fauna and the rabbit and carp have displaced native fauna by destroying their habitats, increasing soil erosion and decreasing water quality.

Issue	Major causes	Extent/impacts
	e.g. lambs and grass.	

Appendix 2 Provisional Assessment of the Conservation Status of Ecological Vegetation Classes

Assessment of the conservation status of vegetation types is traditionally based on the broad concepts of inherent rarity, degree of threat (including consideration of historic and on-going impacts) and importance for supporting other significant features (for example, as a drought refuge for native fauna). These concepts have been expressed as more specific criteria in a number of processes at State and National levels.

The Regional Forest Agreement process undertaken in partnership by Commonwealth and State agencies used National Forest Reserve Criteria which included a number of biodiversity criteria for establishing a *Comprehensive Adequate and Representative reserve system* (outlined in JANIS 1997). Some of these criteria can be used as the basis for assessing conservation status of vegetation types in the Native Vegetation Plan (NVP) process.

However, there are inherent differences between the processes - RFAs focus primarily on establishing a reserve system for forests in largely natural landscapes across public land, while NVPs focus primarily on prioritising protection of all types of remnant vegetation in rural landscapes across private land. These differences necessitate a refinement of the criteria. The key refinements are as follows:

- Depletion and rarity of occurrence assessments are made within a Victorian bioregional framework which is more informative than the RFA study area framework.
- Combinations of depletion-degradation-rarity which give equivalent conservation status to depletion-only thresholds are more explicitly defined.
- A “depleted” category is added to allow identification of vegetation types which may become threatened if broad-scale depletion or degradation activities are not managed appropriately.

The criteria are detailed in the following Appendix and have been used to assign a provisional conservation status for each combination of EVC and bioregion. The status of each combination may be amended with time as more complete or better scale mapping of vegetation type and condition becomes available.

Where an EVC is only a minor occurrence in a bioregion it is assigned the conservation status from an appropriate neighbouring bioregion, unless the occurrence is considered to represent a threatened floristic community. Complexes/mosaics are assigned the conservation status of the most threatened component EVC. Similarly, where threatened EVCs / floristic communities are known to exist but mapping is not available at this level of discrimination, decision-making processes based on more generalised datasets (for example, Broad Vegetation Types at 1:250 000) should be driven by the conservation status of the most threatened component likely to be present in a mapped polygon.

Definitions used in the criteria are:

Subject to a threatening process includes currently acting threats that will lead to degradation (moderate or severe) OR risk of significant rapid change (e.g. rising groundwater; change of land use)

Majority means greater than 50 per cent of area

Minority means greater than 10 per cent and up to 50 per cent of area

Severely degraded floristic and/or structural diversity is greatly reduced (and/or subject to a threatening process which will lead to an equivalent reduction) and unlikely to recover naturally in medium to long term

Moderately degraded floristic and/or structural diversity is significantly reduced (and/or subject to a threatening process which will lead to an equivalent reduction) but may recover naturally with removal of threatening processes little to no degradation floristic and/or structural diversity is largely intact

Range area of smallest concave polygon which includes all occurrences

Appendix 3 Conservation Status Categories for Ecological Vegetation Classes (EVCs) At Bioregional Level

The conservation status of EVCs mapped as occurring as mixed mosaics or complexes, is derived from the most threatened component EVC

Table 13.1 EVC Bioregional Conservation Status

Code	Status	Definition
X	presumed extinct	Probably no longer present in the bioregion OR if present, below the resolution of available mapping.
E	endangered	Less than 10 per cent of former range OR less than 10 per cent of pre-European extent remains (or a combination of depletion, loss of quality, current threats and rarity that gives a comparable status e.g. 10 to 30 per cent pre-European extent remains and severely degraded over a majority of this area; OR naturally restricted EVC reduced to 30 per cent or less of former range and moderately degraded over a majority of this area; OR rare EVC cleared and/or moderately degraded over a majority of this area).
V	vulnerable	10 to 30 per cent of pre-European extent remains (or a combination of depletion, loss of quality, current threats and rarity that gives a comparable status e.g. greater than 30 per cent and up to 50 per cent pre-European extent remains and moderately degraded over a majority of this area; OR greater than 50 per cent pre-European extent remains and severely degraded over a majority of this area; OR naturally restricted EVC where greater than 30 per cent pre-European extent remains and moderately degraded over a majority of this area; OR rare EVC cleared and/or moderately degraded over a minority of former area).
D	depleted	Greater than 30 per cent and up to 50 per cent of pre-European extent remains (or a combination of depletion, loss of quality, current threats and rarity that gives a comparable status e.g. greater than 50 per cent pre-European extent remains and moderately degraded over a majority of this area).
R	rare	Rare (as defined by geographic occurrence) but neither depleted, degraded nor currently threatened to an extent that would qualify as endangered, vulnerable or depleted.
LC	least concern	Greater than 50 per cent or pre-European extent exists and subject to little to no degradation over a majority of this area.
na	not applicable	The map unit is not a distinct native vegetation type and conservation status is not applicable.

Appendix 4 Calculating the Conservation Significance of Native Vegetation

Table 13.2 Biodiversity Attributes

Conservation Significance	VEGETATION TYPES		OR Species	OR Other Attributes
	Conservation Status	Habitat Score		
VERY HIGH	Endangered Vulnerable Rare	0.4 – 1 0.5 – 1 0.6 – 1	best 50 per cent of habitat for each threatened species in a Victorian bioregion	Sites with unique National Estate values. Sites identified as being of national significance as a relict, endemic, edge of range or other non-species values Ramsar, JAMBA/CAMBA. Sites for migratory birds areas identified as providing refuges (e.g. during drought) for threatened species.
HIGH	Endangered Vulnerable Rare Depleted	< 0.4 0.3 – 0.5 0.3 < 0.6 0.6 – 1	the remaining 50 per cent of habitat for threatened species in a Victorian bioregion best 50 per cent of habitat for rare species in a Victorian bioregion	Sites with rare National Estate values. Sites identified as being of state significance for relictual, endemic edge of range or other non-species values. Areas identified as providing refuges (e.g. during drought) for rare species. Priority areas for the re-establishment of habitat for a threatened species (e.g. as determined in a Biodiversity Action Plan).
MEDIUM	Vulnerable Rare Depleted Least Concern	< 0.3 < 0.3 0.3 < 0.6 0.6 – 1	the remaining 50 per cent of habitat for rare species in a Victorian bioregion best 50 per cent of habitat for regionally significant species	Sites with uncommon National Estate values. Sites identified as being of regional significance for edge of range or other non-species values.
LOW	Depleted Least Concern	< 0.3 < 0.6		

Note: Details of all threatened flora and fauna species in the North Central region are described in **Appendix 7** and **Appendix 8** respectively.

* as assessed by guidelines for assessing regeneration potential

Appendix 5 Bioregional Analysis of EVCs in North Central Victoria

Conservation status analysis by David Parkes DSE November 2003 Area analysis by Stephen Farrell Spatial Vision 10 March 2006

Table 13.3 EVC Geographic Occurrence Brief Definition

R	Rare	total range generally < 10 000haOR pre-European extent in Victorian bioregion < 1000ha ORpatch size generally < 100ha
NR	Naturally Restricted	pre-European extent in Victorian bioregion < 10 000ha
C	Common	pre-European extent in Victorian bioregion > 10 000ha
M	Minor	pre-European extent in Victorian bioregion less than approx. 1 per cent of statewide extent
na	not applicable	the map unit is not a distinct native vegetation type and geographic occurrence is not applicable

Table 13.4 Explanation of Terms Above

Current threats	includes currently acting threats that will lead to degradation (moderate or severe) OR risk of significant rapid change (e.g. rising groundwater; change of land use)
Majority	greater than 50 per cent of area
Minority	greater than 10 per cent and up to 50 per cent of area
Severely degraded	floristic and/or structural integrity is greatly reduced (and/or subject to a threatening process which will lead to equivalent reduction) and unlikely to recover naturally in medium to long-term
Moderately degraded	floristic and/or structural integrity is significantly reduced (and/or subject to a threatening process which will lead to equivalent reduction) but may recover naturally with removal of threatening processes
Little to no degradation	floristic and/or structural integrity is largely intact
Range	area of smallest concave polygon which includes all occurrences

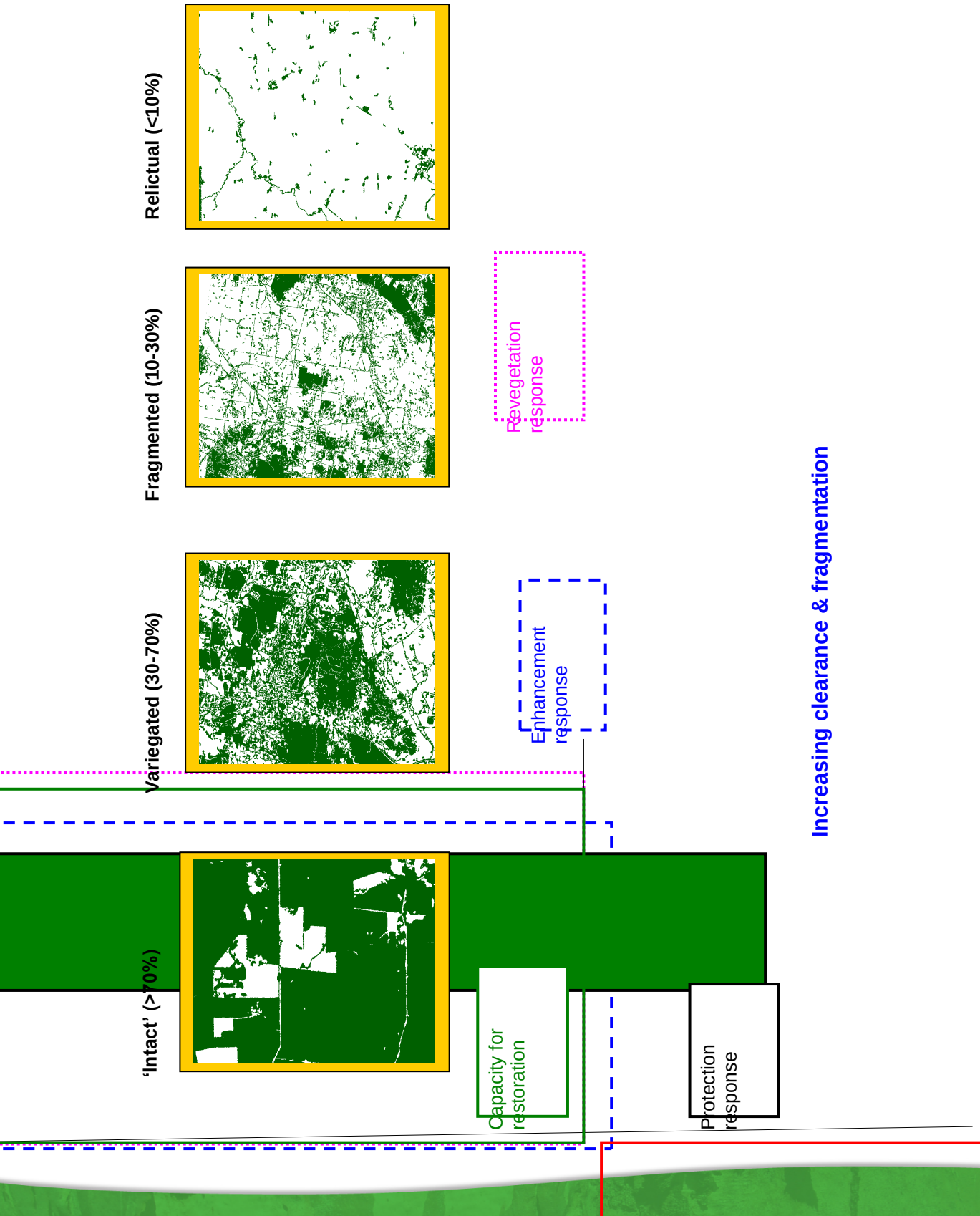
Table 13.5 Map Unit Brief Description

veg group	a general group of vegetation types above the level of EVC
EVC	a pure occurrence of an Ecological Vegetation Class
EVC-plant	native vegetation-plantation hybrid, where the overstorey is planted but there is sufficient re-establishment of species indigenous to the site to identify the EVC
FC	a pure occurrence of a floristic community
Complex	a blend between two or more EVCs that cannot be separately mapped at any scale
Mosaic	a combination of two or more EVCs that could be separately mapped at a better scale
c/m (Gmp)	a complex or mosaic from 1:25 000 mapping - numerous combinations but always small in area
no EVC id.	identified as woody or non-woody vegetation from remote-sensing but no EVC assigned as yet
No nat TC	private land with no native tree cover as identified from remote-sensing
no veg	an area where native vegetation has never been(e.g. sandy beach or natural lake) or has permanently gone (e.g. quarry or artificial lake)
Unknown	not assessed as yet

Table 13.6 Bioregional Conservation Status of EVCs Area Statement

Please refer to Appendix 15 'Revised Bioregional Conservation Status of EVCs Area Statement' as a separate attachment on the North Central CMA website

Appendix 6 Landscape approach based on the proportion of native vegetation remaining



Appendix 7 Rare and Threatened Flora Species for the North Central CMA Region

Species Name	Common Name	Family	AROTS	VROTS	FFGAS
National significance					
Acacia ausfeldii	Ausfeld's Wattle	MIMOSACEAE	R	v	
Acacia williamsonii	Whirrakee Wattle	MIMOSACEAE	R	r	
Amphibromus fluitans	River Swamp Wallaby-grass	POACEAE	V/V	k	
Amphibromus pithogastrus	Swollen Swamp Wallaby-grass	POACEAE	K	eL	
Austrostipa breviglumis	Cane Spear-grass	POACEAE	R	r	
Ballantinia antipoda	Ballantinia	BRASSICACEAE	E/E	eL	
Caladenia audasii	Audas Spider-orchid	ORCHIDACEAE	E/E	eL	24
Caladenia carnea var. ornata	Ornate Pink Fingers	ORCHIDACEAE	V/V	v	
Caladenia concolor	Crimson Spider Orchid	ORCHIDACEAE	V/V	eL	
Caladenia magnifica	Magnificent Spider orchid	ORCHIDACEAE	K	kL	
Caladenia rosella	Rosella Spider Orchid	ORCHIDACEAE	E	eL	
Caladenia versicolor	Candy Spider orchid	ORCHIDACEAE	V/V	v	
Caladenia xanthochila	Yellow-lip Spider Orchid	ORCHIDACEAE	E/E	eL	
Callitriche cyclocarpa	Western Water Starwort	CALLITRICHACEAE	V/V	v	
Cullen parvum	Small Scurf-pea	FABACEAE	E/E	eL	31
Cyphanthera anthocercidea	Large-leaf Ray-flower	SOLANACEAE	R	r	
Discaria pubescens	Hairy Anchor Plant	RHAMNACEAE	R	vL	47
Dodonaea procumbens	Trailing Hop-bush	SAPINDACEAE	V/V	v	
Elachanthus glaber	Shiny Elachanth	ASTERACEAE	R	r	
Eragrostis infecunda	Barren Cane Grass	POACEAE	V		
Eriocaulon australasicum	Southern Pipewort	ERIOCAULACEAE	E/E	eL	97
Eucalyptus froggattii	Kamarooka Mallee	MYRTACEAE	R	vL	27
Euphrasia collina ssp muelleri	Purple Eyebright	SCROPHULARIACEAE	E/E	e	
Euphrasia scabra	Rough Eyebright	SCROPHULARIACEAE	K	eL	10
Genoplesium despectans	Sharp Midge-orchid	ORCHIDACEAE	K		
Glycine latrobeana	Clover Glycine	FABACEAE	V/V	vL	
Grevillia floripendula	Drooping Grevillea	PROTEACEAE	V/V	v	
Grevillea obtecta	Fryerstown Grevillea	PROTEACEAE	R	r	
Grevillea repens	Creeping Grevillea	PROTEACEAE	R	r	
Hibbertia humifusa	Rising Star Guinea-flower	DILLENIACEAE	R	r	
Lepidium hyssopifolium	Basalt Pepper-cress	BRASSICACEAE	E/E	eL	
Lepidium monoplocoides	Winged Pepper-cress	BRASSICACEAE	E/E	eL	
Lepidium pseudopapillosum	Erect Pepper-cress	BRASSICACEAE	V/V	eL	
Maireana cheelii	Chariot Wheels	CHENOPODIACEAE	V	v	
Maireana rohrlachii	Rohlach's Bluebush	CHENOPODIACEAE	R		
Myriophyllum porcatum	Ridged Water-milfoil	HALORAGACEAE	V/V	v	
Olearia pannosa ssp. Cardiophylla	Velvet Daisy-bush	ASTERACEAE	R	vL	
Phebalium festivum	Dainty Phebalium	RUTACEAE	R	vL	
Pimelia spinescens ssp. Spinescens	Spiny Rice-flower	RUTACEAE	V/V	e	
Prasophyllum campestre	Plains Leek-orchid	ORCHIDACEAE	R	e	
Prasophyllum frenchii	Maroon Leek-orchid	ORCHIDACEAE	E/E	e	
Pterostylis despectans	Lowly Greenhood	ORCHIDACEAE	E/E	eL	
Ptersotylis smaragdyna	Emerald-lip Greenhood	ORCHIDACEAE	R	r	
Pultenaea weindorferi	Swamp Bush-pea	FABACEAE	R	r	
Rutidosis leptorhynchoides	Button Wrinklewort	ASTERACEAE	E/E	eL	28
Sclerolaena napiformis	Turnip Bassia	CHENOPODIACEAE	E/E	eL	
Senecio behrianus	Stiff Groundsel	ASTERACEAE	E/E	eL	12
Senecio laticostatus	Fin-fruit Fireweed	ASTERACEAE	V/V	v	
Swainsona murrayana	Murray Swainson-pea	FABACEAE	V/V	VeL	

Species Name	Common Name	Family	AROTS	VROTS	FFGAS
Swainsona plagiotropis	Red Swainson-pea	FABACEAE	V/V	VeL	
Thesium australe	Austral Toad-flax	SANTALACEAE	V/V	VeL	56
Westringia crassifolia	Whipstick Westringia	LAMIACEAE	E/E	EeL	40
State Significance					
Acacia deanei	Deane's Wattle	MIMOSACEAE		r	
Acacia deanei ssp. paucijuga	Deane's Wattle	MIMOSACEAE		r	
Acacia flexifolia	Bent-leaf Wattle	MIMOSACEAE		r	
Acacia lineata	Streaked Wattle	MIMOSACEAE		r	
Acacia melvillei	Myall	MIMOSACEAE		v	
Acacia nano-dealbata	Dwarf Silver Wattle	MIMOSACEAE		r	
Acacia omalophylla	Yarran Wattle	MIMOSACEAE		eL	
Acacia pendula	Weeping Myall	MIMOSACEAE		eL	86
Acacia trineura	Three-nerve Wattle	MIMOSACEAE		v	
Agrostis aemula var. setifolia	Gilgai Blown-grass	POACEAE		v	
Agrostis avenacea var. perennis	Wetland Blown-grass	POACEAE		k	
Allocasuarina luehmannii	Buloke	CASUARINACEAE		L	
Alternanthera nodiflora	Common Joyweed	AMARANTHACEAE		k	
Alternanthera sp. 1 (Plains)	Plains Joyweed	AMARANTHACEAE		k	
Amaranthus macrocarpus var. macrocarpus	Dwarf Amaranth	AMARANTHACEAE	v		
Ammannia multiflora	Jerry-jerry	LYTHRACEAE		v	
Amyema linophylla ssp. orientale	Buloke Mistletoe	LORANTHACEAE		v	
Aristida jerichoensis var. subspinulifera	Jericho Wire-grass	POACEAE	e		
Aristida obscura	Rough-seed Wire-grass	POACEAE		e	
Arthropodium sp. 3 (aff. strictum)	Small Chocolate-lily	ANTHERICACEAE	k		
Asperula gemella	Twin-leaf Bedstraw	RUBIACEAE		r	
Atriplex australasica	Native Orache	CHENOPODIACEAE		k	
Atriplex lindleyi ssp. linkleyi	Flat-top Saltbush	CHENOPODIACEAE		k	
Atriplex pseudocampanulata	Mealy Saltbush	CHENOPODIACEAE		r	
Atriplex stipitata	Kidney Saltbush	CHENOPODIACEAE		v	
Austrodanthonia bipartita s.s.	Leafy Wallaby-grass	POACEAE		k	
Austrodanthonia induta	Shiny Wallaby-grass	POACEAE		k	
Austrodanthonia monticola	Small-flower Wallaby-grass	POACEAE		r	
Austrodanthonia setacea var. breviseta	Short-bristle Wallaby-grass	POACEAE		r	
Austrodanthonia sp. (syn Danthonia procera)	Tall Wallaby-grass	POACEAE	k		
Austrostipa gibbosa	Spurred Spear-grass	POACEAE		r	
Austrostipa hemipogon	Half-bearded Spear-grass	POACEAE		r	
Austrostipa puberula	Fine-hairy Spear-grass	POACEAE		r	
Austrostipa setacea	Corkscrew Spear-grass	POACEAE		r	
Austrostipa tenuifolia	Long-awn Spear-grass	POACEAE		v	
Bolboshoenus fluviatilis	Tall Club-sedge	CYPERACEAE		k	
Bossiaea cordigera	Wiry Bossiaea	FABACEAE		r	
Bossiaea riparia	River Leafless Bossiaea	FABACEAE		r	
Brachyscome chrysoglossa	Yellow-tongue Daisy	ASTERACEAE		v	
Brachyscome debilis	Weak Daisy	ASTERACEAE		v	
Brachyscome gracilis	Dookie Daisy	ASTERACEAE		v	
Brachyscome readeri	Reader's Daisy	ASTERACEAE		r	
Caladenia australis	Southern Spider-orchid	ORCHIDACEAE		k	
Caladenia leptochila	Narrow-lip Spider-orchid	ORCHIDACEAE		k	

Species Name	Common Name	Family	AROTS	VROTS	FFGAS
Caladenia reticulata s.s.	Veined Spider Orchid	ORCHIDACEAE		v	
Caladenia toxochila	Bow-lip Spider-orchid	ORCHIDACEAE		v	
Callitriche sonderi	Matted Water-starwort	CALLITRICHACEAE		k	
Callitriche umbonata	Winged Water-starwort	CALLITRICHACEAE		v	
Callitris glaucophylla	White Cypress-pine	CUPRESSACEAE		d	
Calochilus imberbis	Naked Beard-orchid	ORCHIDACEAE		r	
Cardamine tenuifolia	Slender Bitter-cress	BRASSICACEAE		k	
Carex chlorantha	Green-top Sedge	CYPERACEAE		k	
Centipeda thespidioides	Desert Sneezeweed	ASTERACEAE		r	
Cheilanthes lasiophylla	Wooly Cloak-fern	ADIANTACEAE		r	
Chenopodium desertorum ssp. Desertorum	Frosted Goosefoot	CHENOPODIACEAE	k		
Chenopodium desertorum ssp. Rectum	Frosted Goosefoot	CHENOPODIACEAE	v		
Chenopodium desertorum ssp. Virosum	Frosted Goosefoot	CHENOPODIACEAE	k		
Choretrum glomeratum var. chrysanthum	Common Sourbush	SANTALACEAE	k		
Comesperma polygaloides	Small Milkwort	POLYGALACEAE		vL	96
Craspedia paludicola	Swamp Billy-buttons	ASTERACEAE		v	
Cullen cinereum	Hoary Scurf-pea	FABACEAE		eL	
Cullen tenax	Tough Scurf-pea	FABACEAE		eL	
Cuscuta tasmanica	Golden Dodder	CUSCUTACEAE		k	
Cynodon dactylon var. pulchellus	Native Couch	POACEAE		k	
Cyperus bifax	Downs Flat-sedge	CYPERACEAE		v	
Cyperus concinnus	Trim Flat-sedge	CYPERACEAE		v	
Cyperus victoriensis	Flat-sedge	CYPERACEAE		k	
Dactyloctenium radulans	Finger Grass	POACEAE		r	
Dampiera dysantha	Shrubby Dampiera	GOODENIACEAE		r	
Daviesia genistifolia	Broom Bitter-pea	FABACEAE		r	
Deschampsia caespitosa	Tufted Hair Grass	POACEAE		r	
Desmodium varians	Slender Tick-trefoil	FABACEAE		k	
Dianella porracea	Riverina Flax-lily	PHORMIACEAE		r	
Digitaria ammophila	Silky Umbrella Grass	POACEAE		v	
Digitaria brownii	Cotton Panic-grass	POACEAE		k	
Digitaria divaricatissima	Umbrella grass	POACEAE		v	
Diplachne fusca	Brown-Beetle-grass	POACEAE		r	
Dipodium pardalinum	Spotted Hyacnth-orchid	ORCHIDACEAE		r	
Diuris behrii	Golden Cowslips	ORCHIDACEAE		v	
Diuris palustris	Swamp Diuris	ORCHIDACEAE		v	
Diuris punctata var. punctata	Purple Diuris	ORCHIDACEAE		vL	
Dodonaea boroniifolia	Hairy Hop-bush	SAPINDACEAE		r	
Eleocharis pallens	Pale Spike-sedge	CYPERACEAE		v	
Elytrophorus spicatus	Spike Grass	POACEAE		x	
Eragrostis australasica	Cane Grass	POACEAE		v	
Eragrostis falcata	Sickle Love-grass	POACEAE		k	
Eragrostis lacunaria	Purple Love-grass	POACEAE		v	
Eragrostis setifolia	Bristly Love-grass	POACEAE		v	
Eremophila sturtii	Narrow-leaf Emu-bush	MYOPORACEAE		eL	
Eryngium paludosum	Long Eryngium	APIACEAE		v	
Eucalyptus aggregata	Black Gum	MYRTACEAE		eL	84
Eucalyptus brookeriana	Brooker's Gum	MYRTACEAE		r	
Euphorbia planiticola	Plains Spurge	EUPHORBIACEAE		eL	

Species Name	Common Name	Family	AROTS	VROTS	FFGAS
Euphrasia collina ssp. speciosa	Purple Eyebright	EUPHORBIACEAE		x	
Fimbristylis dichotoma	Common Fringe-sedge	CYPERACEAE		v	
Gahnia microstachya	Slender Saw-sedge	CYPERACEAE		r	
Genoplesium ciliatum	Fringed Midge-orchid	ORCHIDACEAE		k	
Glossostigma cleistanthum	Spoon Mud-mat	SCROPHULARIACEAE	r		
Glycine canescens	Silky Glycine	FABACEAE		eL	
Goodenia benthamiana	Clasping Goodenia	GOODENIACEAE		r	
Goodia medicaginea	Western Golden-tip	FABACEAE		r	
Grevillea dryophylla	Goldfields Grevillea	PROTEACEAE		r	
Haloragis glauca forma glauca	Bluish Raspwort	HALORAGACEAE		k	
Halosarcia nitida	Shining Glasswort	CHENOPODIACEAE		r	
Helichrysum aff. rutidolepis (Lowland Swamps)	Pale Swamp Everlasting	ASTERACEAE		v	
Isolepis congrua	Slender Club-sedge	CYPERACEAE		v	
Isolepis victoriensis	Victorian Club-sedge	CYPERACEAE		k	
Ixiolaena sp. (syn Leptorhynchos panaetioides)	Woolly Buttons	ASTERACEAE	r		
Juncus psammophilus	Sand Rush	JUNCACEAE		r	
Lemna trisulca	Ivy-leaf Duckweed	LEMNACEAE		k	
Lepidium fasciculatum	Bundled Pepper-cress	BRASSICACEAE		k	
Lepidium phlebopetalum	Veined Pepper-cress	BRASSICACEAE		e	
Lepidium pseudohyssopifolium	Native Pepper-cress	BRASSICACEAE		k	
Leptorhynchos elongatus	Lanky Buttons	ASTERACEAE		e	
Leptorhynchos scabrus	Annual Buttons	ASTERACEAE		eL	
Leucochrysum albicans sso, albicans var. tricolor	Hoary Sunray	ASTERACEAE	e		
Maireana aphylla	Leafless Bluebush	CHENOPODIACEAE		v	
Maireana excavata	Bottle Bluebush	CHENOPODIACEAE		v	
Maireana humillima	Dwarf Bluebush	CHENOPODIACEAE		r	
Maireana triptera	Three-wing Bluebush	CHENOPODIACEAE		r	
Marsilea mutica	Smooth Nardoo	MARSILEACEAE		k	
Melaleuca armillaris ssp. armillaris	Giant Honey-myrtle	MYRTACEAE	r		
Melaleuca halmaturorum ssp. halmaturorum	Salt Paperbark	MYRTACEAE	vL		
Minuria cunninghamii	Bush Minuria	ASTERACEAE		r	
Minuria intergerrima	Smooth Minuria	ASTERACEAE		r	
Muehlenbeckia horrida	Spiny Lignum	POLYGONACEAE		k	
Mukia micrantha	Mallee Cucumber	CUCURBITACEAE		r	
Myoporum montanum	Waterbush	MYOPORACEAE		r	
Orobanche cernua var. autraliana	Australian Broomrape	OROBANCHACEAE		k	
Oxalis thompsoniae	Fluffy-fruit Wood-sorrel	OXALIDACEAE		k	
Panicum decompositum	Australian Millet	POACEAE		k	
Philotheca difformis ssp. difformis	Small-leaf Wax-flower	RUTACEAE	r		
Picris squarrosa	Squat Picris	ASTERACEAE		r	
Pimelia flava ssp. dichotoma	Diosma Rice-flower	THYMELAEACEAE		r	
Pimelea spinescens	Spiny Rice-flower	THYMELAEACEAE		eL	
Poa drummondiana	Knotted Poa	POACEA		r	
Poa fordeana	Forde Poa	POACEA		k	
Podolepis canescens	Grey Podolepis	ASTERACEAE		r	
Prasophyllum lindleyanum	Green Leek-orchid	ORCHIDACEAE		v	
Prasophyllum patens	Broad-lip Leek-orchid	ORCHIDACEAE		r	

Species Name	Common Name	Family	AROTS	VROTS	FFGAS
Prasophyllum pyriforme s.s.	Silurian Leek-orchid	ORCHIDACEAE		k	
Pterostylis aciculiformis	Slender Ruddyhood	ORCHIDACEAE		k	
Pterostylis boormanii	Sikh's Whiskers	ORCHIDACEAE		r	
Ptersotylis maxima	Large Rustyhood	ORCHIDACEAE		v	
Pterostylis setifera	Bristly Greenhood	ORCHIDACEAE		r	
Ptilotus erubescens	Hairy-tails	AMARANTHACEAE		L	
Pultenaea graveolens	Scented Bush-pea	FABACEAE		vL	
Pultenaea muelleri var. reflexifolia	Mueller's Bush-pea	FABACEAE		k	
Pultenaea platyphylla	Flat-leaf Bush-pea	FABACEAE		r	
Quinetia urvillei	Quinetia	ASTERACEAE		r	
Ranunculus sessiliflorus var. pilulifer	Annual Buttercup	RANUNCULACEAE	k		
Ranunculus undosus	Swamp Buttercup	RANUNCULACEAE		v	
Rumex stenoglottis	Tongue Dock	POLYGONACEAE		k	
Santalum lanceolatum	Northern Sandalwood	SANTALACEAE		eL	
Scaevola depauperata	Skeleton Fan-flower	GOODENIACEAE		e	
Schoenus nanus	Tiny Bog-sedge	CYPERACEAE		k	
Sclerolaena birchii	Galvanised Burr	CHENOPODIACEAE		k	
Sclerolaena muricata var. semiglabra	Dark Roly-poly	CHENOPODIACEAE	k		
Sclerolaena uniflora	Two-spined Copperburr	CHENOPODIACEAE		r	
Senecio cunninghamii var. cunninghamii	Branching Groundsel	ASTERACEAE	k		
Senecio murrayanus	Murray Groundsel	ASTERACEAE		x	
Sida intricata	Twiggy Sida	MALVACEAE		v	
Sida trichopoda	Narrow-leaf Sida	MALVACEAE		r	
Sporobolus caroli	Yakka Grass	POACEAE		r	
Sporobolus creber	Western Rat-tail Grass	POACEAE		v	
Swainsona behriana	Southern Swainson-pea	FABACEAE		r	
Swainsona phacoides	Dwarf Swainson-pea	FABACEAE		e	
Swainson sericea	Silky Swainson-pea	FABACEAE		v	
Swainsona swainsonioides	Downy Swainson-pea	FABACEAE		e	
Teucrium albicaule	Scurfy Germander	LAMIACEAE		k	
Thelymitra luteocilium	Fringed Sun-orchid	ORCHIDACEAE		r	
Triglochin hexagonum	Six-point Arrow-grass	JUNCAGINACEAE		v	
Trigonella suavissima	Sweet Fenugreek	FABACEAE		r	
Tripogon loliiformis	Rye Beetle-grass	POACEAE		r	
Vittadinia condyloides	Club-hair New Holland Daisy	ASTERACEAE		r	
Vittadinia pterochaeta	Winged New Holland Daisy	ASTERACEAE		v	
Zieria aspalathoides	Whorled Zieria	RUTACEAE		vL	
Zygophyllum crenatum	Notched Twin-leaf	ZYGOPHYLLACEAE		r	

Source: Flora Information System, Department of Natural Resources & Environment.
Conservation Status:
Australian (AROTS): X = Extinct; E = Endangered; V = Vulnerable; R = Rare; K = poorly known.
EPBC Act (*Endangered Species protection Act* 1992, Schedule 1): E = Endangered; V = Vulnerable.
Victorian (VROTS): x = extinct; e = endangered; v = vulnerable; r = rare; k = poorly known.
FFG (*Flora and Fauna Guarantee Act* 1988): L = Listed under Schedule 2.
AS = Action Statement

Appendix 8 Threatened Fauna Species Recorded for the North Central CMA Region

Common Name	Scientific Name	Vic. Status	FFGAS	ANZECC	ESP Act
Birds					
Malleefowl	*Leipoa ocellata*	e L	59	V	V
Brown Quail	*Coturnix ypsilophora*	dd			
Little Button-quail	*Turnix velox*	dd			
Red-chested Button-quail	*Turnix pyrrhothorax*	v			
Plains-wanderer	*Pedionomus torquatus*	e L	66	V	V
Diamond Dove	*Geopelia cuneata*	v			
Lewin's Rail	*Rallus pectoralis*	e N			
Baillon's Crake	*Porzana pusilla*	v N			
Pied Cormorant	*Phalacrocorax varius*	lr			
Whiskered Tern	*Chlidonias hybridus*	lr			
Gull-billed Tern	*Sterna nilotica*	e N			
Caspian Tern	*Sterna caspia*	v N			
Eastern Curlew	*Numenius madagascariensis*	lr			
Painted Snipe	*Rostratula benghalensis*	e			
Bush Stone-curlew	*Burhinus grallarius*	e L	78		
Australian Bustard	*Ardeotis australis*	ce L			
Brolga	*Grus rubicunda*	v L			
Glossy Ibis	*Plegadis falcinellus*	v			
Royal Spoonbill	*Platalea regia*	v			
Little Egret	*Egretta garzetta*	ce L			
Intermediate Egret	*Ardea intermedia*	ce L			
Great Egret	*Ardea alba*	e L			
Nankeen Night Heron	*Nycticorax caledonicus*	v			
Little Bittern	*Ixobrychus minutus*	e N			
Australasian Bittern	*Botaurus poiciloptilus*	e N			
Cape Barren Goose	*Cereopsis novaehollandiae*	v			
Magpie Goose	*Anseranas semipalmata*	e			
Australasian Shoveler	*Anas rhynchotis*	v			
Freckled Duck	*Stictonetta naevosa*	e L			
Hardhead	*Aythya australis*	v			
Blue-billed Duck	*Oxyura australis*	v L			
Musk Duck	*Biziura lobata*	v			
Grey Goshawk	*Accipiter novaehollandiae*	lr			
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	eL	60		
Square-tailed Kite	*Lophoictinia isura*	eN			
Grey Falcon	*Falco hypoleucos*	ceL	83		
Black Falcon	*Falco subniger*	e			
Barking Owl	*Ninox connivens*	eL			
Powerful Owl	*Ninox strenua*	eL	92		
Masked Owl	*Tyto novaehollandiae*	eL			
Major Mitchell's Cockatoo	*Cacatua leadbeateri*	vL	87		
Superb Parrot	*Polytelis swainsonii*	eL	33	V	V
Regent Parrot	*Polytelis anthopeplus*	vL		V	V
Turquoise Parrot	*Neophema pulchella*	lrL			
Swift Parrot	*Lathamus discolor*	e L		V	E
Red-backed Kingfisher	*Todiramphus pyrrhopygia*	v			
Ground Cuckoo-shrike	*Coracina maxima*	e			
Grey-crowned Babbler	*Pomatostomus temporalis*	e L	34		
Chestnut-rumped Heathwren	*Hylacola pyrrhopygia*	dd			
Speckled Warbler	*Chthonicola sagittata*	vN			

Common Name	Scientific Name	Vic. Status	FFGAS	ANZECC	ESP Act
White-browed Treecreeper	*Climacteris affinis*	vL	69		
Painted Honeyeater	*Grantiella picta*	vL			
Regent Honeyeater	*Xanthomyza phrygia*	ceL	41	E	E
Apostlebird	*Struthidea cinerea*	vN			
Long-toed Stint	*Calidris subminuta*	dd			
Pectoral Sandpiper	*Calidris melanotos*	dd			
Mammals					
Spot-tailed Quoll	*Dasyurus maculatus*	eL	15		
Eastern Quoll	*Dasyurus viverrinus*	xL	14		
Brush-tailed Phascogale	*Phascogale tapoatafa*	vL	79		
Common Dunnart	*Sminthopsis murina*	dd			
Fat-tailed Dunnart	*Sminthopsis crassicaudata*	dd			
Squirrel Glider	*Petaurus norfolcensis*	eL			
Rufous Bettong	*Aepyprymnus fufescens*	xL	14		
Eastern Hare-wallaby	*Lagorchestes leporides*	xL	13	T	T
Grey-headed Flying-fox	*Pteropus poliocephalus*	v			
Eastern Long-eared Bat	*Nyctophilus timoriensis*	v			
Reptiles					
Broad-shelled Tortoise	*Chelodina expansa*	v			
Tessellated Gecko	*Diplodactylus tessellatus*	lr			
Pink-tailed Worm-Lizard	*Aprasia parapulchella*	eL		V	V
Striped Legless Lizard	*Delma impar*	eL	17	V	V
Hooded Scaly-foot	*Pygopus nigriceps*	ceL			
Lace Monitor	*Varanus varius*	dd			
Samphire Skink	*Morethia adelaidensis*	e			
Woodland Blind Snake	*Ramphotyphlops proximus*	v			
Common Death Adder	*Acanthophis antarcticus*	eL			
Curl Snake	*Suta suta*	v			
Bandy Bandy	*Vermicella annulata*	lrL			
Carpet Python	*Morelia spilota variegata*	eL			
Amphibians					
Barking Marsh Frog	*Limnodynastes fletcheri*	dd			
Warty Bell Frog	*Litoria raniformis*	vX			
Fish					
Mountain Galaxias	*Galaxias olidus*	dd			
Flat-headed Galaxias	*Galaxias rostratus*	ddX			
Freshwater Catfish	*Tandanus tandanus*	vN			
Murray Hardyhead	*Craterocephalus fluviatilis*	eL		V	V
Trout Cod	*Maccullochella macquariensis*	ceL	38	CE	E
Murray Cod	Maccullochella peelii	vL			
Golden Perch	Macquaria ambigua	v			
Macquarie Perch	Macquaria australasica	eL		E	E
Silver Perch	Bidyanus bidyanus	CeL			
Yarra Pigmy Perch	Edelia obscura	lrL		V	V
River Blackfish	Gadopsis marmoratus	dd			
Southern Purple-spotted Gudgeon	*Mogurnda adspersa*	ceL			
Invertebrates					
Eltham Copper Butterfly	*Paralucia pyrodiscus lucida*	vL	39	-	-
Large Ant Blue Butterfly	*Acrodipsas brisbanensis*	r/rL	70	-	-
Caddisfly	*Archaeophylax canarus*	r/rL		-	-
Bullant	*Myrmecia sp. 17*	vL		-	-
Golden Sun Moth	*Synemon plana*	eL		-	-

Common Name	Scientific Name	Vic. Status	FFGAS	ANZECC	ESP Act
Murray River Crayfish	*Euastacus armatus*	ins		-	-
Harpactacoid copepod	*Fibulacamptus gracilior*	ins		-	-

Source: Atlas of Victorian Wildlife, Wildlife Branch, NRE (30/5/2000) & Threatened Vertebrate Fauna of Victoria – 2000.
Key to Conservation Status
National:
ANZECC (The Australian & New Zealand Environment & Conservation Council of Threatened Vertebrate Fauna 1995). Categories include X = Extinct; CE = Critically Endangered; E = Endangered; V = Vulnerable.
Endangered Species Protection Act 1993. Categories are E = Endangered; V = Vulnerable; T = Presumed extinct.

Victorian:
Threatened Vertebrate Fauna in Victoria – 2000. Categories are x = extinct; ce = critically endangered; e = endangered; v = vulnerable; lr = lower risk, near threatened; dd.= data deficient.
Threatened Fauna in Victoria – 1995 (used for invertebrates). Categories include e = endangered; v = vulnerable; r = rare; ins = insufficiently known; r/r = restricted colonial breeding or roosting.

L = listed under *the Flora and Fauna Guarantee Act* 1988; N = Nominated for Listing; X = Rejected for listing

Appendix 9 Comparison of Vegetation Classification Systems

Vegetation Classification System	Units of Classification	Features of each system
Strongly based on land systems and structure	Broad Vegetation Types (BVTs)	BVTs are based on land systems information: climate, geology, topography and soils, and broad vegetation structure (woodland, forest etc). Suitable for strategic statewide and broad regional planning; insufficient resolution for specific management; maximum scale 1:500 000. Provides a comparison between pre-1750 and present day forest cover
Based equally on land systems, structure and floristics	Ecological Vegetation Classes (EVCs)	EVCs are based on vegetation structure and floristics (the species that occur at a site), land systems, other environmental information (aspect, slope, elevation, rainfall, fire frequency), and ecological responses to disturbance (e.g. modes of regeneration). EVCs provide a standard statewide system of classification that recognises that broadly similar vegetation types occur in different parts of the state because they exist under similar environmental regimes. Map scales 1: 100 000 to 1: 250 000 that is suitable for regional management planning. EVCs do not form part of a hierarchy with BVTs because they are derived from different information sources. As a result, any one EVC may occur in several BVTs
Strongly based on floristics	Communities	Communities are strongly based on floristic information collected in field survey which is analysed to determine groupings or associations of species. Vegetation structure and local environmental factors contribute to a lesser degree. Communities provide sufficient resolution for local management planning They form a hierarchy with EVCs i.e. they are subsets of EVCs.
	Sub-communities	Sub-communities are strongly based on floristic information collected in field survey and analysed to determine close associations of species. Vegetation structure and local environmental factors contribute little although micro-environmental factors such as presence of a soak, fire history or proximity to adjacent vegetation will influence their delineation. Sub-communities reflect the variability's of communities at the local scale. They form a hierarchy with communities i.e. they are subsets of communities.

Source: ECC, Box Ironbark Forests and Woodlands Investigation, Resources and Issues Report

Appendix 10Policy, Legislation and Strategy Framework

Australia is signatory to several International conventions and meets its associated commitments through National and State Agreements, strategies, policies and legislation. There is a requirement for Local and State governments to consider these strategies and policies and for landholders and government to comply with legislation relating to native vegetation when involved in decision making processes.

The Convention on Biological Diversity (1993)

The Convention is an international partnership developed from the Earth Summit in Rio (1992) in recognition of the environmental, social, cultural and economic value of biodiversity and its significant on-going reduction around the world. Signatories are required to implement the Convention's objectives through national strategies, plans and programs, which include the integration of conservation and sustainable management of biodiversity in sectors such as agriculture.

The United Nations Framework Convention on Climate Change (1994)

The ultimate objective of the Convention is to achieve stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.
The key commitment of promoting sustainable development and promoting and cooperating in the conservation and enhancement of sinks and reservoirs of all greenhouse gases including biomass, forests and oceans relates directly to the development of this Native Vegetation Plan.

Ramsar, CAMBA, JAMBA, Bonn

(CAMBA = Chinese-Australian Migratory Bird Agreement)
(JAMBA = Japanese-Australian Migratory Bird Agreement)
Australia is a signatory to these international conventions which aim to protect migratory birds and their habitat requirements.

The Inter-Governmental Agreement on the Environment (1992)

An agreement signed by the Commonwealth, State and Territory Governments in May 1992 to facilitate:

- A cooperative national approach to the environment
- A better definition of the roles of the respective governments
- A reduction in the number of disputes between the Commonwealth and the States and Territories on environment issues
- Greater certainty of government and business decision making, and
- Better environment protection.

The National Strategy for Ecologically Sustainable Development (1992)

The goal of the Strategy is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The core objectives in achieving this goal are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations
- To provide for equity within and between generations
- To protect biological diversity and maintain essential ecological processes and life-support systems.

Murray-Darling Basin Commission Natural Resources Management Strategy

The Strategy aims to manage and conserve the Basin's natural environment by:

- identifying and monitoring the Basin's natural environment;
- preventing the deterioration of the natural environment;
- identifying measures needed to conserve the natural environment;
- ensuring self-maintaining populations of all local native species;
- improving the management practices of those activities harvesting native flora and fauna;
- ensuring the maintenance and preservation of a diverse and representative range of natural environments;

improving efforts to control pest plants and animals; and

- maintaining or enhancing the aesthetic amenity of the Basin.

The National Forest Policy Statement – A New Focus for Australia's Forests

Following the United Nations Conference on the Environment and Development in Rio de Janiero in 1992 the Commonwealth, State and Territory Governments developed the National Forest Policy Statement. The Statement identified eleven broad national goals.

The Conservation goal is to maintain an extensive and permanent native forest estate in Australia and to manage that estate in an ecologically sustainable manner so as to conserve the full suite of values that forests can provide for current and future generations.

The private native forests goal is to ensure that private native forests are maintained and managed in an ecologically sustainable manner, as part of the estate, as a resource in their own right, and to complement the commercial and conservation values of public forest.

One of the goals relating to plantations is to increase plantings to rehabilitate cleared agricultural land, to improve water quality, and to meet other environmental, economic or aesthetic objectives.

The National Strategy for the Conservation of Australia's Biological Diversity (1996)

Australia's principle means for coordinated implementation of The Convention on Biological Diversity is The National Strategy for the Conservation of Australia's Biological Diversity. The Strategy aims to bridge the gap between current activities and those measures necessary to ensure the effective identification, conservation and ecologically sustainable use of Australia's biodiversity.

Plantations for Australia – The 2020 Vision

This document provides a framework for action for the National Forest Policy Statement (1992) and the Wood and Paper Industry Strategy (1995). It identifies the target of trebling the effective area of Australia's plantations between 1996 and 2020.

The "National Framework for the Management and Monitoring of Australia's Native Vegetation" (ANZECC 1999) provides a vehicle for the implementation of the Natural Heritage Trust Agreement between the Commonwealth and the States with a primary objective of reversing the long term decline in the quality and extent of Australia's Native Vegetation cover by June 2001.

The Environment Protection and Biodiversity Conservation Act (1999)

Recognises the significance of:

- World Heritage properties
- RAMSAR wetlands of international significance, and
- Listed threatened species protected under international agreements

The Act replaces several Commonwealth Acts including the Environment Protection (Impact of Proposals) Act, 1974 and establishes an environmental assessment and approval process that is separate from State systems. It is designed to regulate proponents of activities that may impact on Matters of National Significance such as those listed above.

Our Forests, Our Future – Balancing Communities, Jobs and the Environment

Was released in February 2002 and outlines the substantial investment in forestry reform required to ensure that the public land forestry industry is managed on a sustainable and commercial footing and to improve the stewardship of our forests.

Managing Victoria's Catchments - Partnerships in Action (1997)

The Partnerships in Action statement sets out a strategic framework for the partnership between the Victorian Government and the community for the effective delivery of catchment management and sustainable agriculture programs for the next five years. A primary focus of this partnership is the implementation of the ten Regional Catchment Strategies, which have been prepared by the Catchment and Land Protection Boards (nine of which are now Catchment Management Authorities). Victoria's vision for natural resource management 'Sharing Victoria's resources: Prosperity with Care' seeks to ensure that:

- The quality of land and water resources are enhanced.
- Long term productivity of our natural resource based industries is enhanced,
- Regional catchment communities are resilient and prosperous.

Victoria's Biodiversity Strategy (1997)

The goals for biodiversity management are to ensure that within Victoria:

There is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation leading to a net gain with the first target being no net loss by the year 2001

The ecological processes and the biodiversity dependant upon terrestrial, freshwater and marine environments are maintained and, where necessary, restored

The present diversity of species and ecological communities and their viability is maintained or improved across each Bioregion

There is no further preventable decline in the viability of any rare species or of any rare ecological community

There is an increase in the viability of threatened species and in the extent and quality of threatened ecological communities.

The strategy aims to:

- Increase awareness of the need to conserve biodiversity
- Enable continued development of partnerships between community, industry and government in the custodianship of our biodiversity
- Indicate the mechanisms, existing and proposed, for achieving the objectives of flora and fauna conservation and management in the context of ecological sustainability
- Provide perspectives on advances in flora and fauna conservation and directions for future management of existing habitats and the continuation of natural ecological processes
- Highlight the need for protection and replenishment of the total area of native vegetation, with particular emphasis on threatened or depleted types such as Box-Ironbark forests, grasslands and riparian environments
- Highlight the major threatening processes in each bioregion that must be ameliorated to conserve
- Highlight the habitats and environments that require urgent attention

Private Forestry in Victoria: Strategy towards 2020

The vision articulated in this strategy is that by 2020, Victoria will have developed a major market-driven commercially and environmentally sustainable private forestry sector with strategically placed concentrations of plantations comprising suitable species. The target is to treble the effective area of private forestry in Victoria between 1998 and 2020.

Flora and Fauna Guarantee Act (1988)

The *Flora and Fauna Guarantee Act* (1988) (FFG) provides a legal and administrative structure to promote flora and fauna conservation. The objectives of the Act are:

- To provide a program of community education in the conservation of flora and fauna;
- To 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);
- To assist and provide incentives to people, including landholders, to enable flora and fauna to be conserved.

Catchment and Land Protection Act (1994)

The *Catchment and Land Protection Act* (1994) has the objective of establishing a framework for the integrated and coordinated management of catchments which will:

Maintain and enhance long-term land productivity while also conserving the environment, and placement on the title of a covenant to protect the conservation values.

Aim to ensure that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.

The Act established ten Catchment and Land Protection Boards, nine of which have since expanded their roles to

become Catchment Management Authorities. The Catchment and Land Protection Act (1994) provides for the development of Regional Catchment Strategies which, among other things, must assess the nature, causes, extent and severity of land degradation of the catchments in the region and identify areas for priority attention. Local Planning schemes must have regard for the Regional Catchment Strategies.

Victorian Conservation Trust Act (1972)

The Trust for Nature, a statutory authority, was established under the *Victorian Conservation Trust Act* (1972) and has the power to hold, buy and sell real property and the power to enter a binding covenant with a landholder. The Trust uses this power to operate a revolving fund in which areas of high conservation significance are purchased then resold following the placement on the title of a covenant to protect the conservation values.

Appendix 11National Framework for Natural Resource Management

State and commonwealth governments have agreed on the National Framework. It comprises:

- **National natural resource outcomes** – and a minimum set of matters for which regional targets are required, with associated national guidelines and protocols for regional target-setting, monitoring and reporting
- **National standards** defining best practice management of natural resources, applying principally to legislative, policy, process and institutional systems, which when adopted will assist in the achievement of national outcomes.

National Natural Resource Outcomes

The statements of desired national natural resource outcomes are listed below. These include the objectives of both the National Action Plan and the Natural Heritage Trust.

The national outcomes are aspirational statements about desired national natural resource outcomes. They are expressed in a manner that allows an assessment of progress towards those outcomes to be made.

The national outcomes are largely focused on resource condition, but also include the objective of changing land and water management systems and practices that will be integral to achieving improvements in the condition of resources.

The national outcomes provide direction for catchment/regional communities to identify specific time bound and measurable targets for each region, which will move natural resource condition towards the achievement of the national outcomes.

National Outcomes and Minimum Set of Regional Targets

The national outcomes are aspirational statements about desired national natural resource outcomes.

The Native Vegetation Plan is responsible for:

- The maintenance of biodiversity and the rehabilitation of the extent, diversity and condition of native ecosystems.
- The maintenance and rehabilitation of populations of significant species and ecological communities.
- The maintenance and rehabilitation of ecosystem services and functions.

The Native Vegetation Plan contributes to:

- Minimising, reducing or avoiding the impact of salinity on land and water resources.
- Maintaining or improving surface and groundwater quality.
- Avoiding or minimising the impact of threatening processes on locations and systems that are critical for conservation of biodiversity, agricultural production, towns, infrastructure and cultural and social values.
- Minimising, reducing or avoiding the impacts of ecologically significant invasive species.

Matters for which Regional Targets must be set:

- Land salinity
- Soil condition
- The maintenance of the integrity of native vegetation communities.

These communities include:

- Inland aquatic ecosystems (rivers and other wetlands).
- Estuarine, coastal and marine habitats.

Threats to them include:

- Nutrients in aquatic environments.
- Turbidity / suspended particulate matter in aquatic environments.
- Surface water salinity in freshwater aquatic environments.

Sustainable production systems must be developed and management practices put in place to maintain or rehabilitate biodiversity and ecosystem services, maintain or enhance resource quality, maintain productive capacity and prevent and manage degradation.

Targets can be characterised as aspirational targets, achievable resource condition targets, and targets for management actions.

Aspirational targets

Aspirational targets need to be specific, time-bound and measurable. They operate over a 50+ year timeframe, guide regional planning and set a context for the measurable and achievable targets required under the Framework.

Resource condition targets

Regional plans must set specific, time-bound (10-20 year timeframe) and measurable targets, relating to resource condition, against the minimum set of matters for regional targets.
For this plan they are:

- Native vegetation communities' integrity
- Significant native species and ecological communities.

Examples could include: average salinity of X ECs at specific end-of-valley site by year Y; X hectares of specific native vegetation type within region at year Y; X stream sites within region in specific river health category by year Y.

Management action targets

Regional bodies are also required to set short-term targets (1-5 years), relating mainly to management actions or capacity-building. These targets must contribute to progress towards the longer-term resource condition targets.

Examples include: X hectares of recharge zones within region to be revegetated by year Y; X km of riparian zone to be fenced and managed, X per cent of farms within region with whole farm plans or X per cent of agricultural land under perennial vegetation by year Y.

Setting targets

Baselines

Setting targets requires the identification of a baseline – the level against which progress will be measured. Regional bodies will need to draw together baseline data for those matters for targets they have identified as relevant to their region. Ideally, baselines should be quantified as fully as possible, and should relate to trends going back over several years rather than a single point-in-time measurement. While initially more challenging, this will make it easier and faster to identify any change.

Where no reliable baseline data is available, a reasonable period of monitoring will be required in many cases to establish baselines or trends.

Hence, many regions will not be in a position to set specific achievable targets for natural resource condition at the time their regional plans are put forward for accreditation.

The Standards and Targets Framework sets out the requirements for establishing baselines. It notes that for accreditation, a regional plan will need to contain:

- Management action targets which will result in progress towards the minimum set of matters identified for regional targets;
- Resource condition targets consistent with the National Framework for NRM Standards and Targets;
- Resource condition targets which have been agreed by relevant jurisdictions, including affected jurisdictions, through other processes, including MDBC end-of-valley salinity targets;
- Commitment to the early establishment of monitoring systems to collect/analyse baseline and trend information, to enable setting of resource condition targets against the minimum set of matters;
- Proposals and a timetable for setting targets; and
- A commitment to have in place, within three years of signing of the relevant Bilateral Agreement(s), the minimum set of regional resource condition targets or have demonstrated significant progress towards their establishment.

Existing monitoring

As part of identifying baseline data, it will be important to establish what monitoring already exists in that region and to assess whether the current level of monitoring will be sufficient for future needs or whether it will be necessary to invest in additional monitoring. Existing monitoring must be consistent with methods set out for each of the National Monitoring and Evaluation Framework indicators if they are to be used.

Additional monitoring

Regional bodies will need to decide, after taking appropriate scientific advice, the extent and nature of any additional monitoring that is required. They will need to decide the amount to be spent on monitoring in order to measure progress against a particular target, establish the acceptable risk to achieve it, and make provision for that monitoring in their investment plans. The monitoring will enable the region to evaluate the impact of its investment strategy on natural resource management outcomes and progressively adapt its strategy accordingly. The data from monitoring will also be used to aggregate to broader scales, to describe the progress being made on NRM issues throughout the country.

Data management and reporting

Monitoring data needs to be available to all stakeholders. To avoid having to report the same data several times, it should be stored in a way that meets the ANZLIC standards and provides access to those who will need it. This should minimise the resources required for reporting by ensuring that the annual reports from each regional group will provide details that can be collated into various program specific reports at State/Territory and Commonwealth levels. The National Land and Water Resources Audit (NLWRA) is responsible for coordinating consistent data collection, management and assessment. Further guidance will be provided by the NLWRA to help set up data management systems.

Social and economic issues

Central to the setting of resource condition targets at the regional scale will be an understanding of the social and economic consequences that may arise in the delivery of actions towards the targets. It is important that an analysis is undertaken, based on an appropriate level of social, economic as well as environmental data.

The iterative process for setting targets should take place within the context of preparing for accreditation of an integrated NRM Plan, and should include:

- Identifying the regional natural resource assets to be managed, and the threatening processes or risks to them;
- Setting goals or aspirational targets with reference to the national natural resource outcomes being addressed;
- Collecting available resource data and identifying baseline conditions;
- Identification of social and economic values requiring particular consideration;
- Trade-off analysis using management scenarios. Such trade-off analyses could utilise a range of tools to develop and compare scenarios, including modeling, cost-benefit analysis, multiple-criteria analyses etc. The analyses would take account of constraints such as available funding, regional capacity, and the protection of key assets. The option of sacrificing areas where rehabilitation is not feasible or practical may need to be considered;
- Setting achievable resource condition targets for the region with associated timeframes, for those matters identified in the minimum set of regional targets, and using agreed guidelines identified for each matter. Targets for other issues of specific relevance to the region should also be established;
- Establishing shorter-term management actions that will result in progress towards each resource condition target. An iterative planning process should be used to identify 'best bet' strategies that go furthest towards achieving resource condition targets given socio-economic objectives;
- Assessment of the broad social and economic impacts, with particular reference to the economic production profile of the region, the broad social profile (demography, social trends etc), and any relevant ongoing structural adjustment processes; and
- Monitoring and evaluation and review of targets.

If the economic or social impact of proposed interventions is sufficiently large, the regional / catchment body may decide to proceed with a broader socio-economic profiling and impact assessment to increase investor and community confidence and understanding of the scale and distribution of costs and benefits.

Roles and Responsibilities

Roles and responsibilities of regional bodies, State and Territory Governments and the Commonwealth will be set out in general terms in the Accreditation Criteria, the National Action Plan and Natural Heritage Trust Bilateral Agreements and Regional Partnership Agreements.

With regard to standards and targets, **regional bodies are responsible for:**

- undertaking a process of NRM planning and target-setting which draws on relevant environmental, social and

economic information and expertise as well as wide stakeholder consultation, existing targets and target-setting processes, and includes appropriate and agreed regional solutions to NRM problems;

- incorporating, into their integrated regional NRM plans, management targets that will contribute to the achievement of natural resource condition targets and national outcomes;
- submitting a regional plan to governments for accreditation. This plan is to be accompanied by an investment strategy which supports actions to progress towards the targets;
- identifying relevant monitoring systems or establishing monitoring arrangements for both management actions/outputs and natural resource condition, using the relevant agreed guidelines and protocols;
- establishing, within the agreed timeframe, specific natural resource condition targets on the minimum set of matters in the National Framework for NRM Standards and Targets; and
- reporting on progress against management and resource condition targets.

State, Territory and Commonwealth governments will:

- incorporate the National Framework for NRM Standards and Targets as a schedule to National Action Plan and Natural Heritage Trust Bilateral Agreements;
- work with regional bodies to develop integrated regional NRM plans, including targets, by providing:
- support for capacity-building (data, information, analysis, skills, R&D) through foundation funding;
- accreditation criteria and guidelines for plans;
- guidelines for regional target-setting;
- relevant advice;
- accreditation for regional plans which meet the accreditation criteria, and their accompanying investment strategies;
- funding to regions to implement agreed investment priorities; and
- an appropriate legislative, policy and institutional framework to support regional NRM actions and solutions.

Accountability

Setting achievable targets for natural resource condition is a challenging task. In many instances, particularly dryland salinity, changes are only apparent over a long time, and will be influenced by factors that go beyond the actions funded by the NAP. In addition, Australia's high climatic variability makes identifying trends difficult. The assumptions made about the likely effects of management actions will, of necessity, change over time as we gain greater understanding of ecological processes.

Governments will need to take these uncertainties into account in assessing the achievement of regions in making progress towards resource condition targets. Associated with this, there will need to be regular review of targets, to implement an adaptive management approach. Reviews will also enable targets to take account of improving information and scientific understanding about trends in resource condition and about ecosystem function.

Against this background, performance against resource condition targets will be assessed as part of the overall evaluation plans for the implementation of the National Action Plan and the Natural Heritage Trust.

On the other hand, regions will be accountable for, and will be required to report progress against management action targets, and continued investment will be linked to the achievement of these targets.

Indicators

To measure progress against the targets, a suite of related indicators has been developed under the National NRM Monitoring and Evaluation Framework. Once a region has identified the matters for targets relevant to its activities, it will be able to draw on the list of indicators to see which ones it should use, and how to use them.

The indicators that have been developed so far (this is a work in progress) fall into three categories: resource condition, management action and social and economic. The first two are relevant for monitoring regional investments. The socio-economic indicators, which are largely supported by national data collection processes, provide contextual information for regional planning. Regions do not need to set social and economic targets.

The indicators are presented as ‘headings’ as they may, over time, include more than one indicator, or a number of complementary ways of measuring the same outcome.

Headings for resource condition indicators

Area of land threatened by shallow or rising water tables

Soil condition

Native vegetation extent and distribution

Native vegetation condition

River condition

Wetland ecosystem extent and distribution

Wetland ecosystem condition

Estuarine, coastal and marine habitat extent and distribution

Estuarine, coastal and marine habitat condition

Nitrogen in aquatic environments

Phosphorus in aquatic environments

Turbidity / suspended solids

In-stream salinity

Selected significant native species and ecological communities extent and conservation status

Selected ecologically significant invasive species extent and impact

Headings for management action indicators

- Only some matters for management actions are identified here because management actions to reverse resource degradation are likely to vary for each region.
- Critical assets register
- Water Allocation Plan
- Adoption of improved management practice

Indicators of improved management practice may be specific to a region but more broadly relevant indicators might include: the extent of revegetation (native or non-native), revegetation of riparian zones, or changes in land use such as the establishment of perennial vegetation.

Matters for targets

1. **Integrity of Native Vegetation Communities**

National Goal: Maintain or rehabilitate the extent, diversity and condition of native ecosystems. Five yearly reporting on change is required.

Extent, diversity measured by these indicators:

- extent (ha) and distribution (mapping) of each bioregional EVC; and
- extent (ha) and distribution (mapping) of each priority bioregional EVC.

Our priorities are high-threat (endangered and vulnerable) status EVCs or any others that are important for, e.g. habitat for threatened species, land or special habitat protection or other landscape values.

- The proportion remaining of each native vegetation type by IBRA subregion measured as a percentage of the pre-European extent.

Condition measured by this indicator:

- The proportion of each bioregional EVC that is estimated to be in specified habitat condition classes (based on the habitat hectares method).

2. **Conservation of significant species and ecological communities**

National Goal: Maintain or rehabilitate populations of significant species and ecological communities.

In North Central Victoria, bioregional planning is the process where more detailed species conservation planning is undertaken. However, bioregional plans do not set targets. The North Central NVP will only set broad region wide targets

3. **Significant species**

The following indicators are proposed under the national framework, but no indicator protocols are yet available.

Measured by these indicators:

- Range, area and location of each species;
- Area, location and condition of key habitat of each species (baselines established for very few species); and
- Relative abundance of each species

4. **Significant communities**

The special communities are those with high conservation status and ‘guilds’ of EVCs of special concern because of their important for, e.g. habitat for threatened species, land or special habitat protection or other landscape values: These guilds are grasslands, woodlands of the plains, riparian and wetland communities.

Measured by these indicators:

- estimated extent of each community in hectares; and
- the condition of each ecological community.

Appendix 12Native Vegetation Retention (NVR) & Victorian Planning Provisions

A range of measures have been adopted in Victoria to facilitate native vegetation protection. These measures sit within the legislative framework provided by the *Flora and Fauna Guarantee A*ct 1988 (FFG Act) and the *Planning and Environment Act* 1987.

The FFG Act provides a legislative foundation to guarantee that all Victoria's flora and fauna can survive, flourish and retain their potential for evolutionary development in the wild. Complementary goals are to conserve communities of flora and fauna; manage potentially threatening processes; ensure that any use of flora or fauna by humans is sustainable; and ensure that the genetic diversity of flora and fauna is maintained. The FFG Act lists species of 'protected' flora and facilitates various programs that foster community education and voluntary agreement opportunities. Wherever possible, implementation of the FFG Act is integrated into the operation of other legislation that impacts on biodiversity but has broader objectives (e.g. land protection role of the native vegetation retention controls) and that has processes that adequately deal with the objectives of the FFG Act e.g. *Forests Act* (1958). In such cases this arrangement is formalised through a Governor in Council Order under the FFG Act. The Victorian Biodiversity Strategy has been prepared as a requirement of this Act.

Under certain circumstances, DPI/DSE makes targeted purchases of land to address critical gaps in the reserve system. Funding is about $650,000 per annum although funding from the Commonwealth is also available from time to time.

The *Catchment and Land Protection Act 1994* provides for the declaration of special areas and the development of management plans to address specific land management issues in those areas.

The *Planning and Environment Act 1987* provides the planning system through which environmental impacts of land use and development can be considered. The Victoria Planning Provisions (VPP) provides the standard format and the Statewide standard planning provisions for planning schemes in Victoria. A key component of the VPP is the State Planning Policy Framework, which comprises the State planning policies for all land in Victoria.

Statewide Native Vegetation Retention controls (NVR) were introduced in all planning schemes in 1989 and are set out in Clause 52.17. The controls require a planning permit for the removal, destruction or lopping of native vegetation subject to a range of exemptions designed to facilitate normal domestic and rural practices.

The local council is usually the responsible authority for administering and enforcing the planning scheme including deciding on permit applications. However, DPI/DSE is the referral authority for a range of applications including those to clear more than 10 hectares. The responsible authority must include any conditions on a planning permit issued which a referral authority requires to be included and must refuse to grant a permit if the referral authority objects to the grant of a permit.

The State Planning Policy Framework (SPPF) states that responsible authorities should have regard to any relevant Regional Vegetation Plans when amending planning schemes and reviewing Municipal Strategic Statements. Responsible Authorities must also consider any relevant approved Regional Vegetation Plan when considering a planning permit application under Clause 52.17.

The SPPF seeks to ensure that the objectives of planning as described in s4 of the *Planning and Environment Act* (1987) in Victoria are fostered. One of these objectives is:

'to provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity'

The Local Planning Policy Framework contains the Municipal Strategic Statement (MSS) and Local Policies. The MSS contains the strategic planning, land use and development objectives of the Council and spells out:

Strategies for achieving objectives;

- Opportunities and constraints which provide a context for local planning decisions;
- Demonstrated links between the municipality's strategic planning, the regional context and the SPPF; and
- An explanation of the relationship between the objectives, strategies and controls on use and developments.

Local Policies provide detailed directions regarding land use but not development. They either relate to specific areas or local issues and should have their origins in the MSS. The VPP has also introduced a standard set of Zones that control the use of land and Overlays that control development of land.

A balanced approach to development

Within the context of this plan successful implementation depends on the development of a mechanism that accommodates the need for rational on-going development without compromising the principle of Net Gain.

The Net Gain principle recognises the capacity for partial recovery of extent and quality in native vegetation through active intervention. Implementation of this principle is based on the adoption of a planned approach for developments. The first step is the protection and enhancement of significant native vegetation values. Any proposed developments should, through planning and design, avoid impact on native vegetation and habitats and where this is not possible the impacts should be minimised. Only after these steps is it appropriate to consider offsets for impacts on native vegetation.

Offsets need to be closely linked to the nature of the impacts. The following criteria are intended to facilitate the linkage between impacts and offsets.

Areas selected for enhancement or restoration should be the same Ecological Vegetation Class (EVC) as the area impacted.

Areas selected for revegetation should be revegetated as the same EVC.

The ecological function of the offset areas should be similar, or more effective, as the area impacted (e.g. corridor values or breeding sites).

The vegetation quality of areas proposed for offsets should preferably be the same or better than the vegetation quality in the area being lost (or at least have the capacity to reach the same or better quality following mitigation works).

Offset areas should be within the same bioregion as the area impacted and preferably close by.

Offset actions should not be delayed, and, if possible, should take place before the loss. The time to equivalence should be minimised.

Where possible, offset planting should be located so that it adds to existing stands of vegetation.

Net Gain embodies the principle that where losses are permitted effort should be expended to balance the losses with more than commensurate gains. The extent of offsets required for any particular loss scenario should be determined using the quality- quantity accounting system (habitat-hectares) developed by DPI/DSE and described in the *Victoria's Native Vegetation Management Framework.*

Applications to clear native vegetation

Applications to clear native vegetation should be made in a bioregional context that ensures that all vegetation communities are adequately conserved across the region. Implementation of NVR uses Ecological Vegetation Classes (EVCs) at the bioregional level as the fundamental unit for decision making. This requires determination of the conservation significance of the native vegetation subject to the application that can be established through a combination of the conservation status of the EVC, its quality and other attributes.

Appendix 2 and **Appendix 3** outlines the methodology for determination of conservation significance. **Appendix 7** and **Appendix 8** describe the process for determination of off-sets in the context of net gain for the assessment of applications to clear native vegetation.

Appendix 13 Shared Understanding of the Net Gain Goal

As a basis for developing a consistent and more effective approach to accounting for native vegetation it is important to have a shared understanding of the meaning of the key words used in defining the Net Gain goal.

Extent and Quality of Native Vegetation

At the regional scale, native vegetation is considered from the point of view of what type it is (and consequently how rare or depleted the type is) and in what tenures it occurs (and consequently how well protected the type is).

At the local landscape-scale it is also important to focus on where the native vegetation occurs.

It is important to determine not just how much native vegetation is present but what its condition is.

On-ground actions, including revegetation and improved management of existing vegetation, can increase the overall quantity and quality of habitats and ecosystem services across the local landscape - particularly in terms of the levels of biodiversity and catchment protection that they can support.

How do we measure extent and quality?

In determining what exists, what could be lost and what could be gained, there needs to be a measure. The simplest way would be to measure the area of native vegetation in hectares, but our goals mean we must also consider the quality of vegetation. The quality of native vegetation is relevant to the effectiveness of both biodiversity conservation and catchment protection roles, but the biodiversity conservation role has the more specific requirements and accordingly has been the primary focus when developing a quality assessment approach that serves both roles.

There is no absolute measure of general vegetation/habitat quality but there is a range of well-accepted indicators. A method of combining a number of such indicators to calculate a practical relative measure is required, and a simple equation has been developed to achieve this. The two primary determinants of the general vegetation/habitat quality of an area are:

- Inherent **site condition** – i.e. how altered is the site from a notionally optimal state?; and
- **Viability** in the **landscape context** – i.e. does the patch of vegetation that the site is within retain its broader ecological functions and linkages, in a manner that enables it to respond successfully to seasonal fluctuations and other disturbance events?

DPI/DSE has developed a standard statewide approach for estimating general vegetation/habitat quality using the following criteria:

For site condition:

- retention of large old trees (for woodlands and forests);
- retention of tree canopy cover (for woodlands and forests);
- retention of the cover of, and diversity within, understorey lifeforms;
- presence of appropriate recruitment; and
- absence of weeds.

For landscape context:

- size of remnant vegetation patch; and
- links to, and amount of, neighboring patches.

Native vegetation at a site is assessed by comparing it to a benchmark which represents the average characteristics of a mature and apparently long-undisturbed stand of the same type of vegetation. General vegetation/habitat quality is scored from one (complete retention of natural quality as described by benchmark characteristics) to zero (complete loss) – Parkes *et al.* 2002; Oliver, I. *et al.* This approach has been successfully used in the BushTender Trial and will be reviewed after a further two years of use in the context of this Framework and refined in the light of research and operational experience.

The combination of this quality measure and the area of native vegetation that it refers to is known as a habitat hectare (habitat score X area = habitat hectare). A habitat hectare assessment can provide information for three key tasks - it:

- provides a snapshot of current quality;
- can be the basis for estimating what and how much change will occur at a site under different management scenarios; and

- provides a means of calculating net outcomes across losses and gains.

Accounting for Net Gain

What is a Habitat Hectare?

A habitat hectare is a site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type (Parkes *et al*. 2003).

If it is assumed that an unaltered area of natural habitat (given that it is large enough and is within a natural landscape context) is at 100 per cent of its natural quality, then one hectare of such habitat will be equivalent to one habitat hectare. That is, quality multiplied by the quantity. Ten hectares of this high quality habitat would be equivalent to ten habitat hectares, and so on. If an area of habitat had lost 50 per cent of its quality (say, through weed invasion and loss of understorey), then one hectare would be equivalent to 0.5 habitat hectares, ten hectares would be equivalent to five habitat hectares, and so on.

This measure can be consistently applied across the State.

Habitat Hectare assessments help to determine the conservation significance (or priority for action) of particular remnants of native vegetation and may be useful to estimate the 'habitat value' for native fauna species. The approach is being progressively used to estimate the type and amount of improvement that may be achieved through management intervention. Refer to Victoria's Native Vegetation Management Framework (NRE 2002) for further details.

The approach aims to:

- be an objective system that is reliable and repeatable;
- provide a measure of the "naturalness" of the system;
- indicate the direction and amount of potential improvement for lower quality sites;
- allow comparison between different vegetation types;
- combine quantity and quality assessments;
- enable calculation of net outcomes, either for trade-offs and offsets, or to measure achievements of policies and programs;
- be a system that can be used by a range of natural resource managers and not just specialists; and
- present a simple and robust message to land managers about the importance of different components of native vegetation.

Calculating "habitat hectares"

DSE is developing guidelines to assist in the scoring of vegetation stands. The basic system is outlined in the table following. Vegetation quality is defined as the degree to which the current vegetation differs from a benchmark based on the average characteristics of mature and long-undisturbed vegetation of the same type. Once a vegetation quality score has been obtained, the percentage (where 100 per cent represents a mature, undisturbed example) is multiplied by the number of hectares to calculate the 'habitat hectares' (Parkes *et al*. 2003).

The two primary determinants of the general vegetation/habitat quality of an area are:

- inherent **site condition** – i.e. how altered is the site from a notionally optimal state?; and
- **viability** in the **landscape context** – i.e. does the patch of vegetation that the site is within retain its broader ecological functions and linkages, in a manner that enables it to respond successfully to natural fluctuations and other disturbance events?

Table 13.7 Habitat Hectare Scoring

Category	Component	Max value (%)
Site condition		
	Large trees	10
	Tree (canopy) cover	5
	Understorey (non-tree) strata	25
	Lack of weeds	15
	Recruitment	10
	Organic litter	5
	Logs	5
Landscape context		
	Patch size*	10
	Neighbourhood*	10
	Distance to core area*	5
	TOTAL	**100**

What is Net Gain?

Net Gain is where, over a specified area and period of time, losses of native vegetation and habitat, as measured by a combined quality-quantity measure (habitat hectare), are reduced, minimised and more than offset by commensurate gains.
Gains may either be required offsets for permitted clearing or as a result of efforts not associated with clearing.
The notion of Net Gain:

- Recognises that for native vegetation, it is possible to partially recover both extent and quality by active intervention and thus to effect the net result;

  Identifies a quantitative approach to the "reverse the decline" pathway, allowing us to set targets and measure performance;
- At the on-ground level, expresses the principle that where losses are directly permitted and/or incurred, such losses are balanced with commensurate gains;
- At the regional level, facilitates establishment of a complete picture of the native vegetation asset, against which incremental losses and emerging issues can be evaluated; and
- Plays an important part in assessing ecologically sustainable development.

What contributes to the Net Outcome?

With respect to the quality and quantity of native vegetation, a broad range of actions, both human-related and natural, contribute to the net outcome for Victoria.
Losses in extent include:

- permanent clearing of native vegetation, both approved and illegal;
- incremental reduction of woodlands through tree decline;

Losses in quality include:

- ongoing decline resulting from insufficient management of threatening processes;
- impact of forest product harvesting and mining operations; and
- impact of wildfires and fuel-reduction burns.

Gains in extent include:

- new areas of revegetation primarily for biodiversity conservation; and
- new areas of revegetation for land protection, greenhouse or other purposes which have included sufficient locally indigenous species to be considered part of the native vegetation estate.

Gains in quality will include:

- improved management of threatening processes within existing native vegetation including both active improvement (e.g. control of weeds) and avoidance of further impacts by landholders agreeing to forego permitted uses (e.g. stock grazing, harvesting timber for on-farm use);
- recovery from forest product harvesting and mining operations;

- recovery from wildfires; and
- supplementary plantings into depleted existing native vegetation.

The Net Gain approach implies the possibility of 'trade offs'. The Victorian framework emphasises that this is only applied to support the overall conservation of existing native vegetation. The approach is to "Protect, Avoid, Minimise and only then Mitigate" with offsets.

That is, to apply the Net Gain approach to protection and clearance decisions at the on-ground level, the steps are:

1. To seek to protect and enhance significant values;
2. To avoid adverse impacts, particularly through vegetation clearance; and
3. To minimise unavoidable impacts through appropriate consideration in planning processes and expert input to project development or management.

Only after these steps have been taken can offsets be considered.

Considering Land Protection and Conservation Significance in Net Gain

In order to achieve the goals for native vegetation management, application of the Net Gain approach needs to be linked to the land protection and conservation significance of the native vegetation in question.

For land protection, the significance of a patch of vegetation (from the point of view of both hazard avoidance and mitigation) is determined according to:

- the role of the site in surface and groundwater behaviour;
- the erosion hazard and soil structure characteristics of the site;
- the ability of the vegetation to provide ongoing land protection role;
- the productive capability of the site; and
- other recognised criteria (for example, whether climatic conditions favour rapid re-establishment of vegetation cover).

Appendix 1 sets out the factors considered when determining significance of native vegetation for land protection.

Priorities for revegetation for land protection outcomes are outlined in regional plans arising from other strategic documents (e.g. Salinity Management Framework, draft River Health Strategy).

For biodiversity, the conservation significance of a patch of vegetation (from Very High to Low) is determined according to:

- the conservation status of vegetation types present;
- the quality of the vegetation;
- the conservation status of species present (and the potential habitat value);
- the strategic location in the local landscape; and
- other recognised criteria (for example, commitments under international conventions).

The approach to assessing bioregional conservation status of vegetation types (Ecological Vegetation Classes) is described in **Appendix 2**. The criteria and approach for determining conservation significance for biodiversity are outlined in **Appendix 3**

Appendix 14 Responses and Offset Procedures Under the Net Gain Principle

Table 13.8 Criteria for responses and offset procedures

Conservation Significance	Very High	High	Medium	Low
Response to proposal to clear & offset	Clearing not permitted unless exceptional circumstances apply (i.e. impacts are an unavoidable part of a development project with approval of the Minister for Conservation and Environment (or delegate) based on considerations of environmental, social and economic values from a statewide perspective)	clearing generally not permitted	clearing generally not permitted	clearing may be permitted but only as part of an appropriate sustainable use response as determined by the responsible planning Authority
If some clearing is to be permitted, the following offset requirements must be met[1]				
Net outcome	substantial net gain i.e. at least 2 X the calculated loss in habitat hectares[2]	net gain i.e. at least 1.5 X the calculated loss in habitat hectares[2]	no net loss in medium term i.e. at least 1 X the calculated loss in habitat hectares[3]	no net loss in long term i.e. at least 1 X the calculated loss in habitat hectares[3]
Formal agreement to achieve and secure offset	Requirements to achieve offsets must be identified in the associated management agreements &/or the permit conditions. Gains must be of an on-going and secure nature. Once achieved the offset must be maintained and the relevant planning authorities must maintain adequate and readily accessible records of agreed offset arrangements (ultimately on the Native Vegetation Permit Tracking system).			

1 There may be a need to revise some aspects of particular offset provisions during the life of the Regional Native Vegetation Plan (RNVP) as a result of new information becoming available and through experience gained in the application of the Net Gain policy.

2 Gains can include active improvements of quality and/or avoiding potential losses of quality by agreement to forego permitted uses. Note that applying all of the following offset criteria (where relevant) may require more than the minimum habitat hectares specified by these multipliers.

3 Where gains are achieved in vegetation/habitat of a higher significance than the vegetation lost, then the amount of the offset will be proportionally reduced (e.g. offsetting losses in medium conservation significance with very high conservation significance gains will reduce the amount of the offsets required by half, i.e. the medium multiplier divided by the very high multiplier).

Conservation Significance	Very High	High	Medium	Low
Like for Like				
Vegetation or habitat type of the offset	the same vegetation/ habitat type	the same vegetation/habitat type OR a Very High significance vegetation/ habitat in the same Bioregion	Any EVC in the Bioregion OR a Very High or High significance vegetation/ habitat in an adjacent Bioregion	
Landscape role	Similar or more effective ecological function AND land protection function as impacted by the loss	Similar or more effective ecological function OR land protection function as impacted by the loss	Similar or more effective land protection function as affected by the loss	
Quality objectives for offset	The existing vegetation proposed as the basis of an offset must be at least			
	90 per cent of the quality in the area being lost.	75 per cent of the quality in the area being lost	50 per cent of the quality in the area being lost	
	The proportion of revegetation included in the offset (in habitat hectares) is limited to			
	10%	25%	50%	100%
Old tree[4] objectives for offset	**If the remnant native vegetation proposed for clearing contains large old trees[4], then for each large old tree removed as part of permitted clearing[5] the following ADDITIONAL offsets are required:**			
	8 other large old trees to be protected **AND** **40** new trees to be recruited[6]	**4** other large old trees to be protected **AND** **20** new trees to be recruited[6]	**2** other large old trees to be protected **AND** **10** new trees to be recruited[6]	no specific tree offset required
	If the patch of native vegetation proposed for clearing consists ONLY[7] of scattered trees AND is in a parcel of land greater than 4 ha with 8 or more scattered old trees/ ha, then for: each LARGE old tree removed as part of permitted clearing[5] the following minimum offsets are required:			
	8 other large old trees to be protected **AND** **40** new trees to be recruited[6]	**4** other large old trees to be protected **AND** **20** new trees to be recruited[6]	**2** other large old trees to be protected **AND** **10** new trees to be recruited[6]	**30** new trees to be recruited[6]
	AND for each MEDIUM old tree removed as part of permitted clearing[5] the following minimum offsets are required:			
	4 other medium old trees to be protected **AND** **20** new trees to be recruited[6]	**2** other medium old trees to be protected **AND** **10** new trees to be recruited[6]	**1** other medium old tree to be protected **AND** **5** new trees to be recruited[6]	**15** new trees to be recruited[6]

Conservation Significance	Very High	High	Medium	Low
	If the patch of native vegetation proposed for clearing consists ONLY[7] of scattered trees AND is in a parcel of land larger than 4 ha and with less than 8 scattered old trees[4]/ha, OR is less than 4 ha with any number of scattered old trees[4]/ha then for: For each old tree removed as part of permitted clearing[5] the following minimum offsets are required			
For very large old trees	**Recruitment only**			
	400 new plants to be recruited[6]	**270** new plants to be recruited[6]	**150** new plants to be recruited[6]	**70** new plants to be recruited[6]
	OR Protection plus Recruitment			
	10 other very large old trees to be protected **AND** **50** new plants to be recruited and protected[6]	**8** other very large old trees to be protected **AND** **40** new plants to be recruited and protected[6]	**4** other very large old trees to be protected **AND** **20** new plants to be recruited and protected[6]	**2** other very large old trees to be protected **AND** **10** new plants to be recruited and protected[6]
For large old trees	**Recruitment only**			
	270 new plants to be recruited and protected[6]	**150** new plants to be recruited and protected[6]	**70** new plants to be recruited and protected[6]	**30** new plants to be recruited and protected[6]
	OR Protection plus Recruitment			
	8 other large old trees to be protected **AND** **40** new plants to be recruited and protected[6]	**4** other large old trees to be protected **AND** **20** new plants to be recruited and protected[6]	**2** other large old tree to be protected **AND** **10** new plants to be recruited and protected[6]	**1** other large old tree to be protected **AND** **5** new plants to be recruited and protected[6]
For medium old trees	**Recruitment only**			
	150 new plants to be recruited[6]	**70** new plants to be recruited[6]	**30** new plants to be recruited[6]	**15** new plants to be recruited[6]
	OR Protection plus Recruitment			
	4 other medium old trees to be protected **AND** **20** new plants to be recruited and protected[6]	**2** other medium old trees to be protected **AND** **10** new plants to be recruited and protected[6]	**1** other medium old tree to be protected **AND** **5** new plants to be recruited and protected[6]	
For smaller trees	**Recruitment only**			
	70 new plants to be recruited[6]	**30** new plants to be recruited[6]	**15** new plants to be recruited[6]	**10** new plants to be recruited[6]

Conservation Significance	Very High	High	Medium	Low
Vicinity	Gains must be within thesame bioregion, and within the same priority landscape zone[8] as the loss where considered appropriate by the planning authority.	Gains must be within the same bioregion as the loss		Gains must be within the same bioregion as the loss **OR** an adjacent bioregion if offsets are in Very High or High significance vegetation
Timing	Offsets to be initiated prior to the loss	Offsets to be initiated as soon as possible after loss occurs but no more than 1 year (seasonal requirements to be considered)		

4 old trees, are defined as individuals of key long-lived dominant tree species (as specified in the relevant EVC benchmark) that are greater than specified diameters measured over the bark at breast height (1.3 m above ground level). Very large old trees are specified as > 1.5 X the benchmark diameter for large trees, large old trees are defined as > 1 X the benchmark diameter for large trees, medium trees as > 0.75 X the benchmark diameter for large trees and smaller trees as < 0.75 X the benchmark diameter for large trees.

5 these offsets are only required as a consequence of native vegetation clearing which requires and receives a planning permit, and not where tree removal is exempt from the requirement to have such a permit.

6 on a case-by-case basis at the discretion of the planning authority, recruitment may be either through plantings to a prescribed standard (e.g. species composition, density, survivorship) and/or through regeneration associated with protection of other old trees. At least 15% of the plants to be established must be indigenous canopy trees, consistent with the species and provenance of those being removed. The remainder can be indigenous understorey species. Recruitment should meet the timing criterion below. Any plantings that have been undertaken by the landholder since 1989 and that meet all the relevant offset criteria, can be used to meet this requirement.

7 Where indigenous understorey < 10 per cent of the benchmark cover for understorey of the EVC.

Table 13.9 Summary of Offset Criteria for Harvesting Timber from Naturally-established Native Forest on Private Land

Conservation Significance	Very High	High	Medium	Low
Response to proposal to clear & offset	Harvesting generally not permitted[1]		Harvest and regeneration may be permitted as part of sustainable land use option and in accordance with the Code of Forest Practice *and the relevant Forest Management Prescriptions and Forest Management Plans.*[2] *Applications must also include an approved Timber Harvest Plan*[3]	
Net outcome of offset			Regeneration undertaken according to the following criteria will be considered to have achieved sufficient offset. Where selective harvesting or ecological thinning operations do not reduce vegetation quality[3], then no additional offsets will be required.	
Vegetation or Habitat Type of offset			same as harvested	
Landscape role			same as harvested	
Quality objectives for offset Quality objectives for offset *continued*….			**For clearfell harvest & regeneration** Timber harvesting by clear felling is not permitted in North Central Victoria. **For selective harvesting** Selective harvesting is permitted in the Central Victorian Uplands, Goldfields and Murray Fans Bioregions under the following conditions. (also refer to Victoria's Native Vegetation Management – A Framework for Action.) There must be no reduction in habitat quality score components[3] due to selective harvesting apart from the canopy score, within which up to a 40 per cent reduction is permissible but for which proponents must provide evidence that restoration to the initial score or better within 25 years will occur. Harvesting must be in accordance with the relevant Forest Management Plan, Forest Management Prescriptions and approved Timber Harvesting Plan or *Guidelines for Ecological Enhancement* Thinning. <u>Central Victorian Uplands Bioregion:</u> In accordance with Midlands FMA prescriptions. Harvested trees must be less than 70 cm dbhob <u>Goldfields Bioregion:</u> Harvested trees must be less than 40cm dbhob[4] No harvesting permissible in EVCs with conservation status of Endangered or Vulnerable. When harvesting in isolated remnants[5] the *Guidelines for Ecological Enhancement Thinning* must be applied. Where harvesting is for ecological enhancement purposes the *Guidelines for Ecological Enhancement Thinning* must apply. <u>Murray Fans Bioregion:</u> Harvesting will be permitted only in Red Gum dominated vegetation types that are not listed as endangered or vulnerable. Harvested trees must be less than 70 cm dbhob <u>Other Bioregions:</u> In the Murray Mallee, Victorian Riverina, Wimmera and Victorian Volcanic Plain bioregions, harvesting is not permitted except where the proposed harvesting will increase the overall habitat score. If the canopy score will	

Conservation Significance	Very High	High	Medium	Low
			be reduced, this should not be by more than 40 %. Within these bioregions, selective harvesting must be in accordance with the *North Central Ecological Enhancement Thinning Guidelines*	
Vicinity			same as harvested	
Timing			Where intervention to promote regeneration is required, this is to be initiated as soon as possible after harvesting but no more than one year (seasonal requirements to be considered by planning authority)	
Security of offset			Planning permit conditions to apply UP TO TEN YEARS OR WHEN the regeneration achieves the equivalent quality of the vegetation that was harvested (excluding the large old tree component)	

1 Unless harvesting is currently allowed on public land within the same bioregion for areas of vegetation which have equivalent conservation values.
2 A forest management plan is a strategic document that aims to ensure that State forest is managed in an environmentally sensitive and sustainable way that balances all uses and values of the forest.
3 As measured by Habitat Hectares score
4 DBHOB Diameter at Breast Height Over Bark - taken at 1.3 m above ground level.
5 An isolated remnant is one that is not contiguous with a large public forest block.