Conservation Plan
for the
Western Goulburn Landscape Zone

Biodiversity Action Planning in the Shepparton Irrigation Region

Victoria The Place To Be

Department of Sustainability and Environment

Department of Primary Industries

Trust for Nature

Goulburn Broken Catchment Management Authority

Australian Government

Developed By:

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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 Western Goulburn 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. Seven focal species have been suggested for the Zone including, Grey-crowned Babbler (*Pomatostomus temporalis*), Bush Stone-curlew (*Burhinus grallarius*), Brown Treecreeper (*Climacteris picumnus*), Squirrel Glider (*Petaurus norfolensis*), Latham's Snipe (*Gallinago hardwickii*), Tree Goanna (*Varanus varius*) and Brolga (*Grus rubicunda*).

The **key biodiversity asset** approach is a method of grouping biodiversity assets (e.g. birds, animals and plants) that use the same type of habitat. Four key biodiversity assets were identified for the Western Goulburn Landscape Zone including, Wetlands, Public Land, Plains Woodlands and Riverine Woodlands. The grouping of these assets will assist in targeting the 'Very High' value sites first, down to the lowest priority sites.

The **Western Goulburn Landscape Zone** is located within the Goulburn Broken Catchment of Victoria. The Zone, which is approximately 123,833 hectares, is within the Victorian Riverina Bioregion and the (majority of) the Local Government area of Greater Shepparton City Council. Since European settlement much of the vegetation in the Zone has been cleared, leaving a fragmented landscape, with a large proportion of the remnant vegetation that remains being highly modified.

Two hundred and five **priority environmental sites** were identified within the Western Goulburn 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 larger areas such as Doctor's Swamp. In general, the surveyed sites within the Zone were found to have disturbed understorey and a high component of pest plants and animals.

Management actions (advisory only) have been developed for the Western Goulburn 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, into existing projects, strategies and documents, for the benefit of biodiversity conservation in the Western Goulburn Landscape Zone, as well as the Shepparton Irrigation Region 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 biodiversity[1] 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), the 'Landscape Plan for the Goulburn Broken Catchment - Shepparton Irrigation Region – 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 Western Goulburn Landscape Zone' (Ahern *et al* 2003). At the Landscape level, this Plan (especially the accompanying data) is intended to provide a biodiversity conservation resource for the community. Figure 1 illustrates the BAP process and where the 'Conservation Plan for the Western Goulburn Landscape Zone' (as per underlined) fits within a policy context.

1.2 OBJECTIVES

The 'Conservation Plan for the Western Goulburn 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 guide the strategic and coordinated management of conservation and assist with private and public resources being expended and targeted to priority sites for priority actions. It identifies 205 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 Zone.

Broadly, this Plan details;

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

[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 the Western Goulburn 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) into 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 level of species abundance, diversity and interactions. BAP also 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 or 'ideal' ecosystems (Platt & Lowe 2002). The approaches used in Biodiversity Action Planning (e.g. focal species and assets) also provide additional tools for the community and allow for the use of principles of landscape ecological science to conserve biodiversity. It is therefore intended that this Conservation Plan for the Western Goulburn 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 been developed to be adaptive so as to enable management actions and information to be modified in response to further information (e.g. monitoring). This Plan forms the basis for the explanation of the Biodiversity Action Planning process and the associated mapping tool.

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 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 also developed in order to guide the communication of Biodiversity Action Planning. 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 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

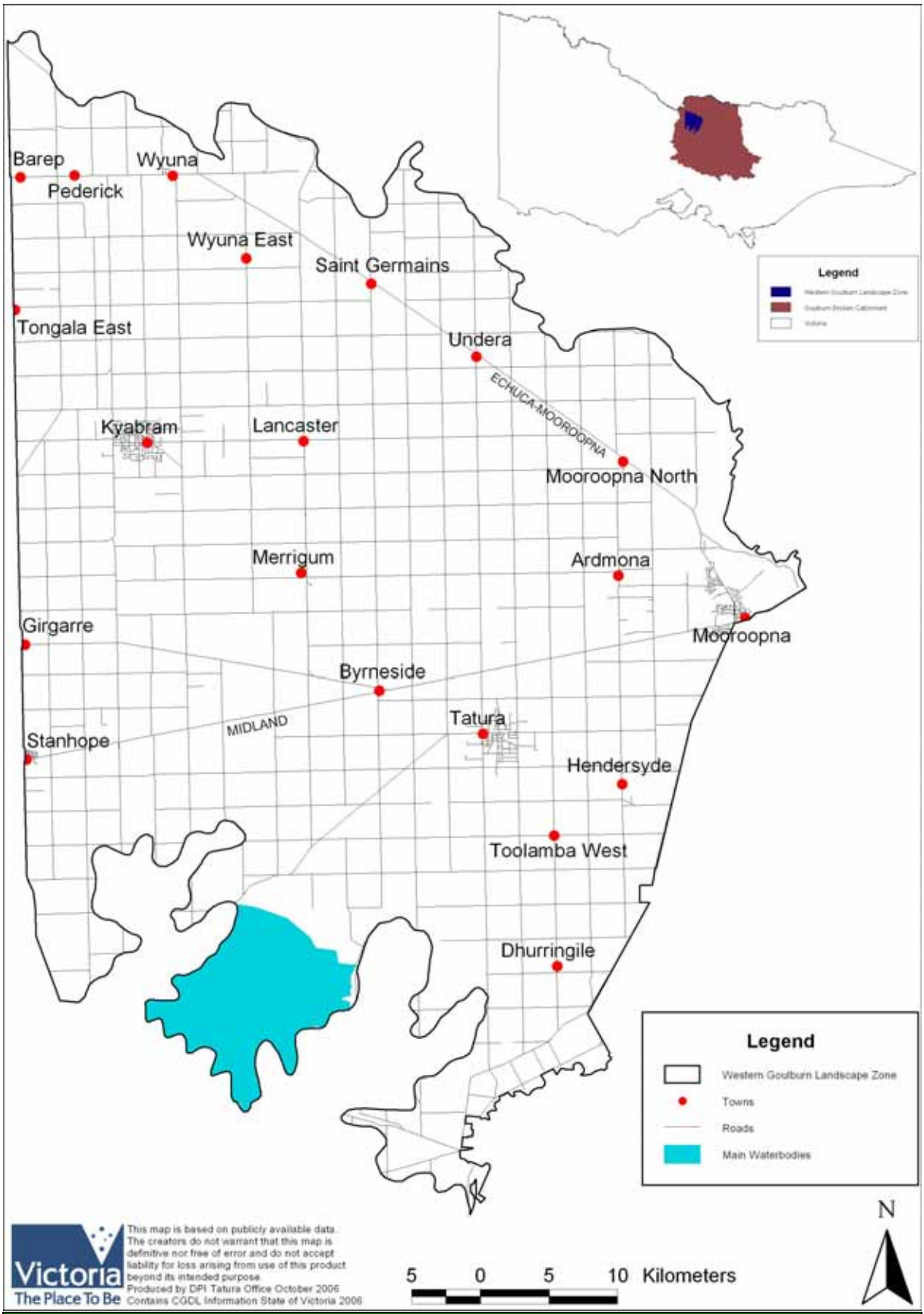


Figure 2a: (Main) Western Goulburn Landscape Zone
Figure 2b: (Inset) Victoria, with the Goulburn Broken Catchment and the Western Goulburn Landscape Zone

2.1 LANDSCAPE

The Western Goulburn Landscape Zone (Figure 2a) is located within the Goulburn Broken Catchment of Victoria (Figure 2b). The Zone (approximately 123,833 hectares) falls within the Victorian Riverina Bioregion and the majority is within the Local Government area of the Greater Shepparton City Council (also includes part of the Shire of Campaspe). It is bounded to the North by the Victorian Riverina Bioregional boundary (along the Southern margin of the Goulburn River floodplain), to the East by the Goulburn River and the Murchison-Mooroopna Road and to the South by the Goldfields bioregional boundary (near Murchison/Waranga Basin). The Western boundary of the Zone is the Girgarre-Rushworth and Curr Roads (extending North to Yambuna). The Midland Highway is the major regional road traversing the Zone (Ahern *et al* 2003).

The Zone is comprised of two main land systems – floodplain and riverine plain. Both land systems consist of quartenary alluvial sediments, with the floodplain deposits being more recent (LCC 1983). The floodplain landform is approximated by the distribution of River Red Gum (*Eucalyptus camaldulensis*) forests along the Murray River. The riverine plain occupies most of the Zone and is characteristically well-drained, with leveed prior streams and wind-blown sand dunes (Ahern *et al* 2003).

The entire Zone lies within the Goulburn River Basin (LCC 1989). The Zone is relatively flat and is therefore serviced by an extensive network of drains and irrigation channels. These systems are connected both with the Goulburn River irrigation system to the North and East and the Waranga Reservoir system in the South. The Zone is a well-drained riverine plain across which leveed prior streams are oriented largely from South-East to North-West (Ahern *et al* 2003).

Private land covers approximately 90% of the Zone, with extensive clearing having taken place, predominantly where intensive agriculture (mostly irrigated) is pursued on the fertile riverine plain. The native vegetation remaining on private land, particularly in the central areas of the Zone is highly fragmented, and typically occurs as isolated remnants. Within the freehold land area, irrigated farming is the major land use. Examples of land-use in the freehold land area include dairying, mixed farming (sheep and cattle), horticulture (particularly around Mooroopna, Tatura and Kyabram), horse studs and hobby farming (Ahern *et al* 2003).

Public land covers the remaining 10% of the Zone and includes areas such as State Forest (e.g. along the Goulburn River floodplain between Shepparton and Coomboona). This area is a listed site (VIC052) in 'A Directory of Important Wetlands in Australia' (EA 2001). Other examples of public land areas within the Zone include; municipal roadsides (e.g. Midland Highway Road Reserve), the Toolamba-Echuca Rail Reserve, Recreation Reserves, Stockyard Plain, Waranga Basin, Murchison-Rushworth Rail Line Nature Conservation Reserve, Doctor's Swamp Wildlife Reserve and Gemmill's Swamp Wildlife Reserve (Ahern *et al* 2003).

Plate: Roadsides such as the Midland Highway are an example of 'public land' areas that comprise approximately 10% of the Western Goulburn 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 23 EVCs[2] were known to have been present within the Western Goulburn Landscape Zone (Figure 3). The pre-1750 vegetation coverage consisted of a matrix of Plains Grassy Woodland and Plains Woodland, with patches of vegetation such as Shallow Sand Woodland/Plains Woodland Mosaic. A scattering of wetlands in the Zone (predominantly near Tatura/Rushworth) would have likely comprised vegetation types of Plains Grassy Woodland/Gilgai Wetland Mosaic, Plains Grassy Wetland, Red Gum Wetland and (less so) Billabong Wetland (Ahern *et al* 2003).

Plains Woodland and Plains Grassy Woodland communities would typically have consisted of open woodlands, with an understorey of scattered shrubs and a high species diversity of grasses, lilies, orchids, herbs and sedges. The overstorey component was generally comprised of Grey Box (*Eucalyptus microcarpa*), White Box (*Eucalyptus albens*) and/or Yellow Box (*Eucalyptus melliodora*). Wattles (*Acacia spp*) and Pea species (e.g. *Daviesia spp*) provide the majority of the understorey component, whilst the groundcover was generally composed of grasses (e.g. *Austrodanthonia* and *Stipa spp*) and chenopods (e.g. *Atriplex spp*) (Berwick 2003).

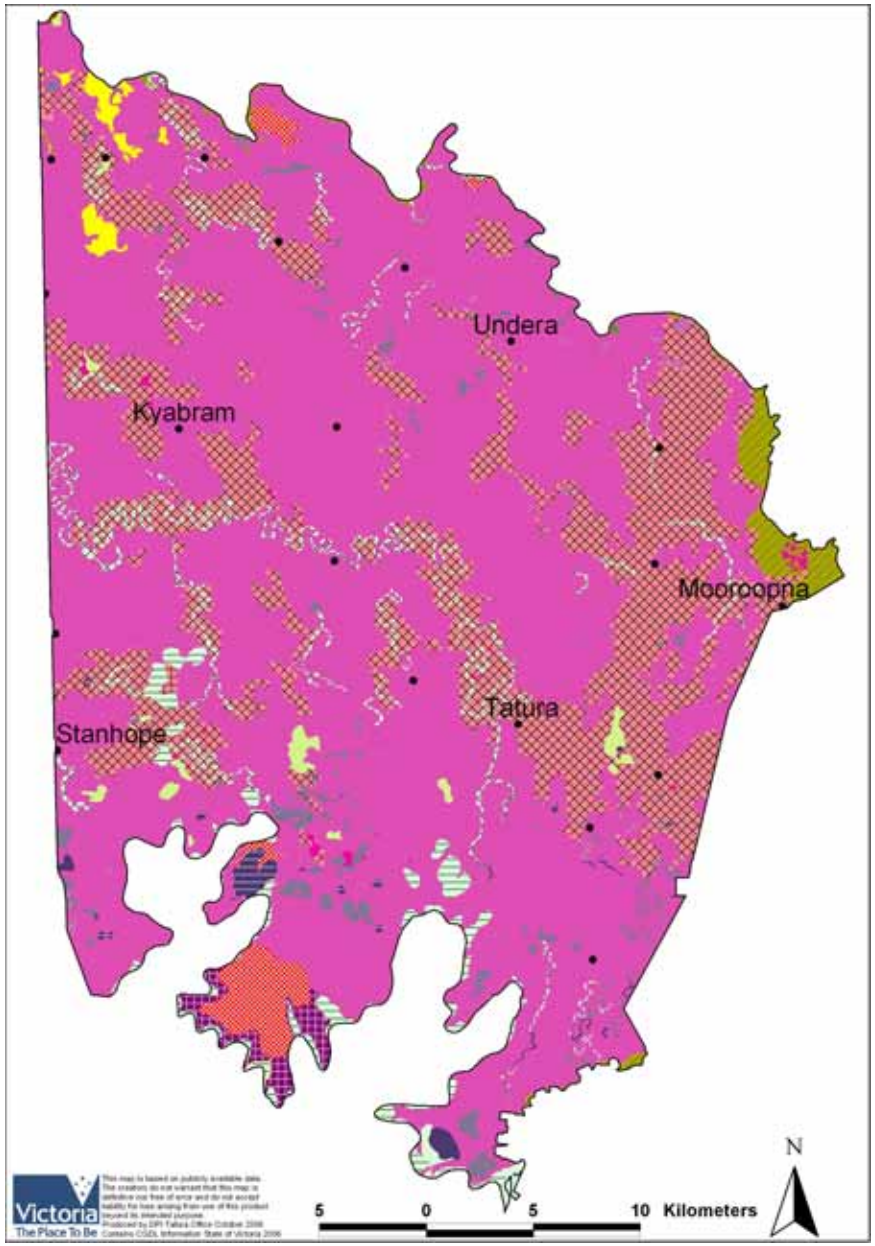
Drainage Line Complex EVC was typically located along ephemeral drainage lines (e.g. creeks) on the floodplains. The creeks and major depressions typically supported an overstorey of River Red Gum (*Eucalyptus camaldulensis*), an understorey of Wattles and were generally lined with tall sedges (e.g. *Carex spp*). The Drainage Line Complex EVC typically varied from grassy wetlands to open herblands, sedgelands and may have developed to Red Gum Wetlands in some areas (Berwick 2003).

Wetlands typically differed in their structure due to seasonal and temporal variations. However, Red Gum Wetlands (as the name suggests) were typically dominated by River Red Gum, sedges (e.g. *Eleocharis spp*) and rushes (e.g. *Juncus spp*). Plains Grassy Wetlands would have occurred in shallow depressions on the alluvial plains, where meanders of prior steams occurred. These shallow seasonal wetlands were typically treeless, with a grassland structure grading into sedgeland or herbland (Berwick 2003).

The current extent of native vegetation in the Western Goulburn Landscape Zone has dramatically reduced (Figure 4) since European settlement, primarily due to clearing. Figures 3 and Figure 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 the Western Goulburn Landscape 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 applicable[3]) EVCs to at least 15% of their pre-European vegetation cover by 2030" (GBCMA 2003). A number of EVCs within the Western Goulburn Landscape Zone are below the 15% target (Table 1) and are therefore considered; 'Endangered' (20) or 'Vulnerable' (3) 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%



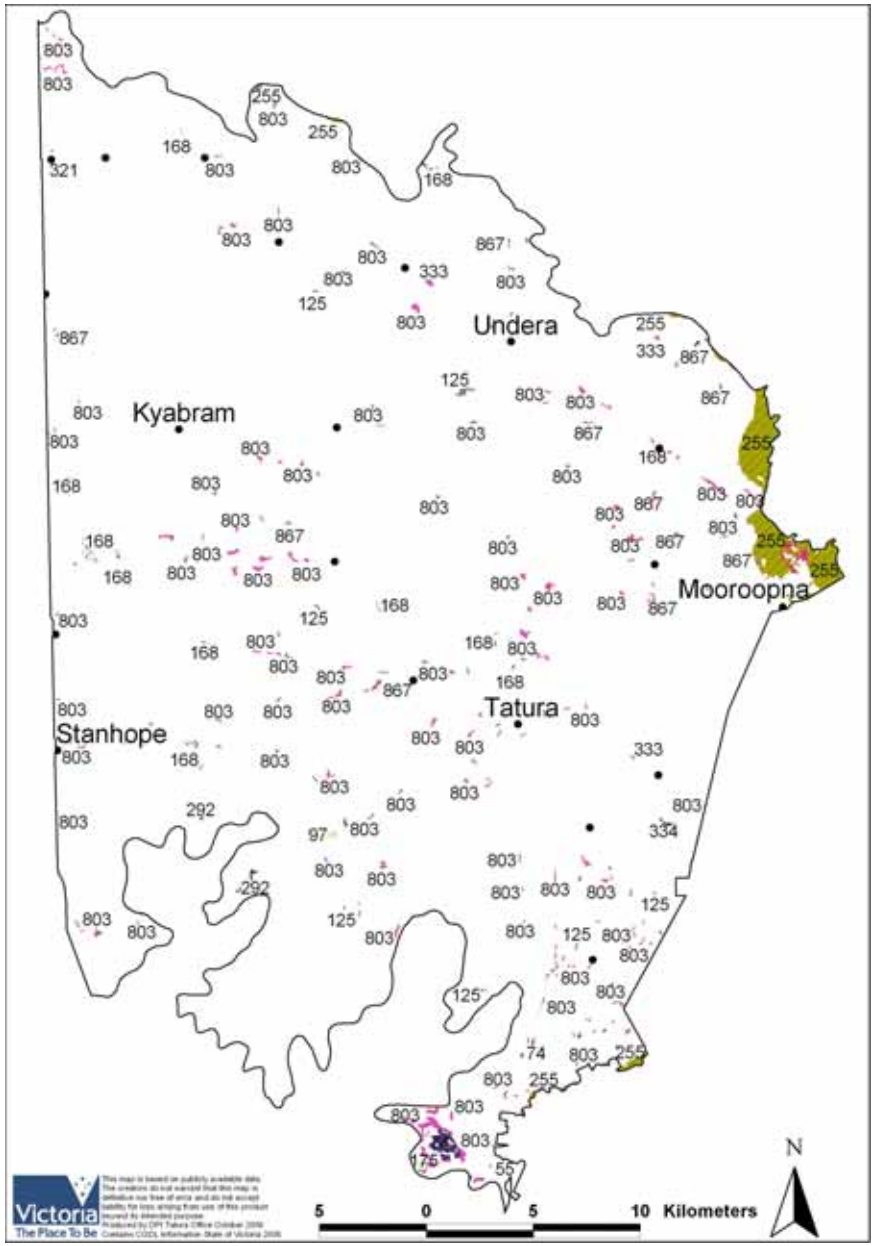


Figure 3: (Left) Pre-European Native Vegetation Cover (Ecological Vegetation Class (EVC) Extent)

Figure 4: (Right) Current Native Vegetation Cover (EVC Extent)

Western Goulburn Landscape Zone

Table 1: Western Goulburn 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	103	7	6.80%	15
61	V	Box Ironbark Forest	4	0	0.00%	1
67	V	Alluvial Terraces Herb-rich Woodland	894	0	0.00%	134
68	E	Creekline Grassy Woodland	25	0	0.00%	4
74	E	Wetland Formation	295	111	37.63%	44
97	E	Semi-arid Woodland	676	10	1.48%	101
103	E	Riverine Chenopod Woodland	18	0	0.00%	3
125	E	Plains Grassy Wetland	1724	46	2.67	259
132	E	Plains Grassland	638	1	0.16%	96
168	E	Drainage Line Complex	2846	87	3.06%	427
175	E	Grassy Woodland	1871	31	1.66%	281
235	E	Plains Woodland/Herb-rich Gilgai Wetland Mosaic	1572	0	0.00%	236
255	V	Riverine Grassy Woodland/Sedgy Riverine Forest/Wetland Formation Mosaic	1665	1285	77.18%	250
259	E	Plains Grassy Woodland/Gilgai Wetland Mosaic	403	<1	<1%	60
264	E	Sand Ridge Woodland	244	37	15.16%	37
292	E	Red Gum Wetland (swamp)	384	15	3.91	58
321	E	Riverine Chenopod Woodland/Lignum Wetland Mosaic	20	1	5.00%	3
333	E	Red Gum Wetland/Plains Grassy Wetland Mosaic	328	19	5.79%	49
334	E	Billabong Wetland	17	8	47.06%	3
803	E	Plains Woodland	85257	608	0.71%	12789
867	E	Shallow Sand Woodland/Plains Woodland Mosaic	24780	135	2.48%	3717
871	E	Riverine Grassy Woodland/Plains Woodland/Gilgai Wetland Complex	56	0	0.00%	8
872	E	Riverine Grassy Woodland/Plains Woodland/Riverine Chenopod Woodland Complex	13	0	0.00%	2
		TOTAL	**123833**	**2401**	**2.09%**	**18575**
997	NA	Private Land No Tree Cover	0	121431	N/A	N/A
Table Information including column A & B modified from Ahern *et al* 2003 & CGDL 2005			*A*	*B*	*C*	*D*

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

* *Rounded to Nearest Unit (Whole Number)*

\# *EVC names have altered since Ahern et al 2003 & are listed according to current corporate data & knowledge (CGDL 2005)*

Explanation of Terms:

- 'EVC Number' – the unique number attributed to an EVC in available literature (e.g. CGDL 2005).
- 'EVC Bioregional Conservation Status' (BCS) - threatened status of an EVC. Endangered (E) means 'less than 10% of the pre-European extent remains', Vulnerable (V) is defined as 'less than 10-30% pre-European extent remaining' and (D) is Depleted (Platt 2002).
- 'Ecological Vegetation Class (EVC) Name' - the name given to that unique community.
- 'Pre-1750 Vegetation Area' - the area of vegetation cover (ha) prior to substantial clearance (e.g. Pre-European Settlement).
- 'Catchment (15%) Target (ha)' - the Goulburn Broken Regional Catchment Strategy 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: Gold-dust Wattle (Acacia acinacea) is an example of a plant species recorded in the Western Goulburn Landscape Zone

A range of native flora is found within the Western Goulburn Landscape Zone. Examples of overstorey species include Grey Box (*Eucalyptus microcarpa*), White Box (*Eucalyptus albens*), Yellow Box (*Eucalyptus melliodora*), White Cypress-pine/Murray Pine (*Callitris glaucophylla*) and Buloke (*Allocasuarina luehmannii*). The range of small trees and shrubs includes species such as Waterbush (*Myoporum montanum*) (rare), Mallee Wattle (*Acacia montana*), Golden Wattle (*Acacia pycnantha*), Gold-dust Wattle (*Acacia acinacea*), Emubush (*Eremophila longifolia*) and Lignum (*Muehlenbeckia spp*). The Zone also contains a range of groundcover plants including Wallaby Grass (*Austrodanthonia spp*) and Spear Grass (e.g. *Austrostipa elegantissima*), herbs (e.g. Bluebush (*Maireana spp*)) and Lilies (e.g. Chocolate Lily (*Arthropodium strictum*)). Plants that favour moist environments, such as Swamp Billy-buttons (*Craspedia paludicola*) (vulnerable) and Common Nardoo (*Marsilea drummondii*) may also be found (Ahern *et al* 2003).

There are twenty-five species of threatened flora recorded within the Western Goulburn 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 Act) 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 Western Goulburn Landscape Zone include:

- Waterbush (*Myoporum montanum*) (rare in Victoria),
- River Swamp Wallaby-grass (*Amphibromus fluitans*) (Vulnerable in Australia),
- Western Water-starwort (*Callitriche cyclocarpa*) (Vulnerable in Australia and Victoria),
- Swamp Billy-buttons (*Craspedia paludicola*) (vulnerable in Victoria),
- Buloke (*Allocasuarina luehmannii*) (Listed under the *Flora and Fauna Guarantee (FFG) Act 1988*),
- Striped Water-milfoil (*Myriophyllum striatum*) (vulnerable in Victoria), and
- Turnip Copperburr (*Sclerolaena napiformis*) (Endangered in Australia and Victoria and *FFG Act 1988* Listed) (Ahern *et al* 2003).

Plate: Waterbush (Myoporum montanum) is an example of a threatened plant species recorded in the Western Goulburn Landscape Zone

2.3.2 Fauna

There are fifty-three threatened (fauna) species recorded in the Western Goulburn 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 Western Goulburn Landscape Zone include:

- Bush Stone-curlew (*Burhinus grallarius*) (Threatened in Australia and endangered in Victoria),
- Hooded Robin (*Melanodryas cucullata*) (*FFG Act 1988* Listed),
- Superb Parrot (*Polytelis swainsonii*) (Vulnerable in Australia and endangered in Victoria),
- Barking Owl (*Ninox connivens*) (Threatened in Australia and endangered in Victoria),
- Grey-crowned Babbler (*Pomatostomus temporalis*) (endangered in Victoria and Listed under the *FFG Act 1988*), and
- Diamond Firetail (*Stagonopleura guttata*) (Threatened in Australia and vulnerable in Victoria) (Ahern *et al* 2003).

Plate: Bush Stone-curlew (Burhinus grallarius) is an example of a threatened species recorded in the Western Goulburn Landscape Zone

Examples of threatened species recorded within the Western Goulburn Landscape Zone, predominantly associated with wetlands include:

- Brolga (*Grus rubicunda*) (vulnerable in Victoria),
- Hardhead (*Aythya australis*) (vulnerable in Victoria),
- Australasian Shoveller (*Anas rhynchotis*) (vulnerable in Victoria),
- Royal Spoonbill (*Platalea regia*) (vulnerable in Victoria),
- Musk Duck (*Biziura lobata*) (vulnerable in Victoria),
- Freckled Duck (*Stictonetta naevosa*) (endangered in Victoria),
- Painted Snipe (*Rostratula benghalensis*) (endangered in Victoria), and
- Little Egret (*Egretta garzetta*) (endangered in Victoria) (Ahern *et al* 2003).

Plate: Brolga (Grus rubicunda) is an example of a threatened species recorded in the Western Goulburn Landscape Zone (Tony Kubeil 2006)

Examples of threatened fish recorded within the Western Goulburn Landscape Zone include:

- Golden Perch (*Macquaria ambigua*) (vulnerable in Victoria), and
- Murray Cod (*Maccullochella peelii peelii*) (Vulnerable in Australia (*EPBC Act 1999*) and endangered in Victoria) (Ahern *et al* 2003).

Mammals (e.g. Bats, Possums, Gliders and Koalas) and Reptiles (e.g. Woodland Blind Snake (*Ramphotyphlops proximus*) (vulnerable in Victoria) and Tree Goanna (*Varanus varius*)) are also significant species, which have been recorded in the Western Goulburn Landscape Zone. Frogs such as the Growling Grass Frog (*Litoria raniformis*) (Vulnerable (V) in Australia and Victoria (v)) have also been recorded within the Zone (Ahern *et al* 2003).

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 Plans.

The methodology used to prepare this Plan contained eight main elements. These were; Identification of Conservation Features and Threatened Species,

1) Ground-truthing of Potential BAP Sites,
2) Field Surveying of BAP sites,
3) Prioritisation of BAP sites,
4) Generation of Focal Species List,
5) Generation of Key Biodiversity Asset List,
6) Development of Actions for Key Biodiversity Assets, and
7) 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 aerials); 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 surveying 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).
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 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 (GBCMA *in prep.*). Huggett 2007 identifies 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 in to 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 (EVC). 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 how to obtain 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.

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, wetlands 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 Western Goulburn Landscape Zone priority (BAP) sites and Landscape Context Model are shown in Appendix 9.

4.0 IDENTIFYING PRIORITY SITES

In the Western Goulburn Landscape Zone 205 sites have been 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 large areas such as Doctor's Swamp. 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. 1-205). 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). Refer to Appendix 12 for further information on obtaining data on each of the 209 BAP sites.

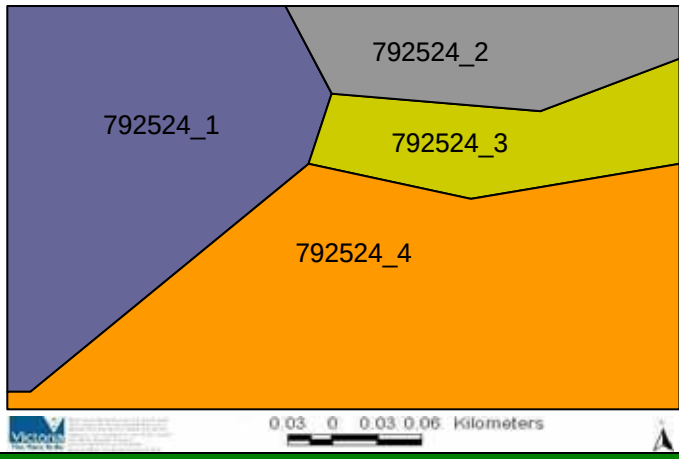


Figure 5: Example of the site identification numbering system

Site Number:	792524_1
Biodiversity Asset	Plains Woodland (Section 6.2)
Priority Status	Very High (VH)
Bioregion	VR (Victorian Riverina)
EVC	803 (Section 2.2)
EVC Conservation Status	E (Endangered)
Focal Species	Bush Stone-curlew (*Burhinus grallarius*) (Section 6.1)
Threatened Flora	Waterbush (*Myoporum montanum*)
Threatened Fauna	Barking Owl (*Ninox connivens*)
Vegetation Quality Score	16/20 (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 hundred[4] of the 205 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 Western Goulburn Landscape Zone scored between 4 and 19 (Appendix 10). The highest scored site was in the South of the Zone at Doctor's Swamp Wildlife Reserve. The lowest scored site was in the central area of the Zone, which is highly modified and fragmented.

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

- Only 31% of surveyed[5] sites had more than 7 large trees per hectare,
- 7% of surveyed sites scored adequate understorey (>75% cover),
- Only 27% of surveyed sites scored less than 25% weed cover,
- 63% of surveyed sites had adequate regeneration,
- Only 23% of surveyed sites have an adequate number of logs (>25m/ha),
- 14% of surveyed sites were larger than 10 hectares and 44% between 2-10 hectares, and
- Only 6% of surveyed sites were surrounded (1km radius) by more than 50% vegetation.

The surveys indicate that there is limited understorey, low connectivity and a large percentage of small sized remnants (e.g. 2-10 hectares). There is a high proportion of natural regeneration that may be attributed to the dry conditions in past years (e.g. less stocking rates). It must be considered that limited surveys were conducted in a number of the very large sites, as they were automatically prioritised as Very high priority (refer to Appendix 7). However for the remainder of the sites, these habitat elements should be targeted (particularly on private land).

5.2 BIRD SURVEYS

One hundred of the 205 priority sites had bird surveys completed. Sixty-seven species of birds were surveyed. A list of birds surveyed at each of the 100 sites is provided in Appendix 11.

Threatened species of birds identified during surveying, included species such as, Latham's Snipe (*Gallinago hardwickii*), Intermediate Egret (*Ardea intermedia*) and Baillon's Crake (*Porzana pusilla*). Some other notable species included, Flame Robin (*Petroica phoenicea*) (migratory species), White-throated Treecreeper (*Cormobates leucophaea*) and Golden Whistler (*Pachycephala pectoralis*). 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 Western Goulburn Landscape Zone refer to Appendix 12.

Note: It is recommended that further wildlife surveying occur in the Western Goulburn Landscape Zone, for species such as mammals, reptiles, bats and frogs. This will assist in providing further detail on biodiversity in the Zone.

[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 Assessments (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).

These included;

- Vegetation Clearance (Land Clearance – removal of native vegetation),
- Habitat Fragmentation/Edge Effects (includes 'Adjacent Land Use Practices'),
- Waterways (instream barriers) (Changes in hydrological regimes e.g. wetlands),
- Animals – Domestic Stock (Inappropriate[6] grazing management (e.g. timing, stocking rate)),
- Firewood Collection & Cleaning Up (Removal of Habitat),
- Animals – e.g. Pest Species - Foxes and Rabbits,
- Invasion by Environmental Weeds (Pest Plants),
- Recreational Activities – motorised (Transport and Recreation), and
- Removal of Rocks/Soil (Impacts of Roadworks on Roadside Vegetation).
- The overall threat of salinity (high watertables) is also discussed below, although not listed specifically against sites. It is an example of an overarching threat that is primarily a result of historical activities and continues to have repercussions on the biodiversity in the Zone.

Vegetation/Land clearance (a key threatening process under the *EPBC Act 1999*) (Wierzbowski *et al* 2002) particularly occurred in the past, however it continues to be a threat to conservation values within the Zone. Practices such as inappropriate[7] earth works (e.g. removal of natural depressions/wetlands) and illegal vegetation removal, is a threat to biodiversity values. Broad-scale spraying of roadsides is also a threatening process, as it removes native vegetation, thus decreasing competition for pest plants (allowing pest plant growth).

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. A range of species such as the Bush Stone-curlew (*Burhinus grallarius*) and Grey-crowned Babbler (*Pomatostomus temporalis*) are detrimentally affected by habitat fragmentation. It affects their 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 remnants in the Zone and adjacent areas (e.g. the Goulburn River).

Adjacent land use practices (e.g. intensive irrigation and inappropriate earthworks (refer to footnote 7)), can also lead to edge effects such as the colonisation of fragmented remnant areas by weeds, waterlogging of vegetation, high watertable, nutrient run-off and an increase in sediment input in 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.

Inappropriate grazing management (refer to Appendix 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). A high percentage (more than 70%) of private land remnants (that were surveyed) within the landscape were heavily grazed, often resulting in minimal shrub or ground cover (only 7% of surveyed sites had adequate understorey). A number of isolated trees in paddocks are stressed (often from cattle rubbing the bark and compacting the soil at the base of the tree) and showing signs of dieback (e.g. dead limbs and loss of trunk bark). It is important to retain these trees as habitat for a range of species (e.g. birds, bats, reptiles and insects).

Changes in hydrology (e.g. hydrological regimes) can be a threat to native vegetation, particularly for wetlands, 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. Terrestrial

[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).

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). A number of integrated projects in the region are designed to reinstate the appropriate hydrological regime to wetlands and protect significant sites. These include the development of Management Plans (e.g. Bray's Swamp), Surface Water Management Systems (e.g. Mosquito Depression) and Environmental Water Allocation (EWA) bids (e.g. Bray's Swamp).

The removal of fallen timber (or 'cleaning up') was evident along roadsides and within both private (see photograph below) and public remnants. 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).

Plate: Firewood collection is an example of a threatening process within the Western Goulburn Landscape Zone

Pest Animals are a threat to the conservation values of the area. 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).

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). Fifty-five percent of the surveyed sites had 50% or more weeds in relation to composition. Examples of weeds evident within the Zone includes; Paterson's curse (*Echium plantagineum*), Peppercorns *(Schinus molle*), Boxthorn (*Lycium ferocissimum*), Sweet Briar Rose *(Rosa rubiginosa*) and Chilean Needle Grass (*Nassella neesiana*). Weeds are especially evident on roadsides due to increased moisture, escaped garden plants, machinery disturbance (e.g. **Roadworks**) and 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). **Transport** and **Recreational** pursuits (e.g. motorised activities) can also lead to increased weeds and loss of native vegetation (DSE 2004).

Salinity is an overarching threat to the area as a result of a high watertable (DSE 2005b). In 1996 (used as the 'representative year') watertable depths ranged from 0-1 metres (Central and Western areas) to more than 3 metres (in the Eastern and far Northern areas) (CGDL 2005). In the region the High Value Environmental Features (HVEF) project (DPI 2006a) identified sites which are either currently or potentially at risk of degradation as a result of a high watertable. This data has been used during the development of this Plan, including the inclusion of data and recommendations.

5.4 SITE PRIORITISATION

The 205 BAP sites (Figure 7) have been given a priority status (ranked value) of Very High (VH), High (H), Medium (M) or Low (L) based on factors (e.g. EVC, threatened species, size and score). Site prioritisation occurred at 3 stages, prior to surveying; following surveying and for unsurveyed sites (Appendix 7). For example prior to surveying, large sites with threatened EVC conservation status and threatened species that did not require ground-truthing, were automatically given a priority status of 'Very High' (VH). The surveyed sites were given a priority status based on factors including the VQA score (Appendix 8). Unsurveyed sites that required ground-truthing but were not able to be surveyed (e.g. more than 100 sites), were given a ranked value to the lesser of the available rankings (until surveying can be conducted).

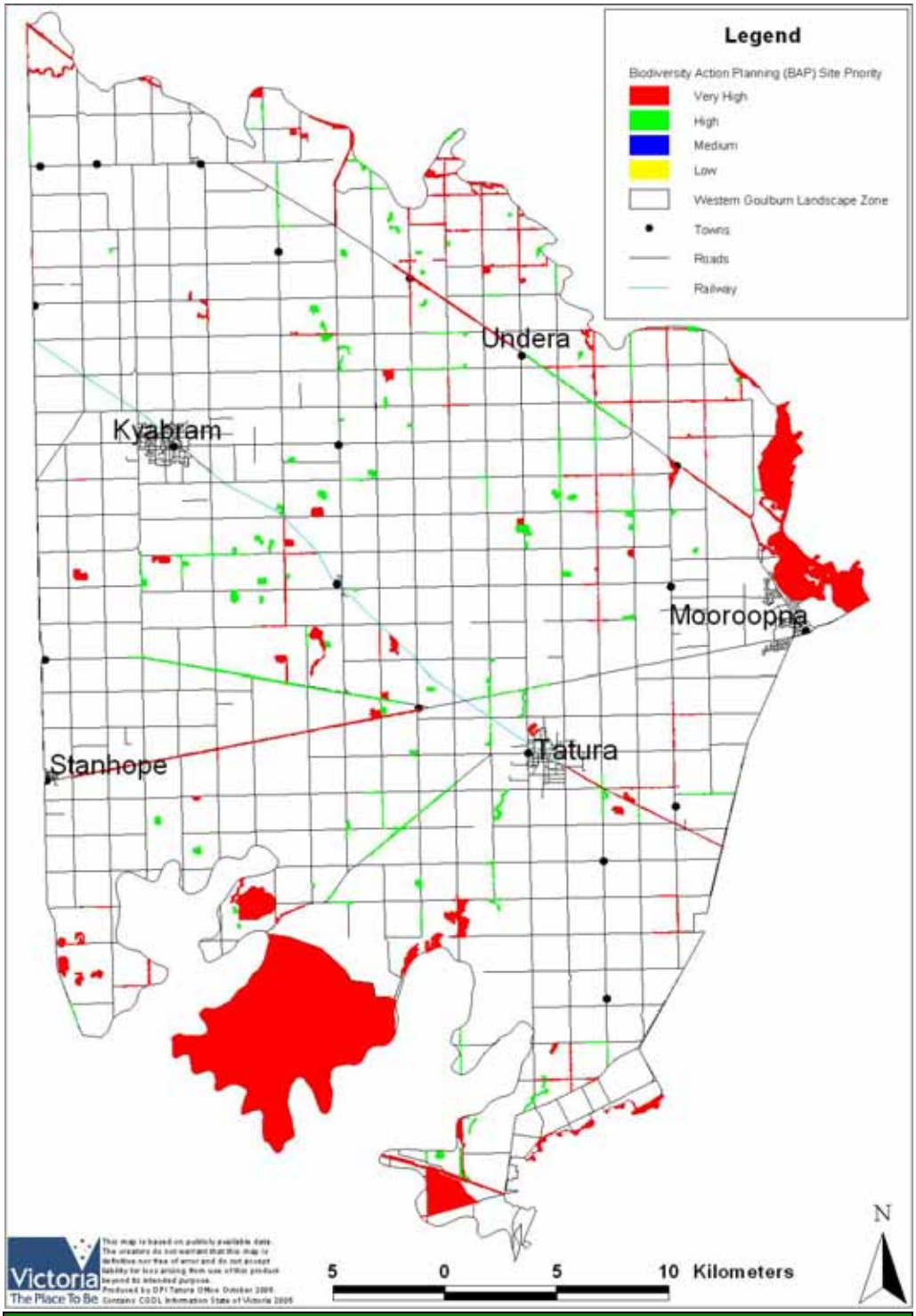


Figure 7: Biodiversity Action Planning (BAP) sites that have been prioritised from Very High to Low for the Western Goulburn Landscape Zone

6.0 BIODIVERSITY ASSETS

6.1 FOCAL SPECIES

Research shows that different 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 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 (GBCMA *in prep.*). The focal species are also predicted to be the most sensitive species (in a given landscape) to a threat or ecological process, such that, their conservation could also conserve other less-sensitive species found in the same vegetation type.

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 science 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 seven focal species identified in the Western Goulburn Landscape Zone, and their ecological requirements (thresholds[8]) are identified below (Table 2). Definitions of the ecological terms used include;

- 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,
- Dispersal threshold – refers to the distance (km) for which the species has been known to travel (e.g. for breeding and 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 (*GBCMA in prep.*)

An example of a focal species project already occurring in the Shepparton Irrigation Region is the Grey-crowned Babbler (*Pomatostomus temporalis*) project. In the first year of the project, outputs included the planting of 28,000 indigenous plants and construction of 10 kilometres of fencing. If we look at the size of patches required to maintain viable Grey-crowned Babbler populations, then the minimum patch size of vegetation required is 2 hectares, preferably with mature trees and no less than 500m gaps between remnants. 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).

It is envisaged that the community target one, or a combination of the focal species identified (Table 2), for planning and implementation of on-ground works. For example (based on Table 2) we want to establish patches of at least 10 hectares in size, as wide as possible and with patches no more than 2 kilometres from one another (connectivity) to aim to conserve targeted taxa in the 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 Habitat Requirements – Western Goulburn Landscape Zone

	**Grey-crowned Babbler (*Pomatostomus temporalis*) (e)**	
	Minimum patch size (threshold)	>2ha, >1km continuous roadside
	Critical distance between patches	<500m from known site
	Dispersal threshold	<2km, very few records >10km
	Ecological Vegetation Class	Woodlands
	Some other requirements (general)	Mature trees, shrubs (>6m), linkages
	**Bush Stone-curlew (*Burhinus grallarius*) (e)**	
	Minimum patch size (threshold)	>1ha, >40m wide
	Critical distance between patches	<1km
	Dispersal threshold	<2km from known site
	Ecological Vegetation Class	Creeklines, Woodlands
	Some other requirements (general)	Ground timber, fox control
	**Brown Treecreeper *(Climacteris picumnus)* (k)**	
	Minimum patch size (threshold)	>30ha
	Critical distance between patches	<500m from known site
	Dispersal threshold	<1km
	EVC utilised	Woodlands, edges, forest clearings
	Some other requirements (general)	Mature trees, fallen timber*, linkages
	**Squirrel Glider (*Petaurus norfolensis*) (e)**	
	Minimum patch size (threshold)	>0.5ha, >1km length
	Critical distance between patches	<50m
	Dispersal threshold	<1km
	Ecological Vegetation Class	Woodlands, forests
	Some other requirements (general)	Mature trees, hollow-dependent
	**Tree Goanna (*Varanus varius*) (v)**	
	Minimum patch size (threshold)	>2km roadside/streamside patches
	Critical distance between patches	<2km
	Dispersal threshold	<2km
	Ecological Vegetation Class	Most except wetlands
	Some other requirements (general)	Mature trees, fox control, logs
	**Brolga (*Grus rubicunda*) (v)**	
	Minimum patch size (threshold)	>50ha or clusters of wetlands
	Critical distance between patches	Varies
	Dispersal threshold	Varies
	Ecological Vegetation Class	Wetland (ephemeral, 20-30cm depth)
	Some other requirements (general)	Fox control, Canegrass, *Eleocharis spp*
	**Latham's Snipe (*Gallinago hardwickii*) (e)**	
	Minimum patch size (threshold)	<1ha (estimate)
	Critical distance between patches	Varies
	Dispersal threshold	Migratory species from Japan
	Ecological Vegetation Class	Wetlands (shallow), grasslands
	Some other requirements (general)	Invertebrates, vegetation cover

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

Victorian threatened status definitions: (e) = endangered, (v) = vulnerable, (k) = poorly known.

Habitat Requirements Source: Variety of Sources (GBCMA in prep.) and DSE 2005a.
Photo Credits: Grey-crowned Babbler (Graeme Chapman), Bush Stone-curlew and Brown Treecreeper (Ian McCann), Tree Goanna (Peter Robertson), Latham's Snipe (Mike Carter) and Squirrel Glider (John Seebeck) (NRE 2002d); 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 targeted 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 assets to focus conservation effort is an important part of the process. This approach has been used to group together species that utilise the same type of habitat. By protecting these assets, we aim to conserve habitat for a suite of threatened and notable species associated with that habitat (Table 3) (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 species). Specific actions (Section 7.0) based on the requirements of each asset can then be developed and implemented (GBCMA *in prep*.) The 205 BAP sites have been categorised according to four key assets (Figure 8). Public land (e.g. roadsides), whilst not a biodiversity asset *per se*, has been included as an asset category, primarily due to their function in the landscape and for practical application of actions in the field. A number of sites can be grouped based on two assets (e.g. Doctor's Swamp). Note: only the primary asset has been identified below. Refer to Appendix 12 on how to obtain further data for each site.

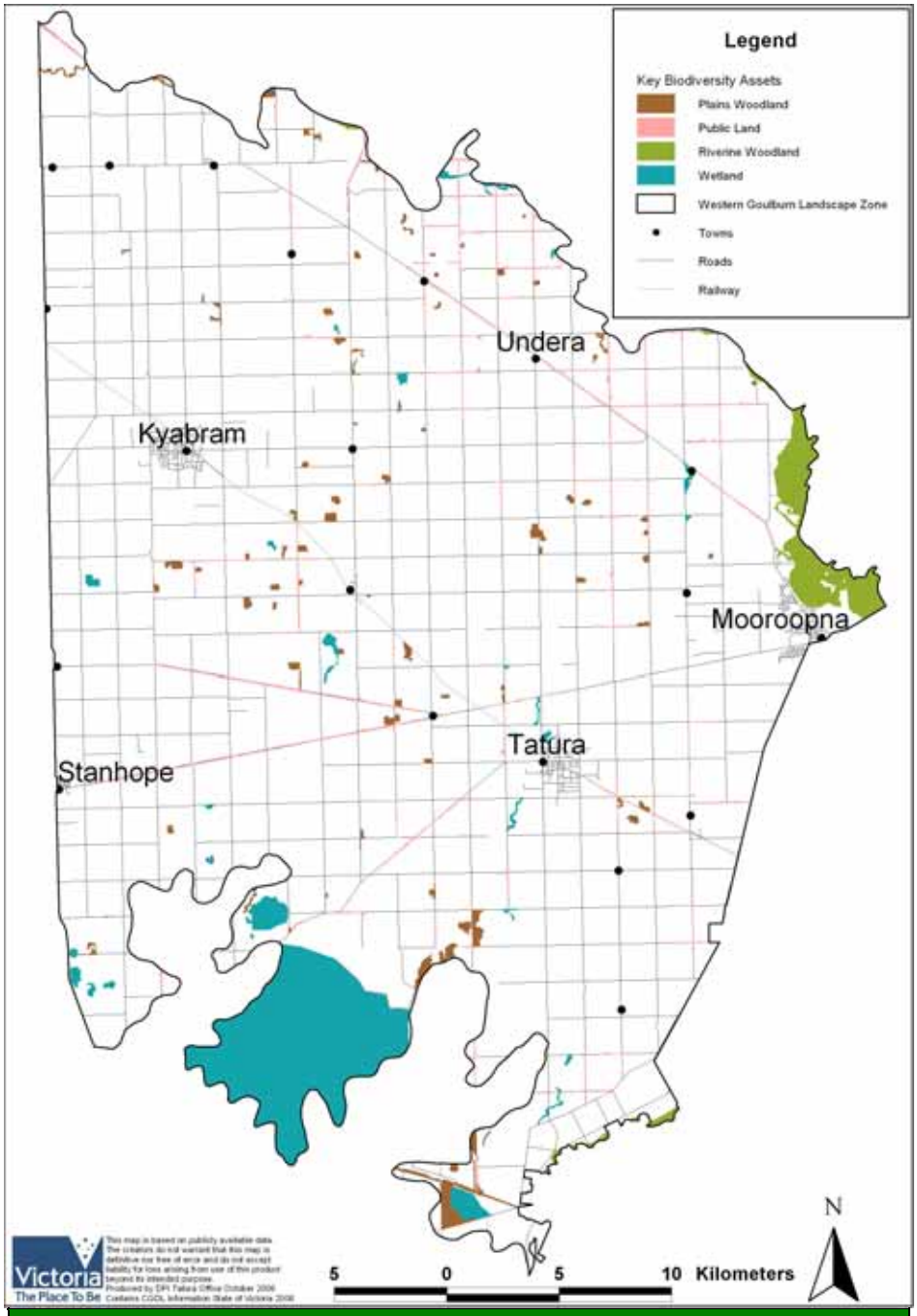


Figure 8: Location of Key Biodiversity Assets in the Western Goulburn Landscape Zone

Table 3: Key Biodiversity Assets – Western Goulburn Landscape Zone	
Key Biodiversity Assets	**Examples of Threatened and Notable Species**
***1) Wetlands** Distinctive ecosystems primarily associated with the Southern part of the Zone near Stanhope and Murchison (e.g Doctor's Swamp, Bray's Swamp and Stockyard Plain). Wetlands (e.g. Gemmill's Swamp) also exist along the Goulburn River floodplain between Shepparton and Coomboona (this area is a listed site (VIC052) in 'A Directory of Important Wetlands in Australia' (EA 2001)).	Nationally significant Goulburn River floodplain, Brolga (*Grus rubicundus*), Australasian Bittern (*Botaurus poiciloptilus*), Australasian Shoveler (*Anas rhynchotis*), White-bellied Sea-Eagle (*Aquila audax*), Latham's Snipe (*Gallinago hardwickii*), Painted Snipe (*Rostratula benghalensis*), Great Egret (*Ardea alba*), Hardhead (*Aythya australis*), Freckled Duck (*Stictonetta naevosa*), Royal Spoonbill (*Platalea regia*), Growling Grass Frog (*Litoria raniformis*), River Swamp Wallaby-grass (*Amphibromus fluitans*) and Striped Water-milfoil (*Myriophyllum striatum*).
2) Public Land # Public land in this instance refers primarily to Road/Rail and Bushland Reserves. Other sites (e.g. Doctor's Swamp) have been grouped based on wetlands primarily and secondly as public land.	Nankeen Night Heron (*Nycticorax caledonicus*), Glossy Ibis (*Plegadis falcinellus*), Woodland birds (e.g. Diamond Firetail (*Stagonopleura guttata*)), Woodland Blind Snake (*Pamphotyphlops proximus*), Tree Goanna (*Varanus varius*), Native Grasses, Turnip-fruit Copperburr (*Sclerolaena napiformis*) and Western Water-starwort (*Callitriche cyclocarpa*).
3) Plains Woodlands Primarily on private land and incorporates Plains Woodland, Plains Grassy Woodland and Plains Grassy Woodland/Gilgai Wetland Mosaic Ecological Vegetation Classes. Less than one percent of EVCs remaining, so requiring the largest increases in extent.	Grey-crowned Babbler (*Pomatostomus temporalis*), Bush Stone-curlew (*Burhinus grallarius*), Superb Parrot (*Polytelis swainsonii*), Brown Treecreeper (*Climacteris picumnus*), Tree Goanna, Grey Box (*Eucalyptus microcarpa*), Yellow Box *(Eucalyptus melliodora*), Waterbush (*Myoporum montanum*), Wheat-grass (*Elymus spp*) and Branching Groundsel (*Senecio cunninghamii var. cunninghamii*).
4) Riverine Woodlands Associated with River Red Gum (*Eucalyptus camaldulensis*) and includes Riverine Grassy Woodlands and Riverine Chenopod Woodland Mosaic Ecological Vegetation Classes. Provide crucial habitat (e.g. hollows) for a range of species. Mainly private land sites and listed secondly for roadsides (e.g. 'public land').	River Red Gum (*Eucalyptus camaldulensis*), Sedges (*Carex spp*), River Swamp Wallaby-grass, Common Joyweed (*Alternanthera modiflora*), Leafy templetonia (*Templetonia stenophylla*), Grey-crowned Babbler, Tree Goanna, Barking Owl (*Ninox connivens*), Powerful Owl (*Ninox strenua*), Nankeen Night Heron, Superb Parrot, Bush Stone-curlew, Diamond Firetail and Squirrel Glider (*Petaurus norfolcensis*).

* The numbering of the Key Biodiversity Assets (1-4) 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 (Appendix 12). All sites have been categorised based on the consistent Asset type (Asset 1) (e.g. roadsides all '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 applicable to its management as possible.

7.0 PRIORITY ACTIONS – KEY BIODIVERSITY ASSETS

Priority actions for the Western Goulburn Landscape Zone have been developed and grouped based on each 'Key Biodiversity Asset'. There are two key asset columns (Asset 1 and Asset 2) included in the data (Appendix 12). All sites have been categorised based on a consistent asset type (e.g. all roadsides as 'Public Land' - as illustrated in Figure 8). For sites that have two asset types (e.g. Roadsides may also be 'Riverine Woodland'), 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 (Asset 1) and also acknowledge where sites cover more than one asset type (Asset 2).

Priority actions for the key biodiversity assets were developed based on (1) size/extent (2) condition and (3) landscape processes (e.g. habitat connectivity and hydrological regimes). The condition (2) section was also 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'.

For each of the four 'Key Biodiversity Assets' (1-4), the following pages identify:

A) An introduction to the asset in the Western Goulburn Landscape Zone,

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).

Plate: Grey-crowned Babblers (Pomatostomus temporalis) are an example of a threatened species associated with a Key Biodiversity Asset (Plains Woodlands) in the Western Goulburn Landscape Zone (Tobi Edmonds 2005)

It is proposed that the community and agencies in the Zone investigate options for implementing these actions into existing projects, policies and documents. The actions are designed to complement existing documents (e.g. Local Area Plans) and provide further guidance on priority sites. BAP sites in each asset type should be targeted in order of priority (Very High, High, Medium to Low). 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*.).

Note: Actions that identify the source as DSE 2005a are developed based on a rigorous legislative 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 WETLANDS

A) Introduction – Wetlands:

Wetlands are amongst the most important, productive and valuable ecosystems within the Zone. 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).

Wetlands in the Southern part of the Zone near Stanhope and Murchison include sites such as Doctor's Swamp and Bray's Wetland. Wetlands such as Gemmill Swamp, which are dominated by River Red Gum (*Eucalyptus camaldulensis*), exist along the Goulburn River floodplain between Shepparton and Coomboona. Gemmill's Swamp is listed (VIC052) in *A Directory of Important Wetlands in Australia* (EA 2001) and is part of the Goulburn River floodplain. It is particularly significant as it contains most of its original wetland plants that provide habitat for a large number of wetland birds and fauna (DNRE 2000). Waranga Basin is a large water storage area West of Dhurringile and is an important area to protect and enhance wetland habitat values, whilst providing for recreation and water supply purposes (Ahern *et al* 2003). Cussen Park is used to biologically treat Tatura's urban stormwater yet provides habitat for a variety of species, including threatened species such as Great Egret (*Ardea alba*) and Grey-crowned Babblers (*Pomatostomus temporalis*) (http://home.vicnet.net.au/~cussenpk/).

Doctor's Swamp is another significant wildlife reserve in the Zone. It is approximately 263 hectares in size and is located near Murchison. It is a River Red Gum wetland with valuable habitat for waterbirds. It also contains woodland remnants (e.g. Plains Woodland) that support species such as Grey-crowned Babblers and Tree Goannas (*Varanus varius*) (Ahern *et al* 2003).

There are a number of threats to these wetlands including, vegetation/land clearing, changed hydrological regimes/instream barriers, habitat fragmentation/edge effects and pest plants and animals. The actions identified below are intended to assist in the protection of the remaining wetlands within the Zone. However 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 Goulburn Broken) (Howell, 2002) also provide direction for protecting wetlands in the Catchment.

B) Photographic Example – Wetlands:

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

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

The site (792441_197) pictured is part of the Doctor's Swamp Wildlife Reserve and is located South-West of Murchison. The EVC is Wetland Formation. The site scored 19 on the Vegetation Quality Assessment and is therefore a 'Very High' value site for the area. This photograph was taken in November 2004 and depicts the site in flood.

Plate: An example of a Wetland of 'Good Condition' for the Western Goulburn Landscape Zone

C) Actions – Wetlands:

Size/Extent Related:

- **Implement a buffer zone** around all identified wetlands (as far out beyond the rim of the basin as possible) to increase the size of wetlands 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 flora and fauna on their properties.
- **Provide opportunities for education** of landholders and school children regarding the benefits of wetlands on farms (e.g. Bray's Swamp) and regarding the value of constructed wetlands (e.g. Anderson's Constructed Wetland (DNRE 1997)).
- **Work with the local community (e.g. Local Area Planning and Landcare Groups) to encourage landholders** with wetlands to protect them (e.g. fence and manage stock).
- **Encourage further research and investigation into grazing** of wetlands as a management tool.
- **Encourage the appropriate use of chemicals** and other water contaminants.
- **Encourage** local community groups and schools to promote World Wetlands Day.
- **Encourage** monitoring of wetlands and the adoption of new wetland monitoring sites, in consultation with the 'Waterwatch' Program and the Goulburn Murray Landcare Network.
- **Encourage** local schools to monitor biodiversity in wetlands in the Zone (e.g. Murchison at Doctors Swamp and Shepparton/Mooroopna schools at Gemmill Swamp and Cussen Park).
- **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 (to allow priority comparisons).
- **Compare** the prioritisation system for the development of Management Plans against the methodology used in the BAP process to identify high priority sites.

On-ground Works:

- **Protect** all identified wetlands, commencing with very high value sites (e.g. Doctor's Swamp).
- **Implement Management Plan** recommendations (e.g. Bray's Swamp).
- **Encourage** the implementation of groundwater protection strategies for Gemmill Swamp, Bray's Swamp and Cussen Park as per the results of the HVEF Project (DPI 2006a).
- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006a) priority system (e.g. those not already included in HVEF project).
- **Revegetate native vegetation** around (e.g. edges - batter stabilisation) built systems (e.g. Surface Water Management Systems and reuse systems) for environmental benefits.
- **Fence** sites to exclude grazing at certain periods (particularly when wet or prior to being wet), to allow flowering and seed-set of native plants.
- **Identify a demonstration site** (showcasing a priority site) for educational purposes.

Threatened Species:

- **Monitor growth** nesting habitat in wetlands (e.g. allow growth of vegetation prior to birds such as Brolga (*Grus rubicunda*) searching for breeding sites).
- **Conserve** threatened flora and fauna taxa (e.g. Grey-crowned Babblers (*Pomatostomus temporalis*)) that wetlands (e.g. Doctor's, Gemmill, Bray's and Cussen Park) support.

Pest Plants and Animals:

- **Implement integrated pest plant and animal** programs in areas with high value wetlands for the benefit of all species, especially Brolga and Latham's Snipe (*Gallinago hardwickii*).
- **Investigate** predator-control fences for known Brolga breeding sites (e.g. Bray's Swamp).

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

- **Form clusters of wetlands** by giving priority to protecting wetlands that are in close proximity to one another, or in close proximity to a high value site.
- **Deliver/Restore natural hydrological regimes** to priority wetlands (e.g. through Surface Water Management Program) for the benefit of biodiversity through stakeholder liaison's.
- **Monitor hydrological regimes** (e.g. water quality, quantity and hydrology) at wetlands and re-evaluate/negotiate any alterations required for the benefit of biodiversity.
- **Continue to seek** Environmental Water Allocations (EWA) for priority wetlands.

7.2 PUBLIC LAND

A) Introduction – Public Land:

Public land comprises approximately 10% of the Zone. The majority of public land sites include State Forest, Roadside Reserves, Railway Lines and Reserves (e.g. part of the Wyuna River Reserve). The Wyuna River Reserve is a very high value site that is currently managed as part of a community partnership under an agreed 'Environmental Management Plan' (DPI 2006b).

Roadsides which are are an important asset within the Western Goulburn Landscape Zone provide opportunity for linkages and connectivity. The Greater Shepparton City Council (minor roads) and Vic Roads (major highways) manage roadsides in the Western Goulburn Landscape Zone. Higher priority roadsides generally occur in then Northern (e.g. Midland Highway) and Southern parts (e.g. Waranga Basin vicinity) of the Zone. Brewer Road is also a high value site within the Zone that has undergone significant on-ground works by local groups.

Railway Reserves in the Zone include the Toolamba-Echuca Railway Line, the Tatura-Toolamba Railway Line and the Murchison-Rushworth Railway Line. The Toolamba-Echuca Railway Line has recorded threatened species including Glossy Ibis (*Plegadis falcinellus*) and the Woodland Blind Snake (*Ramphotypholps proximus*) (Ahern *et al* 2003). The Tatura-Toolamba Railway Line contains flora such as native grasses, lilies and herbs.

Public land in the Zone also includes State Forest along the Goulburn River floodplain, between Shepparton and Coomboona. These areas are zoned 'Special Management Zones' or 'Special Protection Zones'. These areas fall within the Heritage River overlay and are included in the Lower River Floodplain. State Forest is a priority area for protection within the Zone (Ahern *et al* 2003). It is a high overall priority to link the Goulburn River with Waranga Basin/Whroo Forest. This would assist in providing habitat linkages for many species, including the focal species listed in this Plan.

The actions identified below are intended to assist in the protection of bushland reserves, railway reserves and roadsides, within the Western Goulburn Landscape Zone. It will also be important to incorporate recommendations made (draft proposals mid-2007) as part of the Victorian Environmental Assessment Council (VEAC 2006) study which is investigating the condition, management and use of riverine Red Gum forests and their associated wetlands in the region.

B) Photographic Example – Public Land:

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

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

The site (792524_134) pictured is part of Norton Road, located East of Undera. The site scored 12.5 on the Vegetation Quality Assessment and is therefore a 'Very High' value site. The site has a healthy understorey of Gold-dust Wattle (*Acacia acinacea*) and Waterbush (*Myoporum montanum*). The site also contains a mix of native grasses and leaf litter.

Plate: An example of a Public Land (Roadside) site of 'Good Condition' for the Western Goulburn Landscape Zone

C) Actions – Public Land:

Size/Extent Related:

- **Buffer** native vegetation communities on the Toolamba-Echuca, Tatura-Toolamba and Murchison-Rushworth Railway Lines and high value roadsides (e.g. Brewer Road), through consultation with adjacent landholders (e.g. fencing and promotion of natural regeneration).
- **Buffer** roadside vegetation on the Murray Valley Highway near Wyuna (Ahern *et al* 2003).

Condition Related:

Education/Extension:

- **Encourage** local school group involvement and stewardship of Reserves.
- **Promote** the value of roadsides to decrease threatening processes (e.g. Scobie Road and Brewer Road) and **develop** a community education campaign regarding their conservation.
- **Encourage** the long-term protection of all roadsides (e.g. Trevaskis Road and O'Dea Road).
- **Ensure** that all 'unused' roads are protected (e.g. fencing, signage, mapping and education).
- **Encourage** landholders to fence channel banks adjacent to high value roadsides to prevent stock access to roadsides and protect vegetation on channel banks (where applicable).
- **Promote** the flora and fauna values of Railway Lines and encourage land managers (e.g. Pacific National and Vic Track) to manage them for biodiversity conservation.
- **Encourage** the retention of logs, leaf litter and dead trees, as habitat for reptiles and bats.
- **Further liaise** with Local Government regarding the integration of roadside survey data (GIS).

On-ground Works:

- **Protect** significant roadside vegetation (e.g. all priority sites ie. Brewer Road and Murray Valley Highway) from threats (e.g. firewood collection, 'cleaning up' and pest plants).
- **Protect** good quality remnant vegetation directly adjacent to State Forests.
- **Investigate** with Stakeholders options for signage for high value roadsides, as per the DSE significant roadsides 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 – Campaspe and Greater Shepparton).
- **Protect** all unused roadsides (e.g. wet weather/leased roads). In consultation with licensees, review the status of unused roads. For high value sites assess fencing, grazing management and regeneration to ensure habitat protection (Ahern *et al* 2003).
- **Implement** recommendations for all Management Plans (e.g. Bushland Reserves) in the Zone.
- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006a) priority system (e.g. those not already included in HVEF project).
- **Ensure** that Aboriginal places and relics are identified and protected (across all asset types).

Threatened Species:

- **Provide** Local Government with the location of threatened species along roadsides, for inclusion in the permit process (e.g. stock droving) and in maintenance schedules.
- **Protect roadsides** from adverse impacts of roadside grazing/stock movement through Local Government legislation for threatened species (e.g. Bush Stone-curlew (*Burhinus grallarius*)).
- **Maintain and enhance** populations of Waterbush (*Myoporum montanum*).
- **Protect** the Endangered Turnip-fruit Copperburr (*Sclerolaena napiformis*) on the Murray Valley Highway near Wyuna (e.g. signage, pest plant and grazing management) (Ahern *et al* 2003).

Pest Plants and Animals:

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

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

- **Increase** connectivity of public land with nearby vegetation (e.g. provide linkages along the Brewer Road and Midland Highway) in accordance with EVC requirements and vegetation.
- **Develop further linkages** between high value sites (e.g. Roadsides, Railway Reserves, forests and creeks) using the Landscape Context Model (Ferwerda 2003) to identify sites.
- Aim to **link** the Goulburn River (North and East of the Zone) with Waranga Basin/Whroo Forest.

7.3 PLAINS WOODLANDS

A) Introduction – Plains Woodlands:

The key biodiversity asset 'Plains Woodland' is comprised of Plains Woodland, Plains Grassy Woodland and Plains Grassy Woodland/Gilgai Wetland Mosaic Ecological Vegetation Classes (EVC). These EVCs were historically the dominant vegetation types 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 and roadsides. These remnant types serve many important functions, including aesthetic values, habitat values and sources of native seed, food, shelter and nesting sites for a range of woodland birds (Lunt 1998).

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 edge effects/ 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 Western Goulburn 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. '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 as 'public land' and secondly 'plains woodland') 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 on how to obtain information on each site.

B) Photographic Example – Plains Woodlands:

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

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

The site (792441_198) pictured is part of the Doctor's Swamp Wildlife Reserve. The EVC is Plains Grassy Woodland. The site scored 18.5 on the Vegetation Quality Assessment and therefore is a 'Very High' value site for the Zone. The site has a mixture of overstorey and understorey. Natural regeneration of overstorey and understorey was also evident.

Plate: An example of a Plains Woodland site of 'Good Condition' for the Western Goulburn 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 plants and to retain or establish buffer zones of unimproved, uncultivated pasture around woodland (DSE 2005a).

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 (e.g. for Birds, Reptiles and Mammals).
- **Work with the local community to implement community education activities** relating to the importance of Plains Woodlands and associated flora and fauna, specifically targeting priority remnants in paddock environments.
- **Develop a demonstration site** (showcasing a 'Very High' value site) for educational purposes.
- **Investigate** the use of Environmental Management Systems (EMS) in the Zone.

On-ground Works:

- **Encourage the protection (fencing)** of all sites and management of grazing (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).
- **Give priority** to high value remnants or native vegetation under regeneration and apply voluntary programs, incentives and/or planning controls (as appropriate) to protect biodiversity values (Ahern *et al* 2003).
- **Maintain the health**, diversity and cover of native species in the long-term, by reviewing with stakeholders the location of stockholding areas and relocating these activities away from native vegetation remnants (DSE 2004).
- **Enhance** priority sites with indigenous vegetation if regeneration has not occurred following fencing (e.g. no existing viable seed source).
- **Assist** landholders to identify funding for protection of remnants and other important management actions for priority sites (Ahern *et al* 2003).
- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006a) priority system (e.g. those not already included in HVEF project).

Threatened Species:

- **Plant corridors** to supplement habitat for focal species using current projects in the Region as examples (e.g. Superb Parrot (*Polystelis swainsonii*) and Grey-crowned Babblers (*Pomatostomus temporalis*)).
- **Liaise** with stakeholders regarding current Bush Stone-curlew programs in the Nathalia area and options to expand or use as a demonstration project for this Zone (consult with LAP/Landcare).
- **Manage domestic grazing** in sites with threatened flora (Ahern *et al* 2003).

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 predator (fox) control programs** in areas with known records of threatened species (e.g. Bush Stone-curlew, Tree Goannas (*Varanus varius*) and Squirrel Gliders (*Petaurus norfolcensis*)) (Ahern *et al* 2003) in liaison with DPI.
- **Undertake integrated rabbit management** in all priority remnants and investigate re-introducing a program like the 'Rabbit Busters' program (in consultation with DPI Pest Management Officers).
- **Investigate** including pest plant and animal incentives as part of the environmental incentives.

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

- **Increase** connectivity of Plains Woodland sites with nearby sites, regardless of asset type.
- **Develop further linkages** between priority sites, using the Landscape Context Model (Ferwerda 2003) to identify potential sites.
- **Coordinate** restoration and revegetation initiatives to assist landholders and Local Government in consolidating priority remnants (e.g. linkages) (Ahern *et al* 2003).

7.4 RIVERINE WOODLANDS

A) Introduction – Riverine Woodlands:

The key biodiversity asset 'Riverine Woodlands' is comprised of Riverine Grassy Woodland (and mosaics), Riverine Chenopod Woodland and Riverine Sedgy Forest Ecological Vegetation Classes (EVCs). The dominant overstorey is River Red Gum (*Eucalyptus camaldulensis*), occasionally with Black Box (*Eucalyptus largiflorens*). The understorey is typically grassy, with herbs (e.g. Bluebells), Sedges (*Carex spp*) and Daisies (e.g. *Brachyscome spp*) (DPI 2003).

This asset type primarily occurs along the Northern and Southern perimeters of the Zone. These remnants are relatively intact, compared to Plains Woodland remnants. The largest remnants are located on public land (e.g. State Forest), whilst the smallest remnants are scattered throughout the Zone.

Pest plants and animals, vegetation/land clearance, habitat fragmentation/edge effects, 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 Western Goulburn 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. Roadsides). Whilst these could be classified as part of this Riverine Woodland asset type, they have been categorised primarily based on the consistent factor.

B) Photographic Example – Riverine Woodlands:

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

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

The site (792524_43) pictured is part of the Cooma Bend State Forest, along the Goulburn River, North of Mooroopna. The site scored 13.5 on the Vegetation Quality Assessment and is a very high value site. The EVC is Riverine Grassy Woodland/ Sedgy Riverine Forest/ Wetland Formation Mosaic.

Plate: An example of a Riverine Woodland site of 'Good Condition' for the Western Goulburn 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'.

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.
- **Work with the local community to implement education activities** relating to the importance of Riverine Woodlands, 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. management techniques).
- **Implement extension activities** to encourage landholders with priority remnants to enhance the long-term viability of the 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 stockholding areas and relocating these activities away from native vegetation remnants (DSE 2004).
- **Enhance** priority sites with indigenous vegetation if regeneration has not occurred following fencing (e.g. no existing viable seed source).
- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006a) priority system (e.g. those not already included in HVEF project).
- Conduct further **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).

Threatened Species:

- **Plant corridors** to supplement focal species habitat, using current projects in the region as examples (e.g. Superb Parrot (*Polystelis swainsonii*) and Grey-crowned Babbler (*Pomatostomus temporalis*)).
- **Actively discourage** the removal of firewood from all sites for the benefit of threatened fauna.
- **Support and encourage further research** that directly relates to the management of threatened species in the Zone (e.g. Squirrel Gliders (*Petaurus norfolcensis*)).
- **Protect clusters** of old growth or individual large trees that provide potential habitat for significant species (e.g. Owls, Bats and Goannas).

Pest Plants and Animals:

- **Manage** pest plants for the benefit of Riverine Woodland flora and liaise with DPI Pest Management Officers and the landholder, regarding their management.
- **Undertake integrated fox control programs** in areas with known records of threatened species (e.g. Bush Stone-curlew).
- **Undertake integrated rabbit management** in all high priority remnants and investigate re-introducing a program like 'Rabbit Busters' (consult with DPI and the community).
- **Investigate the impact** of Noisy Miners (*Manorina melanocephala*) in areas of significant corridors and known sites inhabited by Grey-crowned Babblers (important for all asset types).

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

- **Link** high value Riverine Woodland remnants using the Landscape Context Model (Ferwerda 2003) as a guide (e.g. link with native vegetation on public land, particularly areas adjacent to forests and reserves).
- **Identify** further opportunities to link priority 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 Western Goulburn 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 Catchment's progress towards meeting the Biodiversity Resource Condition Targets (RCTs).

A wide variety of monitoring actions are 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 may be interested in conducting further surveys). Interested persons can contact the Goulburn Broken Catchment Management Authority, Shepparton, or the Department of Primary Industries/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 – Western Goulburn Landscape Zone

Key Biodiversity Asset	Key Indicators for Monitoring	Frequency/Intensity
1) Wetlands	• Monitoring of wetlands using index of wetland condition guidelines, as well as Vegetation Quality Assessments (to allow priority comparison).	Every 5 years
	• Number of significant wetlands with improved hydrological regimes.	Every 5 years
	• Trends in water quality.	Once yearly as part of EPA monitoring: five yearly as part of ISC: at least 30 sites (GBCMA 2004b)
	• Percentage (%) of sites with barriers to natural flow.	Every 5 years
All Key Biodiversity Assets	• Trends in vegetation condition (resurvey sites using VQA assessments, including threats data).	Every 5 years: wetlands – 20 sites; woodlands/grasslands – 30 sites
	• Trends in bird survey data (resurvey sites using bird survey method).	Every 5 years: wetlands – 20 sites; woodlands/grasslands – 30 sites
	• Photographic point surveys (re-photograph sites).	Every 5 years: when complete VQA and bird surveys
	• 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)
	• 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
	• 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 and 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
	• Monitoring of threatened species against current records.	Every 2 years: across the Zone
	• Survey all listed (threatened) species to establish baseline data on abundance and distribution in accordance with VROTPop (Rare or Threatened Species) procedures and subsequent assessments of selected populations.	Within next 5 years: across the Zone
	• Survey trends in connectivity and characteristics of sites within landscape (e.g. size of remnants).	Every 5 years: aerial photography

All Key Biodiversity Assets (continued from previous page)	• Overlay of on-ground work areas against this BAP mapping data.	Once yearly (end financial year:, all applicable sites
	• 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 information on obtaining data for the 205 BAP sites within the Western Goulburn 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 the site,
- 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 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 or 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, 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 where the best possible linkages could occur, and often this should include scattered vegetation, as whilst scattered vegetation generally has not been identified as sites 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 so as to enable management actions and information to be modified in response to further information, including monitoring. This Plan will also 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 is not always aware of sightings of flora and fauna by individual landholders or community groups that would be of assistance in updating this data.

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@gbcma.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 within the Shepparton Irrigation Region. Also included are some of the programs that could benefit from the information provided in this Plan.

LOCAL AREA PLANS	*WHOLE FARM PLANS*
These Conservation Plans will provide an extra resource for Local Area Planning groups, in relation to their Local Area Plans. It can assist groups with both implementation and in the provision of further information for conducting biodiversity planning in their area.	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) Office, 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, irrigation design, 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 – (e.g. fencing, tubestock and 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 (including 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 Office (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 aiming to encourage and assist landholders to protect and enhance biodiversity values on their properties. *Managed by the Department of Sustainability and Environment – for further information visit www.dse.vic.gov.au*
- Local Government (Greater Shepparton City Council) – managing authority for native vegetation statutory planning requirements. *For further information visit www.greatershepparton.com.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 those who have attended meetings as invited guests (names not listed) and provided valuable comment. Your assistance wass 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 (Dryland) (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 (Dryland) (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 (Dryland) (past)
Sheahan, Mark – (as) Biodiversity Team Leader, North East, DSE (past)

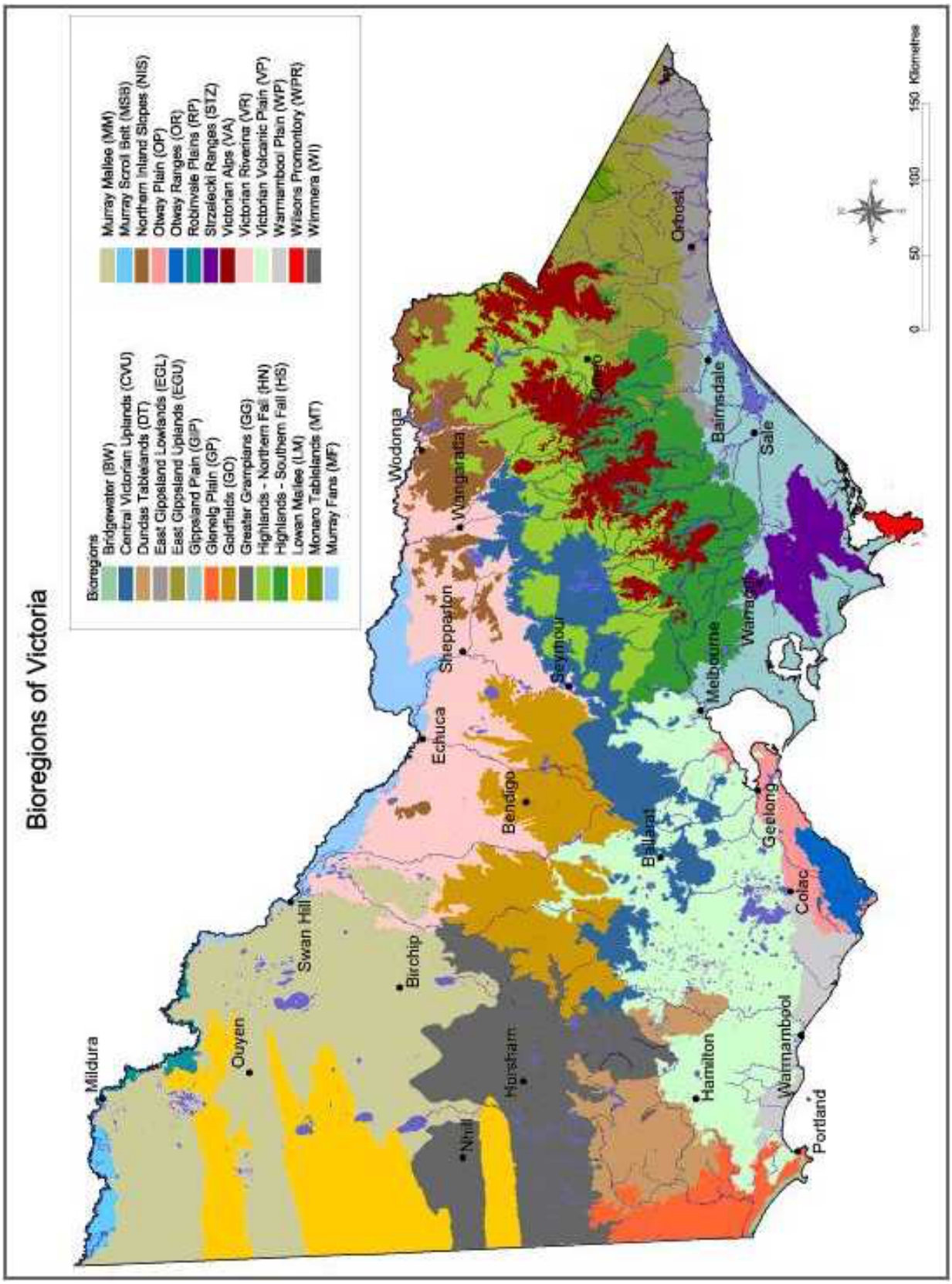
TfN (Vic) - Robinson, (Dr) Doug – Regional Manager, Goulburn Broken – TfN (Vic) (current)

Goulburn Broken Catchment Biodiversity Action Planning Contributors:

Mentiplay-Smith, Janice – Links Officer, DPI (trial implementation, Upper Goulburn)
Olive, Cathy – Links Officer, DPI (trial implementation, Mid Goulburn)
Weber, Rolf – (as) Acting Biodiversity Team Leader, DSE (current)
Berwick, Sue – (as) Flora and Fauna Planner, DSE (current)

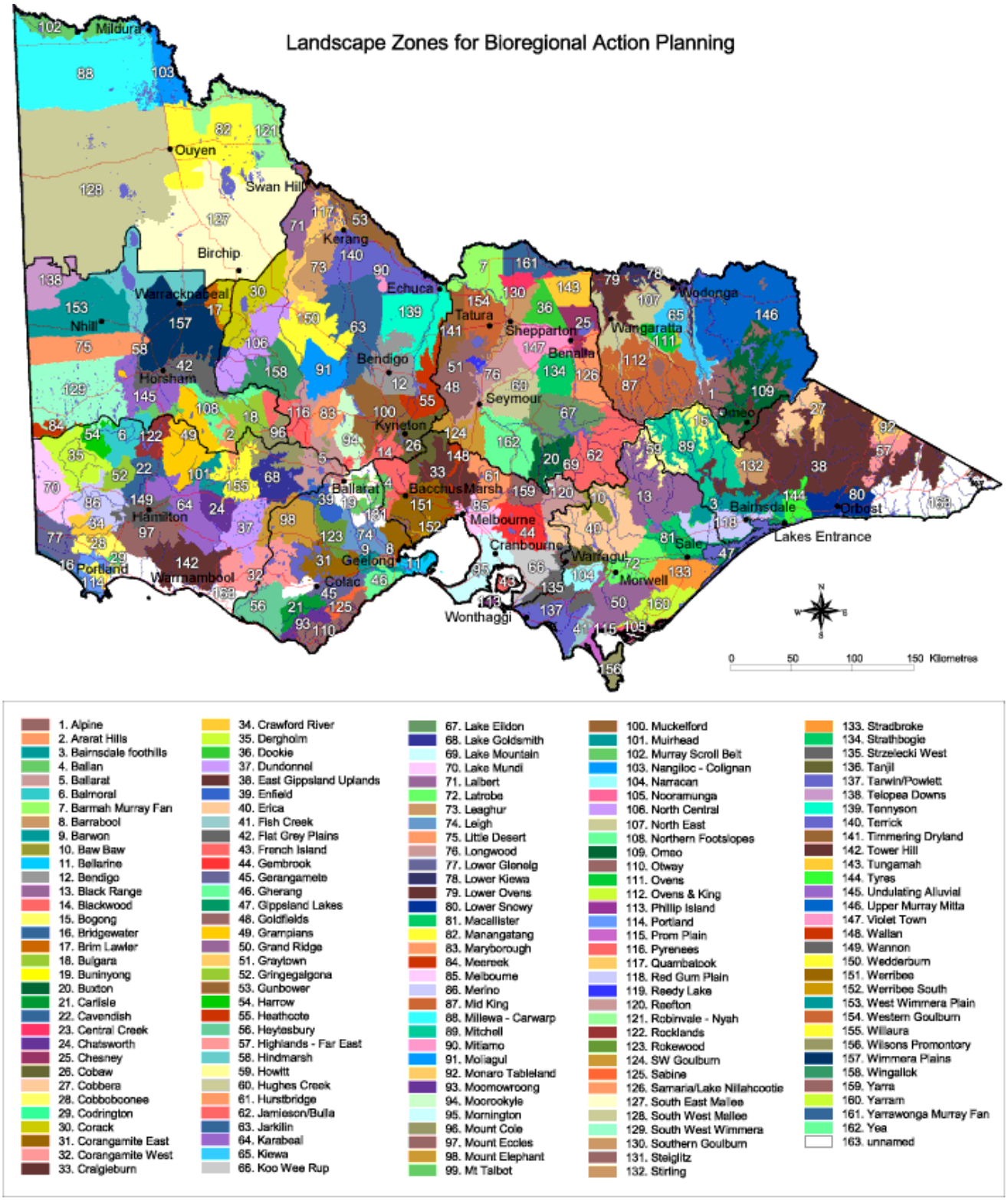
13.0 APPENDICES

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 2003 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 are driven by the conservation significance of the biodiversity asset. Regional investments in biodiversity conservation in the Goulburn Broken 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 relevant 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 and technical/community advice from the Shepparton Irrigation Region Technical Committee (SIRTEC) and the Shepparton Irrigation Region Implementation Committee (SIR IC) respectively).

- Newspaper Article – January 2006 – SIR IC Land and Water Update Column, Country News.

- July to August 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 Western Goulburn Landscape Zone Plan (on-going).

- Biodiversity Celebration Day (September 2006) and subsequent communication (newspaper articles, television and DPI News) regarding Biodiversity Action Planning.

- Meeting/Presentation – October 2006 - Local Area Planning Facilitator's regarding Biodiversity Action Planning. Nanneella Hall, Nanneella.

- Draft Plan Community Review - November 2006 - Community Consultation (letters, phone calls, e-mails and/or meetings) 'Draft Conservation Plan for the Western Goulburn Landscape Zone'. Plan sent for comment to a number of representatives of the following agencies/community groups: SIR IC, SIRTEC, GBCMA (including board representatives), DPI, DSE, TfN (Vic), Goulburn-Murray Water, Parks Victoria, Goulburn Murray Landcare Network, Local Government (Greater Shepparton City Council), Dhurringile Landcare Group, Dhurringile Local Area Planning Group, Wyuna Landcare Group, Wyuna Local Area Planning Group and Kyabram Landcare Group.

- Meeting/Presentation – Dhurringile Landcare Group – November 2006, Dhurringile Hall.

- Final Plan Review/Approval – February-April 2007 – Environmental Management Program, Steering Committee, SIRTEC and SIR IC.

APPENDIX 5 – THREATENED FLORA

List of threatened flora and their conservation status in the Western Goulburn 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*
Austral Trefoil	*Lotus australis*		k				2057
Branching Groundsel	*Senecio cunninghamii var. cunninghamii*		k			Un	3104
Brown Beetle-grass	*Leptochloa fusca ssp. Fusca*		r			Un	1060
Buloke	*Allocasuarina luehmannii*			L		Un	678
Buloke Mistletoe	*Amyema linophylla subsp. orientale*		v				0217
Button Rush	*Lipocarpha microcephala*		v			Un	2020
Common Joyweed	*Alternanthera nodiflora*		k			Un	185
Forde Poa	*Poa fordeana*		k			Un	2593
Granite Love-grass	*Eragrostis alveiformis*		k			Un	1192
Grey Billy-buttons	*Craspedia canens*		e			Un	4643
Hydrilla	*Hydrilla verticillata*		r			Un	1713
Leafy Templetonia	*Templetonia stenophylla*		r			Un	3341
Matted Water-starwort	*Callitriche sonderi*		k			Un	573
River Swamp Wallaby-grass	*Amphibromus fluitans*	V	k				3623
Sand Rush	*Juncus psammophilus*		r			Un	1836
Short-awned Wheat-grass	*Elymus multiflorus*		k			Un	1583
Silky Browntop	*Eulalia aurea*		r			Un	1328
Smooth Minuria	*Minuria integerrima*		r				2201
Spurred Spear-grass	*Austrostipa gibbosa*		k				3277
Striped Water-milfoil	*Myriophyllum striatum*		v			Un	3869
Swamp Billy-buttons	*Craspedia paludicola*		v			Un	4649
Turnip Copperburr	*Sclerolaena napiformis*	E	e	L	171		3991
Twiggy Sida	*Sida intricata*		v				3143
Waterbush	*Myoporum montanum*		r			Un	2240
Western Water-starwort	*Callitriche cyclocarpa*	V	v				569

Table Information:

* 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 Fauna Guarantee Act 1988*) taxon: L = listed (individual species only - not if part of listed communities) and the accompanying identification number.
* 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 Western Goulburn 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	*Botaurus poiciloptilus*		e				Un	197
Australasian Shoveler	*Anas rhynchotis*		v				Un	212
Baillon's Crake	*Porzana pusilla*		v				Un	50
Bandy Bandy	*Vermicella annulata*		I	L				2734
Barking Owl	*Ninox connivens*		e	L				246
Black Falcon	*Falco subniger*		e					238
Blue-billed Duck	*Oxyura australis*		v	L				216
Brolga	*Grus rubicunda*		v	L				177
Brown Quail	*Coturnix australis*		k				Un	10
Brown Treecreeper	*Climacteris picumnus*		k					555
Bush Stone-curlew	*Burhinus grallarius*		e	L	78			174
Cape Barren Goose	*Cereopsis novaehollandiae*		v				Un	198
Caspian Tern	*Sterna caspia*		v				Un	112
Chestnut-rumped Heathwren	*Hylacola pyrrhopygia*		k				Un	498
Crested Bellbird	*Oreoica gutturalis*			L			Un	419
Crimson-spotted Rainbowfish	*Melanotaenia fluviatillis*		k	L				4060
Diamond Dove	*Geopelia cuneata*		v				Un	31
Diamond Firetail	*Stagonopleura guttata*			L			Un	652
Freckled Duck	*Stictonetta naevosa*		e	L	105			214
Glossy Ibis	*Plegadis falcinellus*		v					178
Golden Perch	*Macquaria ambigua*		v					4095
Great Egret	*Ardea alba*		v	L				187
Grey-crowned Babbler	*Pomatostomus temporalis*		e	L	34			443
Gull-billed Tern	*Sterna nilotica*		e				Un	111
Hardhead	*Aythya australis*		v				Un	215
Hooded Robin	*Melanodryas cucullata*			L			Un	385
Intermediate Egret	*Ardea intermedia*		c	L				186
Latham's Snipe	*Gallinago hardwickii*		I					168
Little Bittern	*Ixobrychus minutus*		e					195
Little Egret	*Egretta garzetta*		e					185
Long-toed Stint	*Calidris subminuta*		i				Un	965
Magpie Goose	*Anseranas semipalmata*		e				Un	199
Murray Cod	*Maccullochella peelii peelii*		v	L				4094
Musk Duck	*Biziura lobata*		v				Un	217
Nankeen Night Heron	*Nycticorax caledonicus*		v					192
Painted Honeyeater	*Grantiella picta*		v	L			Un	598
Painted Snipe	*Rostratula benghalensis*		e					170
Pied Cormorant	*Phalacrocorax varius*		I				Un	99
Powerful Owl	*Ninox strenua*		e	L	92		Un	248
Red-backed Kingfisher	*Todiramphus pyrrhopygia*		v				Un	325
Regent Honeyeater	*Hanthomyza phrygia*	En	c	L	41	Yes	Un	603
Royal Spoonbill	*Platalea regia*		v					181
Speckled Warbler	*Chthonicola sagittata*		v				Un	504

Square-tailed Kite	*Lophoictinia isura*		e				Un	230
Squirrel Glider	*Petaurus norfolcensis*		e	L	166			1137
Superb Parrot	*Polytelis swainsonii*	Vu	e	L				277
Swift Parrot	*Lathamus discolor*	En	e	L	169	Yes		309
Tree Goanna	*Varanus varius*		k				Un	2283
Turquoise Parrot	*Neophema pulchella*		l	L				302
Growling Grass Frog	*Litoria raniformis*	Vu	v				Un	3207
Whiskered Tern	*Childonias hybridus*		l				Un	110
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		e	L	60			226
Woodland Blind Snake	*Ramphotyphlops proximus*		v					2603

Table Information:

* Australian Status of Species: En= Endangered, Vu= Vulnerable (in order highest ranking to lowest ranking).
* Victorian Status of Species: e= endangered, v = vulnerable, c = less common, l= lower risk near threatened, k = poorly known.
* FFG (*Flora Fauna Guarantee Act 1988*) taxa: L= listed (individual species only - not if part of listed communities) and the accompanying identification number.
* Recovery Plan (whether there is a recovery plan in place).
* BNA (Bioregional Network Analysis) Assessment: Un = Unassessed.
* Species Number: State identification number/code attributed to individual species (Ahern *et al* 2003).

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 three survey forms for surveying in the Western Goulburn Landscape Zone (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). Information and other factors (e.g. threatening processes) were also recorded at each of the surveyed sites (refer to Appendix 12 for further information on obtaining data).

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** (80 cm) **(Circumference)** (250 cm)	**Number of large trees /ha (100m x 100m)**	*no large trees*	0	
		up to	7 LARGE TREES /ha in WOODLANDS 12 LARGE TREES /ha in FORESTS — 1	
		more than	7 LARGE TREES /ha in WOODLANDS 12 LARGE TREES /ha in FORESTS — 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**	*less than*	25% CANOPY COVER — 0	
		between	25 – 50% CANOPY COVER — 0.5	
		more than	50% CANOPY COVER — 1	
UNDERSTOREY **(B)** Tick appropriate boxes for PRESENCE of native vegetation (i.e. different life forms) Tree >5m; Large herb >1m; Grass or grasslike <1m; Other Shrub 1-5m; Small herb <1m; Fern Small shrub <1m; Grass or grasslike >1m; Moss or lichen	**(A) % cover of native species**	*minimal*	COVER *less than* 10% — 0	
		low	COVER *between* 10% – 25% — 2	
		reduced	COVER *between* 25% - 75% AND *less than* 4 boxes ticked for WOODLANDS *less than* 5 boxes ticked for FORESTS — 3 OR 4 or *more* boxes for ticked WOODLANDS 5 or *more* boxes ticked for FORESTS — 4	
		adequate	COVER *more than* 75% AND *less than* 4 boxes for ticked WOODLANDS *less than* 5 boxes ticked for FORESTS — 4 OR 4 or *more* boxes for ticked WOODLANDS 5 or *more* boxes ticked for FORESTS — 5	
WEEDINESS	**% weed cover**		50% *or more* WEED COVER — 0	
		between	25% - 50% WEED COVER — 1	
		between	5% - 25% WEED COVER — 2	
		less than	5% WEED COVER — 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 x100**	*less than*	30% woody species RECRUITING — 0	
		between	30% -70% woody species RECRUITING — 1	
			70% *or more* woody species RECRUITING — 2	
ORGANIC LITTER Defined as small branches (less than 10cm diameter), twigs, leaves and other fallen or dead organic matter	**% cover of organic litter**	*less than*	5% ORGANIC LITTER for WOODLANDS 10% ORGANIC LITTER for FORESTS — 0	
		more than	5% ORGANIC LITTER for WOODLANDS 10% ORGANIC LITTER for FORESTS — 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 x50m (i.e. 0.25 ha) **Logs (m) x 4 (i.e. m/ha)**	*no logs*	0	
		less than	25m LOGS/ha — 0.5	
		more than	25m LOGS/ha — 1	
SIZE Defined by the size of the area being assessed **AND** any adjoining native vegetation		*less than*	2 ha — 0	
		between	2 – 10 ha — 1	
		more than	10 ha — 2	
NEIGHBOURHOOD Defined by the % area covered by native vegetation within 1 km of the site being assessed		*less than*	10% area covered — 0	
		between	10% - 50% area covered — 1	
		more than	50% area covered — 2	
CORE AREA Defined by the distance of the site being assessed from a block of native vegetation greater than 50ha		*1 km or more*	from 50 ha block of native vegetation — 0	
		less than 1 km	from 50 ha block of native vegetation — 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.

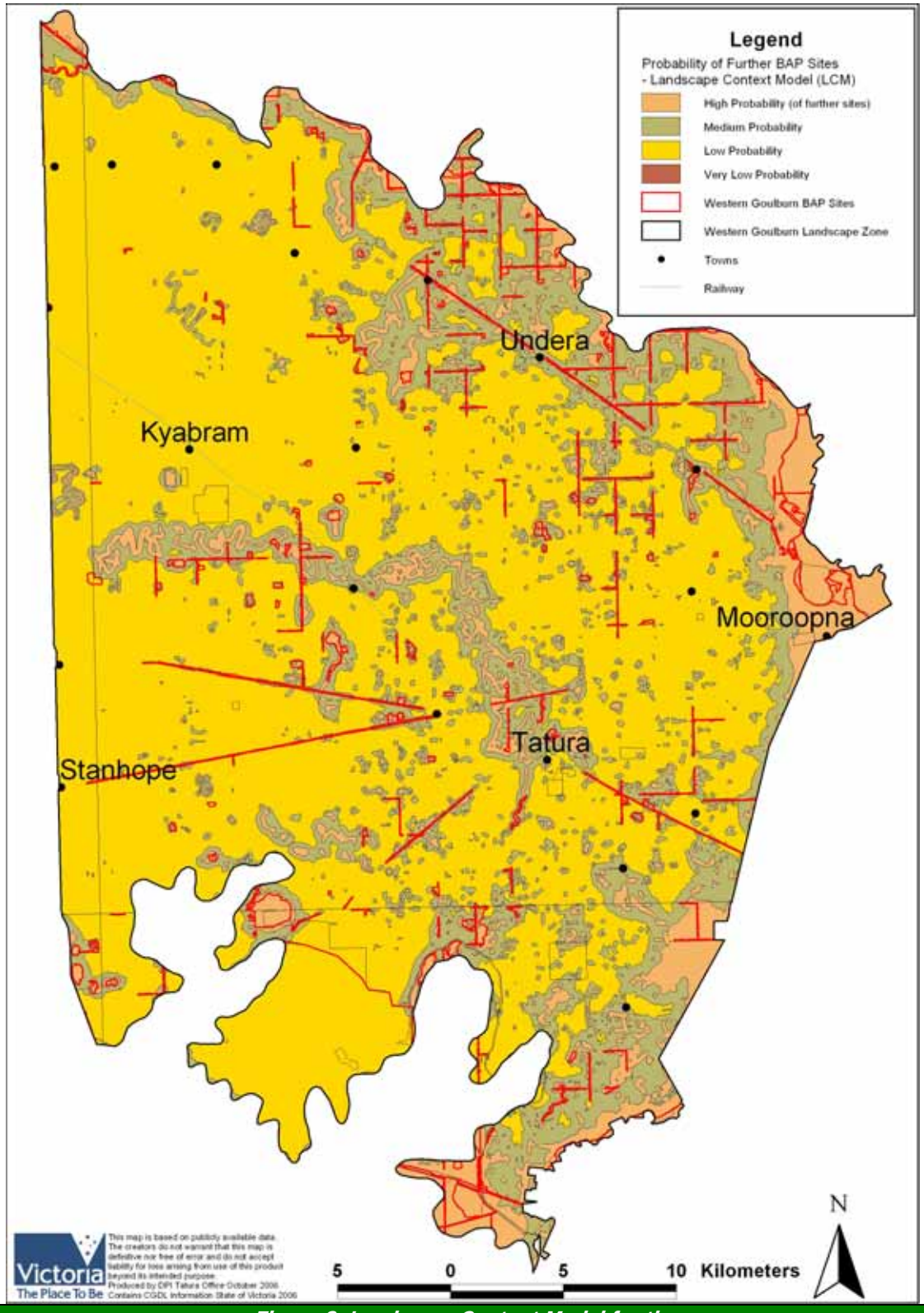
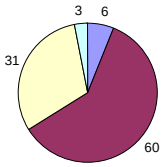


Figure 8: Landscape Context Model for the Western Goulburn Landscape Zone (with Zone BAP site overlay), depicting the probability of further BAP sites within the Zone (e.g. high probability towards the North-East and South-East)

* 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

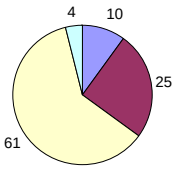
APPENDIX 10 – VEGETATION QUALITY ASSESSMENT (VQA) RESULTS

Number of large trees per hectare



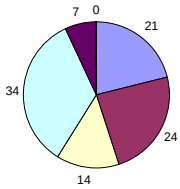
no large trees | up to 7/ha | more than 7/ha | No trees in EVC

Canopy cover



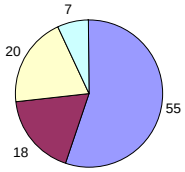
less than 25% | between 25-50% | more than 50% | No trees in EVC

Understorey



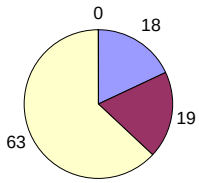
less than 10% | 10-25% | 25-75% <2 types | 25-75% 2 or more | >75% <2 types | >75% 2 or more

Weediness



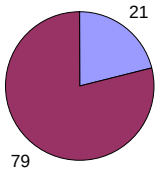
50% or more | 25-50% | 5-25% | 5%

Recruitment



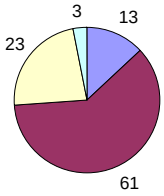
<30% | 30-70% | 70% or more | Not for EVC

Percent cover of organic litter



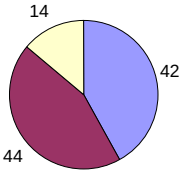
<5% | >5%

Total length of logs (over 25cm diameter) per hectare



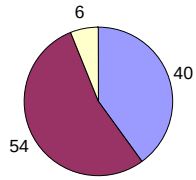
no logs | <25m/ha | >25m/ha | Not for EVC

Surveyed site sizes



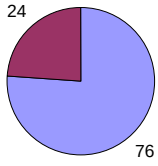
<2ha | 2-10ha | >10ha

Neighbourhood



<10% within 1km | 10-50% within 1km | >50% within 1km

Core Area



1km or more from 50ha | <1km from 50ha

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 Western Goulburn Landscape Zone. For further information on how to obtain data on the birds surveyed at each site refer to Appendix 12.

English Name*	Latin Name
Australian Raven	*Corvus coronoides*
Baillon's Crake	*Porzana pusilla*
Black Cormorant	*Phalacrocorax carbo*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
Black-shouldered Kite	*Elanus axillaris*
Black Swan	*Cygnus atratus*
Black-winged Stilt	*Himantopus himantopus*
Brown Falcon	*Falco berigora*
Buff-rumped Thornbill	*Acanthiza reguloides*
Chestnut Teal	*Anas castanea*
Clamorous Reed-warbler	*Acrocephalus stentoreus*
Common Blackbird	*Turdus merula*
Crested Pigeon	*Geophaps lophotes*
Crimson Rosella	*Platycerus elegans*
Dusky Moorhen	*Gallinula tenebrosa*
Dusky Woodswallow	*Artamus cyanopterus*
Eastern Rosella	*Platycercus eximius*
Falcon spp.	*Falco spp.*
Flame Robin	*Petroica phoenicea*
Galah	*Cacatua roseicapilla*
Golden Whistler	*Pachycephala pectoralis*
Grey Butcherbird	*Cracticus torquatus*
Grey Shrike-thrush	*Colluricincla harmonica*
Grey Teal	*Anas gracilis*
Hory-head Grebe	*Poliocephalis poliocephalis*
House Sparrow	*Passer domesticus*
Intermediate Egret	*Ardea intermedia*
Latham's Snipe	*Gallinago hardwickii*
Laughing Kookaburra	*Dacelo novaeguineae*
Little Corella	*Cacatua sanguinea*
Long-billed Corella	*Cacatua tenuirostris*
Magpie	*Gymnorhina tibicen*
Magpie Lark	*Grallina cyanoleuca*
Masked Lapwing	*Vamellus miles*
Mountain Duck	*Tadorna tadornoides*
Musk Lorikeet	*Glossopsitta concinna*
Noisy Miner	*Manorina melanocephala*
Pacific Black Duck	*Anas superciliosa*
Pelican	*Pelecanus conspicillatus*
Pied Butcherbird	*Cracticus nigrogularis*
Pied Cormorant	*Phalacrocorax varius*
Pied Currawong	*Strepera graculina*
Purple Swamphen	*Porphyrio porphyrio*
Red-browed Finch	*Neochmia temporalis*
Red-rumped Parrot	*Psephotus haematonotus*
Red Wattlebird	*Anthocaera carunculata*
Royal Spoonbill	*Platelea regia*
Starling	*Sturnus vulgaris*
Straw-necked Ibis	*Threskiornis molucca*
Striated Pardalote	*Pardalotus striatus*
Sulphur-crested Cockatoo	*Cacatua galerita*
Superb Fairy-wren	*Malurus cyaneus*
Thornbill spp.	*Acanthiza spp.*
Tree Sparrow	*Passer montanus*
Welcome Swallow	*Hirundo neoxena*
White-faced Heron	*Egretta novaehollandiae*
White Ibis	*Threskiornis molucca*
White-necked Heron	*Ardea pacifica*
White-plumed Honeyeater	*Lichenostomus penicilatus*
White-throated Greygone	*Greygone olivacea*
White-throated Treecreeper	*Cormobates leucophaeus*
White-winged Chough	*Cocorax melanorhamphos*
Willie Wagtail	*Rhipidura leucophrys*
Wood Duck	*Chenonetta jubata*
Wood Swallow spp.	*Artamus spp.*
Yellow-billed Spoonbill	*Platelea flavipes*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*

* 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