

Conservation Plan

for the
Timmering Landscape Zone



Biodiversity Action Planning in the Shepparton Irrigation Region



Department of Sustainability and Environment
Department of Primary Industries



Developed By:

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Data front cover: Part of the Cornella Creek System (Nickee Freeman 2006).

Inset & Banner: Brolga (Grus rubicundus) (Ian McCann NRE 2002d).

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EXECUTIVE SUMMARY

The **ultimate aim** of Biodiversity Action Planning (BAP) is to achieve broad-scale conservation of native biodiversity. BAP identifies priorities for the conservation of native biodiversity, as part of the implementation of the Victorian Biodiversity Strategy 1997. It is not a 'stand-alone' project; rather a process for translating objectives set out in Victoria's Biodiversity Strategy to Regional, Catchment and Local level (Victoria's Biodiversity Strategy fulfils a statutory requirement under Section 17 of the *Flora and Fauna Guarantee Act 1988* and provides the Biodiversity Action Plan for Victoria).

To **translate objectives** from State to Regional, Catchment and Local Landscape level, Victoria was first divided on a Bioregional basis (Bioregions) and then at a Landscape level (Landscape Zones). The 'Victorian Riverina Bioregional Plan' and the 'Shepparton Irrigation Region South Landscape Zone Plan' outline biodiversity priorities at the bioregional level. This 'Conservation Plan for the Timmering Landscape Zone' has been developed at the Local (Landscape) level and is intended to assist government agencies (primarily extension staff) and the community to work in partnership towards achieving catchment targets, by setting priority areas for protection and enhancement of native biodiversity. This Plan is also intended to enable biodiversity priorities, data and advice, to be disseminated through existing planning processes to landholders and agencies.

The **methodology** used to develop this Plan is according to the 'Developer's Manual for Biodiversity Action Planning in the Goulburn Broken Catchment (GBCMA 2004a)'. Two important components of the BAP process are the 'focal species' approach and the 'key biodiversity assets' approach. The **focal species** approach uses the habitat requirements of a particular species, or a group of species, to define the attributes that must be present in a landscape for these species to persist. Six focal species have been suggested for the Timmering Landscape Zone including, Brolga (*Grus rubicunda*), Bush Stone-curlew (*Burhinus grallarius*), Brown Treecreeper (*Climacteris picumnus*), Tree Goanna (*Varanus varius*), Squirrel Glider (*Petaurus norfolcensis*) and Latham's Snipe (*Gallinago hardwickii*).

The **key biodiversity asset** approach is a method of grouping assets (e.g. birds, animals and plants) that use the same type of habitat. Six key biodiversity assets were identified for the Timmering Landscape Zone including, Waterways, Wetlands, Public Land, Plains Woodlands, Riverine Woodlands and Box Ironbark Forests. The grouping of these assets will assist in targeting the very high value sites first down to the lowest priority sites.

The **Timmering Landscape Zone** is located within the Goulburn Broken Catchment of Victoria. The Zone is approximately 104,355 hectares in size and is within the Victorian Riverina Bioregion and the Local Government areas of Campaspe Shire (majority) and the City of Greater Bendigo. Since European settlement much of the vegetation in the Timmering Landscape Zone has been cleared, leaving a fragmented landscape with many of the remnants that remain being highly modified.

Two hundred and nine **priority environmental sites** were identified within the Timmering Landscape Zone. The priority sites have been determined and ranked (Very High, High, Medium or Low) based on factors such as; size, quality, Ecological Vegetation Class (EVC) conservation status, threatened species, landscape context and field surveying. These sites contain remnant vegetation and vary greatly in size, from a stand of paddock trees, to areas such as the Corop Lakes System. In general the surveyed sites within the Timmering Landscape Zone were of a good size (more than half are larger than 10 hectares) and found to have a good cover of organic litter.

Management actions (advisory only) have been developed for the Timmering Landscape Zone, based on the results of desktop analysis and surveying. It is intended that government agencies and the community, work together to incorporate these actions in to existing projects and strategies for the benefit of biodiversity conservation in the Timmering Landscape Zone and the Goulburn Broken Catchment.

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1.0 BACKGROUND



1.1 INTRODUCTION



**Figure 1:
BAP Process**

The ultimate aim of Biodiversity Action Planning (BAP) is to achieve broad-scale conservation of native biodiversity. BAP identifies priorities for the conservation of native biodiversity as part of the implementation of the Victorian Biodiversity Strategy (Crown 1997). In particular, it aims to:

- Conserve native biodiversity¹ by maintaining viable examples of the range of ecosystems that occur naturally in Victoria,
- Promote a more strategic and cost-effective expenditure of public funds for the protection, restoration and ongoing management of priority biodiversity sites, and
- Achieve community support for biodiversity landscape planning and the conservation of strategic assets in rural landscapes (Platt & Lowe 2002).

In order to achieve these aims effective planning for native biodiversity also requires detailed planning at a Bioregional and Landscape level. Therefore, Victoria was first divided on a Bioregional basis (Appendix 1) and then at a landscape level (Landscape Zones) (Appendix 2).

At the regional scale the 'Bioregional Strategic Overview for the Victorian Riverina Bioregion' and more specifically to the Shepparton Irrigation Region (SIR), the 'Landscape Plans for the Goulburn Broken CMA - SIR - South Zones', identify the broad priorities for biodiversity conservation in the region. They also provide the foundation for producing detailed plans, such as the Conservation Plan for the Timmering Landscape Zone (Ahern *et al* 2003). At the landscape level this Plan is intended to provide a biodiversity conservation resource for the community. Figure 1 illustrates the BAP process and where this Plan (as per underlined) fits within a policy context.

1.2 OBJECTIVES

The 'Conservation Plan for the Timmering Landscape Zone' has been developed at the local (Landscape) level and is intended to assist government agencies (primarily extension staff) and the community, to work in partnership towards achieving Catchment targets and set priority areas for the protection and enhancement of native biodiversity. This Plan aims to assist in private and public resources being expended and targeted to priority sites for priority actions. It identifies 209 priority sites, ranging across 'Very High', 'High', 'Medium' or 'Low' value. The protection and management of these priority sites is important for the conservation of flora and fauna in the Timmering Landscape Zone. This Plan is intended primarily for use by extension officers, as well as the community, to guide the strategic and coordinated management of conservation in the area.

Broadly, this Plan details:

- The landscape, vegetation and significant flora and fauna of the area,
- Conservation vision for the area,
- Priority assets to be conserved, their biodiversity value and threatening processes,
- Actions to protect and restore these assets, and
- Monitoring opportunities.

¹ Biodiversity: the natural variety of life: the sum of our native plants and animals, the genetic variations they contain, and the natural ecosystems they form (GBCMA 2000).

1.3 A VISION FOR CONSERVATION

The Goulburn Broken Regional Catchment Strategy (RCS) identifies a vision for biodiversity in the catchment. The vision is that “the community will work in partnership with Federal and State Governments and other agencies, to protect and enhance ecological processes and genetic diversity, to secure the future of native species of plants, animals and other organisms in the catchment” (GBCMA 2003 p87). The Conservation Plan for Timmering Landscape Zone aims to assist in achieving this vision through providing a strategic coordinated approach for the conservation of priority assets.

The RCS also identifies targets and priorities for the Catchment (refer to Appendix 3 for further detail). It is intended that the actions outlined in this Plan will complement the targets of the RCS and other policy/strategies pertinent to the State, Catchment and Region (e.g. Victoria’s Native Vegetation Management – A Framework for Action (NRE 2002a); Goulburn Broken Native Vegetation Management Plan (GBCMA 2000); and the Victorian River Health Strategy (NRE 2002b)). This Plan is also intended to integrate such policies (e.g. targets and legislative requirements) in to the one document for use by local communities. For example, this Plan incorporates aspects of legislation (e.g. Action Statements prepared under the *Flora and Fauna Guarantee Act 1988*), into recommended on-ground actions, for the conservation of threatened species and communities.

The BAP process uses current scientific knowledge to produce an ‘ideal’ landscape for biodiversity conservation. This ‘ideal’ landscape provides for the current levels of species abundance, diversity and interactions. BAP attempts to take a strategic approach to the conservation of threatened and declining species and vegetation types by looking for opportunities to conserve groups of species in appropriate ecosystems (Platt & Lowe 2002). It is therefore intended that this Conservation Plan for the Timmering Landscape Zone will assist government agencies and the community to work in partnership towards achieving Catchment targets and an ‘ideal’ landscape, by setting priority areas for protection and enhancement of native biodiversity.

This Plan is not intended to be a method of ‘taking over’ land, but rather a resource document that assists with identifying priority assets and methods of action, to protect or restore valuable assets, through voluntary extension principles. This document may be used by agencies and community groups for informing existing projects and for strategic planning. However it must be remembered that this document is by no means ‘comprehensive’, as the BAP process relies on the regular updating of information, to keep it accurate and timely. This Plan has therefore been developed to be adaptive so as to enable management actions and information to be modified, in response to further information (e.g. monitoring). However it forms the basis for explaining the BAP process and associated mapping.

Therefore this Plan will be reviewed when necessary to ensure that it remains a ‘living’ document. It is also intended that extension staff will utilise Geographical Information System (GIS) programs, databases and other agency staff, to fully identify and understand the BAP process and to provide further information to the community. Consultation (refer to Appendix 4) and extension with relevant stakeholders, including agencies and community groups was conducted (and will continue to occur) throughout the development and implementation of this Plan. A Communication Plan was developed in order to guide Biodiversity Action Planning in the Shepparton Irrigation Region. In summary, it is envisaged that this Plan will be a valuable resource for identifying priority biodiversity sites and initiating further conservation works in the Landscape Zone, and that at a later stage, will lead to further sites and projects being identified by interested individuals and groups.

2.0 THE STUDY AREA

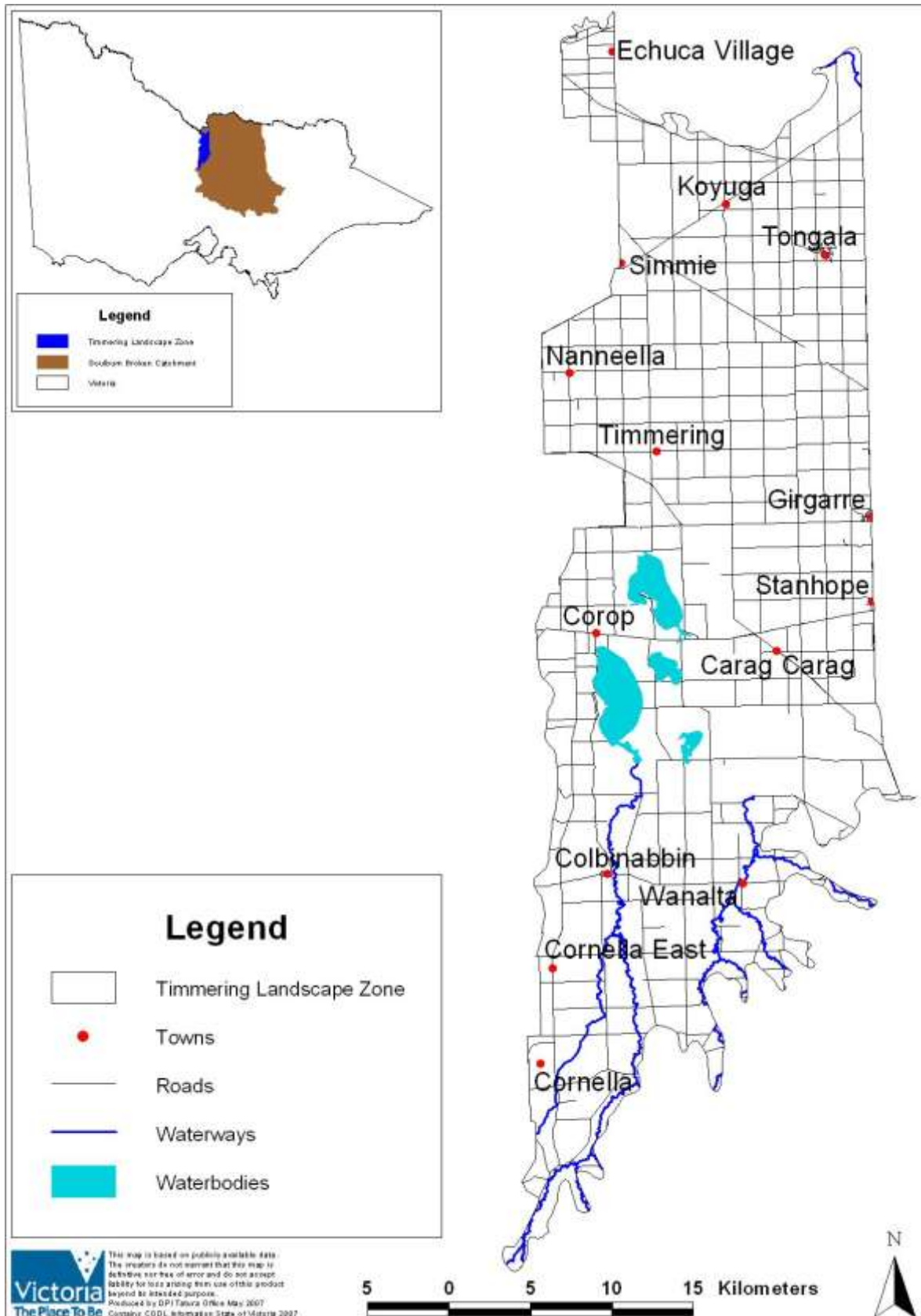


Figure 2a: Timmering Landscape Zone
Figure 2b: (Inset) Victoria, with the Goulburn Broken Catchment and the Timmering Landscape Zone

2.1 LANDSCAPE

The Timmering Landscape Zone (Figure 2a) is located within the Goulburn Broken Catchment of Victoria (Figure 2b). The Zone is approximately 104,355 hectares in size and is within the Victorian Riverina Bioregion and the Local Government areas of Shire of Campaspe (majority) and Greater Bendigo City Council (Southern tip). The Landscape Zone lies in the Shepparton Irrigation Region (North) and the Mid Goulburn Broken Catchment Areas (South). It is bounded in the North-West by the North Central CMA area; in the South and South-West by the Goldfields Bioregion, and in the North by the Murray Fans Bioregion skirting around Kanyapella Basin from Echuca Village to Yambuna. It extends southward almost to Lady's Pass on the Southern end of Mt Camel Range, North of Heathcote. The Timmering Landscape Zone commences at the Western border of the Western Goulburn Landscape Zone. Examples of townships within the Timmering Landscape Zone include Echuca Village, Tongala, Girgarre, Stanhope and Colbinabbin (Ahern *et al* 2003).

The Timmering Landscape Zone consists predominantly of quaternary alluvial sediments forming a flat plain across which younger sediments are evident in the channels and terraces of present-day drainage lines (LCC 1983). Mt Scobie (120m), to the North of Girgarre, is a localised protrusion of Palaeozoic sedimentary rock (Ahern *et al* 2003).

The Timmering Landscape Zones main drainage system is via the Timmering Depression and the Cornella and Wanalta Creek systems (into the Corop Lakes), which is part of the Goulburn River Basin (LCC 1989). Local areas within the Zone are serviced by a system of artificial drains and channels. The Waranga Western Channel traverses the Zone, transporting water from Waranga Basin through Colbinabbin and Timmering before veering West to Rochester and continuing (Ahern *et al* 2003).

Private land covers more than 90% of the Zone, with extensive clearing having taken place, predominantly in the South and East of the Zone. Less than 5% of private land retains native vegetation cover (Ahern *et al* 2003). The remaining remnants on freehold land are mainly River Red Gum (*Eucalyptus camaldulensis*) dominated wetlands (typically degraded by grazing and/or cropping); or Grey Box (*Eucalyptus microcarpa*) or Buloke (*Allocasuarina luehmanni*) woodland patches with an understorey dominated by weed and pasture species. Yellow Box (*Eucalyptus melliodora*) also occur in the Zone on higher rises. The main land use in the Zone is irrigated farming. The better-drained soils support dairying and mixed farming while the heavier clay soils support low intensity irrigation mixed farming. Ahern *et al.* (2003) emphasises that the creeklines and remnants on freehold in this Zone are important as part of the habitat network supporting significant local Squirrel Glider (*Petaurus norfolcensis*) populations.

Public land covers the remaining area of the Zone (less than 10%) and is predominantly associated with significant water bodies, in particular the Corop Lakes (including Lake Cooper and Green Lake) and the creeklines of Wanalta and Gobarup Creek systems as well as the Cornella Creek. Cornella State Forest (refer to picture opposite) is the only State forest within the Zone (170 ha). The other public land areas within the Zone include Roadsides, Railway Reserves, Bushland Reserves and other publicly owned Reserves which often provide important habitat links (Ahern *et al* 2003).



**Plate: Cornella State Forest
is an example of public land
in the Timmering Landscape Zone**

2.2 VEGETATION

Ecological Vegetation Class (EVC) is a vegetation classification system, derived from groupings of vegetation communities based on floristic, structural and ecological functions. Mosaics (combinations of EVCs) are a mapping unit where the individual EVCs could not be separated, at the scale of 1:100,000 (Berwick 2003).

Prior to European settlement 29 EVCs² were known to have been present within the Timmering Landscape Zone (Figure 3). The pre-1750 vegetation coverage consisted of vegetation communities such as Plains Grassy Woodland, Plains Grassland, Drainage Line Complex, Pine Box Woodland, Riverine Plains Grassy Woodland Mosaics, Wetlands, Creekline Grassy Woodland and Box Ironbark Forest.

Plains Woodland and Plains Grassy Woodland communities would typically occurred on loamy soils and would have consisted of low open and grassy stands of Grey Box (*Eucalyptus microcarpa*), Buloke (*Allocasuarina luehmannii*), White Box (*Eucalyptus albens*), River Red Gum (*Eucalyptus camaldulensis*) and Yellow Box (*Eucalyptus melliodora*) (Ahern *et al* 2003). Understorey would have included scattered shrubs (e.g. Wattles and Peas) and a high species diversity of grasses, lilies, orchids, herbs and sedges (Berwick 2003).

Plains Grassland communities would have occurred as patches within Plains Woodland communities on the heavier clay soils (e.g. along the Timmering Depression and between Timmering and Koyuga). These areas would have comprised a diverse treeless community with orchids, lilies, daisies, herbs and sedges amongst grasses (Ahern *et al* 2003). O'Dea Road is a significant area of grassland in the Northern extent of the Zone.

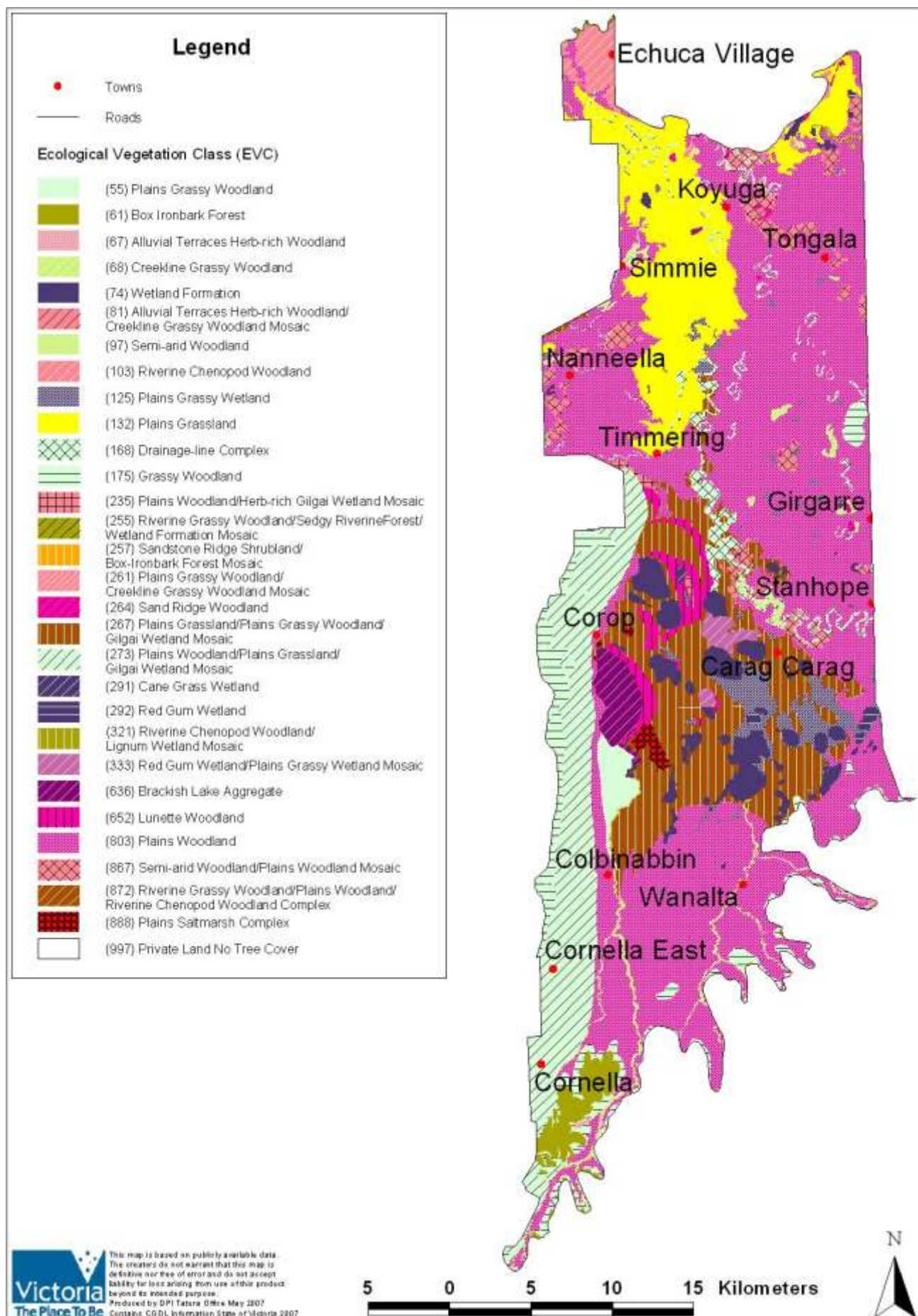
The Drainage Line Complex EVC was typically located along depressions and leveed stream courses that drained in the direction of Kanyapella Basin (Ahern *et al* 2003). This EVC typically varied from grassy wetlands to open herblands, sedgeland and may have developed to wetlands in some areas (Berwick 2003). The Creekline Grassy Woodland EVC occurred along the creek systems (e.g. Cornella and Wanalta) and drained towards lakes (e.g. Corop). Lakes would have supported EVCs such as Wetland Formation, Plains Grassy Wetland, Brackish Lakes and Red Gum Wetlands (Ahern *et al* 2003).

The current extent of native vegetation in the Timmering Landscape Zone has reduced (Figure 4) since European settlement. Figures 3 and 4 are included primarily to illustrate the comparison between vegetation cover from European settlement to the current extent. Table 1 further identifies the EVCs in Zone including their Bioregional Conservation Status (BCS), their pre-European settlement extent and current (as of 2003) extent (in hectares and % cover). Table 1 also identifies the area of 'Private Land No Tree Cover' (Ahern *et al* 2003).

The Goulburn Broken Regional Catchment Strategy (RCS) identifies goals and targets that have been set for the vegetation communities within the catchment (Appendix 3). This includes 'increasing the cover of all 'Endangered' and 'Vulnerable' (where applicable³) EVCs to at least 15% of their pre-European vegetation cover by 2030' (GBCMA 2003). A number of EVCs within the Zone are below the 15% target (Table 1) and are therefore considered 'Endangered' or 'Vulnerable' at the Bioregional level (Ahern *et al* 2003).

² For further information on each EVC, refer to the Department of Sustainability and Environment website at www.dse.vic.gov.au

³ Applicable to Ecological Vegetation Classes that are 'Vulnerable' and are below 15%



**Figure 3: Pre-European
Native Vegetation Cover in the Timmering Landscape Zone**

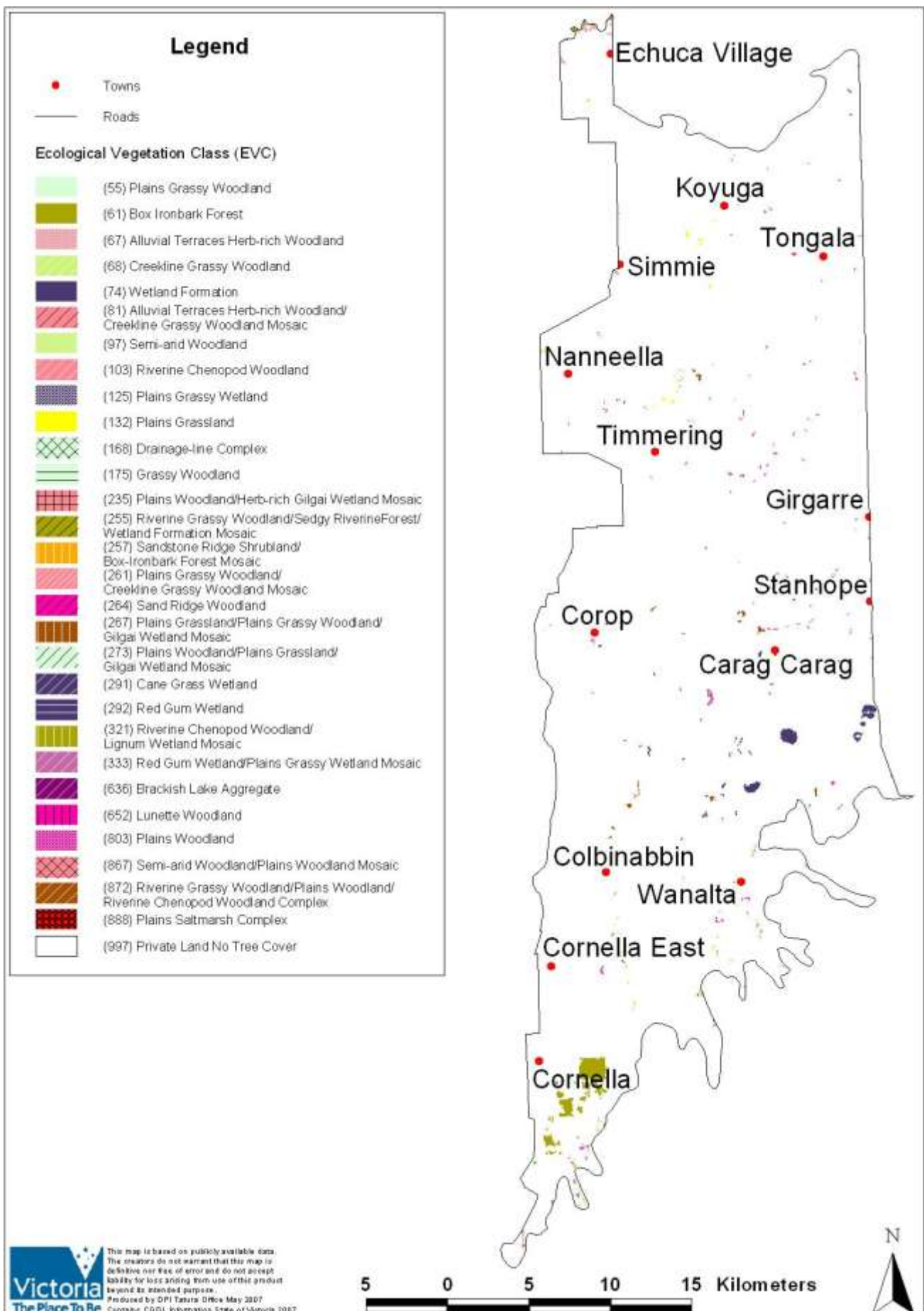


Figure 4: Current Extent of Native Vegetation Cover in the Timmering Landscape Zone

Table 1: Timmering Landscape Zone Ecological Vegetation Classes (pre-1750 and current)

EVC Number	EVC Bioregional Conservation Status	Ecological Vegetation Class (EVC) Name	Pre-1750 Vegetation Area (ha) *	Current Area of Vegetation (ha)*	Current Area of Vegetation (%)	Catchment (15%) Target (ha)*
55	E	Plains Grassy Woodland	855	<1	0	128
61	V	Box Ironbark Forest	1554	436	28.06	233
67	V	Alluvial Terraces Herb-rich Woodland	30	1	3.33	5
68	E	Creekline Grassy Woodland	1025	124	12.10	154
74	E	Wetland Formation	3868	147	3.80	580
81	E	Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic	3	0	0	0
97	V	Semi-arid Woodland	513	2	0.39	77
103	E	Riverine Chenopod Woodland	228	0	0	34
125	E	Plains Grassy Wetland	2395	18	0.75	359
132	E	Plains Grassland	4516	15	0.33	677
168	E	Drainage Line Complex (Aggregate)	1938	19	0.98	291
175_61	E	Low Rises Grassy Woodland	4373	53	1.21	656
235	E	Plains Woodland/ Herb-rich Gilgai Wetland Mosaic	140	0	0	21
255	V	Riverine Grassy Woodland/Sedgy Riverine Forest/Wetland Formation Mosaic	12655	X	X	X
257	E	Sandstone Ridge Shrubland/Box Ironbark Forest Mosaic	4	0	0	1
261	E	Plains Grassy Woodland/Creekline Grassy Woodland Mosaic	17	0	0	3
264	E	Sand Ridge Woodland	208	2	0.96	31
267	E	Plains Grassland/Plains Grassy Woodland/Gilgai Wetland Mosaic	11570	73	0.63	1736
273	E	Plains Woodland/Plains Grassland/Gilgai Wetland Mosaic	10760	23	0.22	1614
291	V	Cane Grass Wetland	46	0	0	7
292	E	Red Gum Wetland	240	86	35.83	36
321	E	Riverine Chenopod Woodland/Lignum Wetland Mosaic	71	0	0	11
333	E	Red Gum Wetland/Plains Grassy Wetland Mosaic	574	27	4.70	86
636	X	Brackish Lake Aggregate	1254	2	0.16	188
652	E	Lunette Woodland	1642	1	0.06	246
803	E	Plains Woodland	41467	211	0.51	6220
867	E	Shallow Sand Woodland/Plains Woodland Mosaic	2039	6	0.29	306
872	E	Riverine Grassy Woodland/Plains Woodland/Riverine Chenopod Woodland Complex	15	0	0	2
888	E	Plains Saltmarsh Complex	343	6	1.75	50
		TOTAL	104355	1253	1.37%	13753
997	N/A	Private Land No Tree Cover	0	90437	N/A	N/A

Table Information including column A & B modified from (Ahern *et al* 2003), (CGDL 2005) & DSE.

Column C derived from (column B divided by column A) multiplied by 100 (for %)

Column D derived from (column A divided by 100) multiplied by 15. All rounded to nearest unit (whole number)

Explanation of Terms:

- 'EVC Number' refers to the unique number attributed to that EVC in available literature (e.g. CGDL 2005).
- 'EVC Bioregional Conservation Status' (BCS) refers to the threatened status of the EVC in the Bioregion (e.g. Victorian Riverina). Endangered (E) means 'less than 10% of the pre-European extent remains, Vulnerable (V) is 'less than 10-30% pre-European extent remaining' and 'X' means presumed extinct (mapped at 1:100 000) (Platt 2002).
- 'Ecological Vegetation Class (EVC) Name' is the name given to that unique community.
- 'Pre-1750 Vegetation Area' refers to the area of vegetation cover (ha) prior to substantial clearance (e.g. Pre-European Settlement).
- 'Catchment (15%) Target (ha)' refers to the GBRCs target of 'increasing the cover of all 'Endangered' and 'Vulnerable' EVCs to at least 15% of their pre-European vegetation cover by 2030' (GBCMA 2003) (refer to Appendix 3 for further information).

2.3 SIGNIFICANT FLORA AND FAUNA

2.3.1 Flora



Plate: Drumsticks (*Pycnosorus globosus*) are an example of a plant species recorded in the Timmering Landscape Zone

A range of native flora is found within the Timmering Landscape Zone. Overstorey species include species such as River Red Gum (*Eucalyptus camaldulensis*), Grey Box (*Eucalyptus microcarpa*), Black Box (*Eucalyptus largiflorens*), Yellow Box (*Eucalyptus melliodora*), White Cypress-pine (Murray Pine) (*Callitrus glaucophylla*) and Buloke (*Allocasuarina luehmannii*). The range of small trees and shrubs includes species such as Mallee Wattle (*Acacia montana*), Golden Wattle (*Acacia pycnantha*), Gold-dust Wattle (*Acacia acinacea*), Common Eutaxia (*Eutaxia microphylla*), Emubush (*Eremophila longifolia*), Drooping Cassinia (*Cassinia arcuata*), Cherry Ballart (*Exocarpus cupressiformis*) and Lignum (*Muehlenbeckia spp.*). The Zone also contains a range of groundcover plants including Wallaby Grass (*Austrodanthonia spp.*) and Spear Grass (e.g. Corkscrew Spear-grass (*Austrostipa setacea*) and Austrostipa

gibbosa (*Spurred Spear-grass*)), herbs (e.g. Leafless Bluebush (*Maireana aphylla*) and Dwarf Bluebush (*Marieana humillima*)), Lilies (e.g. Chocolate Lily (*Arthropodium strictum*)), orchids, saltbush (e.g. Berry Saltbush (*Atriplex semibaccata*)) and Drumsticks (*Pycnosorus globosus*) (Ahern *et al* 2003).

There are twenty-nine species of threatened flora recorded within the Timmering Landscape Zone (NRE 2002c). These species are noted in Appendix 5, along with their threatened status (as per the Flora Information System) (NRE 2002c), the State Level (*Flora and Fauna Guarantee Act (FFG) 1988*) and the National Level (*Environmental Protection and Biodiversity Conservation Act (EPBC) 1999*) (Ahern *et al* 2003).

Examples of threatened plant species recorded in the Timmering Landscape Zone include:

- Yarran Wattle (*Acacia omalophylla*) (Endangered in Australia and Victoria and listed under the *FFG Act 1988*),
- Turnip Copperburr (*Sclerolaena napiformis*) (Endangered in Australia and Victoria and listed under the *FFG Act 1988*),
- Slender Darling-pea (*Swainsona murrayana*) (Vulnerable in Australia, endangered in Victoria and listed under the *FFG Act 1988*),
- Red Swainson-pea (*Swainsona plagiotropis*) (Vulnerable in Australia and Victoria and listed under the *FFG Act 1988*),
- Slender Water-ribbons (*Triglochin dubium*) (rare in Victoria), and
- Rigid Water-milfoil (*Myriophyllum porcatum*) (Vulnerable in Australia and Victoria)(Ahern *et al* 2003).



Plate: Red Swainson-pea (*Swainsona plagiotropis*) are an example of a threatened plant species recorded in the Timmering Landscape Zone (Chelsea Nicholson 2007)

2.3.2 Fauna

There are forty-four recorded threatened (fauna) species recorded in the Timmering Landscape Zone (NRE 2002d) (refer to Appendix 6 for a list of species, their threatened status and relevant acts) (Ahern *et al* 2003).

Examples of threatened woodland species recorded in the Timmering Landscape Zone include:

- Swift Parrot (*Lathamus discolor*) (Endangered in Australia and Victoria and listed under the *FFG Act 1988*)
- Bush Stone-curlew (*Burhinus grallarius*) (Threatened in Australia and endangered in Victoria),
- Hooded Robin (*Melanodryas cucullata*) (near threatened in Victoria and listed under the *FFG Act 1988*),
- Grey-crowned Babbler (*Pomatostomus temporalis*) (endangered in Victoria and listed under the *FFG Act 1988*),
- Diamond Firetail (*Stagonopleura guttata*) (Threatened in Australia and vulnerable in Victoria), and
- Tree Goanna (*Varanus varius*) (vulnerable in Victoria) (Ahern *et al* 2003).

Examples of threatened mammals recorded in the Timmering Landscape Zone include:

- Squirrel Glider (*Petaurus norfolcensis*) (endangered in Victoria and listed under the *FFG Act 1988*).

Species such as Sugar Glider (*Petaurus breviceps*), Koalas, Kangaroos, Bats, Wallabies and Possums would also be found.

Examples of threatened bird species recorded within the Timmering Landscape Zone that are predominantly associated with wetlands include:

- Brolga (*Grus rubicunda*) (vulnerable in Victoria and listed under the *FFG Act 1988*),
- Hardhead (*Aythya australis*) (vulnerable in Victoria),
- Australasian Shoveller (*Anas rhynchos*) (vulnerable in Victoria),
- Musk Duck (*Biziura lobata*) (vulnerable in Victoria),
- Freckled Duck (*Stictonetta naevosa*) (endangered in Victoria and listed under the *FFG Act 1988*),
- Painted Snipe (*Rostratula benghalensis*) (endangered in Victoria),
- Royal Spoonbill (*Platalea regia*) (vulnerable in Victoria),
- Little Egret (*Egretta garzetta*) (endangered in Victoria),
- Great Egret (*Ardea alba*) (vulnerable in Victoria and listed under the *FFG Act 1988*) (Ahern *et al* 2003).



Plate: Tree Goannas (*Varanus varius*) are an example of a threatened species recorded in the Timmering Landscape Zone (Chris Garth 2005)



Plate: Royal Spoonbill (*Platalea regia*) is an example of a threatened species recorded in the Timmering Landscape Zone (Peter Menkhurst NRE 2002d)

3.0 PREPARING A CONSERVATION PLAN



3.1 METHODOLOGY

The methodology used to develop this Conservation Plan is based on the 'Goulburn Broken Biodiversity Action Planning Developer's Manual' (GBCMA *in prep.*). This document provides the background information relating to BAP in the Goulburn Broken Catchment and is designed to ensure consistency during the development of the Landscape Zone Plans.

The methodology used to prepare this Plan contained eight main elements. These were;

- 1) Identification of Conservation Features and Threatened Species,
- 2) Ground-truthing of Potential BAP Sites,
- 3) Field Surveying of BAP Sites,
- 4) Prioritisation of BAP Sites,
- 5) Generation of Focal Species List,
- 6) Generation of Key Biodiversity Asset List,
- 7) Development of Actions for Key Biodiversity Assets, and
- 8) Landscape Context Analysis.

Step 1. Identification of Conservation Features and Threatened Species

Features in the landscape that are of potential priority for conservation were identified, as well as flora and fauna species of conservation significance (e.g. threatened under State or Commonwealth legislation). This involved desktop analysis of data (e.g. literature review; spatial data (e.g. EVC, trees cover, wetlands, flora and fauna records and aerals); corporate databases (e.g. Biosites, Victorian Fauna Display and Flora Information Systems); local knowledge investigations; and the Landscape Context Model (refer to Step 8). From this analysis, a series of sites likely to have conservation values and threatened species, were identified and mapped using GIS (CGDL 2005).

Step 2. Ground-Truthing of Potential BAP Sites

This involved the surveying of the Zone (from the roadside) to compare desktop analysis data (Step 1) to the actual on-ground area (in regard to presence/absence, type of vegetation and raw condition).

Step 3. Field Surveying of BAP Sites

Sites were prioritised for survey as per the 'Goulburn Broken Biodiversity Action Planning Developer's Manual' (GBCMA *in prep.*). This prioritisation method is shown in Appendix 7. One hundred of the sites requiring ground-truthing were field surveyed (on-site or from the nearest public land). This involved;

3.1) Bird Surveys: Undertaken in accordance with the Birds of Australia – Atlas Search Method of 'Area Search' (1 hectare (as per VQA survey), twenty minutes, any shape) (Birds Australia 2001).

3.2) Vegetation Quality Assessment (VQA)(DSE 2004): Site-based habitat and landscape components were assessed against a pre-determined 'benchmark' relevant to the vegetation type being assessed (e.g. grasslands, wetlands, plains grassy woodlands) (Refer to Appendix 8 for form).

3.3) Threat Identification: Whilst undertaking the Vegetation Quality Assessment (DSE 2004), a list of threatening processes (e.g. pest plants and animals) at the priority sites were recorded according to the Actions for Biodiversity Conservation (ABC) database (DSE 2005a).

Step 4. Prioritisation of BAP Sites

One hundred sites were given a ranked value of 'Very High' (VH), 'High' (H), 'Medium' (M) or 'Low' (L) based on a range of factors (e.g. conservation status of the EVC, presence of threatened species, size and VQA score). Sites not surveyed, nor automatically ranked (as per Appendix 7), were given a ranked value to the lesser of the available options (until surveying occurs).

Step 5. Generation of Focal Species List

The focal species approach (Lambeck 1997) uses the habitat requirements of a particular species, or group of species, to define the attributes that must be present in a landscape for these species to persist. It is acknowledged that the approach will not ensure the conservation of all biota. However, broadly the concept recognises that if a species that requires the largest remnant size is selected, then fulfilling the needs of that species may result in the conservation of all species, with smaller remnant size requirements (GBCMA *in prep.*). Huggett 2007 identifies the strengths of the approach as; its ability to provide quantitative and spatial advice for strategically restoring landscapes; its use of landscape ecological science principles to build new habitat for targeted taxa; and its ability to provide a tool that can be applied in the community.

Therefore, focal species were identified for each Zone based primarily on landscape ecological science principles (e.g. species with particular spatial, composition or functional requirements that may help address the functionality of the systems in the Zone) (GBCMA *in prep.*). Other factors such as social values (e.g. to entice the community to conserve biodiversity) and the practical application of the species in the community (e.g. for on-ground works) was also considered.

Step 6. Generation of Key Biodiversity Asset List

The identified environmental or managerial features, including flora and fauna species, were categorised into a series of 'nested' assets. For example, similar species or environmental features may be located in 'nested assets' such as creeklines, wetlands or Ecological Vegetation Classes. Public Land (e.g. roadsides) whilst not a biodiversity asset *per se*, have been included as an asset category primarily due to their function in the landscape and for practical application in the field. Where sites have been identified as 'public land', attempt has been made to also identify an environmental asset category (e.g. 'riverine woodland') to allow querying of information (refer to Appendix 12 for further information).

Step 7. Development of Actions for Key Biodiversity Assets

This step involved the development of a list of actions aimed at protecting and enhancing the biodiversity values in the Zone, by reducing the identified threats for each key biodiversity asset (as determined in Step 6). Actions were based on improving the size/extent of a site, the condition of the site and landscape processes (e.g. habitat connectivity). Available information (e.g. Actions for Biodiversity Conservation (ABC) database) (DSE 2005a) and the SIR South Landscape Plan (Ahern *et al* 2003) were also used to compile suggested actions. Where sites have current management plans, these are noted in the actions to encourage implementation.

Step 8. Landscape Context Analysis

To achieve long-term viability of the priority 'BAP' sites they need to be linked and/or increased in size and total tree cover, to form a viable functioning landscape. The Landscape Context Model (LCM) (Ferwerda 2003) uses a model of 'known habitat' (based on mapping for tree cover, wetland, and major watercourses) to identify large remnants, key remnant clusters and the key linkages between them. However because of potential limitations of the input data, areas of conservation significance (particularly grasslands and sparse woodlands) may not be identified. Similarly, areas with minimal conservation significance may be included, because habitat quality data is not included in the model.

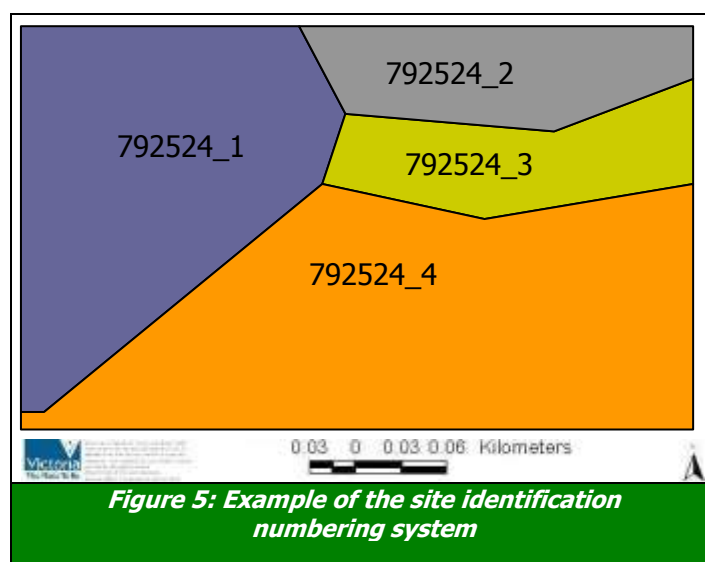
However, the Landscape Context Model is useful as a background to BAP mapping, as it identifies areas that have the highest (or least) probability of containing additional sites of conservation interest (as per Step 1). Therefore the model can be used to identify areas of the landscape that should be used to link and strengthen a network of conservation sites, and create a sustainable landscape. The Timmering Landscape Zone priority (BAP) sites and Landscape Context Model are shown in Appendix 9.

4.0 IDENTIFYING PRIORITY SITES



In the Timmering Landscape Zone 209 sites were identified as Biodiversity Action Planning (BAP) priority sites for conservation management. These sites are termed BAP sites. They contain remnant vegetation and vary greatly from a stand of paddock trees, to larger areas of native vegetation such as the Corop Lakes. One hundred of these BAP sites have been ground-truthed and surveyed. A summary of these results is provided in Section 5.0.

In order to identify the BAP sites each site was assigned a number that identifies its location and the associated data. This unique number has been calculated using the map-index (map reference) number (1:25,000 map) and a site number (e.g. 1-209). An example of the site identification numbering system (e.g. how the site(s) are identified using the site number system) is illustrated below (Figure 5). An example of the data that is contained in the database (referred to as 'Attribute Table') for each BAP site is detailed below (Figure 6). For further information on how to obtain data on each of the 209 BAP sites refer to Appendix 12.



Site Number:	792524_4
Biodiversity Asset	Riverine Woodland (Section 6.2)
Priority Status	Very High (VH)
Bioregion	VR (Victorian Riverina)
EVC	872 (Section 2.2)
EVC Conservation Status	E (Endangered)
Focal Species	Tree Goanna (<i>Varanus varius</i>) (Section 6.1)
Threatened Flora	Forde Poa (<i>Poa fordeana</i>)
Threatened Fauna	Squirrel Glider (<i>Petaurus norfolcensis</i>)
Vegetation Quality Score	14/20 (Section 5.1)
Landholder	Private
Threats	(230) Pest Plants, (500) Habitat Fragmentation

Figure 6: Example of the data contained in the data (Attribute Table)

5.0 SUMMARY OF SITE SURVEYING



5.1 VEGETATION QUALITY ASSESSMENTS

One hundred⁴ of the 209 BAP sites were assessed based on habitat features of 1) Large trees, 2) Canopy Cover, 3) Understorey, 4) Weediness, 5) Recruitment, 6) Organic Litter, 7) Logs (and Landscape Component Scores) 8) Size, 9) Neighbourhood and 10) Core Area. They were scored out of a maximum score of 20 (assumed intact habitat). An example of the assessment sheet is provided in Appendix 8. Graphical illustration of the results is also provided in Appendix 10.

The surveyed sites in the Timmering Landscape Zone scored between 2 and 17 (Appendix 10). Three sites scored the highest, two in the Southern area of the Zone towards Corop (a wetland and a bushland reserve site) and a site in the Northern extent (North of the Murray-Valley Highway). The lowest scored sites were in the Northern extent of the Zone.

The graphical results (Appendix 10) highlight some of the challenges and positives for biodiversity conservation in the Timmering Landscape Zone. In summary, the assessments identified that;

- Only 21% of surveyed⁵ sites had more than 7 large trees per hectare,
- Only 9% of surveyed sites scored adequate understorey (>75% cover),
- Only 35% of surveyed sites scored less than 25% weed cover,
- 70% of surveyed sites had 70% or more regeneration,
- 78% of sites surveyed had more than 5% organic litter,
- Only 36% of surveyed sites have adequate number of logs (>25m/ha),
- 55% of surveyed sites were larger than 10 hectares and 41% between 2-10 hectares, and
- 40% of sites surveyed sites had less than 10% area covered by native vegetation within a 1km radius.

These surveys indicate that overall there is a good presence of overstorey that contributes to a good layer of organic litter. It was evident from the surveys that there is an excellent opportunity to target a number of remnants for high biodiversity benefit in areas such as understorey, pest plants and linkages. Surveys indicate that remnants in the Zone are of a good size (e.g. 55% of sites are larger than 10 ha and 41% of sites are between 2 – 10 hectares). High priority sites between 2-10 hectares should be targeted to increase their extent and link with other high priority sites, especially creeks and roadsides. There is also an opportunity to survey the remaining 109 sites in the Zone (e.g. sites that were automatically given a very high priority ranking but were not surveyed in the initial process).

5.2 BIRD SURVEYS

One hundred of the 209 priority sites had bird surveys completed. Sixty-nine species of birds were surveyed. A collective list of birds surveyed at the 100 sites is provided in Appendix 11.

Threatened species identified during surveying included species such as, Grey-crowned Babbler (*Pomatostomus temporalis*), Hardhead (*Aythya australis*), Bush Stone-curlew (*Burhinus grallarius*) and Hooded Robin (*Melanodryas cucullata*). Brolga (*Grus rubicunda*) and Royal Spoonbill (*Platylea regia*) were also sighted in the Timmering Landscape Zone during ground-truthing. A list of threatened fauna (including birds) recorded in the Zone is shown in Appendix 6. For further information on how to obtain data on birds in the Timmering Landscape Zone refer to Appendix 12.

⁴ The majority of the one hundred sites that were surveyed are sites that were not automatically given a very high value status during prioritisation (see Appendix 7). However, a few sites that received very high value status were surveyed to compare the assessment system with the prioritisation system.

⁵ Surveyed sites scored in relation to requirements for Ecological Vegetation Class Benchmark. Refer to Appendix 8 for further information on surveying.

5.3 CONSERVATION THREATS

Whilst undertaking the Vegetation Quality Assessment (DSE 2004) at the 100 sites, a list of threatening processes (e.g. pest plants and animals) were recorded according to the Actions for Biodiversity Conservation (ABC) database (DSE 2005a).

These included;

- Animals – Domestic Stock (Inappropriate⁶ grazing management (e.g. timing, stocking rate)),
- Vegetation Clearance (Land Clearance – removal of native vegetation),
- Land Use Changes – agricultural intensification,
- Animals – e.g. Pest Species - Foxes and Rabbits,
- Firewood Collection & Cleaning Up (Removal of Habitat),
- Groundwater – level changes (e.g. Watertable Levels),
- Invasion by Environmental Weeds (Pest Plants),
- Removal of Rocks/Soil (Impacts of Roadworks on Roadside Vegetation),
- Waterways (in stream barriers) (Changes in hydrological regimes, e.g. wetlands),
- Waterways – removal of wood debris/snags, and
- Habitat Fragmentation/Edge Effects (includes 'Adjacent Land Use Practices').

Inappropriate grazing management (*refer to footnote 6*) affects biodiversity conservation through soil compaction, removal of vegetation, introduction of pest plants, changed nutrient levels in and around native vegetation, tree dieback and results in competition for fodder by native animals which require tussocky grass for shelter (Wilson & Lowe 2002). Nine percent of the surveyed sites scored in the category of having more than 75% understorey cover, however they had less than two types of forms (e.g. Tree, Shrub, Herb, Fern, and Grass). No sites scored in the category of having more than 75% cover and two or more forms. Forty-eight percent of the surveyed sites scored between 25-75% cover with two or more forms. This result demonstrates the opportunities to protect these sites from threats and manage grazing for biodiversity conservation.

Vegetation/Land clearance (a key threatening process under the *EPBC Act 1999*) (Wierzbowski *et al* 2002) particularly occurred in the past and it continues to be a threat to conservation values within the Zone. Practices such as inappropriate⁷ earth work (e.g. removal of natural depressions/wetlands) and illegal vegetation removal are a threat to biodiversity values. **Habitat fragmentation** (a potentially threatening process for fauna in Victoria under the *FFG Act 1988* (Wierzbowski *et al* 2002)) is primarily the result of land clearance and **agricultural intensification** (especially evident in the Southern part of the Zone in the last ten years). Habitat fragmentation affects species ability to source food and suitable habitat required for their survival (e.g. leads to less effective immigration, emigration and breeding success). Further links should be made between the priority sites within the Zone (e.g. linking with the creeks).

Adjacent land use practices (e.g. intensive irrigation, effluent run-off, chemical use and inappropriate earthworks (*refer to footnote 7*)) can also lead to **edge effects**. Examples include the colonisation of fragmented remnant areas by weeds, waterlogging, high watertable depths, nutrient run-off and an increase in sediment input to rivers and streams (DPI 2005). Programs in the area such as Water Use Efficiency and Surface Water Management Systems are designed to alleviate these issues.

Pest Animals threaten conservation values in the Zone. Predation of native wildlife by the Cat (*Felis catus*) and by the introduced Red Fox (*Vulpes vulpes*) are listed as potentially threatening processes under the *FFG Act 1988* (Wierzbowski *et al* 2002), due to their impact on native species. The European Rabbit (*Oryctolagus cuniculus*) and European Hare (*Lepus europaeus*) compete for habitat, remove native vegetation and disturb soil structure (DSE 2004). 'Vermin on land' is listed as an issue in the Cornella Local Area Plan which lists pest species such as hares, foxes, rabbits, feral cats and carp (Cornella LAP 2000). 'Pest eradication' (e.g. rabbits and foxes) is also listed as an issue in the Nanneella and District Local Area Plan (Nanneella LAP 2002).

⁶ The term inappropriate (in this sense) refers to grazing native vegetation without consideration of stock capacity, time of year or length of time.

⁷ The term inappropriate (in this sense) refers to the purposeful movement of soil/vegetation without consideration of the natural landscape (e.g. water flow).

The removal of fallen timber (or 'cleaning up') is a threatening process within the Zone. Removal of fallen timber can result in a loss of habitat for birds, mammals, reptiles and insects, exposing them to predation by introduced predators. With a reduction in insect populations, timber removal also reduces the number of insect-eating birds in an area. For example, the Bush Stone-curlew (*Burhinus grallarius*) is just one of the species that is severely impacted upon by timber removal, due to loss of insects and the loss of fallen timber that is used as habitat and camouflage for the protection of chicks (DSE 2005a).

Salinity is an overarching potential threat to the area as a result of **high watertable** (DSE 2005b). Both the Cornella Local Area Plan (Cornella LAP 2000) and the Nanneella and District Local Area Plan (Nanneella LAP 2002) identify salinity and rising watertables as issues in the Catchment. In 1996 (used as the 'representative year') watertable depths in the Zone ranged from 0-1 metres (North-East and South-Eastern areas), to more than 3 metres in areas (in the Western areas) (CGDL 2005). In the region the High Value Environmental Features (HVEF) project (DPI 2006) has identified sites that are either currently or potentially at risk of degradation as a result of high watertable. This data has been used during the development of this Plan, including the inclusion of data and recommendations (e.g. for Gaynor Swamp/Corop Wetland Complex near Stanhope).

Pest Plants (Weeds) are a major threat to biodiversity because they compete with native species, for essentials (e.g. space, light and nutrients). Invasion of native vegetation by environmental weeds is listed as a potentially threatening process under the *FFG Act 1988* (Wierzbowski *et al* 2002). Thirty-five percent of the one hundred surveyed sites had 50% or more weeds in relation to composition. Weeds are listed as an issue in the Cornella and Nanneella Local Area Plan's and list species such as, Blackberry (*Rubus fruticosus agg*), Sweet Briar Rose (*Rosa rubiginosa*), Paterson's Curse (*Echium plantagineum*), Boxthorn (*Lycium ferocissimum*), St John's Wort (*Hypericum perforatum*) and Bathurst Burr (*Xanthium spinosum*) (Cornella LAP 2000; Nanneella LAP 2002). Priorities for pest plants are part of a statewide priority system and whilst they should be targeted as such, landholders are encouraged to manage all pest plants on their land. Weeds are especially evident on roadsides due to increased moisture, escaped garden/agricultural plants, machinery disturbance (e.g. **Roadworks**) and can be a result of poor vehicle hygiene. Pest plants invading remnants can also be a result of adjacent land practices (e.g. agricultural weeds) and animal movement (e.g. birds) (DSE 2004).

Changes in hydrology (e.g. hydrological regimes) can be a threat to native vegetation, particularly for wetlands and creeks, which have evolved to function with the natural cycles of flood and drought. In-stream barriers such as roads can interrupt water supply to natural wetlands and creek systems. Removal of wood debris and snags also threaten the waterways in the Zone and impact on species survival (e.g. River Blackfish (*Gadopsis marmoratus*)). Water quality (e.g. saline flows in creeks, saline groundwater, turbidity, loss of aquatic species and nutrients) were listed in the Cornella Local Area Plan as issues in the Catchment (Cornella LAP 2000).

Terrestrial remnant vegetation in the Zone is also affected by changes in hydrology.

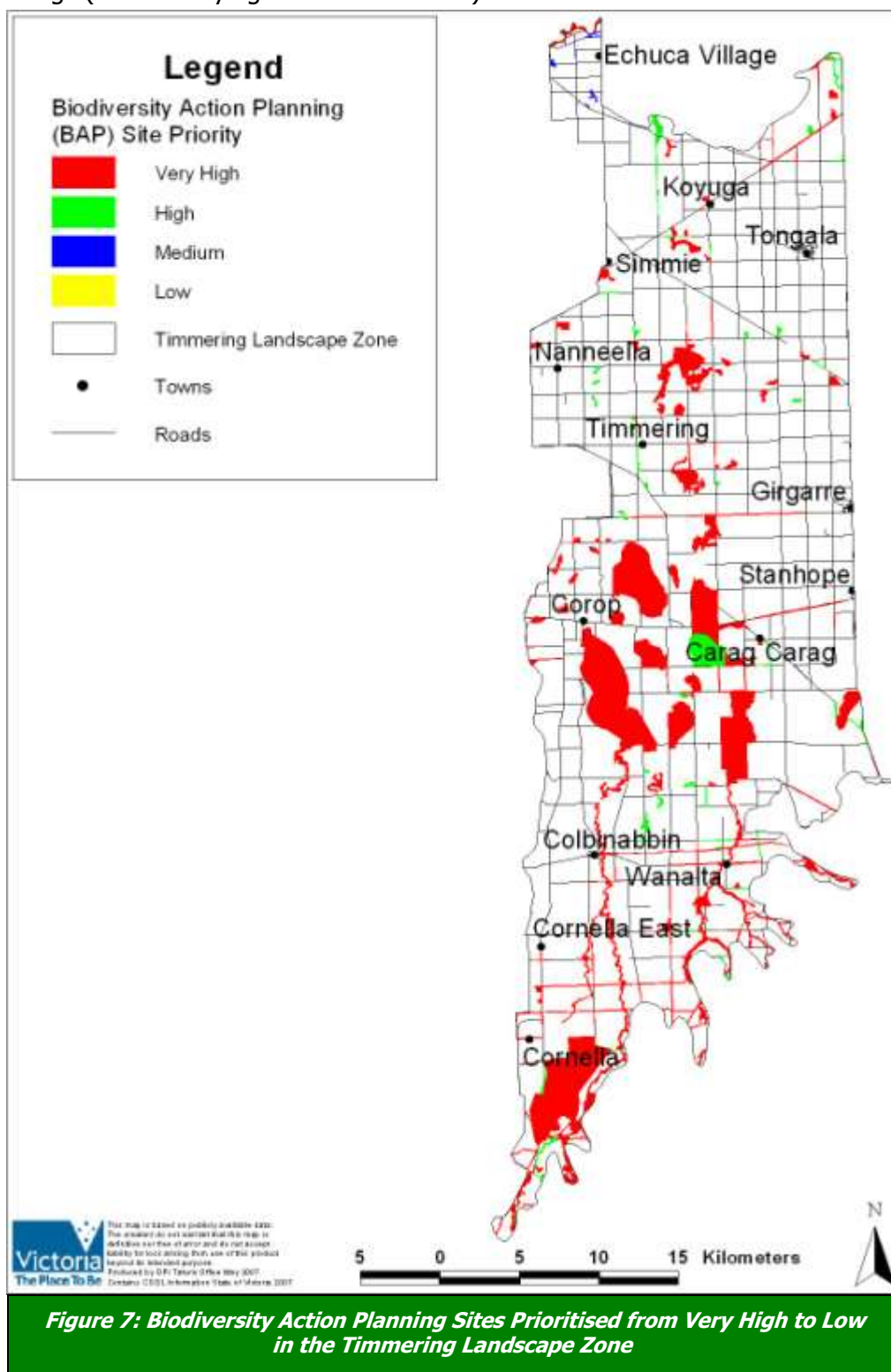
For example, stands of Grey Box (*Eucalyptus microcarpa*) trees within irrigated paddocks were showing signs of stress (e.g. dead limbs) (e.g. towards the Northern extent of the Zone).



Plate: An example of a site (Lake Stewart) in the Timmering Landscape Zone that was showing signs of stress (salt scold)

5.4 SITE PRIORITISATION

Figure 7 illustrates the 209 BAP sites that have been given a priority status (ranked value) of Very High (VH), High (H), Medium (M) or Low (L), based on a range of factors (conservation status of the EVC, presence of threatened species, size and VQA score). Prioritisation occurred at 3 stages (refer to Appendix 7); prior to surveying; following surveying and for unsurveyed sites. For example, prior to surveying, large sites with high EVC conservation status and threatened species that did not require ground-truthing, were automatically given a priority status of very high (VH). Surveyed sites were given a priority status based on the three factors above and the VQA score (Appendix 8). Sites that were not able to be surveyed (e.g. more than 100 sites that required ground-truthing), nor able to be automatically ranked as 'Very High' prior to surveying, were given a ranked value to the lesser of the available rankings (until surveying can be conducted).



6.0 BIODIVERSITY ASSETS



6.1 FOCAL SPECIES

Research shows that species have different types of responses to landscape change. The focal species approach (Lambeck 1997) uses the habitat requirements of a particular species (or group of species), to define the attributes that must be present in a landscape for these species to persist. Broadly, the focal species concept recognises that if a species which requires the largest remnant size is selected, then fulfilling the needs of that species may assist in the conservation of other species, with smaller remnant size requirements. The focal species are also predicted to be the most sensitive species (in a given landscape) to a threat of ecological process, such that, their conservation could also conserve other less-sensitive species found in the same vegetation type (GBCMA *in prep*).

Whilst it is acknowledged that the focal species approach will not ensure the conservation of all biota (Huggett 2007), its key strengths and ability to define and guide targets (e.g. patch size and connectivity) for our landscape restoration strategies (Lambeck 1997) is recognised. Other strengths of the approach is its ability to provide quantitative and spatial advice for strategically restoring landscapes and its use of landscape ecological principles to build new habitat for targeted taxa (Huggett 2007). The approach also allows for the monitoring of actions (e.g. can undertake regular surveys to establish if targeted species are increasing in numbers and/or using new sites) and provides the community with an 'iconic/focal' species (a social-hook') (Huggett 2007) to enhance enthusiasm for implementing works.

The six focal species identified in the Timmering Landscape Zone, and their ecological requirements (thresholds⁸) are identified below (Table 2). A definition of the ecological terms used includes;




- Minimum patch size (patch size threshold) – refers to the minimum patch size of vegetation required for the species to maintain viable populations,
- Critical distance between habitat patches (isolation threshold) – refers to the size of the gap between habitats, beyond which, on a daily basis, the animal doesn't generally cross (GBCMA *in prep.*),
- Dispersal threshold – refers to the distance (km) for which the species has been known to travel (e.g. for breeding, migration), but generally does not on a daily basis,
- Ecological Vegetation Class (EVC) – the vegetation community that the species prefers, and
- Other requirements – identifies some other known requirements (not comprehensive) for the species to survive, or to inhabit an area.

An example of a focal species project that has occurred in the Northern extent of the Shepparton Irrigation Region (e.g. Strathmerton) is the Grey-crowned Babbler (*Pomatostomus temporalis*) project. In the first year of the project 28,000 indigenous plants were planted and 10 kilometres of fencing constructed. If we look at the patch size required to maintain viable Grey-crowned Babbler populations (the minimum patch size of vegetation required is 2 hectares, preferably with mature trees, and no less than 500-metre gaps (critical distance)), this valuable information can assist in the future direction of on-ground works for such projects (e.g. we can model the best places to increase existing patch size or create new patches through BAP and the Landscape Context Model approach).

It is envisaged that community groups and agencies may target one, or a combination of the focal species identified (Table 2), for planning and implementation of on-ground works in the Zone. For example (based on Table 2) we know that we want to establish patches of at least 30 hectares (larger for Brolgas or clusters) and as wide as possible (e.g. at least 40 metres) with connectivity between sites to aim to conserve targeted taxa in the Timmering Landscape Zone.

⁸ Thresholds refer to the point at which relatively rapid change occurs (e.g. loss of species). Therefore, these should be used as a minimum target only.

**Table 2: Focal Species and their Habitat Requirements –
Timbering Landscape Zone**

	Brolga (<i>Grus rubicunda</i>) (v) Minimum patch size (threshold) Critical distance between patches Dispersal threshold Ecological Vegetation Class Some Other requirements (general)	>50ha or clusters of wetlands Varies Varies Wetland (ephemeral, 20-30cm depth) Fox control, Cane Grass vegetation
	Bush Stone-curlew (<i>Burhinus grallarius</i>) (e) Minimum patch size (threshold) Critical distance between patches Dispersal threshold Ecological Vegetation Class Some other requirements (general)	>1ha, >40m wide <1km <2km from known site Creeklines, Woodlands Ground timber, fox control
	Brown Treecreeper (<i>Climacteris picumnus</i>) (k) Minimum patch size (threshold) Critical distance between patches Dispersal threshold Ecological Vegetation Class Some other requirements (general)	>30ha <500 m <1km Woodlands, edges, forest clumps, Mature trees, fallen timber#, linkages
	Tree Goanna (<i>Varanus varius</i>) (v) Minimum patch size Critical distance between patches Dispersal threshold EVC utilised Some other requirements (general)	>2km roadside/streamside patches <2km <2km Most except wetlands Mature trees, fox control, logs
	Squirrel Glider (<i>Petaurus norfolcensis</i>) (e) Minimum patch size (threshold) Critical distance between patches Dispersal threshold Ecological Vegetation Class Some other requirements (general)	>0.5ha, >1km length <50 metres <1km Woodlands, Forests Mature trees, hollow-dependent+
	Latham's Snipe (<i>Gallinago hardwickii</i>) (e) Minimum patch size (threshold) Critical distance between patches Dispersal threshold Ecological Vegetation Class Some other requirements (general)	<1ha (estimate) Varies Migratory species from Japan Wetlands (shallow), grasslands Invertebrates, vegetation cover

Habitat requirements for Brown Treecreeper includes fallen timber at >40t/hectare (MacNally 2006).

+ Tree hollows (with tight-fitting entrance hole) are essential to Squirrel Gliders for breeding and den sites.

Victorian Threatened Status Definitions: (e) = endangered, (v) = vulnerable, (k) = poorly known.

Habitat Requirement Source: Variety of Sources (GBCMA *in prep.*).

Photo Credits: Bush Stone-curlew (Ian McCann), Tree Goanna (Peter Robertson), Squirrel Glider (John Seebeck) and Latham's Snipe (Mike Carter) (NRE 2002d); Brown Treecreeper (Dr. Neville. R. Bartlett 2006); and Brolga (Paul O'Connor 1992).

Note: The focal species are only a suggestion of species to focus on-ground works. Other species may also be the focus for on-ground works, given new information and community desire to implement works for another species.

6.2 KEY BIODIVERSITY ASSETS

BAP attempts to take a strategic approach toward the conservation of threatened and declining species and vegetation types, by looking for opportunities to conserve groups of species in appropriate ecosystems. The identification of the appropriate biodiversity assets to focus conservation effort is an important part of the process. The approach has been used to group together species that utilise the same type of habitat. By protecting these assets (Table 3) we aim to conserve habitat for a suite of threatened species associated with that habitat (e.g. by choosing 'Wetlands' as a key biodiversity asset it incorporates all of the species that live in, and use a wetland, as well as the individual threatened species). Specific actions (Section 7.0) based on the requirements of each asset can be developed and implemented (GBCMA *in prep.*). The 209 BAP sites in the Zone have been categorised into six key biodiversity assets (Figure 8). A number of sites can be grouped based on two assets (e.g. Gaynor Swamp as a wetland and public land). Note: only the primary asset is identified below. Refer to Appendix 12 for how to obtain further information on each site.

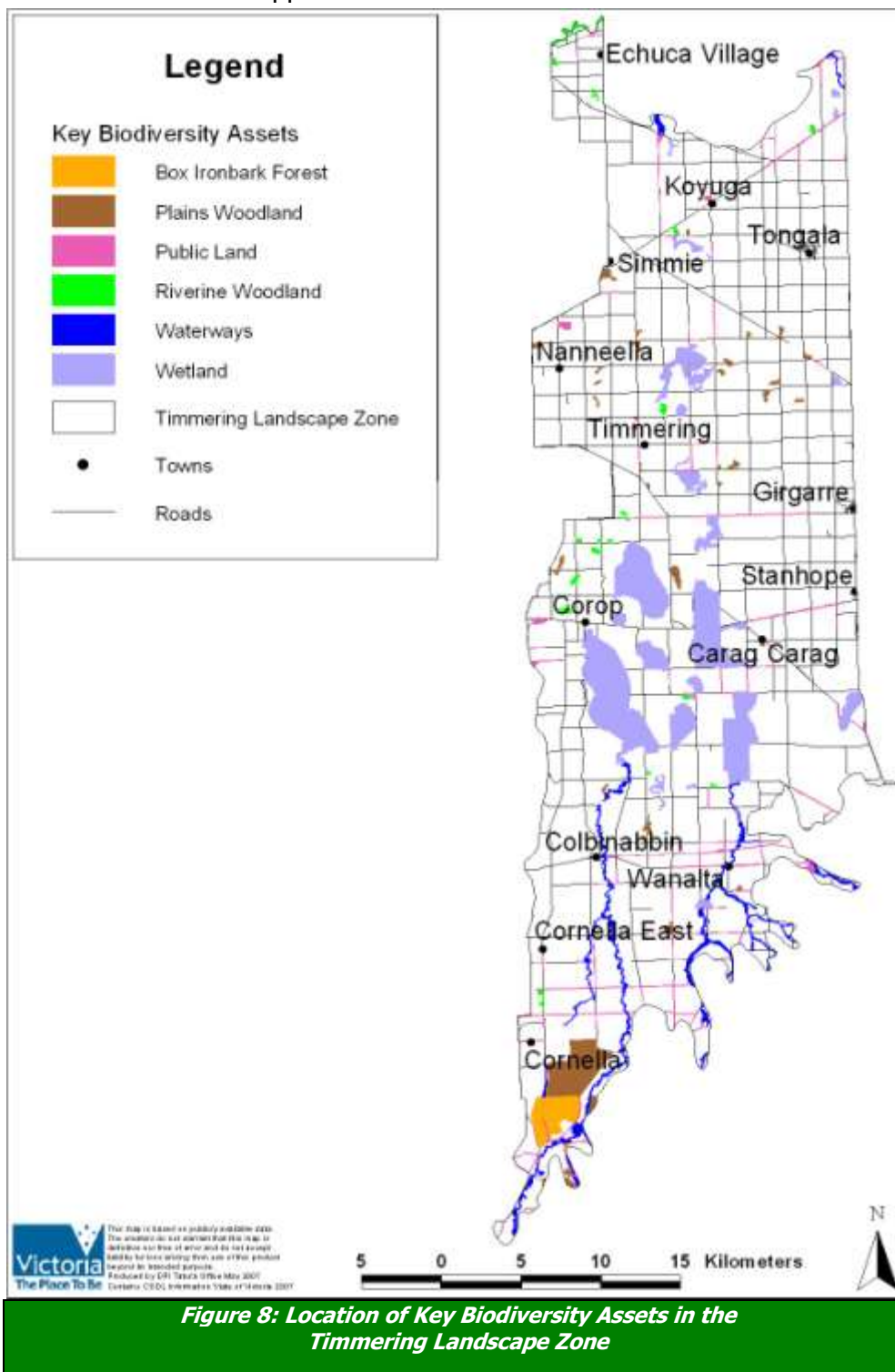


Figure 8: Location of Key Biodiversity Assets in the Timmering Landscape Zone

Table 3: Key Biodiversity Assets – Timmering Landscape Zone

Key Biodiversity Assets	Examples of Threatened and Notable Species
*1) Waterways Major Bioregional and local habitat links for terrestrial fauna. Includes areas such as Cornella Creek, Wanalta Creek, Nine-Mile Creek, Yallagalorrah and Gobarup Creek. Waterways connected to a network of wetlands (lakes and swamps).	Bush Stone-curlew (<i>Burhinus grallarius</i>), Black Falcon (<i>Falco subniger</i>), Great Egret (<i>Ardea alba</i>), Grey-crowned Babbler (<i>Pomatostomus temporalis</i>), Little Bittern (<i>Ixobrychus minutus</i>), River Blackfish (<i>Gadopsis marmoratus</i>), Squirrel Glider (<i>Petaurus norfolcensis</i>) and Murray Spiny Cray (<i>Euastacus armatus</i>).
2) Wetlands Distinctive ecosystems primarily associated with the Corop Lakes System such as Lake Cooper, Green Lake, Gaynors Swamp, Mansfield Swamp, Wallenjoie Swamp, One Tree Swamp and Two Tree Swamp. Priority wetlands occur on private land occur in the Zone (e.g. near Corop).	Brolga (<i>Grus rubicundus</i>), Australasian Bittern (<i>Botaurus poiciloptilus</i>), White-bellied Sea-Eagle (<i>Aquila audax</i>), Great Egret, Hardhead (<i>Aythya australis</i>), Freckled Duck (<i>Stictonetta naevosa</i>), Spiny Lignum (<i>Muehlenbeckia horrida</i> ssp. <i>Halmaturorum</i>), Winged Water-starwort (<i>Callitriche umbonata</i>), Stiff Groundsel (<i>Senecio behrianus</i>), Downy Swainson-pea (<i>Swainsona swainsonoides</i>) and Ridged Water-milfoil (<i>Myriophyllum porcatum</i>).
3) Public Land (Roads/Railway & Bushland Reserves) #Public land in this instance refers primarily to Road/Rail and Bushland Reserves. Other sites (e.g. Gaynor Swamp, Two Tree Swamp) have been grouped as wetlands (primarily) and as public land (second).	Tree Goanna (<i>Varanus varius</i>), Squirrel Glider, Woodland Blind Snake (<i>Ramphotyphlops proximus</i>), Diamond Firetail (<i>Stagonopleura guttata</i>), Forde Poa (<i>Poa fordeana</i>), Turnip Copperburr (<i>Sclerolaena napiformis</i>), Slender Darling-pea (<i>Swainsona murrayana</i>), Red Swainson-pea (<i>Swainsona plagiotropis</i>), Yarran Wattle (<i>Acacia omalophylla</i>) and Ausfeld's Wattle (<i>Acacia ausfeldii</i>).
4) Plains Woodlands Incorporates Plains Woodland, Sand Ridge Woodland, Plains Grassy Woodland and Plains Grassy Woodland/Gilgai Wetland Mosaic Ecological Vegetation Classes. Less than one percent of EVCs remaining and requiring the largest increases in extent.	Small Scurf-pea (<i>Cullen parvum</i>), Chocolate lily (<i>Arthropodium fimbriatum</i>), Branching Groundsel (<i>Senecio cunninghamii</i> var. <i>cunninghamii</i>), Native Grasses, Wattles (<i>Acacia spp</i>), Tree Goanna, Bush-Stone-curlew (<i>Burhinus grallarius</i>), Diamond Firetail and Hooded Robin (<i>Melanodryas cucullata</i>).
5) Riverine Woodlands Includes Riverine Grassy Woodlands and Riverine Chenopod Woodland Mosaic Ecological Vegetation Classes. Provide crucial habitat (e.g. hollows) and other requirements for a range of species.	Sedges (<i>Carex spp</i>), Common Joyweed (<i>Alternanthera nodiflora</i>), Frosted Goosefoot (<i>Chenopodium desertorum</i> ssp. <i>Virosum</i>), Forde Poa, Yarran Wattle, Grey-crowned Babbler, Tree Goanna, Bush Stone-curlew, Diamond Firetail, White-bellied Sea-Eagle and Swift Parrot (<i>Lathamus discolor</i>).
6) Box Ironbark Forest Includes the Box Ironbark Forest EVC which is vulnerable. Occurs in the Southern end of the Zone (near Cornella) on private and public land. Primarily occur as open forests on low sedimentary hills. Important habitat for a range of species.	Ausfeld's Wattle, Orchids, Herbs, Lichens, Moss, Woodland Blind Snake, Squirrel Glider, Tree Goanna, Brown Treecreeper (<i>Climacteris picumnus</i>) and Swift Parrot.

* The numbering of the Key Biodiversity Assets (1-6) is only intended to assist with the identification of the assets throughout the remainder of the report. Scientific names listed only once.

Whilst public land (e.g. roadsides) is not a biodiversity asset *per se*, it has been included as an asset category, primarily due to their function in the landscape and for practical application in the field.

Note: There are two asset columns (Asset 1 and Asset 2) included in the data (refer to Appendix 12). All sites have been categorised based on the consistent Asset type (Asset 1) (e.g. Roadsides are listed as Public Land). For sites that have two asset types (e.g. Roadsides may also be Riverine Woodland), this is also listed (Asset 2) to allow querying of actions for land managers and to include as much data on each site as applicable to its management as possible.

7.0 PRIORITY ACTIONS – KEY BIODIVERSITY ASSETS



Priority actions for the Timmering Landscape Zone have been developed and grouped based on each 'Key Biodiversity Asset'. There are two key biodiversity asset categories (Asset 1 and Asset 2) included in the data (refer to Appendix 12). All sites have been categorised based on a consistent asset type (e.g. Creeks are listed as Waterways) (as illustrated in Figure 8). For sites that have two asset types (e.g. Creeks also Public Land), both assets have been listed in the data to allow further querying of actions for land managers. The actions listed below include actions for the consistent asset type but also acknowledge where sites cover more than one asset type.

Priority actions for the key biodiversity assets were developed based on the following factors, (1) size/extent (2) condition and (3) landscape processes (e.g. habitat connectivity and hydrological regimes). The condition (2) section was further split in relation to; education/extension; on-ground works; threatened species; and pest plants and animals. For example; an action relating to the condition of a remnant, due to rabbits, can be found under; 'condition' – 'pest plants and animals'.

The actions identified below are intended to assist in the protection of natural features within the Zone. This Plan does not provide detailed management actions for all sites (e.g. Mansfield Swamp), as such sites have detailed Management Plans (DPI 2007a). The actions do however consider the landscape value of the Zone as a whole, which incorporates all sites both public and private (e.g. encouraging the linking of high priority public land sites and private land sites).

For each of the six key biodiversity assets (1-6), the following pages identify:

- A) An introduction to the asset,
- B) Photographic example of the asset in 'good condition' for the Zone, and
- C) Proposed actions for each of the assets in the Zone (broader actions in Ahern *et al* 2003).

It is proposed that the community and agencies in the Zone investigate options for implementing these actions into existing projects, policies and strategies. The actions are designed to work with existing documents (e.g. Local Area Plans) and provide further guidance on priority sites. For example, BAP sites in each asset type, should be targeted in order of priority (Very High, High, Medium to Low) in relation to these actions (where applicable). This forms the basis of BAP, where the 'Very High' value sites that require less cost for long-term protection, will provide the highest prospect for conservation (GBCMA *in prep.*).



Plate: Biodiversity Action Planning sites in the Timmering Landscape Zone have been grouped based on six 'Key Biodiversity Assets' (e.g. wetlands such as Gaynor Swamp (above))

Note: Actions that identify the source as DSE 2005a are developed based on a rigorous process (Acts of Parliament) and are therefore of high priority. These actions originate from the Flora and Fauna Guarantee Act 1988 that provides for the listing of Victoria's threatened plant and animal species, ecological communities and potentially threatening processes. Under the Act, an Action Statement must be prepared. Action Statements outline what is required for the species conservation. For further information refer to the 'Actions for Biodiversity Conservation Database' (ABC) (DSE 2005a).

Acts of Parliament exist that must be adhered to when planning and implementing actions. For example, the Archaeological and Aboriginal Relics Preservation Act 1972 protects all Aboriginal places and relics in Victoria. For further information visit: <http://www.dms.dpc.vic.gov.au/>

7.1 WATERWAYS

A) Introduction - Waterways:

Waterways such as creeks, streams and lagoons are the lifeblood upon which most of the other assets depend. There are a number of waterways in the Zone, including the Cornella Creek (and part of the Yallagalorrah Creek branch) which flow in to a network of wetlands such as Lake Cooper. The Gobarup, Wanalta and Nine-Mile Creek systems occur in the South-Eastern part of the Zone and flow through areas such as Groves Weir to One Tree and Two Tree Swamps. These creeklines are of high conservation value as they provide essential corridors for species movement and provide habitat, food and shelter for a range of species (Ahern *et al* 2003).

A number of threats to waterways include vegetation/land clearing (e.g. to the edges), adjacent land use practices (e.g. nutrient run-off), hydrological regime alterations, de-snagging and pest plants and animals. The Cornella Local Area Plan (Cornella LAP 2000) aims to "...convey clean water flow down streams without causing erosion" (p.7). The actions identified below are intended to assist with the conservation of waterways within the Timmering Landscape Zone. However these actions are specific to the Zone and are by no means comprehensive for the region. Other strategies, such as the Victorian River Health Strategy (NRE 2002b) and the Draft Goulburn Broken River Health Strategy (GBCMA 2004b) provide a framework for managing and restoring rivers, streams and floodplains in Victoria and are overarching strategies for all areas. Whilst these strategies include other mechanisms for prioritising waterways (e.g. Index of Stream Condition), a Vegetation Quality Assessment (VQA) can also be a useful tool for site management.

B) Photographic Example - Waterways:

Example of a Waterway BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the Vegetation Quality Assessment (VQA) scores for sites surveyed in the Zone

The site (782413_29) pictured is a very high value site and is part of the Gobarup Creek. The EVC is Creekline Grass Woodland. As per the Vegetation Quality Assessment the site scored 16.5 due to good scores in size, understorey, large trees, regeneration, organic litter and low level of pest plants. Other high value sites (e.g. Cornella Creek, sections of Wanalta Creek) which are of good condition were not surveyed, as they were automatically given a very high value prior to surveying.



C) Actions Proposed – Waterways:

Size/Extent Related:

- **Increase the extent (buffering)** of all waterways, by continuing to support the Cornella Local Area Plan project (Cornella LAP 2000) (e.g. revegetating and fencing along creeks).
- **Encourage** the buffering of all identified waterways in the Zone, especially those with particular significance for threatened species (e.g. Squirrel Glider (*Petaurus norfolcensis*) and Tree Goanna (*Varanus varius*)).

Condition Related:

Education/Extension:

- **Promote** the benefits of protecting and enhancing native vegetation in the in-stream and riparian environments, through extension and voluntary programs (e.g. incentives).
- **Promote** the protection of sites from threatening processes to improve overall condition, through extension principles and/or incentives.
- **Promote** the use of direct seeding in the Corop, Colbinabbin and Wanalta areas (where appropriate) to increase efficiency of revegetation and assist in buffering waterways.
- **Encourage** the retention of fallen timber on all waterways and adjoining remnants.
- **Work with the local community (e.g. Local Area Planning)** to undertake a targeted community education program to promote the conservation of waterways such as the Cornella Creek and Wanalta Creek and the threats posed to these systems.
- **Consult** with licensees of waterways (e.g. Cornella, Wanalta and Nine Mile Creeks) to fence (waterway incentives) and encourage the removal of stock, especially during set times to allow regeneration (refer to off-stream watering point action below).

On-ground Works:

- **Protect** (e.g. fence) all priority waterways through covenants or incentives.
- **Improve** (dependent upon needs) the condition of high priority waterways (e.g. parts of Yallagalorrah and Cornella Creeks) to be very high value sites (as per adjoining areas).
- **Give priority** to protection and management of Public Land Water Frontage along Wanalta and Gobarup Creek systems (includes Nine Mile Creek) (Ahern *et al* 2003).
- **Monitor the condition** of stream frontages especially with respect to fencing and grazing, giving priority to well-connected water frontage corridors (e.g. Cornella Creek).
- **Establish off stream watering points** for all affected waterway sites.
- **Encourage** the planting of alternative timber supplies to reduce the impact of firewood collection on waterway frontages.
- **Encourage regeneration** of locally indigenous shrubs and groundcover along Waterways.

Threatened Species:

- **Modify stocking levels and grazing times**, as necessary, to benefit threatened species (e.g. Cane Spear-grass (*Austrostipa breviglumis*)) (e.g. Wanalta/Gobarup Creeks).
- **Control introduced predators** to benefit threatened species (e.g. Squirrel Glider, Bush Stone-curlew (*Burhinus grallarius*) and Tree Goannas).
- **Investigate** presence and management of Wanalta Creek for White-bellied Sea-Eagles (*Haliaeetus leucogaster*).
- **Investigate** the presence of River Blackfish (*Gadopsis marmoratus*) in the Zone and opportunities for use of the species as an indicator for river health.
- **Retain** all snags and boulders in waterways (e.g. Cornella and Wanalta Creek Systems) to improve water quality, habitat and food sources for the River Blackfish (see above action).

Pest Plant and Animals:

- **Implement ongoing integrated control of foxes and feral cats** for the protection of threatened species.
- **Target pest plants and animals** (e.g. European Carp (*Cyprinus carpio*)) in the Zone.

Landscape Process (e.g. flow regimes, connectivity):

- **Increase connectivity** between creeks (e.g. link the Cornella System to the Nine Mile Creek System) and remnants on adjoining tenures (e.g. **promote regeneration** of Public Land Water Frontages to improve connectivity with one another and with the adjacent remnants).
- **Reintroduce ecological flooding regimes** for waterways (and associated habitats) so as to equate as far as possible, with pre-European frequencies (Ahern *et al* 2003).

7.2 WETLANDS

A) Introduction – Wetlands:

Wetlands are amongst the most important, productive and valuable ecosystems within the region. They perform vital functions including water purification, nutrient processing, flood management and maintenance of the watertable. They provide habitat, refuge, and breeding (nursery areas) for many common and threatened species (e.g. Brolga, *Grus rubicunda*) (Howell 2002).

The Timmering Landscape Zone contains a number of very high value wetlands. These include sites such as One Tree Swamp, Two Tree Swamp, Wallenjoe Swamp, Little Wallenjoe Swamp, Mansfield Swamp State Game Reserve, Gaynor Swamp, Horseshoe Lake, Lake Cooper, Greens Lake and Grove's Weir. The wetlands are predominantly located in the central section of the Zone, between Colbinabbin and Koyuga. Areas of private land such as depression systems/drainage lines (e.g. the Timmering Depression) are also classified as part of this wetland asset and are often of very high value.

Wallenjoe, One Tree, Two Tree, Little Wallenjoe, Mansfield and Gaynor Swamps are all part of the Wallenjoe Wetlands Complex. They are a system of deep and shallow freshwater marshes that are valued for their size, species diversity, habitat value (e.g. for the Brolga (*Grus rubicunda*)) and rarity of wetland type (SKM 2004). The Wallenjoe Wetland Complex is listed in 'A Directory of Important Australian Wetlands (VIC 060) as a high value wetland system (EA 2001). Gaynor Swamp is monitored as part of the Statewide Mandatory Monitoring Program.

Lake Cooper (1194ha) and Greens Lake (1176ha) provide water storage and distribution for irrigation and flood mitigation as part of the Waranga-Mallee Irrigation system and also have a role for nature conservation and recreation (Ahern *et al* 2003).

There are a number of threats affecting wetlands in the Zone, such as vegetation/land clearing, changed hydrological regimes, water diversion, adjacent land use practices and pest plants and animals. The actions identified below aim to complement current activities as part of the Regional Catchment Strategy (GBCMA 2003) (e.g. Environmental Management Plans and Surface Water Management Program). These actions are specific to the Zone and are by no means comprehensive for the region. Other documents (e.g. Wetlands Directions Paper for the GB) (Howell 2002) provide direction for protecting wetlands in the catchment.

B) Photographic Example – Wetlands:

Example of a Wetland BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the Vegetation Quality Assessment (VQA) scores for sites surveyed in the Zone

The site (782414_69) pictured is Groves Weir which is part of the Wanalta Creek. The EVC is Wetland Formation. Although the site has been altered through water regulation, it scored 14.5 on the Vegetation Quality Assessment and is therefore a 'Very High' value site. Birds surveyed include species such as the Red Wattlebird (*Anthochaera carunculata*), Sacred Kingfisher (*Todiramphus sanctus*), Darter (*Anhinga melanogaster*) and White-plumed Honeyeater (*Lichenostomus penicillatus*).



C) Actions – Wetlands:

Size/Extent Related:

- Provide a **buffer** for all very high priority wetlands to protect from associated edge effects.
- **Buffer** (as far out beyond the rim of the basin as possible) **smaller sized wetlands** (e.g. North of Corop and Timmering) to increase their size and provide for their protection.

Condition Related:

Education/Extension:

- **Provide extension** to all landholders with wetlands in the Zone to assist with recognition of the benefits of wetlands and associated plants and animals on their properties.
- **Work with** the Cornella Local Area Planning (LAP) Group and associated community groups (e.g. Landcare) to develop a community program to **encourage landholders** with wetlands to protect them (e.g. fence/manage stock).
- **Encourage** landholders with priority wetlands to protect for the long-term (e.g. covenant).
- **Provide opportunities for education** of landholders and school children regarding the benefits of wetlands on farms, including the use of legislation where necessary (e.g. a campaign on the productive value of intact wetlands, in coordination with agriculture).
- **Investigate the development of a Site Management Plan** for all identified wetlands in the Zone (e.g. where a site is not a high priority for an Environmental Management Plan).
- **Encourage the appropriate use of chemicals** and other water contaminants on farms and within local communities, especially along the Wanalta and Cornella Creek Systems.
- **Encourage** the Cornella LAP group, Landcare Groups and local schools, to promote World Wetlands Day as a focus for increasing community awareness of wetlands.
- **Encourage** monitoring of wetlands and the adoption of new wetland monitoring sites, in consultation with the 'Waterwatch' Program and the Goulburn Murray Landcare Network.
- **Continue** to monitor the 'Timmering Depression' site as part of the Mandatory Monitoring Program.
- **Prevent** further removal of wetlands through education (and legislation where required).
- **Investigate** the use of 'Index of Wetland Condition Assessments' (DSE 2006) in conjunction with Vegetation Quality Assessments (still required to allow priority comparisons).
- **Compare** the Environmental Management Plan priority list against the BAP priority data and identify opportunities for integration of the processes/priority lists.
- **Investigate the purchase** of priority wetlands existing on private land, especially parts adjoining public land sites.

On-ground Works:

- **Protect** all identified wetlands in the Zone, commencing with very high value sites (e.g. all sites listed in 'A Directory of Important Australian Wetlands' (VIC 060)).
- **Implement** Environmental Management Plan recommendations (where existing) (e.g. Mansfield Swamp (DPI 2007a), Gaynor Swamp (DPI 2007b), Wallenjoe Swamp (DPI *in prep*)).
- **Continue** to encourage local groups to have input in to management of wetlands (e.g. Field and Game, Local Area Planning and Landcare).
- **Protect, enhance and/or revegetate native vegetation** on built systems (e.g. plantings along Surface Water Management Systems and reuse systems) to increase water quality, assist with batter stabilisation and create wetland environments.
- **Create wetland environments** (e.g. use of reuse systems) to provide habitat for threatened species (e.g. Latham's Snipe (*Gallinago hardwickii*)).
- **Encourage the fencing** of sites to exclude grazing, particularly when wet or prior to being wet, to allow flowering and seed-set of native plants.
- **Identify a demonstration site** (showcasing very high value site) for educational purposes.
- **Seek approval** from the Shepparton Irrigation Region Implementation Committee for the Environmental Incentives program to provide off-stream watering points for private wetlands.
- **Encourage** the Waterways Program to target the Cornella and Wanalta Creek Systems for incentives (e.g. alternative water supply).
- **Investigate** drainage diversion in the Catchment and the impact on wetlands (e.g. Grove's).
- **Encourage** the implementation of ground-water protection strategies for Gaynor Swamp – Corop Wetland Complex as per the results of the HVEF Project (DPI 2006).

- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006) priority system (e.g. those not already included in HVEF project).
- **Pursue recommendations** in the HVEF project for Mansfield, Wallenjoie and Two Tree Swamps, which all scored a high EC reading but did not have watertable data available at the time of surveying (DPI 2006).

Threatened Species:

- **Monitor growth** of nesting habitat in wetlands to ensure that grazing does not remove habitat for Brolga (*Grus rubicunda*) (e.g. allow time for growth of vegetation prior to Brolga and other birds searching for breeding sites).
- **Manage water flow** in wetlands for the benefit of threatened species such as Brolga and Latham's Snipe.
- **Protect and enhance** native vegetation communities within Gaynor, Two Tree, Wallenjoie and Mansfield Swamps and Lake Cooper, to enhance habitat values for the threatened species they support (e.g. Slender Darling-pea (*Swainsona murrayana*), Downy Swainson-pea (*Swainsona swainsonoides*), Cane Grass (*Eragrostis australasica*), Spiny Lignum (*Muehlenbeckia horrida ssp horrida*), Brolga and Latham's Snipe) (Ahern *et al* 2003).
- **Encourage implementation of** actions for threatened species as identified in Ahern *et al* 2003 pages 104-5.
- **Survey** the presence of frogs in priority wetlands and opportunities for protection.
- **Supplement habitat**, exclude grazing and enhance flow regimes to benefit threatened species such as Royal Spoonbill (*Platalea regia*), Nankeen Night Heron (*Nycticorax caledonicus*), Blue-billed Duck (*Oxyura australis*) and Glossy Ibis (*Plegadis falcinellus*) (Ahern *et al* 2003).
- **Ensure protection** from grazing for Stiff Groundsel (*Senecio behrianus*) (DSE 2005a) and Slender Darling-pea near the Wallenjoie Wetlands.

Pest Plants and Animals:

- **Implement integrated fox control programs** in high priority wetland areas (e.g. the Timmering Depression and Wanalta Creek Wetlands – e.g. Wallenjoie) for the benefit of threatened species such as Brolga and Latham's Snipe.
- **Investigate** predator-control fences for known Brolga breeding sites (e.g. Wanalta System).

Landscape Processes (e.g. flow regimes, habitat connectivity):

- **Encourage collaborative management** of priority wetlands (e.g. Gaynor, Two Tree, Wallenjoie and Mansfield Swamps) and freehold wetlands such as Little Wallenjoie Swamp and Horseshoe Lake, as a closely interlinked system of deep and shallow freshwater marshes (Ahern *et al* 2003).
- **Encourage** collaborative management for Lake Stewart.
- **Promote linkages** between wetlands in the North of the Zone (e.g. around Timmering and Koyuga) with the wetlands in the Corop area (e.g. Wallenjoie Complex).
- **Promote linkages** between the 'Timmering Depression' sites (e.g. around Tehan and Everard Roads) with sites near O'Dea and Finlay Roads and beyond to the Murray River.
- **Investigate** the flow regimes for the Wanalta Creek, beyond Grove's Weir, for the benefit of wetlands in the Wallenjoie Complex (SKM 2004).
- **Restore and deliver natural hydrological regimes** to wetlands for the benefit of flora and fauna, through liaison with landholders, DSE and Goulburn-Murray Water (and according to current Environmental Management Plan recommendations (where applicable)).
- **Enhance flow regimes** in Lake Cooper for the Painted Snipe (*Rostratula benghalensis*) (China-Australia Migratory Bird Agreement listed) and Flat-headed Galaxias (*Galaxias rostratus*).
- **Monitor hydrological regimes** (e.g. water quality, quantity and hydrology) in all priority wetlands and re-evaluate/negotiate any alterations required (DSE 2004).
- **Continue to seek** Environmental Water Allocations for priority wetlands.

7.3 PUBLIC LAND

A) Introduction – Public Land:

Public land comprises less than 10% of the Zone and includes areas such as Roadside Reserves, Reserves (e.g. Railways, Ford Reserve), State Forest and Wetlands (see Section 7.2). Roadside vegetation is recognised as being a very valuable biodiversity asset that provides important linkages for flora and fauna between larger patches of vegetation. The Shires of Campaspe (majority) and Bendigo (part of the Zone) (minor roads) and Vic Roads (major highways) manage roadsides in the Timmering Landscape Zone.

A number of Roadside Reserves in the Zone contain high quality patches of remnant grasslands. O'Dea Rd at Barep is recognised as a 'Very High' quality site that contains grassland species, which is listed on the Register of the National Estate (for further information visit www.deh.gov.au). Other examples of high quality roadsides include Winter, Deviation, Wallenjoe, Gilmour, Fraser and Robertson Roads (Ahern *et al* 2003).

Rushworth-Colbinabbin Railway Reserve Bushland Reserve is a 7-hectare Reserve noted for its Plains Grassy Woodland and Grassy Woodland EVC, both of which have endangered Bioregional Conservation Status. It is a disused section of Railway that forms parts of branch-lines from Rushworth to Colbinabbin and Girgarre (Ahern *et al* 2003). Protection of this site, including connectivity with other reserves, creeks and roadsides will assist in biodiversity conservation in the Zone. The actions identified below are intended to assist in the protection of Roadsides, Railway Reserves and other Reserves within the Timmering Landscape Zone.

B) Photographic Example – Public Land:

Example of a Public Land BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the Vegetation Quality Assessment (VQA) scores for sites surveyed in the Zone

The site (782424_79) pictured is part of Eickerts Road (near Connally Road), near Cornella. The site scored 13 on the Vegetation Quality Assessment and is therefore a very high value site. The EVC is Plains Woodland, which is endangered. The site is over 10 hectares in size and has good connectivity with other remnant sites. Significant birds surveyed include White-brown Babbler (*Pomostostomus superciliosus*), Brown Treecreeper (*Climacteris picumnus*), Dusky Woodswallow (*Artamus cyanopterus*) and Grey Shrike-thrush (*Colluricincla harmonica*).

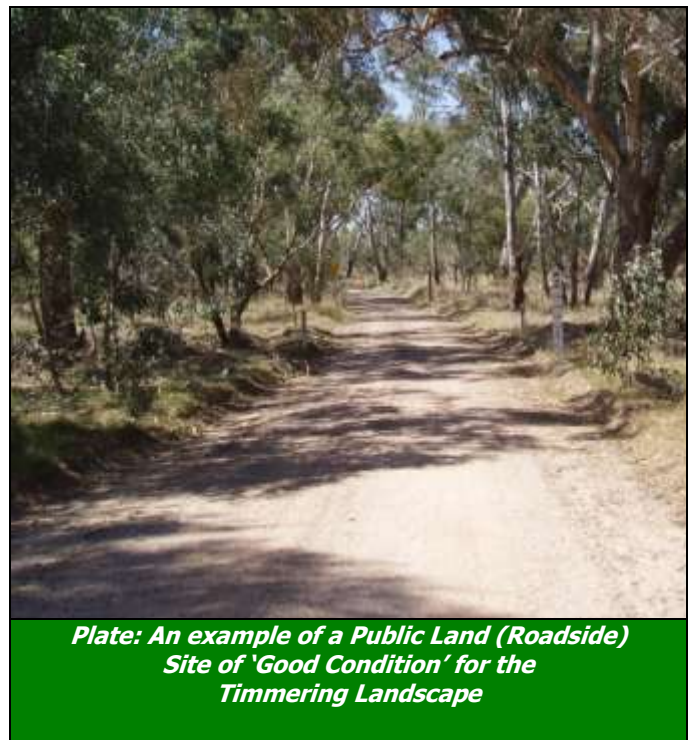


Plate: An example of a Public Land (Roadside) Site of 'Good Condition' for the Timmering Landscape

C) Actions – Public Land:

Size/Extent Related:

- **Buffer** native vegetation on roadside reserves by extending native vegetation through promotion of natural regeneration and revegetation on adjoining properties. Give priority to priority roadsides in proximity to large areas (e.g. creeks).
- **Liaise** with landholders to establish habitat corridors to broader roadside habitat adjacent to roadsides with known threatened fauna populations.
- **Buffer** Rushworth-Colbinabbin Rail Reserve through landholder consultation (e.g. fencing and promoting natural regeneration).
- **Expand** remnants at significant roadside patches (e.g. Barep).

Condition Related:

Education/Extension:

- **Consult** with licensees of unused roads (where habitat values exist), to actively manage for biodiversity benefits (e.g. assess fencing, grazing exclusion and promote regeneration) and improve connectivity (Ahern *et al* 2003).
- **Encourage** local school group involvement and stewardship of reserves (e.g. Roadside remnants (where safe to do so) and Ford Reserve).
- **Promote** Rushworth-Colbinabbin Rail Reserve flora values and pursue upgrading its conservation status to protect for the long-term.
- **Promote** the value of roadsides in the landscape and protect and enhance priority sites down to lower quality sites.
- **Work with the community** (e.g. Local Area Planning) to develop a community education campaign regarding the conservation of roadsides.
- **Encourage** the retention of logs, leaf litter and dead trees, as habitat for threatened species.

On-ground Works:

- **Protect** all high value sites from threats (e.g. O'Dea Rd Barep, Rushworth-Colbinabbin Rail Reserve and Ford Reserve).
- **Manage** grazing on roadsides (e.g. O'Dea Rd Barep, Winter and Deviation Rd in Corop) to promote growth of native groundcover species.
- **Investigate** with stakeholders, options for signage for high value roadsides and sites with threatened species, as per the DSE system or the 'Enviromark' (Greening Australia) method.
- **Ensure** maintenance of roads in the Zone has minimal impact on biodiversity values (e.g. Roadside Management Plans) (e.g. Campaspe Shire Council 2004).
- **Protect** all unused roadsides (e.g. wet weather/leased roads) from threatening processes.
- **Work** with the Cornella and the Nanneella and District Local Area Planning Groups (as per Cornella LAP 2000; Nanneella LAP 2002), Landcare and Community Groups to protect all priority sites in the Zone.
- Conduct **wildlife surveys** (e.g. for species of mammals, reptiles, birds, bats and frogs) as per the method utilised in the Murray Catchment (NSW) (Herring *et al* 2007) (across all asset types).
- **Work** with the Nanneella Bushland Reserve Committee of Management to ensure **protection and implementation** of management actions for the Nanneella Bushland Reserve and associated works with adjoining private landholders (e.g. corridors, surface water management and pest plants and animals).
- **Encourage** implementation of threatened species actions as identified in Ahern *et al* 2003 pages 118 and 121.

Threatened Species:

- **Provide** the Shire of Campaspe and the City of Bendigo Shire with the location of threatened species along roadsides, for inclusion in the permit process (e.g. stock droving), maintenance schedules and development of Roadside Vegetation Plans.
- **Encourage management of roadside grazing** and stock movement for the protection of threatened species (flora and fauna).
- **Manage** grazing to benefit threatened species such as Slender Darling-pea (*Swainsona murrayana*) and Red Swainson-pea (*Swainsona plagiotropis*) and assess management needs of Turnip-fruit Copperburr (*Sclerolaena napiformis*) and Ridged Water-milfoil (*Myriophyllum porcatum*).

- **Work with the local community** to ensure protection of O'Dea's Road from threatening processes.
- **Work with** Local Government, Vic Roads and CFA regarding management of roadsides (e.g. for fire-sensitive flora taxa, advise CFA to avoid or limit control burning of these sites) (Ahern *et al* 2003).
- **Protect** and enhance known sites of Stiff Groundsel (*Senecio behrianus*) at Lake Wallenjoe Rd, Gilmour Rd and nearby sites on freehold.
- **Investigate** ecological burning regimes that may benefit Stiff Groundsel and other grassland plants and avoid road works in known areas (Ahern *et al* 2003).
- **Investigate** the presence of **Woodland Blind Snake** (*Ramphotyphlops proximius*) in the Zone and protect known sites.
- **Investigate** the occurrence of threatened species with known records within proximity to the Zone, such as Dainty Phebalium (*Phebalium festivum*), Scented Bush-pea (*Pultenea graveolens*) Velvet Daisy-bush (*Olearia pannosa subsp. cardiopylla*), Coccid Emu-bush (*Eremophila gibbifolia*) and Whirrakee Wattle (*Acacia williamsonii*) as to their presence within the Zone.
- **Ensure** inclusion of all threatened flora and fauna records on the Flora Information System (NRE 2002c) and Fauna Information System (NRE 2002d).

Pest Plants and Animals:

- **Undertake integrated pest plant management** at priority sites (e.g. encourage group control programs/community working bees).
- **Undertake integrated pest animal management** (e.g. foxes) in areas adjoining reserves to benefit threatened fauna (e.g. Bush Stone-curlew (*Burhinus grallarius*), Tree Goannas (*Varanus varius*)) (DSE 2005a).
- **Educate** the community about the spread of 'escaped' agricultural plants on to roadsides.

Landscape Processes (e.g. flow regime, habitat connectivity):

- **Develop further linkages** between high value sites (e.g. roadsides, railway reserves, forests and creeks) using the Landscape Context Model (Ferwerda 2003) to identify areas.
- **Extend linkages** along roadsides in accordance with EVC requirements and existing vegetation (e.g. native grasses).
- **Investigate** potential to link freehold remnants to complement public land water frontage and significant Road and Rail Reserves (e.g. Rushworth-Colbinabbin disused Railway Reserve) (Ahern *et al* 2003).
- **Develop linkages** along roadsides between the Cornella and Wanalta Creek Systems.
- **Develop linkages** between the Nanneella Bushland Reserve and the Campaspe and Murray Rivers (long-term action).

7.4 PLAINS WOODLANDS

A) Introduction – Plains Woodlands:

The key biodiversity asset 'Plains Woodland' is comprised of Ecological Vegetation Classes (EVCs) such as Plains Woodland, Sand Ridge Woodland and Plains Grassy Woodland/Gilgai Wetland Mosaic. These EVCs were historically the dominant vegetation types in the riverine plain part of the Timmering landscape, but are now endangered. The majority of Plains Woodland communities (generally attributed to an overstorey of Grey Box (*Eucalyptus microcarpa*)) in the Zone occur on private land, roadsides and edges of larger public land. These remnant types serve many important functions, including aesthetic values, habitat values, sources of native seed and sources of food, shelter and nesting sites for a range of woodland birds (Lunt 1998).

The majority of this asset type is scattered across the Zone (Figure 8). Many of the areas in the Zone that once contained these vegetation types have been cleared for agriculture, leaving fragmented landscapes. Other threats to this asset include adjacent land use practices, inappropriate grazing management and pest plants and animals. The actions identified below are intended to assist in the protection of the remaining remnants within the Zone. However these actions are specific to the Timmering Landscape Zone and are by no means comprehensive for the region.

There are other BAP sites within the Zone that contain Plains Woodland or Mosaic EVCs (e.g. roadsides and fringes of public land). Whilst these could be classified as part of this Plains Woodland asset type, they have been categorised primarily based on the consistent factor (e.g. roadsides all public land, waterways all waterways) to ensure consistency of actions. Note: Both sets of actions for each listed Asset can be used (e.g. Public Land and Plains Woodland). Refer to Appendix 12 for how to obtain further information on each site.

B) Photographic Example – Plains Woodlands:

Example of a Plains Woodland BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the Vegetation Quality Assessment (VQA) scores for sites surveyed in the Zone

The site (782413_43) pictured is a remnant on private land located near Cornella. The EVC is Plains Woodland, which is endangered. The site scored 10.5 on the Vegetation Quality Assessment and therefore is a 'Very High' value site for the Zone. Natural regeneration is evident at the site, although shrub cover is low. The site has a good amount of litter coverage, although it was very dry at the time of survey. This site has potential for protection and enhancement to increase the amount of understorey and the habitat value of this site. White-winged Choughs (*Cocorax melanorhaphos*) were surveyed at the site.

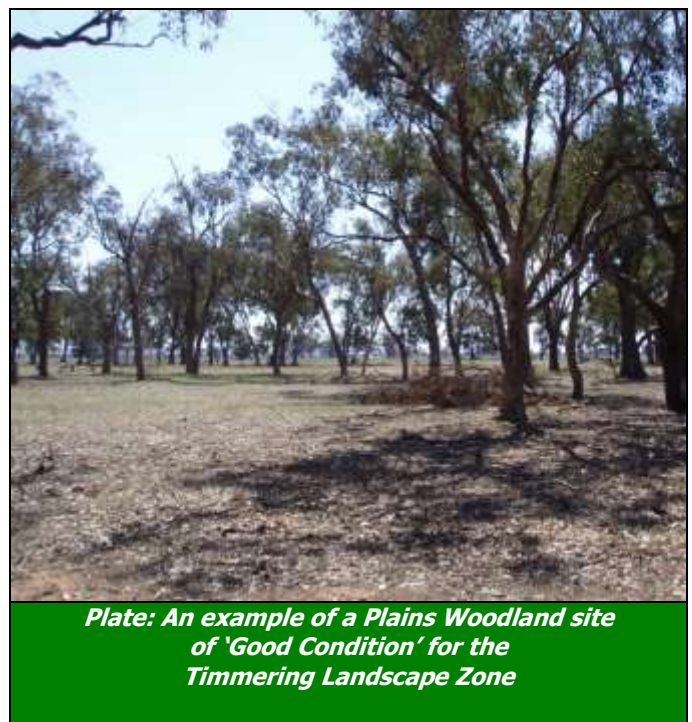


Plate: An example of a Plains Woodland site of 'Good Condition' for the Timmering Landscape Zone

C) Actions – Plains Woodlands:

Size/Extent Related:

- **Encourage the implementation of buffer strips** around Plains Woodland sites.
- **Encourage landholders to increase the size** of priority remnants (e.g. fence to promote natural regeneration), to establish new areas of indigenous species of trees and shrubs, and to retain or establish buffer zones of unimproved, uncultivated pasture around woodland (DSE 2005a).
- **Encourage expansion** of Plain Woodland sites adjacent to 'Significant Roadsides' for threatened species.

Condition Related:

Education/Extension:

- **Encourage** landholders to leave fallen branches and debris on the ground, especially at known Bush Stone-curlew (*Burhinus grallarius*) sites (DSE 2005a).
- **Encourage** the retention of dead trees as habitat for Birds, Reptiles, Insects and Mammals (e.g. Bats).
- **Implement community education activities** relating to the importance of Plains Woodlands and associated flora and fauna species, specifically targeting high priority remnants in paddock environments.
- **Work** with the Cornella and the Nanneella and District Local Area Planning Groups, Landcare and Community Groups to implement actions in the Zone for the protection of Plains Woodland sites.
- **Develop a demonstration site** (showcasing a very high value site) for educational purposes.

On-ground Works:

- **Encourage the protection (fencing)** of all Plains Woodland remnants and grazing management (e.g. encourage the exclusion of domestic grazing in remnants to allow plants to set seed and regenerate. Manage stock grazing for the benefit of native vegetation once plants set seed).
- **Maintain the health**, diversity and cover of native species in the long-term, by reviewing with stakeholders the location of stock holding areas and relocating these activities away from native vegetation remnants (DSE 2004).
- **Enhance** high value sites with shrubs if regeneration has not occurred (in time) following fencing (e.g. no existing viable seed source).

Threatened Species:

- **Plant corridors** to supplement habitat for all focal species, using current regional projects as examples (e.g. Superb Parrot (*Polystelis swainsonii*) and Grey-crowned Babbler (*Pomatostomus temporalis*)).
- **Liaise** with stakeholders regarding current Bush Stone-curlew fox management programs in the Nathalia area and options to expand or use as a demonstration project in the Timmering Zone.
- **Investigate** the presence of **Woodland Blind Snake** (*Ramphotyphlops proximus*) in the Zone and protect known sites.

Pest Plants and Animals:

- **Manage** pest plants for the benefit of Plains Woodland flora and liaise with stakeholders (e.g. DPI Pest Management Officers) regarding their management.
- **Undertake integrated fox control programs** in areas with known records of Bush Stone-curlews and Tree Goannas (*Varanus varius*), in liaison with DPI Pest Management Officers.
- **Undertake integrated rabbit/hare management** in all priority remnants and investigate re-initiating a program like the 'rabbit busters' program (in consultation with DPI Pest Management Officers).
- **Investigate** including pest plant and animal incentive as part of the environmental incentives.

Landscape Processes (e.g. flow regime, habitat connectivity):

- **Increase** connectivity of Plains Woodland sites with nearby sites, regardless of asset type.
- **Develop further linkages** between high value sites, using the Landscape Context Model (Ferwerda 2003) to identify potential sites.
- **Give** priority to linking priority sites to other plains woodland sites (e.g. especially in the Northern part of the Zone between Timmering and Tongala).

7.5 RIVERINE WOODLANDS

A) Introduction – Riverine Woodlands:

The key biodiversity asset 'Riverine Woodlands' is comprised of Ecological Vegetation Classes (EVCs) such as Riverine Grassy Woodland (and mosaics), Riverine Chenopod Woodland and Riverine Sedgy Forests. These EVCs occur on the riverine floodplain at elevations of 100-200m and an annual general rainfall of 400-700mm. The dominant overstorey are River Red Gum (*Eucalyptus camaldulensis*), occasionally with Black Box (*Eucalyptus largiflorens*) on the margins. The understorey is typically grassy, with herbs (e.g. Grey Germander (*Teucrium racemosum*)), Sedges (*Carex spp*) and Daisies (e.g. *Brachyscome spp*) (DPI 2003).

In regards to the grouping of this asset, it primarily occurs on private land between Corop and Timmering. However Riverine Woodland also exists extensively in the Southern area of the Zone, along the Cornella and Wanalta Creek systems (listed as Waterways). The private land remnants vary in size (with the largest patch 19 hectares) and in regards to condition.

Pest plants and animals, vegetation/land clearance (e.g. for new developments), inappropriate grazing management and changed hydrological cycles are examples of threats to this asset. The actions identified below are intended to assist in the protection of the remaining remnants within the Timmering Landscape Zone. However these actions are specific to the Zone and are by no means comprehensive for the region.

As per the Plains Woodland asset, there may be BAP sites within the Zone that contain Riverine Grassy Woodland or Mosaic EVCs (e.g. public land sites – Midland Highway Road Reserve and waterways – e.g. Cornella Creek). Whilst these could be classified as part of this Riverine Woodland asset type, they have been categorised primarily based on the consistent factor (e.g. Roadsides are all public land) to ensure consistency of actions. Refer to Appendix 12 for how to obtain further information for each site.

B) Photographic Example – Riverine Woodlands:

Example of a Riverine Woodland BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the Vegetation Quality Assessment (VQA) scores for sites surveyed in the Zone

The site (782413_27) pictured is located adjacent to the Heathcote-Rochester Road. The site scored 12 on the Vegetation Quality Assessment, particularly due to good scores landscape values such as neighbourhood, size and connectivity. The site is therefore of very high value for the Timmering Landscape Zone. The site has potential for protection and enhancement to increase the understorey component and habitat values. Species such as Striated Pardalote (*Pardalotus striatus*) and Eastern Rosellas (*Platycercus eximius*) were surveyed at the site.

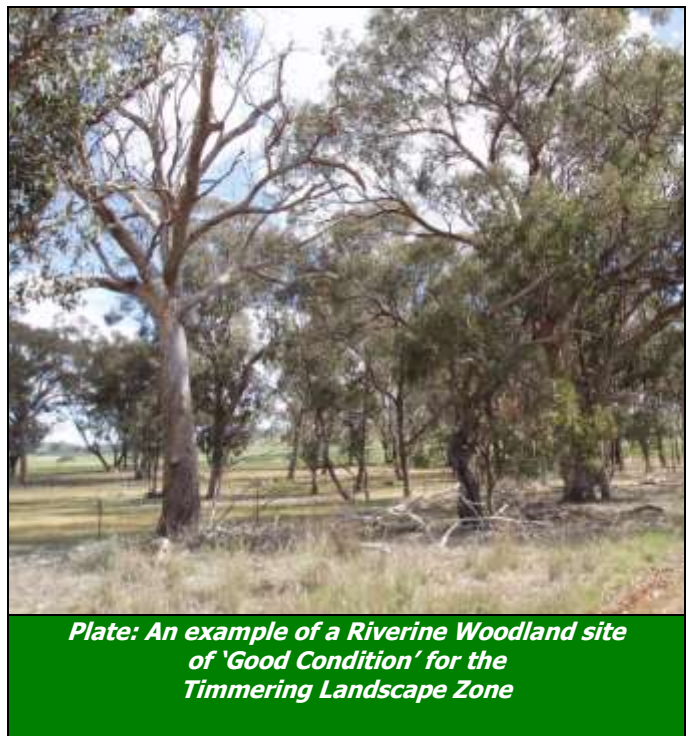


Plate: An example of a Riverine Woodland site of 'Good Condition' for the Timmering Landscape Zone

C) Actions – Riverine Woodlands:

Size/Extent Related:

- **Encourage the implementation of buffer strips** around Riverine Woodland sites.
- **Encourage landholders to increase the size** of priority remnants (e.g. fence to promote natural regeneration), to establish new areas of indigenous species and to retain or establish buffer zones of unimproved, uncultivated pasture around woodland (DSE 2005a).
- **Encourage expansion** of Riverine Woodland sites adjacent to 'Significant Roadsides' for threatened species.

Condition Related:

Education/Extension:

- **Encourage** landholders to leave fallen branches and debris on the ground, especially at known threatened species (e.g. Bush Stone-curlew (*Burhinus grallarius*)) (DSE 2005a).
- **Encourage** the retention of dead trees as habitat for Birds, Reptiles, Insects and Mammals (e.g. Bats and *Antechinus spp*).
- **Implement community education activities** relating to the importance of Riverine Woodlands and associated species, targeting high priority remnants in paddock environments.
- **Develop a demonstration site** (showcasing a very high value site) for educational purposes.
- **Promote** the benefits of native grasses in remnants, through education (e.g. values and management techniques).
- **Implement extension activities** to encourage landholders with high value remnants to enhance the long-term viability of the sites.
- **Work** with the Cornella and Nanneella Local Area Planning Groups, Landcare and Community Groups to implement actions in the Zone for the protection of Riverine Woodland sites.

On-ground Works:

- **Encourage the protection (fencing)** of all Riverine Woodland remnants to allow flowering and seed set of native plants. Retain access for controlled grazing to manage weeds, where necessary. Manage stock grazing for the benefit of native vegetation once plants set seed.
- **Maintain the health**, diversity and cover of native species in the long-term, by reviewing with landholders the location of stock holding areas and relocating these activities away from native vegetation remnants (DSE 2004).
- **Enhance** high value sites with shrubs if regeneration has not occurred (in time) following fencing (e.g. no existing viable seed source).

Threatened Species:

- **Plant corridors** to supplement focal species habitat, using current projects as examples (e.g. Grey-crowned Babbler (*Pomatostomus temporalis*)).
- **Actively discourage** the removal of firewood from all priority sites in the Zone, for the benefit of threatened fauna.
- **Support and encourage further research** that directly relates to the management of the Superb Parrot (DSE 2005a).
- **Protect clusters** of old growth or individual large trees that provide potential habitat for significant species (e.g. Owls, Bats, Tree Goanna (*Varanus varius*) and Squirrel Glider (*Petaurus norfolcensis*)).
- **Collect** seed from threatened flora (e.g. *Swainsona spp* and *Senecio spp*) for GBCMA Seedbank.

Pest Plants and Animals:

- **Manage** pest plants for the benefit of Riverine Woodland flora and liaise with DPI Pest Management Officers and the land manager, regarding their management.
- **Undertake integrated fox control programs** in areas with known threatened species.
- **Undertake integrated rabbit management** in all high priority remnants and investigate re-initiating a program like the 'rabbit busters' program (consult with Pest Management Officers).
- **Investigate the management** of Noisy Miners (*Manorina melanocephala*) in areas of significant corridors and known sites inhabited by Grey-crowned Babblers.

Landscape Processes (e.g. flow regime, habitat connectivity):

- **Link** high value Riverine Woodland remnants using the Landscape Context Model (Ferwerda 2003) as a guide (e.g. to link with and complement native vegetation on public land, particularly areas adjacent to forests/reserves and Plains Woodland remnants in the North).

7.6 BOX IRONBARK FORESTS

A) Introduction – Box Ironbark Forests:

The key biodiversity asset 'Box Ironbark Forests' is defined by the one EVC, namely Box Ironbark Forest (vulnerable). Box Ironbark Forests are typically open forests that occur on low hills between 150-230 metres altitude. The soils are skeletal sandy loam to clay loams and are often gravelly, with a poor moisture holding capacity. Box Ironbark Forests have a high proportion of animal species dependent upon large old Eucalypts. Eucalypt species such as Grey Box (*Eucalyptus microcarpa*) and Red Ironbark (*Eucalyptus tricarpa*) and Yellow Gum (*Eucalyptus leucoxylon*) occur in the overstorey (differs between regions). The understorey consists of a scattered shrub layer including species such as Golden Wattle (*Acacia pycnantha*), Gold-dust Wattle (*Acacia acinacea*), Twiggy Bush-pea (*Pultanea largiflorens*) and some heath species (e.g. Daphne Heath (*Brachyloma daphnoides*)). Sparse grasses (e.g. Wallaby grasses (*Austrodanthonia spp*)), forbes, moss and lichens also contribute to a diverse and open ground layer (DPI 2002).

Box Ironbark Forests occupy a small proportion of their pre-1750 extent in the Timmering Landscape Zone. This is concentrated in the Southern part of the Zone near Cornella. Cornella State Forest is the largest Box Ironbark Forest area surveyed in the Zone. Whilst it is publicly owned, it has been categorised based on the consistent factor (e.g. Box Ironbark Forest) to ensure consistency of actions. Both sets of actions for each listed Asset can be used (e.g. Box Ironbark and Public Lands).

The Environment Conservation Council (ECC) (at the request of the Victorian Government) completed an investigation in to the 'Box Ironbark Forests and Woodlands' (ECC 2001) in Northern Victoria. This report details recommendations 'for balanced use and development of public land in the Box Ironbark study area' (ECC 2001). The actions identified below recommend that the ECC (2001) recommendations continue to be implemented for Box Ironbark Forests in Victoria. They also identify actions for issues such as firewood collection, housing development, habitat fragmentation, edge effects, inappropriate grazing regimes and pest plants and animals which are identified as threatening processes for Box Ironbark Forests (DPI 2002).

B) Photographic Example – Box Ironbark Forests:

Example of a Box Ironbark Forest BAP Site of 'Good Condition'* for the Timmering Landscape Zone

* Based on the priorities assessment for sites in the Timmering Landscape Zone

The site pictured is located South of Colbinabbin. The site automatically scored as 'Very High' (Appendix 7) due to high landscape values such as connectivity, size and neighbourhood. The Ecological Vegetation Class (EVC) is Box Ironbark Forest, which is a vulnerable EVC. The site contains good cover of leaf litter and logs, along with a diversity of overstorey, shrubs and ground cover species. It would be expected to score very high in a Vegetation Quality Assessment. A variety of species such as Squirrel Gliders (*Petaurus norfolcensis*), Tree Goannas (*Varanus varius*) and woodland birds could be found at the site.



Plate: An example of a Box Ironbark Forest Site of 'Good Condition' for the Timmering Landscape Zone

C) Actions – Box Ironbarks Forests:

Size/Extent Related:
<ul style="list-style-type: none"> • Encourage landholders to increase the size of sites through buffering (e.g. fence to allow natural regeneration). • Revegetate around remnants with indigenous plants to buffer from the impacts of adjacent land use/edge effects.
Condition Related:
<p><u>Education/Extension:</u></p> <ul style="list-style-type: none"> • Implement existing strategies for the Box Ironbark Forests (ECC 2001) and liaise managing authorities regarding site management. • Encourage the inclusion of Box Ironbark BAP sites from the Timmering Landscape Zone with the Goldfields Landscape Zone, particularly where targeted extension projects occur (e.g. as part of the Whroo Conservation Management Network). • Liaise with landholders of all identified sites regarding their past and future management. • Encourage the continued use of Community Advisory Groups for all publicly owned Box Ironbark Forest. • Promote the benefits/uniqueness and management requirements of diverse Box Ironbark forests. • Promote rubbish dumping in allocated areas rather than in remnant vegetation. • Encourage the retention of logs and leaf litter, as habitat for all species (e.g. reptiles, bats and insects). • Encourage the retention of dead and hollow bearing trees for a range of species reliant on these (investigate erecting nest boxes for sites without) (DPI 2002). • Investigate opportunities to conduct courses in the SIR as per the Box Ironbark Course. • Support landholders and community groups (e.g. Local Area Planning) in the protection and enhancement of all sites (e.g. Environmental incentives and extension). • Encourage landholders to minimise the impacts associated with housing developments in areas of high priority for conservation. <p><u>On-ground Works:</u></p> <ul style="list-style-type: none"> • Develop a Site Management Plan for privately owned sites and implement recommended actions. • Survey all priority sites during Spring and input data in to the attribute table database. • Encourage all landholders to protect sites for the long-term (e.g. covenants). • Protect all sites (e.g. fence) from threatening processes starting with very high value sites. • Discourage grazing in Spring and early Summer to allow flowering and seed set of native plants (DPI 2002). • Encourage natural regeneration (where required) to encourage shrubs (e.g. <i>Acacia spp</i>) (DPI 2002). Consider understorey planting for remnants with no shrubs or ground layer. <p><u>Threatened Species:</u></p> <ul style="list-style-type: none"> • Protect known records of threatened species, by providing stakeholders with extension regarding their protection and enhancement. • Develop a flier promoting the assets (e.g. wetlands) and focal species in the Timmering Landscape Zone and their biodiversity value. • Manage grazing pressure in all sites for the benefit of threatened species. <p><u>Pest Plants and Animals:</u></p> <ul style="list-style-type: none"> • Undertake coordinated pest plant management at all priority sites (e.g. encourage group control programs/community working bees). • Undertake integrated pest animal management (e.g. foxes, feral cats, rabbits) to benefit threatened fauna (e.g. Bush Stone-curlew (<i>Burhinus grallarius</i>) and Tree Goannas (<i>Varanus varius</i>)).
Landscape Processes (e.g. flow regime, habitat connectivity):
<ul style="list-style-type: none"> • Identify further opportunities to link priority sites. • Aim to create corridors between all Box Ironbark sites and link with waterways and roadsides in the Zone and link Timmering BAP sites to the Goldfields Landscape Zone BAP sites.

8.0 MONITORING



Monitoring is a fundamental component of all management activities and an important tool, which can be used to enhance the knowledge of biodiversity assets and manage for their on-going protection (Robinson *in prep.*).

The following table (Table 4) provides a basis for monitoring in the Timmering Landscape Zone. Where possible this information will feed into the various monitoring programs in the Goulburn Broken Catchment. It identifies a general monitoring outline including actions that may be conducted to determine progress towards achieving Catchment biodiversity targets. It identifies the key biodiversity asset, key indicators for monitoring and the suggested frequency/intensity of monitoring.

It is important to note that many of the monitoring activities listed below are already taking place, through a variety of mechanisms (e.g. collection of data via Local, Catchment and Statewide databases and processes). Where existing mechanisms are already in place they will continue to be used. However there are other monitoring activities that are needed, to provide useful information and allow for accurate assessment of the Catchments progress towards meeting the Biodiversity Resource Condition Targets (RCTs).

A wide variety of monitoring actions is listed below. However this does not result in a binding commitment of organisations (e.g. time or funding) to undertake all of the monitoring. Rather, this table is intended to be a source of ideas for agency staff and community groups (e.g. community groups such as Local Area Planning and Landcare may be interested in conducting further surveys). Interested persons can contact the Goulburn Broken Catchment Management Authority, Shepparton, or the Department of Primary Industries and Department of Sustainability and Environment Offices, Tatura, to discuss ideas and to ensure a coordinated approach (refer to Section 10.0 for contact information).

Whilst Table 4 outlines monitoring actions, evaluation of the BAP process also needs to occur to evaluate its effectiveness (e.g. in engaging people and prioritising works). An 'Evaluation Plan' is therefore being developed to provide an overarching evaluation process for BAP in the Goulburn Broken Catchment.

Table 4: Monitoring – Timmering Landscape Zone

Key Biodiversity Asset	Key Indicators for Monitoring	Frequency/Intensity
1) Waterways	<ul style="list-style-type: none"> Trends in environmental flows and in-stream habitat condition (as measured by ISC). 	Five yearly* ISC assessments
	<ul style="list-style-type: none"> Trends in water quality. 	Once yearly; as part of EPA monitoring: five yearly as part of ISC; at least 30 sites (GBCMA 2004b)
	<ul style="list-style-type: none"> Monitor the trends in condition and functionality of riparian vegetation/stream frontage condition (resurveying of sites using VQA assessments; area/number fenced; area/number with restored flows). 	Every 5 year; 30 sites; part of ISC; CAMS inputs
	<ul style="list-style-type: none"> Surveying of mean habitat width of waterways in Zone. 	Every 5 years; all sites (or in accordance with existing waterways monitoring), aerial photography
2) Wetlands	<ul style="list-style-type: none"> Monitoring of wetlands using index of wetland condition guidelines, as well as Vegetation Quality Assessments (to allow priority comparison). 	Every 5 years
	<ul style="list-style-type: none"> Number of significant wetlands with improved hydrological regimes. 	Every 5 years
	<ul style="list-style-type: none"> Percentage (%) of sites with barriers to natural flow. 	Every 5 years
3) Public Land	<ul style="list-style-type: none"> Refer to "All Key Biodiversity Sites" below. 	See below
4) Plains Woodland	<ul style="list-style-type: none"> Refer to "All Key Biodiversity Sites" below. 	See below
5) Riverine Woodland	<ul style="list-style-type: none"> Refer to "All Key Biodiversity Sites" below. 	See below
6) Box Ironbark Forest	<ul style="list-style-type: none"> Refer to "All Key Biodiversity Sites" below. 	See below

* Five yearly refers to five times per year

All Key Biodiversity Assets	<ul style="list-style-type: none"> Trends in vegetation condition (resurvey the sites using VQA assessments, including recording threats). 	Every 5 year;; wetlands – 20 sites; Woodlands/grasslands – 30 sites
	<ul style="list-style-type: none"> Trends in bird survey data (resurvey the sites using the bird survey method). 	Every 5 years; wetlands – 20 sites; Woodlands/grasslands – 30 sites
	<ul style="list-style-type: none"> Photographic point surveys (re-photograph surveyed sites). 	Every 5 years; when complete VQA and bird surveys
	<ul style="list-style-type: none"> Vegetation Quality Assessments, bird surveys and photographic point surveys at the remaining unsurveyed BAP sites. 	Within next 5 years; to allow monitoring of these sites (as outlined above)
	<ul style="list-style-type: none"> Inclusion and surveying of up-to-date data and information (if any changes), or addition of sites (e.g. if not already an identified site). 	Once yearly; all new information; all sites
	<ul style="list-style-type: none"> Trends in Focal Species reporting/sightings (e.g. population size, age distribution, frequency of records, number of birds/pairs recorded, habitat (e.g. number of sites/EVC), breeding success, recruitment). 	Initial survey throughout Zone to establish baseline data on population size and structure, subsequent two-yearly; as part of Bioregional program: across the Zone
	<ul style="list-style-type: none"> Monitoring of threatened species against current records. 	Every 2 years; across the Zone
	<ul style="list-style-type: none"> Undertake surveys for all of listed (threatened) species to establish baseline data on abundance and distribution in accordance with VROTPop procedures. 	Within next 5 years; across the Zone
	<ul style="list-style-type: none"> Subsequent assessments of selected populations (as per above threatened populations) to determine population trends. 	Within next 5 years; (subsequent to above action) across the Zone
	<ul style="list-style-type: none"> Trends in connectivity and characteristics of sites within landscape (e.g. size of remnants). 	Every 5 years; aerial photography
	<ul style="list-style-type: none"> Overlay of on-ground works areas against this Plan's mapping data. 	Once yearly; (end financial year), all applicable sites
	<ul style="list-style-type: none"> Number of incentives processed and implemented for priority sites for all Key Biodiversity Assets (private land only). 	Once yearly; in accordance with incentive mapping and overlaying of on-ground works areas (as per above action)

9.0 FURTHER INFORMATION – PRIORITY SITES



Priority Site Data:

Appendix 12 provides further information on obtaining data for the 209 priority BAP sites within the Timmering Landscape Zone. It is intended that the priority site information and other information detailed in this Plan, will allow groups and staff (e.g. extension staff and community groups) to;

- Be pro-active in targeting sites,
- Act as a basis for informed management of sites,
- Provide a further rationale for applying incentives,
- Provide a tool for landholders and the wider community,
- Provide a tool to show how a site fits into the wider landscape, and
- Provide a benchmark against which future improvements in management can be monitored.

How to Use the Data Provided:

The data provided is intended for use by a range of agencies and community groups to assist with biodiversity conservation in the Zone. It is particularly targeted towards agency extension officers. For example, it is anticipated that prior to, or following a site visit, an extension officer will investigate the data associated with a site, such as;

- What is the Ecological Vegetation Class of the site?
- How does the site fit in to the wider landscape?
- Are there any management agreements or incentives for the site (e.g. covenant, bush tender)?
- Are there threatened or notable species recorded at the site or nearby?
- What is the rating of the site and those near it (e.g. 'Very High', 'High', 'Medium' or 'Low')?
- What are the actions recommended for the site (e.g. pest plant management)?
- What are the options available to the landholders to fulfil these actions (e.g. fencing incentive)?
- What are the options for joining the site to public land (e.g. widening roadsides to provide a corridor/link)?
- Use the Landscape Context Map (Appendix 9) to determine where possible linkages (revegetation) may be of the most benefit. Think about the landscape and what we could do to help the area.
- It is also important to remember that sites with scattered trees are still a vital link in the landscape and especially in an area where much of the original vegetation has given way to agriculture. Officers need to determine on site where the best possible linkages could occur, and often this should include scattered vegetation, as although they generally have not been identified as a site in this Plan, they form an important element for providing links between the identified sites.

Keeping the Data Current:

The data contained in this report is by no means 'comprehensive', as this process relies on the regular updating of information, to keep it accurate and timely. Therefore this Plan is adaptive to enable management actions and information to be modified in response to further information, including monitoring. This Plan will be reviewed when necessary to ensure that it remains a 'living' document. In order for the data and associated maps to remain as up-to-date and relevant as possible, it is important that site data continue to be added to the database. For example, the Department are not always aware of sightings of flora and fauna by individual landholders or community groups and there are a number of sites that require Vegetation Quality Assessments and Bird Surveys.

Further Information or To Provide Data:

BAP data relies on regular updating to keep the information relevant for users. For clarification of information or to provide further data, please refer to Appendix 12 (CD) or contact bap@ghcma.vic.gov.au, or the Biodiversity Action Planning Officer, Department of Sustainability and Environment, Benalla PO BOX 124, Vic 3672.

10.0 LANDHOLDER ASSISTANCE



There is a range of assistance available for landholders in regards to planning for biodiversity conservation and implementing works on their properties. This section is designed to provide an overview of some of the property planning, management tools and incentives available to landholders and the community within the Shepparton Irrigation Region. Also included are some of the programs within the community that can benefit from the information provided in this Plan.

LOCAL AREA PLANS	WHOLE FARM PLANS
This Plan can provide an extra resource for Local Area Planning groups, in relation to their Local Area Plans. It can assist groups in the provision of further information for conducting biodiversity planning in their area and in regards to implementation of works.	Protecting biodiversity on farm is an important element when developing and implementing a Whole Farm Plan. Biodiversity Action Planning can inform the process and provide extra information for landholders and extension officers.

Advice and Information:

Please contact your local Department of Primary Industries (DPI), Department of Sustainability and Environment (DSE), the Goulburn Broken Catchment Management Authority (GBCMA), the Goulburn Murray Landcare Network (GMLN) or Trust for Nature (TfN) (VIC), for further information on biodiversity conservation. There are extension officers within these organisations who can provide advice on a range of aspects such as; Whole Farm Planning, groundwater management, revegetation and protection of remnant vegetation, threatened species protection and best management practices.

Incentives for On-Ground Works:

There are a range of incentives available for landholders within the Shepparton Irrigation Region for Catchment works, including,

- ◆ Environmental incentives – (fencing, tubestock or direct seeding) to assist with the protection and/or enhancement of remnant vegetation, including wetlands and grasslands,
- ◆ Tree Growing incentives - to assist with the re-establishment of native vegetation,
- ◆ Water Use Efficiency Incentives (Whole Farm Planning, Reuse and Automatic Irrigation).

For the above three points, contact the Department of Primary Industries, Tatura on (03) 58 335 222.

- ◆ Waterways Incentives – for on-ground works along rivers and creeks.

For the above point contact the GBCMA office, Shepparton on (03) 58 201 100.

Management Arrangements:

Programs such as Carbon Tender, Bush Returns, EcoTender and Bush Broker may provide incentives and advice for long-term conservation management on properties. *Contact the GBCMA, Shepparton (03) 58 201 100 for further information or visit www.gbcma.vic.gov.au*

Permanent Protection:

A Conservation Covenant permanently protects sites for conservation. It may provide assistance for rate relief, tax concessions and incentives for the costs of on-ground works. *TfN (Vic) is the managing organisation in regard to conservation covenants; visit their website at www.tfn.org.au*

Other Assistance:

- ◆ Goulburn Murray Landcare Network Shepparton – Landcare related advice (www.gmln.org.au)
- ◆ Land for Wildlife – a voluntary scheme aimed at encouraging and assisting landholders to protect and enhance biodiversity on their properties. *Managed by the Department of Sustainability and Environment. For further information visit www.dse.vic.gov.au*

- ◆ Local Government (Campaspe or Bendigo Shire) – managing authorities for native vegetation statutory planning requirements. Campaspe Shire provide an environmental rate rebate for landholders who complete environmental works on their property (conditions apply).

For further information visit www.campaspe.vic.gov.au or visit www.localgovernment.vic.gov.au

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A special acknowledgment to all past and current representatives (to date) on the Goulburn Broken Biodiversity Action Planning (BAP) Steering Committee. This Committee was established to oversee the BAP process and is responsible for the coordination of BAP in the Goulburn Broken Catchment. The committee is comprised of personnel from a range of departmental organisations, including the GBCMA, DPI, DSE and TfN (Vic). Committee members are detailed below, along with steering committee contributors. Thank you to person's whom have attended meetings as invited guests (names not listed) and provided valuable comment. Your assistance was very much appreciated.

Goulburn Broken Catchment Biodiversity Action Planning Steering Committee Members:

GBCMA -	Barlow, Tim – Manager, Biodiversity Program, GBCMA (current)
	Brunt, Kate – Biodiversity Projects Coordinator, GBCMA (current)
	Bell, Kate – (as) Manager, Biodiversity Program, GBCMA (past)
DPI -	Stothers, Kate – Nature Conservation Coordinator, DPI (Mid) (current)
	Heard, Rebecca – Native Biodiversity Coordinator, DPI (SIR) (current)
	Sislov, Alex – Environmental Management Program Team Leader (SIR) (current)
	Williams, Lance – Planning Officer, DPI (past)
DSE -	Smith, Stephen – Senior Flora and Fauna Officer, DSE (Upper) (current)
	Wilson, (Dr) Jenny – Biodiversity Projects Officer, DSE (Mid) (current)
	Edmonds, Tobi – Threatened Species Project Officer, DSE (current)
	Merritt, Bronwyn – (as) Biodiversity Landscape Plan Project Officer, DSE (past)
	Colbourne, Debbie – (as) Flora and Fauna Planner, DSE (Mid) (past)
TfN (Vic) -	Sheahan, Mark – (as) Biodiversity Team Leader, North East, DSE (past)
	Robinson, (Dr) Doug – Regional Manager, Goulburn Broken – TfN (Vic) (current)

Goulburn Broken Catchment Biodiversity Action Planning Contributors:

Mentiplay-Smith, Janice – Links Officer, DPI (trial implementation, Upper Goulburn) (current)
Olive, Cathy – Links Officer, DPI (trial implementation, Mid Goulburn) (current)

Weber, Rolf – (as) Acting Biodiversity Team Leader, DSE (current)

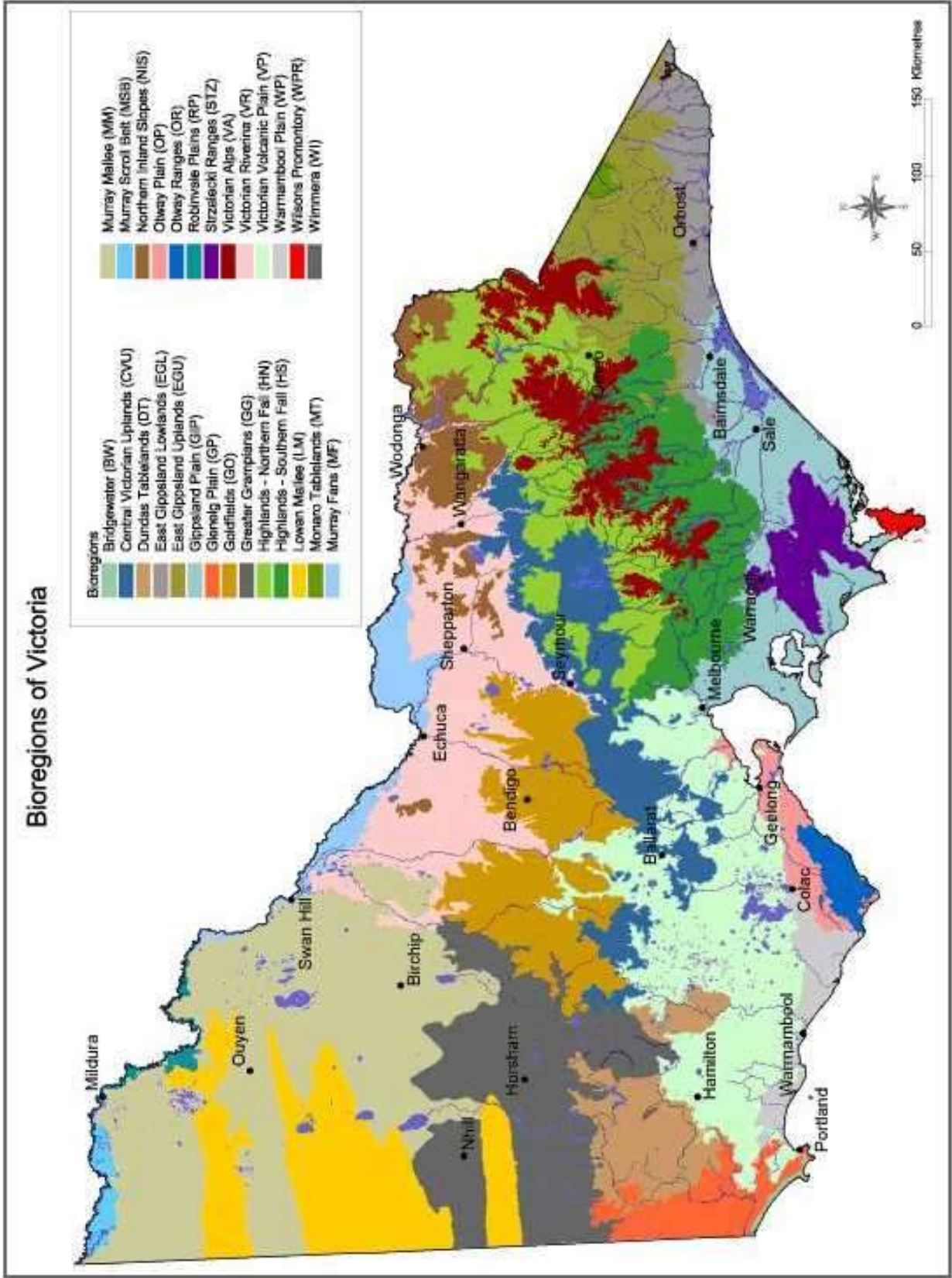
Berwick, Sue – (as) Flora and Fauna Planner, DSE (current)

Marion Howell – (as) Biodiversity Officer, GBCMA (past)

13.0 APPENDICES

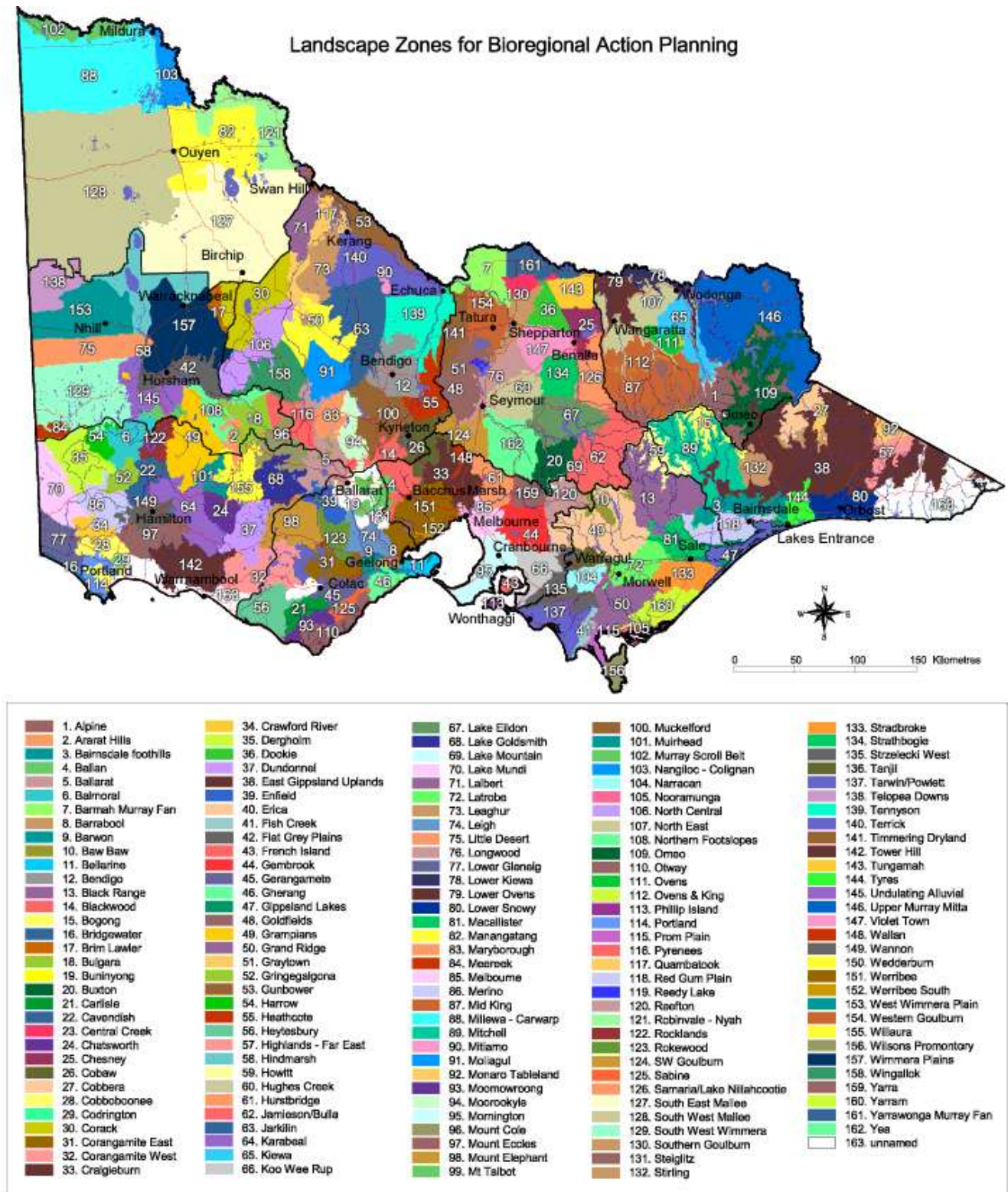


APPENDIX 1 – VICTORIAN BIOREGIONS



Source: www.dse.vic.gov.au

APPENDIX 2 – VICTORIAN LANDSCAPE ZONES



Source: www.dse.vic.gov.au

APPENDIX 3 – GOULBURN BROKEN CATCHMENT TARGETS

This Appendix is intended to provide a summary of the Goulburn Broken Regional Catchment Strategy targets and priorities for biodiversity conservation. For further information please refer to GBCMA 2003a or visit www.gbcma.vic.gov.au.

The Goulburn Broken Regional Catchment Strategy identifies the following biodiversity resource condition targets for native vegetation in the Catchment;

1. Maintain the extent of all native vegetation types at 1999 levels in keeping with the goal of 'Net Gain' listed in Victoria's Biodiversity Strategy 1997,
2. Improve the quality of 90% of existing (2003) native vegetation by 10% by 2030,
3. Increase the cover of all endangered and applicable vulnerable Ecological Vegetation Classes to at least 15% of their pre-European vegetation cover by 2030,
4. Increase 2002 conservation status of 80% threatened flora and 60% threatened fauna by 2030,
5. Maintain the extent of all wetland types at 2003 levels where the extent (area and number) has declined since European settlement, and
6. Improve the condition of 70% of wetlands by 2030, using 2003 as the benchmark for condition (GBCMA 2003 p11).

Priorities for action to conserve biodiversity in the Goulburn Broken Catchment (GBC) are driven by the conservation significance of the biodiversity asset. Regional investments in biodiversity conservation in the Catchment are driven by the following goals (in order of priority);

1. **Protecting** existing viable remnant habitats and the flora and fauna populations they contain (e.g. through reservation, covenants, management agreements, fencing and statutory planning),
2. **Enhancing** the existing viable habitats that are degraded (e.g. management of threats such as pest plants and animals, grazing, salinity, promotion of natural regeneration and/or revegetation with understorey), and
3. **Restoring** under-represented biodiversity assets to their former extent by revegetation (to create corridors, buffers, patches of habitat) (GBCMA 2003).

APPENDIX 4 – COMMUNITY ACTIVITIES

A Communication Plan was developed in the Shepparton Irrigation Region to guide Biodiversity Action Planning community consultation activities. The following list identifies the range of community consultation activities that have occurred during the development of this Plan.

Note: Whilst a large number of activities have occurred in the Goulburn Broken Catchment that led to the development of these Plans (e.g. existing biodiversity management programs and strategies), only the most recent activities in relation to this Conservation Plan have been included.

- Steering Committee Meetings – (quarterly) Goulburn Broken Biodiversity Action Planning Steering Committee Meetings. Comprising representatives from; Department of Primary Industries (DPI), Department of Sustainability and Environment (DSE), Goulburn Broken Catchment Management Authority (GBCMA) and Trust for Nature (Victoria) (TfN) (Vic).
- Working Group Memos/Presentations (throughout 2006-2007) (papers, plan reviews, technical/ community advice from the Shepparton Irrigation Region Technical Committee (SIRTEC) and the Shepparton Irrigation Region Implementation Committee (SIR IC).
- Newspaper Article – January 2006 – SIR IC Land and Water Update Column, Country News.
- August to October 2006 – Field Surveying – Liaisons with Landholders regarding property access, background to BAP process, Field Surveys, Data Collection and Local Knowledge.
- Monthly Environmental Management Program Report to stakeholders regarding progress of Timmering Landscape Zone Plan (on-going).
- Meeting/Presentation – October 2006 – Local Area Planning Facilitator's regarding Biodiversity Action Planning. Nanneella Hall, Nanneella.
- Draft Plan Community Review - February 2006/2007 - Community Consultation (letters, phone calls, e-mails and/or meetings) Draft Timmering Landscape Zone Conservation Plan.
- Cornella Local Area Planning Committee – presentation/meeting – March 23rd 2007.
- Final Draft Plan Review – Steering Committee, Environmental Management Program, Shepparton Irrigation Region Technical Committee, the Shepparton Irrigation Region Implementation Committee and Department of Primary Industries - May - October 2007.

APPENDIX 5 – THREATENED FLORA

List of threatened flora and their conservation status in the Timmering Landscape Zone (NRE 2002c).
(Table modified from Ahern *et al* 2003).

English Name	Latin Name	Australian Status*	Victorian Status*	FFG Listed*	FFG Action Statement Number	BNA Assessment*	Species Number*
Ausfeld's Wattle	<i>Acacia ausfeldii</i>	R	v			Un	13
Australian Millet	<i>Panicum decompositum</i>		k				2403
Branching Groundsel	<i>Senecio cunninghamii</i> var. <i>cunninghamii</i>		k			Un	3104
Bluish Raspwort	<i>Haloragis glauca</i> f. <i>glauca</i>		k				3766
Buloke	<i>Allocasuarina luehmannii</i>			L		Un	678
Buloke Mistletoe	<i>Amyema linophylla</i> ssp. <i>orientale</i>		v				217
Cane Grass	<i>Eragrostis australasica</i>		v				1184
Cane Spear-grass	<i>Austrostipa breviglumis</i>	R	r			Un	3628
Common Joyweed	<i>Alternanthera nodiflora</i>		k			Un	185
Common Sour-bush	<i>Choretrum glomeratum</i>		r			Un	760
Downy Swainson-pea	<i>Swainsona swainsonoides</i>		e	L			3328
Ferny Small-flower Buttercup	<i>Ranunculus pumilio</i> var. <i>politus</i>		k			Un	4909
Forde Poa	<i>Poa fordeana</i>		k			Un	2593
Frosted Goosefoot	<i>Chenopodium desertorum</i> ssp. <i>virosum</i>		k			Un	4383
Mealy Saltbush	<i>Atriplex pseudocampanulata</i>		r			Un	330
Native Orache	<i>Atriplex australasica</i>		k			Un	3621
Pale Spike-sedge	<i>Eleocharis pallens</i>		v				1143
Red Swainson-pea	<i>Swainsona plagiotropis</i>	V	e	L			3324
Ridged Water-milfoil	<i>Myriophyllum porcatum</i>	V	v				2257
Salt Paperbark	<i>Melaleuca halmaturorum</i> ssp. <i>Halmaturorum</i>		v	L		Un	2149
Silky Swainson-pea	<i>Swainsona sericea</i>		v			Un	4946
Slender Darling-pea	<i>Swainsona murrayana</i>	V	e	L			3321
Slender Water-ribbons	<i>Triglochin dubium</i>		r			Un	5010
Spiny Lignum	<i>Muehlenbeckia horrida</i> ssp. <i>horrida</i>		r			Un	2230
Stiff Groundsel	<i>Senecio behrianus</i>	E	e	L	12		3101
Turnip Copperburr	<i>Sclerolaena napiformis</i>	E	e	L	171		3991
Waterbush	<i>Myoporum montanum</i>		r			Un	2240
Winged Water-starwort	<i>Callitriche umbonata</i>		v			Un	575
Yarran Wattle	<i>Acacia omalophylla</i>		e	L			69

* Australian (denoted by capital letter) Status of Species: E = Endangered, V = Vulnerable (in order highest to lowest).

* Victorian (denoted by lower case) Status of Species: e = endangered, v = vulnerable, r = rare, k = poorly known.

* FFG (*Flora and Fauna Guarantee Act 1988*) taxon: L = listed (individual species only - not if part of listed communities).

* BNA (Bioregional Network Analysis) Assessment: Un = Unassessed. Ranking refers to the required response level for each taxon (determined through the occurrence of the species in the Bioregion, in different land tenures, occurrence ranking, risk ranking and priority level).

* Species Number: State identification number/code attributed to individual species.

APPENDIX 6 – THREATENED FAUNA

List of threatened fauna and their conservation status in the Timmering Landscape Zone (NRE 2002d).
(Table modified from Ahern *et al* 2003).

English Name	Latin Name	Australian Status*	Victorian Status*	FFG Listed*	FFG Action Statement Number	Recovery Plan	BNA Unassessed*	Species Number*
Australasian Bittern	<i>Botaurus poiciloptilus</i>		en				Un	197
Australasian Shoveler	<i>Anas rhynchotis</i>		vu				Un	212
Baillon's Crake	<i>Porzana pusilla</i>		vu				Un	50
Black Falcon	<i>Falco subniger</i>		en				Un	238
Blue-billed Duck	<i>Oxyura australis</i>		vu	L	174		Un	216
Brolga	<i>Grus rubicunda</i>		vu	L	119			177
Brown Quail	<i>Coturnix ypsilophora</i>		nt				Un	10
Bush Stone-curlew	<i>Burhinus grallarius</i>		en	L	78			174
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>		vu				Un	198
Caspian Tern	<i>Sterna caspia</i>		vu				Un	112
Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>		v	L			Un	498
Crested Bellbird	<i>Oreica gutturalis</i>		nt	L			Un	419
Diamond Dove	<i>Geopelia cuneata</i>		vu				Un	31
Diamond Firetail	<i>Stagonopleura guttata</i>		vu	L			Un	652
Flat-headed Galaxias	<i>Galaxias rostratus</i>		dd					4037
Freckled Duck	<i>Stictonetta naevosa</i>		E	L	105			214
Glossy Ibis	<i>Plegadis falcinellus</i>		v					178
Great Egret	<i>Ardea alba</i>		v	L	120			187
Grey Goshawk	<i>Accipiter novaehollandiae</i>		l				Un	220
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>		e	L	34			443
Gull-billed Tern	<i>Sterna nilotica</i>		e				Un	111
Hardhead	<i>Aythya australis</i>		v				Un	215
Hooded Robin	<i>Melanodryas cucullata</i>		nt	L			Un	385
Intermediate Egret	<i>Ardea intermedia</i>		cr	L	120			186
Little Bittern	<i>Ixobrychus minutus</i>		E					195
Little Button-quail	<i>Turnix velox</i>		nt				Un	18
Little Egret	<i>Egretta garzetta</i>		e	L	120			185
Mountain Galaxias	<i>Galaxias olidus</i>		dd				Un	4036
Murray Spiny Cray	<i>Euastacus armatus</i>		i	L	184		Un	5041
Musk Duck	<i>Biziura lobata</i>		v				Un	217
Nankeen Night Heron	<i>Nycticorax caledonicus</i>		v					192
Painted Snipe	<i>Rostratula benghalensis</i>		e				Un	170
Pectoral Sandpiper	<i>Calidris melanotos</i>		nt				Un	978
Pied Cormorant	<i>Phalacrocorax varius</i>		nt				Un	99
Red-backed Kingfisher	<i>Todiramphus pyrrhopygia</i>		vu				Un	325
River Blackfish	<i>Gadopsis marmoratus</i>		cr				Un	4127
Royal Spoonbill	<i>Platalea regia</i>		vu					181
Speckled Warbler	<i>Chthonicola sagittata</i>		vu				Un	504
Squirrel Glider	<i>Petaurus norfolcensis</i>		en	L	166			1137
Swift Parrot	<i>Lathamus discolor</i>	EN	en	L	169	Yes	Un	309
Tree Goanna	<i>Varanus varius</i>		vu				Un	2283
Whiskered Tern	<i>Chlidonias hybridus</i>		nt				Un	110
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		en	L	60			226

Woodland Blind Snake	<i>Ramphotyphlops proximus</i>		vu				2603
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* Australian Status of Species: EN= Endangered, VU= Vulnerable (in order highest ranking to lowest ranking).

* Victorian Status of Species: cr= critically endangered, en= endangered, vu= vulnerable, nt = near threatened, dd = data deficient.

* FFG (*Flora and Fauna Guarantee Act 1988*) taxa: L= listed (individual species only - not if part of listed communities).

* BNA (Bioregional Network Analysis) Assessment: Un = Unassessed.

* Species Number: State identification number/code attributed to individual species.

APPENDIX 7 – SITE PRIORITISATION METHOD

To determine the conservation significance and the need for ground-truthing (surveying) sites were prioritised according to the following table (GBCMA *in prep.*). If ground-truthing was required and no survey was completed (e.g. more than 100 sites required survey), the minimum priority status was applied. *LCM refers to the Landscape Context Model.

Status of EVC	Potential habitat within known dispersal range of threatened taxon or focal species, or within priority areas as identified by LCM*	EVC Patch Size	Ground-truthing required to confirm priority rank on basis of vegetation condition	Priority Status: Very High, High, Medium or Low
Endangered	Y	<5ha	Ground-truthing needed	VH or H
E	N	<5ha	Ground-truthing needed	VH or H
E	Y	5-10ha	Ground-truthing needed	VH or H
E	N	5-10ha	Ground-truthing needed	VH or H
E	Y	11-40ha		VH
E	N	11-40ha		VH
E	Y	>40ha		VH
E	N	>40ha		VH
Vulnerable	Y	<5ha	Ground-truthing needed	M, H or VH
V	N	<5ha	Ground-truthing needed	M or H or VH
V	Y	5-10ha	Ground-truthing needed	M, H or VH
V	N	5-10ha	Ground-truthing needed	M or H or VH
V	Y	11-40ha		VH
V	N	11-40ha	Ground-truthing needed	H or VH
V	Y	>40ha		VH
V	N	>40ha		VH
Rare	Y	<5ha	Ground-truthing needed	M, H or VH
R	N	<5ha	Ground-truthing needed	M or H or VH
R	Y	5-10ha	Ground-truthing needed	M, H or VH
R	N	5-10ha	Ground-truthing needed	M or H or VH
R	Y	11-40ha		VH
R	N	11-40ha	Ground-truthing needed	H or VH
R	Y	>40ha		VH
R	N	>40ha		VH
Depleted	Y	<5ha	Ground-truthing needed	M or H
D	N	<5ha	Ground-truthing needed	L or M
D	Y	5-10ha	Ground-truthing needed	M or H
D	N	5-10ha	Ground-truthing needed	L, M or H
D	Y	11-40ha		H
D	N	11-40ha	Ground-truthing needed	M or H
D	Y	>40ha		VH
D	N	>40ha		VH
Least Concern	Y	<5ha		M
LC	N	<5ha		L
LC	Y	5-10ha		M
LC	N	5-10ha	Ground-truthing needed	L or M
LC	Y	11-40ha	Ground-truthing needed	M or H
LC	N	11-40ha	Ground-truthing needed	L or M
LC	Y	>40ha	Ground-truthing needed	H or VH
LC	N	>40ha	Ground-truthing needed	H or VH

APPENDIX 8 – VEGETATION QUALITY ANALYSIS (VQA) ASSESSMENT FORM

There are eight survey forms for vegetation types in the Timmering Landscape Zone (e.g. grassland, wetland, plains grassy forests or woodlands and riverine forests or woodlands). The example below is the plains grassy forests or woodlands sheet (refer to DSE 2004 for further information). Recording of site information and other factors (e.g. threatening processes) was also recorded at each of the surveyed sites. For further information on how to obtain data (scores) refer to Appendix 12.

ASSESSMENT OF HABITAT QUALITY – Self-assessment method			
Site score sheet 12. Plains Grassy FORESTS or WOODLANDS			
Component & Benchmark	Observations	Quality Range	Score
LARGE TREES Defined as trunk diameter or circumference at breast height. Apply to both WOODLANDS and FORESTS: Diameter (Circumference) 80 cm (250 cm)	Number of large trees /ha (100m x 100m)	<i>no large trees</i> <i>up to</i> 7 LARGE TREES /ha in WOODLANDS 12 LARGE TREES /ha in FORESTS <i>more than</i> 7 LARGE TREES /ha in WOODLANDS 12 LARGE TREES /ha in FORESTS	0 1 2
CANOPY COVER Defined as the tallest stratum of native trees greater than 5m tall. Apply as: Plains Grassy WOODLANDS 10% benchmark Plains Grassy FORESTS 30% benchmark	% canopy cover % cover/benchmark x 100	<i>less than</i> 25% CANOPY COVER <i>between</i> 25 – 50% CANOPY COVER <i>more than</i> 50% CANOPY COVER	0 0.5 1
UNDERSTOREY (B) Tick appropriate boxes for PRESENCE of native vegetation (i.e. different life forms) <div> <div>Tree >5m</div> <div>Large herb >1m</div> <div>Grass or grasslike <1m</div> <div>Other</div> </div> <div> <div>Shrub 1-5m</div> <div>Small herb <1m</div> <div>Fern</div> </div> <div> <div>Small shrub <1m</div> <div>Grass or grasslike >1m</div> <div>Moss or lichen</div> </div>	(A) % cover of native species	<i>minimal</i> COVER <i>less than</i> 10% <i>low</i> COVER <i>between</i> 10% – 25% <i>reduced</i> COVER <i>between</i> 25% – 75% AND <i>less than</i> 4 boxes ticked for WOODLANDS <i>less than</i> 5 boxes ticked for FORESTS OR 4 or <i>more</i> boxes for ticked WOODLANDS 5 or <i>more</i> boxes ticked for FORESTS <i>adequate</i> COVER <i>more than</i> 75% AND <i>less than</i> 4 boxes for ticked WOODLANDS <i>less than</i> 5 boxes ticked for FORESTS OR 4 or <i>more</i> boxes for ticked WOODLANDS 5 or <i>more</i> boxes ticked for FORESTS	0 2 3 4 4 5
WEEDINESS	% weed cover	<i>between</i> 25% – 50% WEED COVER <i>between</i> 5% – 25% WEED COVER <i>less than</i> 5% WEED COVER	0 1 2 3
RECRUITMENT A woody species is considered to be recruiting when the number of immature plants (i.e. not flowering or fruiting) of an individual woody species is at least 10% of the total population of that species	(A) Number of woody species present (B) Number of woody species recruiting % recruitment = B/A x 100	<i>less than</i> 30% woody species RECRUITING <i>between</i> 30% – 70% woody species RECRUITING 70% or <i>more</i> woody species RECRUITING	0 1 2
ORGANIC LITTER Defined as small branches (less than 10cm diameter), twigs, leaves and other fallen or dead organic matter	% cover of organic litter	<i>less than</i> 5% ORGANIC LITTER for WOODLANDS 10% ORGANIC LITTER for FORESTS <i>more than</i> 5% ORGANIC LITTER for WOODLANDS 10% ORGANIC LITTER for FORESTS	0 1
LOGS Defined by length of stumps, fallen trees or branches at least 10 cm diameter (30 cm circumference)	Length of logs greater than 10 cm dia in 50m x 50m (i.e. 0.25 ha) Logs (m) x 4 (i.e. m/ha)	<i>no logs</i> <i>less than</i> 25m LOGS/ha <i>more than</i> 25m LOGS/ha	0 0.5 1
SIZE Defined by the size of the area being assessed AND any adjoining native vegetation		<i>less than</i> 2 ha <i>between</i> 2 – 10 ha <i>more than</i> 10 ha	0 1 2
NEIGHBOURHOOD Defined by the % area covered by native vegetation within 1 km of the site being assessed		<i>less than</i> 10% area covered <i>between</i> 10% – 50% area covered <i>more than</i> 50% area covered	0 1 2
CORE AREA Defined by the distance of the site being assessed from a block of native vegetation greater than 50ha		1 km or <i>more</i> from 50 ha block of native vegetation <i>less than</i> 1 km from 50 ha block of native vegetation	0 1
Department of Sustainability and Environment ENVIRONMENTAL MANAGEMENT IN AGRICULTURE Native Biodiversity Resource Kit ©2004		Assessment of Habitat Quality (total)	

APPENDIX 9 – LANDSCAPE CONTEXT MODEL (LCM)

The LCM mapping is also contained on the BAP CD* (Version 1, January 2008) or on the GBCMA website (www.gbcma.vic.gov.au). This mapping can be used in conjunction with the BAP mapping and this Conservation Plan.

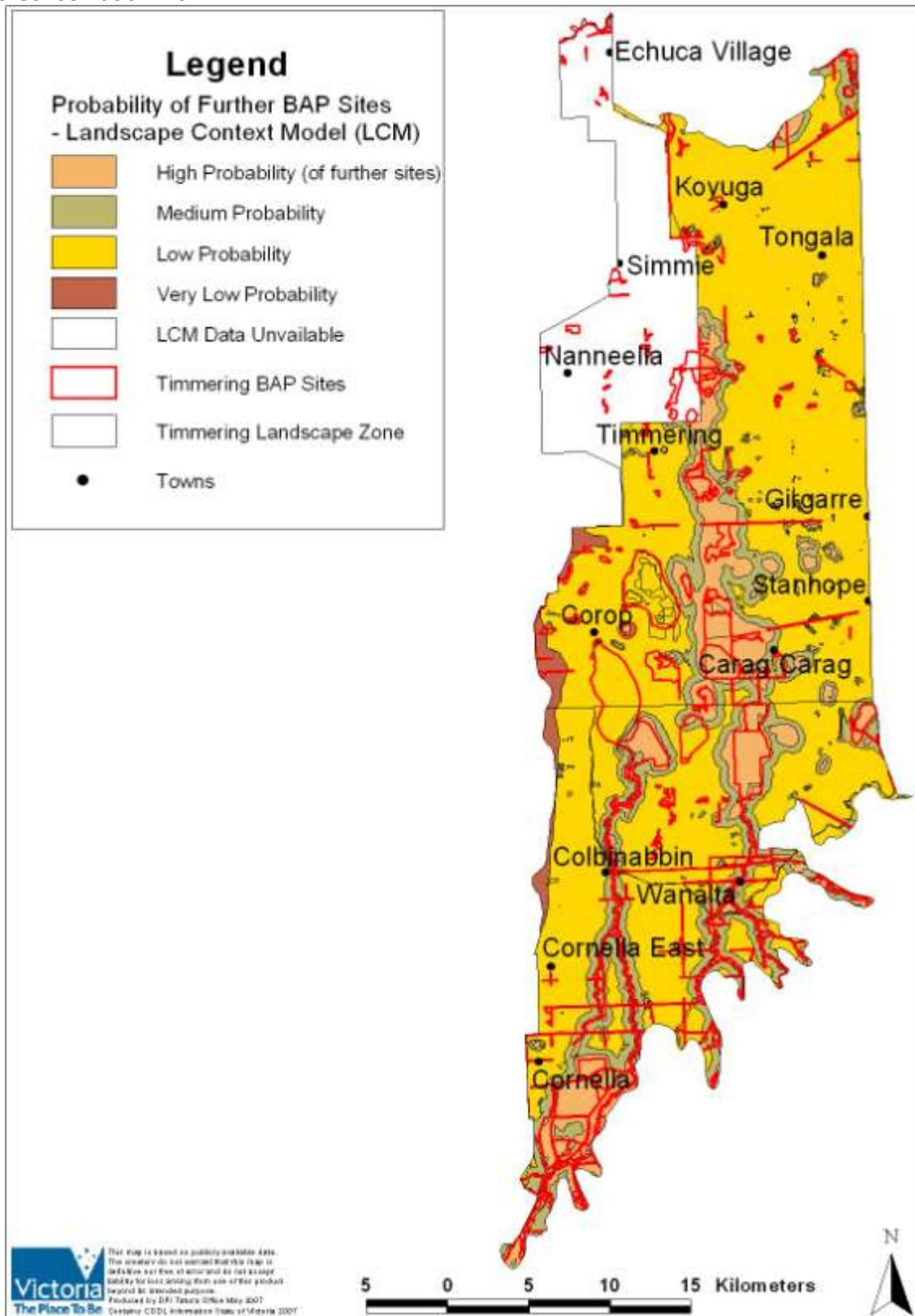
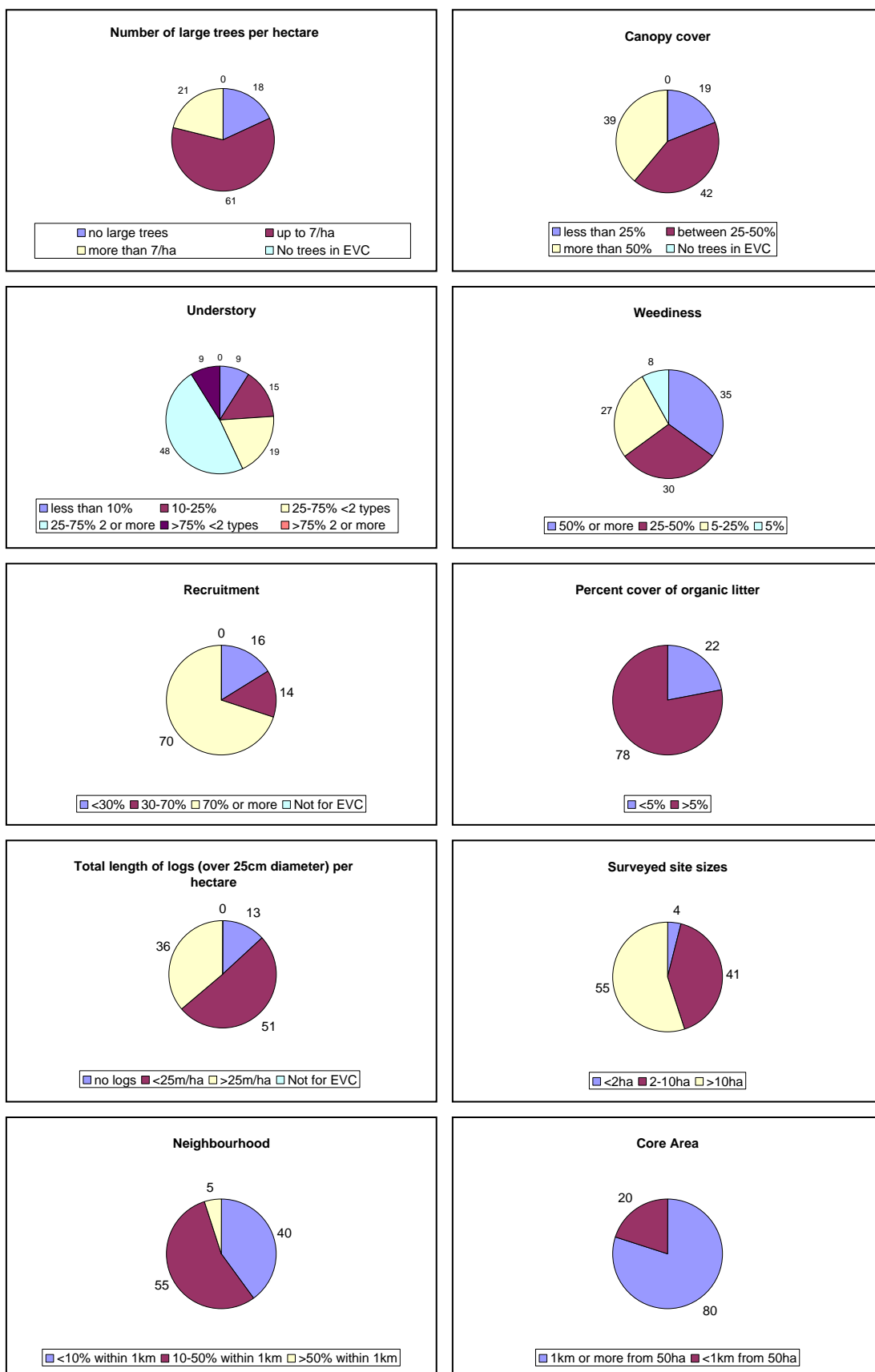


Figure 8: Landscape Context Model for the Timmering Landscape Zone (with the priority BAP sites) which depicts the probability of further BAP sites within the Zone

* To obtain copies of the BAP CD (Version 1, January 2008), or for further information on BAP, please contact bap@gbcma.vic.gov.au OR the Biodiversity Action Planning Officer, Department of Sustainability and Environment (DSE) Benalla at Ph: (03) 57 611 611

APPENDIX 10 –VEGETATION QUALITY ASSESSMENT (VQA) RESULTS



APPENDIX 11 – BIRD LIST

This list includes birds surveyed during the 100 site (20 minute) surveys. It is not intended to represent the entire bird population in the Timmering Landscape Zone. Refer to Appendix 12 for further information on how to obtain data on birds surveyed at each site.

<u>English Name*</u>	<u>Latin Name</u>	<u>English Name*</u>	<u>Latin Name</u>
Australian Hobby	<i>Falco longipennis</i>	Martin	<i>Hirundo spp.</i>
Australian Raven	<i>Corvus coronoides</i>	Masked Lapwing	<i>Vamellus miles</i>
Barn Owl	<i>Tyto alba</i>	Mistletoebird	<i>Dicaeum hirundinaceum</i>
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Mountain Duck	<i>Tadorna tadornoides</i>
Black-shouldered Kite	<i>Elanus axillaris</i>	Nankeen Kestrel	<i>Falco cenchroides</i>
Black Swan	<i>Cygnus atratus</i>	Noisy Friarbird	<i>Philemon corniculatus</i>
Black-winged Stilt	<i>Himantopus himantopus</i>	Noisy Miner	<i>Manorina melanocephala</i>
Black-fronted Dotterel	<i>Elseyornis melanops</i>	Olive-backed Oriole	<i>Oriolus sagittatus</i>
Blue-faced Honeyeater	<i>Entomyzon cyanotis</i>	Oriole	<i>Oriolus spp.</i>
Brown Falcon	<i>Falco berigora</i>	Pacific Black Duck	<i>Anas superciliosa</i>
Brown Thornbill	<i>Acanthiza pusilla</i>	Pelican	<i>Pelecanus conspicillatus</i>
Brown Treecreeper	<i>Climacteris picumnus</i>	Pied Butcherbird	<i>Cracticus nigrogularis</i>
Buff-rumped Thornbill	<i>Acanthiza reguloides</i>	Pied Currawong	<i>Strepera graculina</i>
Bush Stone-curlew	<i>Burhinus grallarius</i>	Purple Swampphen	<i>Porphyrio porphyrio</i>
Chestnut Teal	<i>Anas castanea</i>	Raven	<i>Corvus spp.</i>
Clamorous Reed-warbler	<i>Acrocephalus stentoreus</i>	Red-kneed Dotterel	<i>Erythronyus cinctus</i>
Common Blackbird	<i>Turdus merula</i>	Red-rumped Parrot	<i>Psephotus haematonotus</i>
Common Bronzewing	<i>Phaps chalcoptera</i>	Restless Flycatcher	<i>Myiagra inquieta</i>
Crested Pigeon	<i>Geophaps lophotes</i>	Rufous Songlark	<i>Cincloramphus mathewsi</i>
Crested Shrike-tit	<i>Falcanculus frontatus</i>	Rufous Whistler	<i>Pachycephala rufiventris</i>
Domestic Peahen	<i>Pavo cristatus</i>	Southern Whiteface	<i>Aphelocephala leucopsis</i>
Dusky Moorhen	<i>Gallinula tenebrosa</i>	Starling	<i>Sturnus vulgaris</i>
Dusky Woodswallow	<i>Artamus cyanopterus</i>	Straw-necked Ibis	<i>Threskiornis molucca</i>
Eastern Rosella	<i>Platycercus eximius</i>	Striated Pardalote	<i>Pardalotus striatus</i>
Fairy Martin	<i>Hirundo ariel</i>	Striated Thornbill	<i>Acanthiza lineata</i>
Feral Pigeon	<i>Columba livia</i>	Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
Flame Robin	<i>Petroica phoenicea</i>	Superb Fairy-wren	<i>Malurus cyaneus</i>
Galah	<i>Cacatua roseicapilla</i>	Superb Parrot	<i>Polytelis swainsonii</i>
Golden Whistler	<i>Pachycephala pectoralis</i>	Tawny Frogmouth	<i>Podargus strigoides</i>
Grey Falcon	<i>Falco hypoleucos</i>	Tree Sparrow	<i>Passer montanus</i>
Grey Fantail	<i>Rhipidura fuliginosa</i>	Wedge-tailed Eagle	<i>Aquila audax</i>
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	Welcome Swallow	<i>Hirundo neoxena</i>
Grey Teal	<i>Anas gracilis</i>	Whistling Kite	<i>Haliastur spheurnus</i>
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	White-backed Swallow	<i>Cheramoeca leucosternus</i>
Hardhead	<i>Aythya australis</i>	White-browed Babbler	<i>Pomostostomus superciliosus</i>
Hooded Robin	<i>Melanodryas cucullata</i>	White-eared Honeyeater	<i>Lichenostomus leucotis</i>
House Sparrow	<i>Passer domesticus</i>	White-faced Heron	<i>Egretta novaehollandiae</i>
Indian Mynah	<i>Acridotheres tristis</i>	White Ibis	<i>Threskiornis molucca</i>
Intermediate Egret	<i>Ardea intermedia</i>	White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>
Jacky Winter	<i>Microeca fascians</i>	White-throated Treecreeper	<i>Cormobates leucophaeus</i>
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	White-winged Chough	<i>Cocorax melanorhamphos</i>
Letter-winged Kite	<i>Elanus scriptus</i>	Willie Wagtail	<i>Rhipidura leucophrys</i>
Little Corella	<i>Cacatua sanguinea</i>	Wood Duck	<i>Chenonetta jubata</i>
Little Friarbird	<i>Philemon citreogularis</i>	Wood Swallow	<i>Artamus spp.</i>
Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>	Yellow-billed Spoonbill	<i>Platelea flavipes</i>
Little Raven	<i>Corvus mellori</i>	Yellow Rosella	<i>Platycercus elegans flaveolus</i>
Long-billed Corella	<i>Cacatua tenuirostris</i>	Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
Magpie	<i>Gymnorhina tibicen</i>	Yellow Thornbill	<i>Acanthiza nana</i>
Magpie Lark	<i>Grallina cyanoleuca</i>	Zebra Finch	<i>Taeniopygia guttata</i>

* In Alphabetical Order of English Name

APPENDIX 12 –PRIORITY SITE INFORMATION (MAPPING):

Mapping and accompanying information for each of the priority BAP sites is contained on the BAP CD* (Version 1, January 2008) or on the GBCMA website (www.gbcma.vic.gov.au). This mapping data is designed to be used in conjunction with this Conservation Plan to assist users to obtain further information on priority sites.

HOW TO OBTAIN INFORMATION FROM THE BAP CD:

1. Locate the available mapping data by clicking on the 'BAP Mapping' hyperlink#.
2. Click on the hyperlink relating to the Zone of interest under 'BAP Mapping' and the 'Available Maps Subheading' (e.g. 'Barmah').
3. This will lead to a map identifying priority BAP sites within the chosen Zone.
4. On this map, locate the area/site of interest by clicking on the area.
5. Zoom in or out to the areas/sites of interest, using the North, South, East, West arrows.
6. Click on a BAP site to view the Attribute Table information for that site.
7. Refer to the list of birds surveyed at each site (where available).
8. An explanation of the data provided in the Attribute Table is provided in the 'Attribute Table Definition' document under the 'BAP Mapping' subheading.
9. For further information to assist with the identification of opportunities to link the BAP sites, refer to 'BAP Mapping', 'Landscape Context Model Maps' and choose the relevant Zone name hyperlink (e.g. 'Barmah').
10. To access the data via the Geographical Information System (GIS) (where available) select 'BAP Mapping', 'GIS data' then either 'BAP GIS layer' or 'LCM GIS layer'.

Note: Mapping data for each Landscape Zone can also be located by clicking on the 'BAP Zones' hyperlink and choosing the Landscape Zone of interest from the map of the Goulburn Broken Catchment.

* To obtain copies of the BAP CD (Version 1, January 2008), or for further information on BAP, please contact bap@gbcma.vic.gov.au OR the Biodiversity Action Planning Officer, Department of Sustainability and Environment (DSE) Benalla at Ph: (03) 57 611 611