Conservation Plan

for the

Southern 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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Edmonds, T. (2007). Conservation Plan for the Southern Goulburn Landscape Zone – Biodiversity Action Planning in the Shepparton Irrigation Region. Department of Sustainability and Environment, Tatura.

Acknowledgments:

This project is funded as part of the Goulburn Broken Catchment Management Authority Regional Catchment Strategy in the Shepparton Irrigation Region and is provided with support and funding from the Australian and Victorian Governments, through the Natural Heritage Trust. This project is delivered primarily through partnerships between the Goulburn Broken Catchment Management Authority, Department of Primary Industries, Department of Sustainability and Environment, Trust for Nature and other community bodies. Personnel from these agencies provided generous support and advice during the development of this plan. We also thank numerous Landholders, Landcare groups, Local Area Planning Groups and other individuals, who also provided generous support advice, information and assistance wherever possible. Some information sourced from Heard (2007).

Front cover: Goulburn Valley Water Revegetation Site -Barmah-Shepparton Road (Photo: Edmonds 2006)
Inset: Bush Stone-curlew (Burhinus grallarius) (Photo: Peter Robinson)

Published & Printed By:

Water and Biodiversity Group
Department of Sustainability and Environment
Tatura, Victoria, Australia
Final (Version 1) January 2008

Authorised by:

Victorian Government
1 Treasury Place
Melbourne, Victoria
3000 Australia

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For Further Information:

For further information about Biodiversity Action Planning please visit the DPI website at www.dpi.vic.gov.au or the DSE website at www.dse.vic.gov.au or call the Customer Service Centre on 136 186. Or visit the Goulburn Broken Catchment Management Authority website at www.gbcma.vic.gov.au

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 methodology used to develop the Landscape Zone plans is according to 'Developer's Manual for Biodiversity Action Planning in the Goulburn Broken Catchment (GBCMA 2004)'. The Victorian Riverina Bioregional Plans and the Southern Goulburn Landscape Zone plan outline biodiversity priorities at the bioregional level. This Southern Goulburn Landscape Zone Conservation Plan 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 to other planning processes, landholders and agencies.

The **Southern Goulburn Landscape Zone** is located within the Goulburn Broken Catchment of Victoria. The Zone, 84,500 hectares in extent and is part of the Victorian Riverina Bioregion. It is within the Local Government areas of Moira (a small portion in the North), City of Greater Shepparton (the majority) and Strathbogie (a small portion in the south). Since European settlement most of the vegetation in the zone has been cleared, leaving a fragmented landscape, with many of the remnants that remain, being highly modified.

There are 166 **priority environmental sites** that have been identified within the Southern Goulburn Landscape Zone. The priority sites have been determined and ranked (low, medium, high or very high) based on factors such as, size, vegetation quality, Ecological Vegetation Class (EVC) conservation status, threatened species, and landscape context and field survey results. These sites contain remnant vegetation and vary greatly in size from a stand of paddock trees, to the 5,400 hectares along the Goulburn River.

Two important components in the Biodiversity Action Planning process are the **focal species** approach and the **Key Biodiversity Assets** approach. The focal species approach uses the habitat requirements of a particular species, or a group of species, to define the attributes that must be present in a landscape for these species to persist. Six focal species have been identified in the Zone: Grey-crowned Babbler (*Pomatostomus temporalis*), Bush Stone-curlew (*Burhinus grallarius*), Squirrel Glider (*Petaurus norfolcensis*), Brown Treecreeper (*Climacteris pecumnus*), Tree Goanna (*Varanus varius*) and Azure Kingfisher (*Alcedo azurea*). These approaches provide additional tools for the community and allow for the use of the principles of landscape ecological science to conserve biodiversity.

The **Key Biodiversity** Assets approach is a method of grouping biodiversity assets (ie. birds, animals and plants) that use the same type of habitat. Three Key Biodiversity Assets were identified for the Southern Goulburn Landscape Zone: Grassy Woodlands, Wetlands and Waterways. The grouping of these assets will assist in targeting actions towards the very high value sites first.

Management actions have been developed for the Southern Goulburn Landscape Zone, based on the results of desktop analysis and field surveying. It is intended that government agencies (primarily extension staff) and the community will work together to implement these actions, for the benefit of biodiversity conservation in the Southern Goulburn Landscape Zone and the wider area of the Goulburn Broken Catchment.

CONTENTS

SECTIONS PAGE

1.0 BACKGROUND

1.1 INTRODUCTION

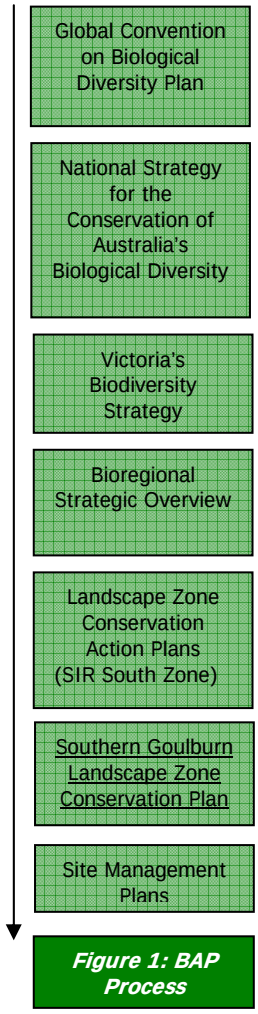

Figure 1: BAP Process

Biodiversity Action Planning[1] (BAP) is an initiative by the Victorian Government to identify priorities for the conservation of native biodiversity, as part of the implementation of the State's Biodiversity Strategy (Crown 1997). In particular, it aims to:

- Conserve native biodiversity 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.
- Achieve community support for landscape planning for biodiversity and the conservation of strategic assets, particularly in rural landscapes.

In order to achieve these aims, effective planning of actions 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). Figure 1 illustrates the Biodiversity Action Planning process and where the Southern Goulburn Landscape Zone Conservation Plan (highlighted in red) fits within a policy context.

At the regional scale the 'Landscape Plan for the Shepparton Irrigation Region South Plan' identifies the broad priorities for biodiversity conservation in the region. They also provide the foundation for producing detailed Plans. This Southern Goulburn Landscape Conservation Plan (as per underlined) is intended to provide biodiversity conservation actions for the community to implement at a local level.

1.2 OBJECTIVES

The 'Southern Goulburn Landscape Zone Conservation Plan' 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. This plan aims to ensure that private and public resources expended for conservation are targeted to priority sites. In this way, available resources can be used for the greatest possible outcomes. There are 166 priority sites, identified in the Southern Goulburn Zone, 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 local area.

Broadly, this plan details:

- The landscape, vegetation and significant flora and fauna of the Zone,
- Conservation objectives for the Southern Goulburn Landscape Zone,
- Priority assets to be conserved, and the threats to these biodiversity values,
- Priority actions required to protect and restore the assets, and
- Further monitoring requirements for the Zone (GBCMA *in prep*).

[1] For further information on Biodiversity Action Planning visit Department of Sustainability and Environments website at www.dse.vic.gov.au

1.3 CONTEXT FOR THE DEVELOPMENT OF THE SOUTHERN GOULBURN CONSERVATION PLAN

The Goulburn Broken Regional Catchment Strategy (RCS) 2003 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). This Southern Goulburn Landscape Conservation Plan is to assist in achieving this vision, through providing a strategic coordinated approach, for conservation of priority assets.

The RCS also identifies targets and priorities for the catchment (refer to Appendix 3 for further detail). The following points are intended to provide a summary of the RCS targets and priorities for biodiversity conservation. For further information please refer to GBCMA 2003.

The Goulburn Broken Catchment Management Strategy identifies the following biodiversity resource condition targets for native vegetation in the catchment:

- 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
- Improve the quality of 90% of existing (2003) native vegetation by 10% by 2030,
- Increase the cover of all endangered and applicable vulnerable Ecological Vegetation Classes to at least 15% of their pre-European vegetation cover by 2030
- Increase 2002 conservation status of 80% threatened flora and 60% threatened fauna by 2030,
- Maintain the extent of all wetland types at 2003 levels where the extent (area and number) has declined since European settlement
- 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 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 (ie through reservation, covenants, management agreements, fencing and statutory planning),
2. **Enhancing** the existing viable habitats that are degraded (management by controlling 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).

It is intended that the actions outlined in this Plan will complement the targets of the GBRCS and other policy/strategies pertinent to the state, catchment and region (e.g. Victoria's Native Vegetation Management – A Framework for Action (NRE 2002a): Goulburn Broken Native Vegetation Management Plan (GBCMA 2000): and the Victorian River Health Strategy (NRE 2002b)). This plan is also intended to integrate such policies (e.g. targets and legislative requirements) in to the one document, for use by local communities. For example, this plan incorporates aspects of legislation (e.g. Action Statements prepared under the *Flora and Fauna Guarantee Act 1988*), in to recommended on-ground actions, for the conservation of threatened species and communities.

The Biodiversity Action Planning (BAP) process uses current scientific knowledge to produce an 'ideal' landscape for biodiversity conservation. This 'ideal' landscape provides for the current levels of species abundance, diversity and interactions. BAP attempts to take a strategic approach to the conservation of threatened and declining species and vegetation types, by looking for opportunities to conserve groups of species in appropriate ecosystems (Platt & Lowe 2002). 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 Southern Goulburn Landscape Zone Conservation Plan 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. The plan has therefore been developed as an adaptive plan, to enable management actions and information to be modified, in response to further information (e.g. monitoring).

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 DSE/DPI staff, to fully identify and understand the BAP process and to provide further information to the community. Consultation 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. 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 (Heard 2007).

2.0 THE STUDY AREA

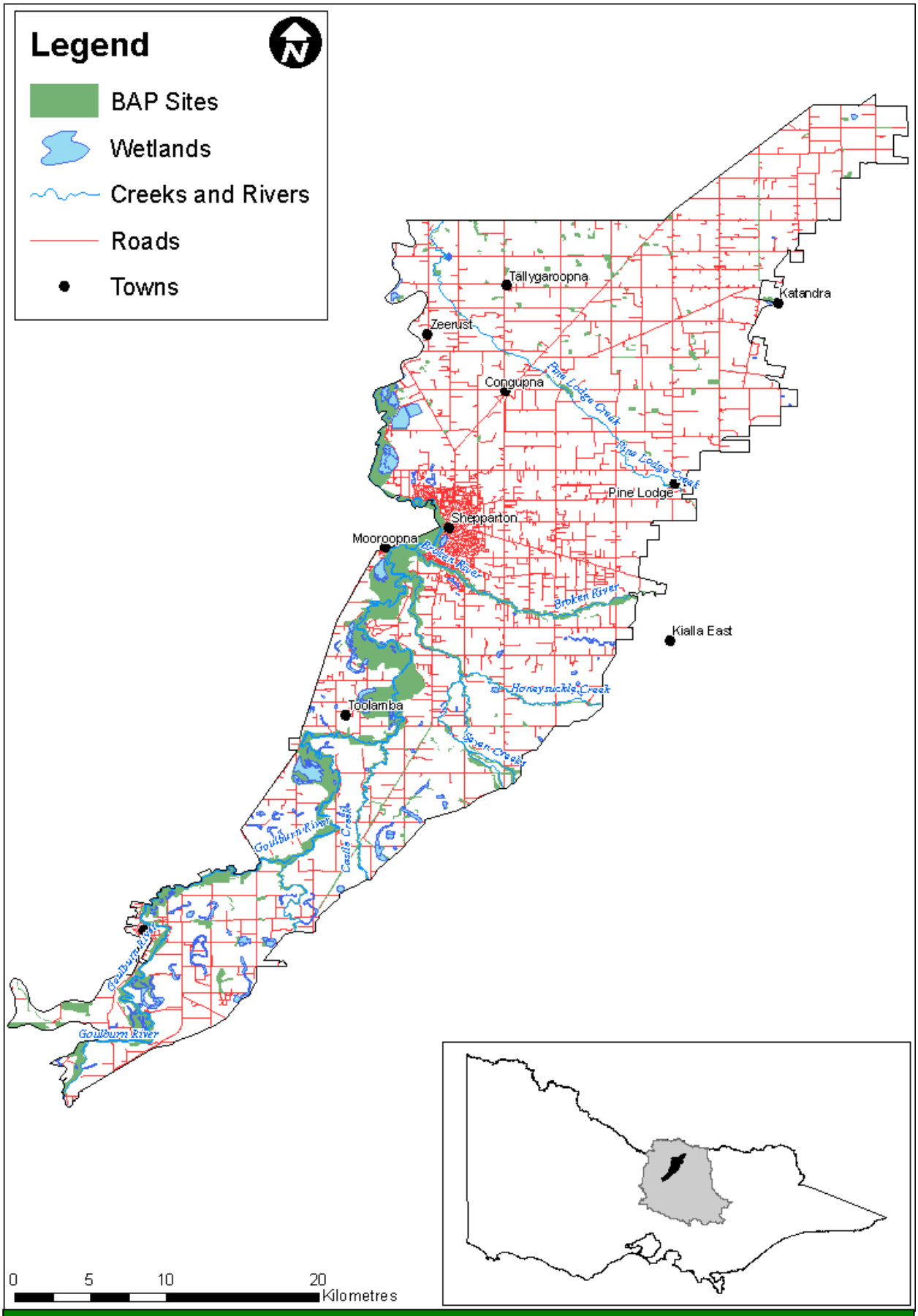

Figure 2: The Southern Goulburn Landscape Zone

2.1 LANDSCAPE

The Southern Goulburn Landscape Zone covers an area of approximately 84,500 ha within the Goulburn Broken Catchment (Figure 2). The Zone is within the Goulburn River Basin, with floodplains of grassy woodlands and wetlands surrounding the meandering Broken, Honeysuckle and Seven Creeks.

The Zone is formed of Quaternary alluvial sediments, with the more recent deposits along the main streambeds of the Broken and Goulburn Rivers. The land system along the course of the Goulburn is categorised as floodplain, with ox bows, meander scrolls and occasional source bordering dunes. The surrounding riverine plain land system is well-drained, and flat to gently undulating in the north of the zone, but with increasing evidence of leveed prior streams in the landscapes further south (LCC 1983).

Private land covers 85% of the Zone. This has resulted in changes to native vegetation, with most of the area cleared of trees for agriculture (approximately 97%). The remaining treed vegetation is highly fragmented, and usually occurring as small, isolated remnants (Figure 2). This results in not only a loss of habitat but also an inability for the landscape to function in a sustainable way. For example, many species may not be able to move across open farmland and as a result there cannot be any gene exchange and random events such as disease can wipe out sub-populations without replacement. Eventually, this results in decline and then extinction of species.

Within private land, land use is varied, surrounding Shepparton are orchards and urban blocks further out there is a variety of agriculture including dryland and intensive irrigation (LCC 1983; Ahern *et al* 2003).

Public land makes up 15% of the zone and occurs mostly along the river frontages (various widths) as well as roadsides and some small reserves. Public land Reserves occur mostly along the Goulburn River frontage resulting in a long and narrow reserve system (Figure 2).

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, 20 EVCs[2] were known to have been present within the Southern Goulburn Landscape Zone (Figure 3). The vegetation of the Southern Goulburn zone was a mixture of native grasslands, open woodlands and wetlands. Woodland communities on the plains were dominated by Grey Box (*Eucalyptus microcarpa*) and Yellow Box (*Eucalyptus melliodora*), White Cypress Pine (*Callitris glaucophylla*) and Buloke (*Allocasuarina leuhmannii*). Ground cover in these woodlands comprised grasses and chenopods with peas and wattles providing an understorey. The stream sides supported an overstorey of River Red Gum.

Of the 20 EVCs that existed prior to European Settlement, 14 have been identified as currently occurring in the zone (Table 1; Figure 3). The dominant EVCs are those that are the types of Grassy Woodlands, Grasslands and Wetlands. All EVCs are considered endangered or vulnerable at the bioregional level (GBCMA 2000). A few EVCs of note are described below, and further information can be gained from Berwick (2003) or www.dse.vic.gov.au.

Plains Grassy Woodland communities on the Riverine plains 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

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

Pea species provided 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).

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

Red Gum Wetlands were typically dominated by River Red Gum, sedges (e.g. *Eleocharis spp*) and rushes (e.g. *Juncus spp*). Plains Grassy Wetlands 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 in to sedgeland or herbland (Berwick 2003).

The current extent of native vegetation in the Southern Goulburn Zone has been dramatically reduced (Figure 4) since European settlement due to clearing. Table 1 identifies the pre 1750 EVCs in the Southern Goulburn Landscape Zone, including their Bioregional Conservation Status, their current extent (as of 2003) (in hectares and % cover). The table also identifies the area of 'Private Land No Tree Cover' (Ahern *et al* 2003).

The Goulburn Broken Regional Catchment Strategy 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). The majority of EVCs within the Southern Goulburn Landscape Zone are below the 15% target (Table 1) and are therefore considered 'Endangered' (16), 'Vulnerable' (2) or 'Depleted' (1) at the Bioregional level (Ahern *et al* 2003).

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

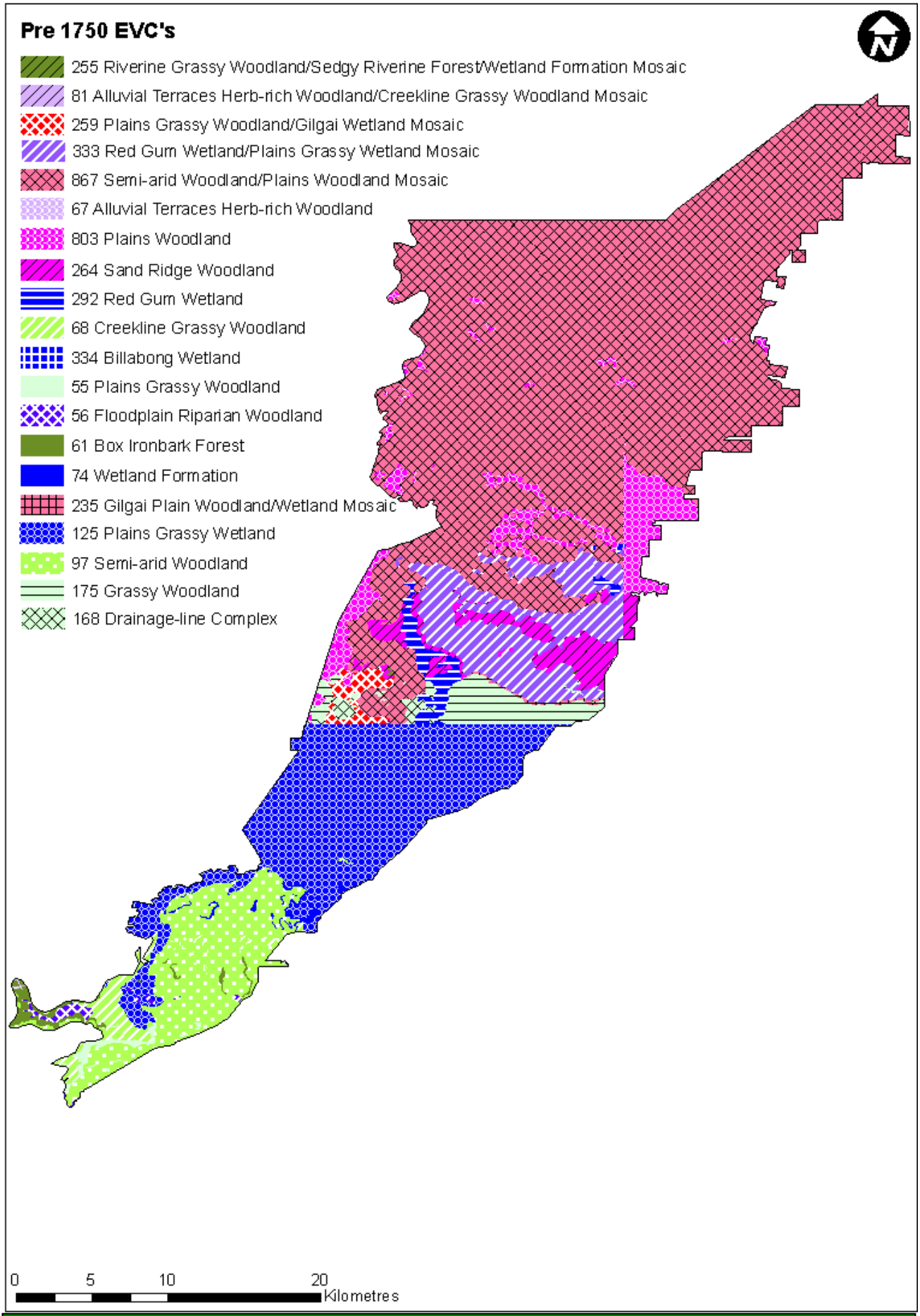

Figure 3: Pre-European Native Vegetation Cover – Southern Goulburn Landscape Zone. The different colours represent different Ecological Vegetation Classes. For details of which EVCs are represented see Berwick 2003

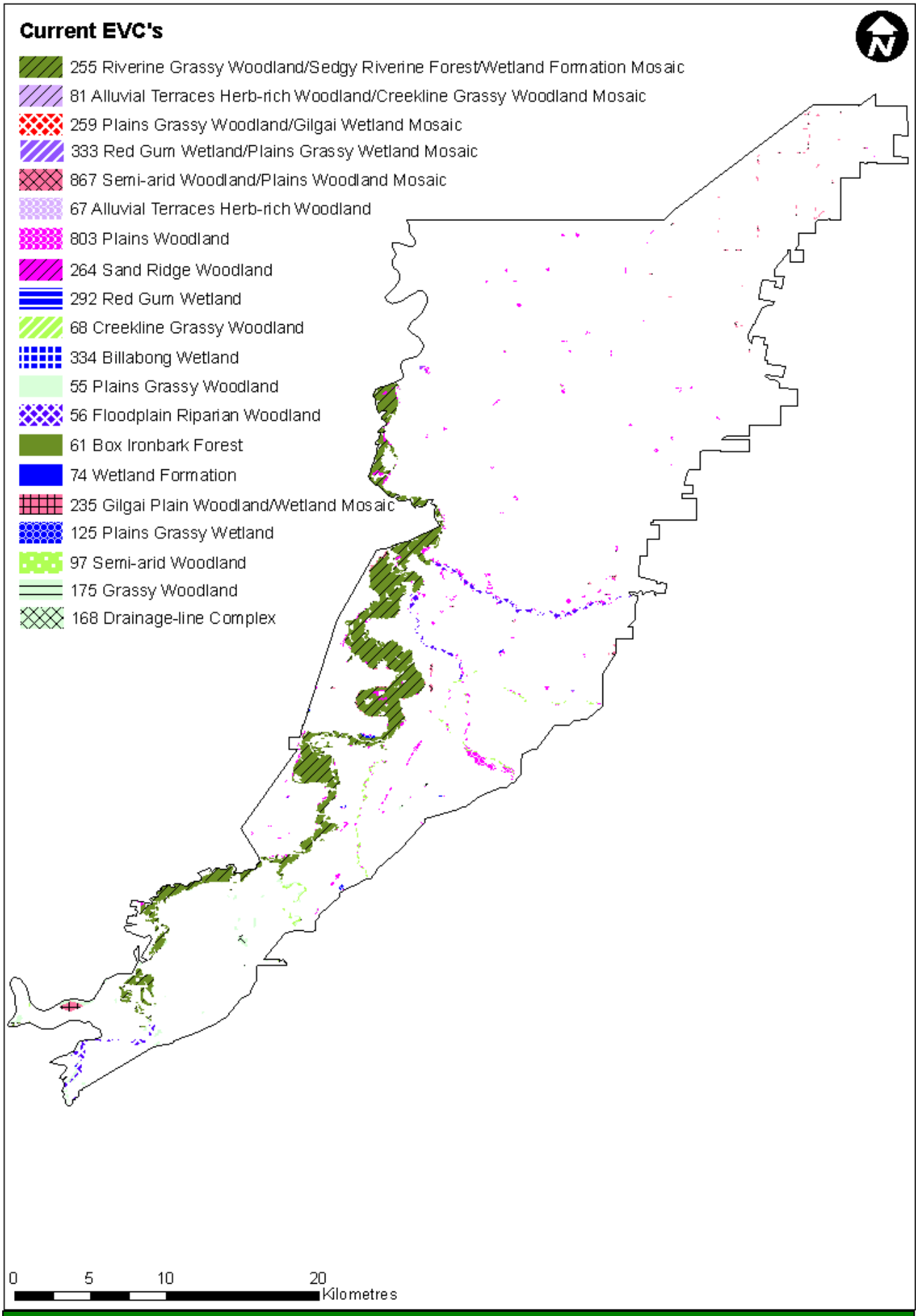

Figure 4: Current extent of Native Vegetation Cover, (represented by darker areas) and cleared land (represented by white areas) in the Southern Goulburn Landscape Zone.

Table 1 Southern Goulburn Zone Ecological Vegetation Classes (pre-1750 and current)

EVC Group	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)*
14	55	E	Plains Grassy Woodland	58834	724	1.2	8825.1
14	867	E	Pine Box Woodland/Riverina Plains Grassy Woodland Mosaic	13949	130	0.9	2092.4
15	255	D	Riverine Grassy Woodland/Riverine Sedgy Forest/Wetland Mosaic	6226	4394	70.6	933.9
14	294	E	Plains Grassy Woodland/Gilgai Plains Woodland/Wetland Mosaic	847	0	0.0	127.1
15	56	V	Floodplain Riparian Woodland	731	419	57.3	109.7
14	868	E	Pine Box Woodland	690	0	0.0	103.5
14	264	E	Sand Ridge Woodland	646	78	12.1	96.9
15	68	E	Creekline Grassy Woodland	622	163	26.2	93.3
19	125	E	Plains Grassy Wetland	544	24	4.4	81.6
5	175	E	Grassy Woodland	413	30	7.3	62.0
15	168	E	Drainage Line Complex	297	30	10.1	44.6
19	333	E	Red Gum Wetland/Plains Grassy Wetland Mosaic	270	7	2.6	40.5
14	235	E	Gilgai Plain Woodland/Wetland Mosaic	162	52	32.1	24.3
4	61	V	Box Ironbark Forest	133	6	4.5	20.0
19	292	E	Red Gum Wetland	78	3	3.8	11.7
19	74	E	Wetland Formation	77	2	2.6	11.6
16	67	E	Alluvial Terraces Herb-rich Woodland	27	0	0.0	4.1
16	81	E	Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic	16	0	0.0	2.4
19	334	E	Lagoon Wetland	8	0	0.0	1.2
	97	E	Semi-arid Woodland	690	<1	0.1	103.5
			TOTAL	84570	6062	235.8	12685.5
99	997	NA	Private Land No Tree Cover	0	78509	NA	NA
Table Information including column A & B from Ahern *et al* 2003				*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 unit ten)

Explanation of Terms:

- EVC Bioregional Conservation Status refers to the threatened status of the EVC in the bioregion (e.g. Victorian Riverina). Endangered (E) means that 'less than 10% of the pre-European extent remains, whilst Vulnerable (V) is defined as 'less than 10-30% pre-European extent remaining, Depleted (D) means that greater than 50% pre-European extent remains and moderately degraded over a majority of this area. (Platt 2002).
- EVC Number refers to the unique number attributed to that EVC.
- *Catchment Target refers to the RCS targets of increasing native vegetation to 15% of pre European extent (GBCMA 2003).

2.3 SIGNIFICANT FLORA AND FAUNA

2.3.1 Flora:

A range of native flora is found within the Southern Goulburn Landscape Zone. Overstorey species include River Red Gum (*Eucalyptus camaldulensis*), Grey Box (*Eucalyptus microcarpa*), Yellow Box (*Eucalytpus melliodora*), Murray Pine (*Callitris glaucophylla*) and Buloke (*Allocasuarina leuhmannii*). The range of small trees and shrubs includes species such as, Lightwood Wattles (*Acacia implexa*), Mallee Wattle (*Acacia montana*), Golden Wattle (*Acacia pycnantha*), Gold-dust Wattle (*Acacia acinacea*), *(Bursaria spinosa*) and Lignum (*Muehlenbeckia* spp). The Zone also contains a range of groundcover plants including Wallaby Grass (*Austrodanthonia spp*) and Spear Grasses including Corkscrew Spear-grass (*Austrostipa setacea*), herbs such as Leafless Bluebush (*Marieana aphylla*) and Smooth Rice-flower (*Pimelea glauca*) and Lilies including Chocolate Lily (*Arthropodium strictum*). Plants that favour moist environments, such as Common Spike-Rush (*Eleocharis actua*) and Nardoo (*Marsilea drumondii*) may also be found (Ahern *et al* 2003).

A total of 21 species of threatened flora are known from the Southern Goulburn Zone. These species are noted in Appendix 4, along with their threatened status, as per the Flora Information System, the State level (Flora and Fauna Guarantee Act (FFG Act) 1998) and the National level (Environmental Protection and Biodiversity Act (EPBC) 1999) (Ahern *et al* 2003).

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

- Small Scurf-pea (*Cullen parvum*) (Endangered EPBC Act 1999, endangered Victoria),
- River Swamp Wallaby-grass (*Amphibromus fluitans*) (Vulnerable Australia) (Ahern *et al* 2003),
- Western Silver Wattle (*Acacia flexifolia*) (rare Victoria), and
- Waterbush (*Myoporum montanum*) (rare Victoria).

2.3.2 Fauna:

There are 52 threatened fauna species recorded in the Southern Goulburn Zone (refer to Appendix 5 for species, their threatened status and relevant acts) (Ahern *et al* 2003).

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

- Bush Stone-curlew (*Burhinus grallarius*) (Threatened in Australia, endangered in Victoria),
- Superb Parrot (*Polytelis swainsonii*) (Vulnerable in Australia, endangered in Victoria),
- Grey-crowned Babbler (*Pomatostomus temporalis*) (endangered in Victoria, listed under *FFG Act* 1988), and
- Diamond Firetail (*Stagonopleura guttata*) (Threatened Australia, vulnerable Victoria) (Ahern *et al* 2003).

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

- Hardhead (*Aythya australis*) (vulnerable in Victoria),
- Australasian Shoveller (*Anas rhynchotis*) (vulnerable in Victoria),
- Musk Duck (*Biziura lobata*) (vulnerable in Victoria),
- Freckled Duck (*Stictonetta naevosa*) (endangered in Victoria).

Photo: Freckled Duck (Stictonetta naevosa) By Peter Rogers (NRE 2002d)

Other notable species are, Tree Goanna (*Varanus varius*) (vulnerable in Victoria), Growling Grass Frog (*Litoria raniformis*) (Vulnerable across Australia and endangered in Victoria) and Squirrel Glider (*Petaurus norfolcensis*) (endangered in Victoria).

3.0 PREPARING A CONSERVATION PLAN

3.1 METHODOLOGY

The methodology used to prepare this plan contained eight main elements. These were,
1) Identification of Conservation Features and Threatened Species,
2) Ground truth Potential BAP Sites,
3) Field Survey BAP Sites,
4) Prioritise BAP Sites,
5) Generate Focal Species List,
6) Generate Key Biodiversity Asset List,
7) Develop Actions for Key Biodiversity Assets, and
8) Landscape Context Analysis.

Step 1. Identification of Conservation Features and Threatened Species
Features in the landscape that are of potential priority for conservation were identified, as well as flora and fauna species of conservation significance (ie. Threatened under State or Commonwealth legislation). This involved desktop analysis of data (e.g. literature review; spatial data (eg EVC, trees cover, wetlands, flora and fauna records, 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 Geographical Information Systems (GIS).

Step 2. Ground-Truthing of Potential BAP Sites
Involved surveying of the Zone from the roadside to compare desktop analysis data with the on-ground sites in regards to presence, type of vegetation and condition.

Step 3. Field Survey BAP Sites
Sites were prioritised for survey as per (GBCMA *in prep.*) method (Appendix 6). One hundred of the sites requiring ground-truthing were field surveyed (on-site or from the nearest public land), by,
3.1) Bird Surveys - Undertaken in accordance with the Birds of Australia - Atlas Search Method 'Area Search'. This covered the same area (1 hectare) as per the Vegetation Quality Assessment, for a period of 20 minutes (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 (ie. grasslands, wetlands, plains grassy woodlands) (Refer to Appendix 7).
3.3) Threat Identification – Whilst undertaking the Vegetation Quality Assessment, a list of threatening processes (ie. pest plants and animals) on the priority sites, were recorded.

Step 4. Prioritise BAP Sites
The 166 sites were given a ranked value of very high (VH), high (H), medium (M) or low (L), based on a range of factors (conservation status of the EVC, presence of threatened species, size, VQA score). Sites not surveyed, nor automatically ranked (as per Appendix 6), were given a ranked value to the lesser of the available options until surveying occurs.

Step 5. Generate 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 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. Generate Key Biodiversity Asset List

The identified environmental features, including flora and fauna species, were categorised into a series of 'nested' environmental assets. For example; similar species or environmental features may be located in ‘nested assets’ such as creeklines or ecological vegetation classes.

Step 7. Develop Actions for Key Biodiversity Assets

Involved 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. Available information (e.g. Actions for Biodiversity Conservation (ABC) database) (DSE 2005a) and the SIR North Landscape Plan (Ahern *et al* 2003) were also used to compile the actions.

Step 8. Landscape Context Analysis

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

The Landscape Context Model identifies areas that have the highest (or least) probability of containing additional sites of conservation interest (as per Step 1). The model is useful in identifying the areas of the landscape that should be used to link and strengthen a network of conservation sites, and create a sustainable landscape. The model can be used to further determine the major linkages between the priority sites. The Southern Goulburn Landscape Zone priority sites and Landscape Context overlay are shown in Appendix 8.

4.0 IDENTIFYING PRIORITY SITES

In the Southern Goulburn Landscape Zone 166 sites have been identified as Biodiversity Action Planning 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 forested areas such as the crown land along the Goulburn River. Of the 166 BAP sites identified 50 have been ground-truthed and surveyed (refer to Section 5.0 for further information on surveying).

In order to identify the BAP sites, each site was assigned a number that identifies its location (maps) and the associated data (attribute table). This unique number has been calculated using the map-index number (1:25,000 maps) and a site number (ie. 1-166). An example of the site identification numbering system (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 (attribute table), for each BAP site is detailed below (Figure 6). The location of all of the 166 BAP sites (in map form) is available, in hard copy (general map) and electronic form (CD) (Appendix 10).

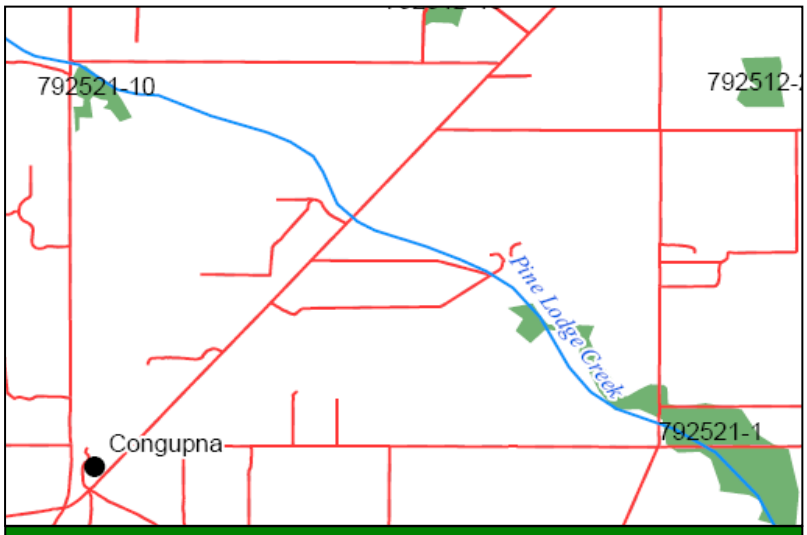

Figure 5: An example of the site identified numbering system

Site Number:	792521-10
Biodiversity Asset	Plains Woodland (Section 6.0)
Priority Status	Very High
EVC	55 (Section 2.2)
EVC Conservation status	E (Endangered)
Focal Species	Bush-Stone Curlew (*Burhinus grallarius*) (Section 6.1)
Vegetation Quality Score	16/20 (Section 5.1)
Landholder	Private
Threats	Pest Plants (230), Land Clearance (293)

Figure 6: An example of the data contained in the database (attribute table)

5.0. SUMMARY OF PRIORITY SITE SURVEYING

5.1. VEGETATION QUALITY ASSESSMENTS

All of the 166 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 of, 8) Size, 9) Neighbourhood and 10) Core Area. They were scored out of a maximum score of 20 (intact habitat). An example of the assessment sheet is provided in Appendix 7. Graphical illustration of the results is also provided in Appendix 9.

The sites in the Southern Goulburn Landscape Zone scored between 3 and 16. The graphical results (Appendix 9) highlight some of the challenges for biodiversity conservation in the Southern Goulburn Zone. In summary, the assessments identified that:

- 25% of sites scored the highest for large trees (more than 7 Large trees/ha)
- 54% of the sites scored the highest for canopy cover (more than 50% of benchmark cover)
- 17% of sites scored adequate understorey (more than 75% understorey cover and more than three forms)
- 4% of sites scored less than 25% weed cover,
- 4% of sites have adequate regeneration (10% or more of each woody species population)
- 71% of sites have adequate organic litter covering the ground (more than 5% cover),
- 42% of sites have adequate number of logs (25m of logs/ha),
- 4% of sites were larger than 10 hectares and 28% between 2-10 hectares
- None of sites surveyed had more than 50% vegetation cover in the surrounding landscape (to 1 km radius) were surrounded by more than 50% vegetation
- 21% of sites were less than 1km from a block of native vegetation greater than 50-hectares.

(Note: Sites were scored in relation to Ecological Vegetation Class Benchmarks, for each EVC Refer to Appendix 7 for further information on surveying).

Over the entire zone, the surveys show that there is: very little understorey or regeneration, a high percentage of pest plants, a lack of connectivity, small sized remnants (2-10 hectares) and a limited number of large trees. These habitat elements should be targeted within the zone.

The Vegetation Quality Assessment (VQA) scores for each of the sites provide a valuable monitoring system that can be repeated over time.

5.2 CONSERVATION THREATS

Threats to the conservation values for the Southern Goulburn Landscape Zone were identified, as:

- Land Clearance – (removal of native vegetation),
- Habitat Fragmentation – (isolation of remnants and species due to land clearance),
- Elevated competition by Noisy Miners,
- Changes in hydrology (inappropriate wetting/drying/flow regimes),
- Inappropriate management of grazing (by introduced animals),
- Removal of habitat (e.g. firewood collection, 'cleaning' up),
- Pest Plants,
- Pest Animals (including soil disturbance),
- Salinity (high watertable), and
- Adjacent Land Use Practices (e.g. irrigation, laser grading).

Land clearance (a key threatening process under the *EPBC Act* 1999) (Wierzbowski *et al* 2002) continues to be a threat to conservation values within the zone. Laser grading and cropping threatens wetlands and natural depression values. For example, further clearing occurred during the recent dry years, when depressions and wetlands were more accessible and were able to be sown

to crops. Many of wetlands identified to occur prior to European settlement are no longer present. This is due to laser grading, cropping and grazing.

Habitat fragmentation (a potentially threatening process for fauna in Victoria under the *FFG Act* 1988 (Wierzbowski *et al* 2002)), is usually the result of land clearance. A range of species such as the Grey-crowned Babbler (*Pomatostomus temporalis)* are detrimentally affected by habitat fragmentation, as it affects their ability to source food and suitable habitat required for their survival. Habitat fragmentation also favours species such as Noisy Miners (*Manorina melanocephala*) (Platt 2002).

Elevated competition from these aggressive species threatens biodiversity in the area, by the exclusion of less aggressive species (e.g. Grey-crowned Babbler (*Pomatostomus temporalis*) from remnants). The Noisy Miner is a native bird that lives in groups of 6-30 individuals. Together, a group of Noisy Miners defend their territory by aggressively attacking other birds. The exclusion, through group aggression, of small insectivorous birds by Noisy Miners, and their communal relationship with sap-sucking scale-like psyllid insects, is considered a factor in the dieback of trees in rural areas. Miners also compete for territory with declining woodland birds (see p57), such as the Grey-crowned Babbler. Noisy Miners prefer not to forage in remnants with a dense understorey of shrubs or grasses (Platt 2002).

Changes in hydrology (e.g. wetting/dry/flow regimes) are a threat for native vegetation, particularly for wetlands, which have evolved to function with the natural cycles of flood and drought. Alteration to natural flow regimes of rivers and streams is listed as a threat to Victorian waterways under the *FFG Act* 1988 (Wierzbowski *et al* 2002). A change in water regimes can dramatically alter wetland and waterway appearance and functioning, disrupt natural productivity cycles and cause changes in vegetation and habitat, which in turn affects fauna that rely on wetlands (ie. for resources and breeding) (Howell 2002). The reduction in numbers of Brolga (*Grus rubicunda*) from the Zone has been attributed to the loss of breeding habitat, increase of pest animals and changes in hydrology.

Inappropriate Management of Grazing by introduced and native herbivores affects biodiversity conservation, through, soil compaction; removal of vegetation (ie. regeneration); changed nutrient levels in and around native vegetation. It contributes to tree dieback; and results in competition for fodder by native animals and small mammals that require tussocky grass for shelter (Wilson & Lowe 2002). A large percentage (more than 80%) of remnants (both fenced and unfenced) within the landscape are grazed, often resulting in minimal shrub or ground cover (only 3% of BAP sites had adequate understorey). A large number of isolated trees in paddocks are stressed and showing signs of dieback (ie. dead limbs, loss of trunk bark and compacted soils around bases), particularly in highly irrigated paddocks, most likely the result of inappropriate wetting regimes (e.g. waterlogging) and compaction from grazing.

The removal of fallen timber (or 'cleaning up') was evident along roadsides and within private remnants (see photograph below). Fallen timber provides shelter for regenerating seedlings; protection from fire and hollows for ground mammals, and a wide variety of smaller organisms that provide food for mammals and birds. Removal of fallen timber results in a loss of habitat and food on which many animals rely. The Bush-stone Curlew (*Burhinus grallarius*), is just one of the species that is severely impacted upon by timber removal, as this species requires fallen timber for camouflage for protection for chicks and habitat (DSE 2005a).

Pest Plants (Weeds) are a major threat to biodiversity because they compete for space, light and nutrients with native species. Invasion of native vegetation by environmental weeds is listed as a potentially threatening process under the *FFG Act* 1988 (Wierzbowski *et al* 2002). Some of the weeds evident in the zone include Paterson's Curse (*Echium plantagineum*), Horehound (*Marrubium vulgare*), Olives (*Olea europaea*), Peppercorns *(Schinus molle*), Boxthorn (*Lycium ferocissimum*), Bridal Creeper (*Myrsiphyllum asparagoides*), African Love-grass (*Eragrostis curvula*), Willows (*Salix spp*) and Poplars (*Poplar spp*). Weeds are especially evident on roadsides, where edge effects and machinery create disturbance. Vehicles assist in spreading weed seed, and remnant areas adjacent to farmland will be invaded by agricultural weeds.

Photo: Firewood Collection in remnant vegetation (Heard 2007)

Pest Animals are a major threat to the conservation values of the area. Predation of native wildlife by the cat (*Felis catus*) and the Red Fox (*Vulpes vulpes*) are listed as potentially threatening processes under the *FFG Act* 1988 (Wierzbowski *et al* 2002). Species such as the Bush-stone Curlew (*Burhinus grallarius*) are preyed upon by these species. The European Rabbit *(Oryctolagus cuniculus*) and European Hares (*Lepus europaeus*) compete for habitat, remove native vegetation and disturb soil structure. Noisy Miner (*Manorina melanocephala)* competition was also evident in the zone. They were often seen chasing other bird species, such as Grey-crowned Babblers (*Pomatostomus temporalis*).

Salinity is a potential threat to the area as a result of high watertables (DSE 2005b). In 1996, watertable depths in the zone ranged from 0-1 metres to more than 3 metres (CGDL 2005). Remnant vegetation on the lower-lying parts of the landscape is especially at risk from a rising watertable. Further loss of vegetation and biodiversity in the zone will degrade the capacity of the natural ecosystem to support essential landscape functions (DSE 2005b). If not managed appropriately increases in salinity are also a potential threat to biodiversity.

Adjacent land use practices such as irrigation and inappropriate earthworks[4] are a threat to remnant vegetation, as they can lead to the colonisation of areas by weeds, waterlogging of vegetation, high watertable depths, nutrient run-off and an increase in sediment input to rivers and streams (DPI 2005).

[4] The term inappropriate earthworks in this sense refers to the purposeful movement of soil and vegetation without consideration of the natural landscape functions such as water flow

6.0 CONSERVATION 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 6 focal species identified in the Southern Goulburn Zone, and their ecological requirements (thresholds[5]) 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 (GBCMA *in prep.*),
- Dispersal threshold – refers to the distance (km) for which the species has been known to travel (e.g. for breeding, migration), but generally does not on a daily basis,
- Ecological Vegetation Class (EVC) – the vegetation community that the species prefers, and
- Other requirements – identifies some other known requirements (not comprehensive) for the species to survive, or to inhabit an area.

It is envisaged that community groups and agencies may target one, or a combination of, the focal species identified (Table 2), for planning and implementation of on-ground works in the Zone. The focal species are only a suggestion of species to focus on-ground works. Other species may also be the focus for on-ground works, given new information and community desire to implement works for another species. Keeping in mind that if we aim to cater for these species, we are also assisting a suite of species and working towards overall vegetation cover targets for the catchment to aim to conserve targeted taxa in the Zone.

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

Table 2: Focal Species and their Habitat Requirements – Southern Goulburn Zone

	**Squirrel Glider (*Petaurus norfolcensis*)**	
	Minimum patch size (threshold)	2ha
	Critical distance between patches	50m
	Dispersal threshold	100m
	Ecological Vegetation Class	Box Ironbark, Grassy Woodland
	Some other requirements (general)	fox/cat control, feral bee control
	**Bush Stone-curlew (*Burhinus grallarius*)**	
	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)	Fallen logs, Fox control
	**Grey-crowned Babbler (*Pomatostomus temporalis*)**	
	Minimum patch size (threshold)	>2ha, >1km of continuous roadside
	Critical distance between patches	<500m from known site
	Dispersal threshold	<2km, very few records >10km
	Ecological Vegetation Class	Grassy Woodland
	Some other requirements (general)	Mature trees, shrubs, corridors
	**Tree Goanna (*Varanus varius*)**	
	Minimum patch size	>2km roadside/streamside patches
	Critical distance between patches	<2km
	Dispersal threshold	<2km
	EVC utilised	Most except wetlands
	Some other requirements (general)	Mature trees, fox control, logs
	**Brown Tree Creeper (*Climacteris picumnus*)**	
	Minimum patch size (threshold)	30ha
	Critical distance between patches	500m
	Dispersal threshold	1 km
	Ecological Vegetation Class	Box ironbark, Grassy Woodland, Wetland EVCs
	Some other requirements (general)	Mature trees, linkages
	**Azure Kingfisher (*Alcedo azurea*)**	
	Minimum patch size (threshold)	5ha
	Critical distance between patches	500m
	Dispersal threshold	<2km
	Ecological Vegetation Class	Creeklines
	Some other requirements (general)	Waterways close to or overhanging the bank.

Habitat Requirement Source: Variety of Sources in GBCMA in prep.
Photo Credits: Squirrel Glider (John Seedbeck), Bush-stone Curlew & Brown Treecreeper (Ian McCann), Grey-crowned Babbler (Eileen Collins), Tree Goanna (Wendy Opie) and Azure Kingfisher (Paul Gullan).

6.2 KEY BIODIVERSITY ASSETS

The identification of the appropriate biodiversity assets to focus conservation effort is the most critical part of the BAP process. The approach of using 'Key Biodiversity Assets' has been used, to group together the birds, animals and plants that utilise the same type of habitat. For example, 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 (e.g. Brolga (*Grus rubicunda*), Barking Marsh Frog (*Limnodynastes fletcheri*), Small Spike-rush (*Eleocharis pusilla*) (GBCMA *in prep*)).

Three Key Biodiversity Assets have been identified for the Southern Goulburn Landscape Zone (Table 3). The 166 priority sites have been categorised in one of these Key Biodiversity Assets (Figure 6). The 166 priority sites have also been mapped in accordance with the correlating Key Biodiversity Asset (Figure 7).

The benefit of this approach is that specific actions (Section 7.0), based on the requirements of each asset (to counter the threats and improve the status of the asset), can be developed. Planning and implementation of on-ground works and actions that specifically target each of these assets can then occur.

Table 3: Key Biodiversity Assets – Southern Goulburn Zone

Key Biodiversity Assets	Examples of Locally Significant Species
(1) Grassy Woodland Was historically the dominant vegetation type in the landscape; now the vegetation type requiring the largest increases in extent	**Fauna**: Tree Goanna, Bush Stone-curlew, Grey-crowned Babbler, Diamond Firetail and Squirrel Glider **Flora**: Western Silver Wattle, Buloke, Small Chocolate-lily, Small Scurf-pea, Late Flower Flax lily, Waterbush **EVCs**: EVC groups 5 and 14 as listed in Table 1
(2) Wetlands Mostly located on the floodplains of the major creeklines. Prior to the use of laser grading, many drainage depressions formed shallow ephemeral wetlands (Plains Grassy Wetlands) where water would accumulate for only a few months of the year	**Fauna**: Australasian Bittern, Freckled Duck, Great Egret, Magpie Goose and White-bellied Sea-eagle **Flora**: Ridged Water-milfoil, River Swamp Wallaby-grass, Swamp Billy-buttons, Victorian Club-sedge, Wetland Blown-grass and Slender Water-ribbons. **EVCs**: Group 19 as listed in Table 1
(3) Waterways The most significant areas of native vegetation left in the landscape Major bioregional habitat links. Habitat for most of the threatened species found in the zone.	**Fauna**: Bush Stone-curlew, Tree Goanna, Squirrel Glider, Superb Parrot, Brown Treecreeper, Nankeen Night-heron **Flora**: River Swamp Wallaby-grass, Small Chocolate-lily, Late Flower Flax-lily, Jericho Wire-grass

* The numbering of the Key Biodiversity Assets (1-3) is only intended to assist with the identification of the assets throughout the remainder of the report.

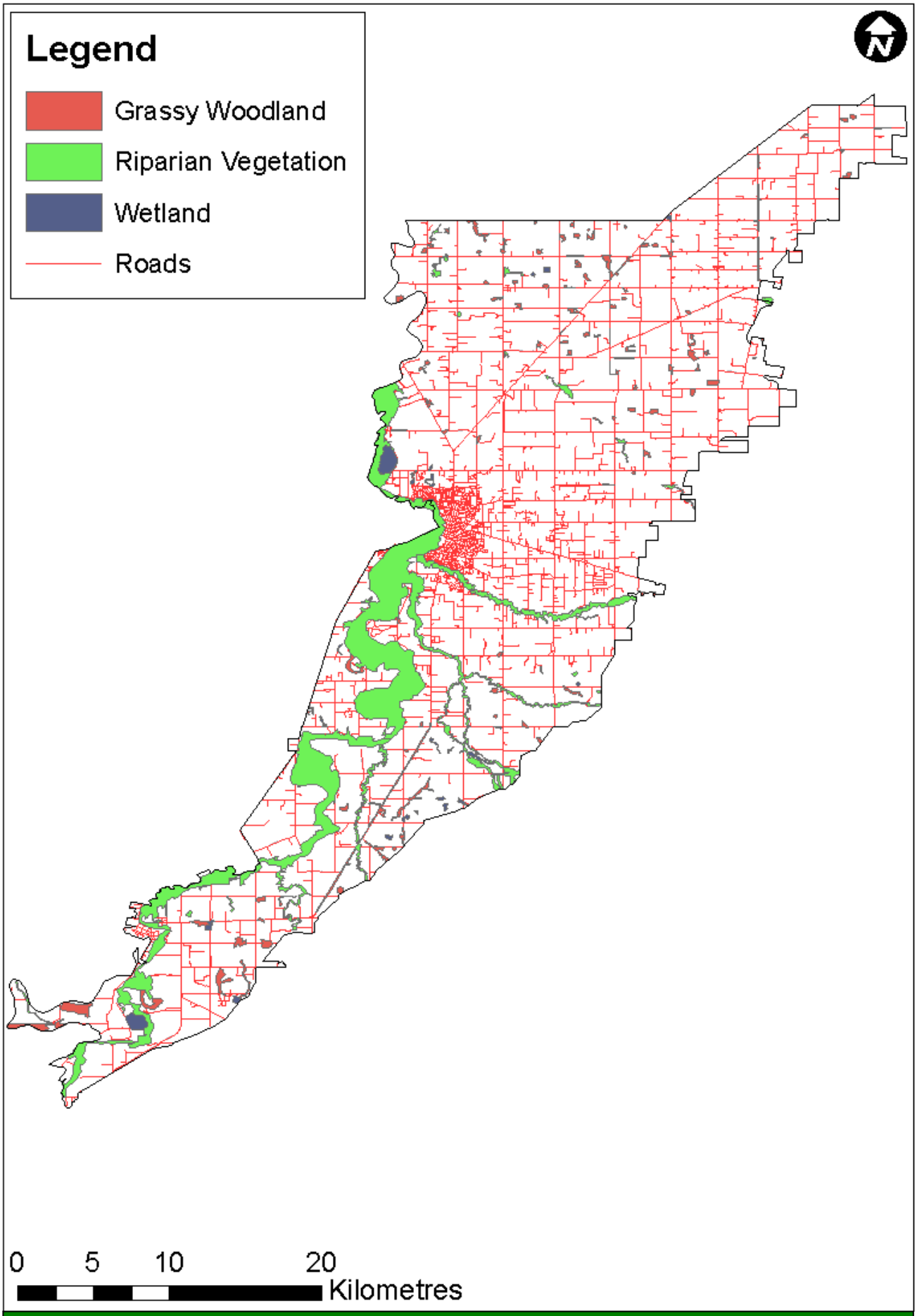

Figure 6: Location of Key Biodiversity Assets – Southern Goulburn Landscape Zone

7.0 PRIORITY ACTIONS FOR KEY BIODIVERSITY ASSETS

For each of the three Key Biodiversity Assets (1-3), the following pages identify:
A) An introduction to the Asset in the Southern Goulburn Landscape Zone
B) Photographic example of the Asset in good condition in the zone
C) The Actions for each of the Assets in the zone (broader actions are also identified for the Southern Goulburn Landscape Zone in Ahern *et al* 2003).

Priority actions for the Southern Goulburn Landscape Zone have been developed and grouped based on each 'Key Biodiversity Asset' (refer to section 6.2 and Table 3). Priority actions for the key biodiversity assets were developed based on the following factors: size/extent, condition and landscape processes (e.g. habitat connectivity, appropriate water regimes). The condition section was also further split in relation to education/extension, on-ground works, threatened species and pest plants and animals. For example, and action relating to the condition of a remnant, due to rabbits, can be found under 'Condition' – 'Pest plants and animals'.

It is proposed that the community and agencies in the Southern Goulburn Landscape Zone investigate options for implementing these actions into existing projects/polices. For example, BAP sites in each asset type, should be targeted in order of site priority (Very High, High, Medium to Low) in relation to these actions (where applicable). This forms the basis of BAP, where the very high value sites, that require less cost for long-term protection, will provide the best prospect for conservation (GBCMA *in prep*). The location of the Assets (maps) and the photographic examples of the condition of the Assets will assist with the planning and implementation of the actions.

1) KEY BIODIVERSITY ASSET –GRASSY WOODLAND

1A) Introduction - Grassy Woodland:

The Key Biodiversity Asset Plains Grassy Woodland is comprised of the EVC Groups 5 & 14. These were historically the dominant vegetation types in the riverine plain parts of the Southern Goulburn Landscape zone, but are now endangered. The majority of Grassy Woodland in the zone occurs on private land, roadsides and edges of larger public land. These remnants serve many important functions, including water conservation, aesthetic values, habitat values, sources of native seed and sources of food, shelter and nesting sites for a range of woodland birds and mammals (Lunt 1998).

Grassy woodlands are currently scattered throughout the Southern Goulburn Landscape Zone. Many of the areas in the zone that once contained these vegetation types have been cleared for agriculture, leaving small fragments across the Victorian Riverina. Other threats include adjacent land use practices, grazing, pest plants and pest 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 Southern Goulburn Landscape Zone and are by no means comprehensive for the region.

1B) Photographic Example –Grassy Woodland:

Example of a Grassy Woodland BAP Site of Good Condition - Southern Goulburn Zone

Site 792521-12 (pictured below) is an example of a Plains Grassy Woodland BAP site in good condition. The site is on the Shepparton–Barmah Road opposite the Sewage treatment plant. It has had a good mixture of understorey species planted as recruitment was limited. The habitat quality score was lowered by the lack of neighbouring native vegetation, common in this type of agricultural landscape.

Photo: Grassy Woodland – A Key Biodiversity Asset - Southern Goulburn Landscape Zone

1C) Actions –Grassy Woodland:

Size/Extent:

- **Create buffers**, through revegetation, on freehold land abutting roadside remnants or reserves such as Congupna and Inglis Bushland reserves in order to increase habitat.
- **Increase connectivity** to remnants and reserves along roadsides and the riparian areas.
- **Expand** patch size and improve connectivity of isolated or partly disconnected patches

Condition:

Education/Extension

- **Encourage** landholders to increase the size of existing remnants, to establish new areas of indigenous species of trees and shrubs, and to retain or establish buffer zones of revegetation or unimproved, uncultivated pasture around woodland.
- **Liase** with Parks Victoria, DSE, Trust for Nature, committees of management and adjacent landholders, to ensure the best practice for reserve management.
- **Encourage protection** (fencing) of remnants and manage grazing practices to benefit the grassy woodland (e.g. manage domestic grazing in remnants to allow plants to set seed and regenerate. Manage stock grazing to benefit the native vegetation once plants have set seed).
- Organise **community education** activities relating to the importance of Plains Grassy Woodlands and associated flora and fauna species, specifically targeting high priority remnants in paddock environments.
- Further **promote** the benefits of protecting and enhancing remnant patches through extension and voluntary programs, such as Environmental Management Incentives.
- **Educate** landowners on the need to retain fallen timber in privately owned sites and making sure that fallen timber is not removed illegally from public land.
- **Further investigate** the effects of high watertable on priority BAP sites through use of the HVEF project (DPI 2006)

On-ground Works

- **Minimise disturbance** at high value sites to prevent erosion and minimise weed invasion.
- **Ensure** clusters or individual specimens of large, hollow-bearing trees and dead standing trees are retained and protected throughout the Zone.
- **Enhance** high value sites with shrubs and other species if regeneration has not occurred following fencing (e.g. no existing seed source).
- **Identify** additional native grassland paddocks for protection and restoration, where artefact grasslands were once grassy forests.
- **Complete** all actions listed in the Congupna and Inglis Bushland Reserve Management Plans.

Threatened Species

- **Install nest boxes** where hollows are deficient to increase the number of nesting hollows for woodland birds and Squirrel Gliders.
- In conjunction with Department of Sustainability and Environment **collect seed** from rare and threatened plant species (e.g. Western Silver Wattle, Waterbush, Bent-leaf Wattle, Jericho Wire-grass and Small Scurf-pea) and have them **propagated** for use in revegetation projects throughout the Zone.

Pest Plant and Animals

- Continue ongoing **control of foxes and feral cats**.
- **Reduce** the numbers of Hares, Rabbits, and Kangaroos on land that borders state forest.
- Irradicate **feral Bee** populations to allow the hollows to be used for native animals.
- Control regionally listed **weeds** and environmental weeds from sites.

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

- **Continue to support** the Congupna-Tallygaroopna Landcare Group and adjacent landholders to revegetate adjacent to significant road reserves such as Inverness Road, Boschetti Road, parts of the Goulburn Valley Highway, Congupna and Inglis Bushland reserves. In order to widen and buffer them against weed invasion.
- **Revegetate** by **direct seeding** or **planting** tube stock, along all roadsides that are able to accommodate at least 1 row of trees.
- **Identify and prioritise potential** sites for habitat expansion and improved connectivity as identified by the landscape context tool and maps provided in this document.

2) KEY BIODIVERSITY ASSETS – WETLANDS

2A) Introduction – Wetlands:

Wetlands are a characteristic feature of the Southern Goulburn Landscape Zone. The wetlands and waterways are interconnected systems and therefore any changes in one, such as reduced flows or salinity, will affect the other. The largest wetland found in the Southern Goulburn Zone is Reedy Swamp, which is listed in the Directory of Nationally Important Wetlands (Lyon *et al*. 2002). The Seven Creeks Floodplain contains mainly sedge-dominated freshwater meadows. The Sewage treatment ponds are listed as significant within the Victorian Riverina.

Within the Southern Goulburn Landscape Zone wetlands are amongst the most important, productive and valuable ecosystems. They perform vital functions including water purification, nutrient processing, flood management and maintenance of the watertable.

There are a number of threats affecting wetlands in the zone, such as land clearing, changed hydrological regime, adjacent land use practices and pest plants and animals. The actions identified below are intended to assist in the protection of the remaining wetlands within the Southern Goulburn Landscape Zone. However, these actions are specific to the zone and are by no means comprehensive for the region. Other strategies (e.g. Draft Wetlands Strategy for the Goulburn Broken) (GBCMA 2003), provides a framework for protecting wetlands in the catchment, and are overarching strategies for the area.

2B) Photographic Example – Wetlands:

Example of a Wetland BAP Site of Good Condition – Southern Goulburn Zone

Reedy Swamp (pictured right) is the largest wetland in the Southern Goulburn Zone. It is considered to be of National importance.

The photo shows a number of good habitat features such as reeds for shelter and nesting dead hollow bearing trees, mud flats and varying water depths.

Photo: Reedy Swamp– A Wetland Key Biodiversity Asset in the Southern Goulburn Landscape Zone Photo: DPI Tatura

2C) Actions – Wetlands:

Size/Extent:

- **Create buffers** around all identified wetlands (as far out beyond the rim of the basin as possible) and protect and maintain vegetative cover on inflow paths.
- **Protect** natural wetlands from grazing (while wet) and earthworks.
- If feasible **design reuse dams** to include areas for water birds to feed and breed.
- **Create artificial wetlands** designed to attract particular species of birds in areas where no wetlands or native vegetation currently exist.

Condition:

Education/Extension:

- Produce a site **management plan** for all high value wetlands and encourage incentives for other wetlands in the Zone.
- Provide opportunities for **education of landholders** and school children regarding the benefits of wetlands on the farm, including the provision of an extension campaign on the productive value of intact wetlands, rather than for agricultural pursuits.
- Provide **extension** to all landholders with wetlands in the zone, to assist with recognition of the benefits of wetlands on their properties and to assist with identification of plants and animals.
- **Identify** a demonstration site (showcasing a very high value site) for educational purposes.
- **Prevent** further **removal** of wetlands, through education and legislation where required.

On ground works:

- **Protect** (via incentives) all identified wetlands in the zone, commencing with very high value sites.
- **Provide** off-stream, watering points for private wetlands through the Environmental Incentives program.
- **Reduce** the use of chemicals and other water contaminants on farms and within local communities.
- In consultation with the Waterwatch program, enhance **monitoring** of wetlands and encourage the community to adopt new wetland monitoring sites.
- **Implement** all actions in the Reedy Swamp Environmental Management Plan (DPI 2003)
- **Implement** all actions in the Bunbartha-Kaarimba Zeerust Local Area Plan (BKZ LAP 2003)
- **Protect** wetland sites at risk of high watertable levels as identified in the HVEF project (DPI 2006) such as Ferguson Road Wetland.
- **Revegetate** along all community surface water management systems.

Threatened Species:

- **Manage grazing** to exclude grazing when wet, or prior to being wet, to allow flowering and seed-set of native plants (such as Milfoil). Graze under management only when dry to prevent seed set of weeds. Monitor growth of cane grass and other nesting habitat, to ensure that grazing does not remove habitat for bird species.
- **Collect seed and propagate** threatened species such as Ridged Water-milfoil, Western and Winged Water-starwort for revegetation in ephemeral wetlands.

Pest plants and animals:

- **Undertake fox and cat control** programs for the benefit of all species.
- **Control** Carp and other introduced fish species.

Landscape Processes (ie. hydrological regime, habitat connectivity):

- Give priority for protection to wetlands that are currently in close proximity to one another, or in close proximity to a high value site, to **form clusters of wetlands** if size cannot be extended.
- Liaise with Goulburn-Murray Water and landholders, to restore and deliver natural hydrological regimes to all identified wetlands, for the benefit of flora and fauna.

3) KEY BIODIVERSITY ASSET – WATERWAYS

3A) Introduction – Waterways:

Waterways comprise a considerable part of the zone and contain the most significant areas of native vegetation left in the landscape. Waterways also form major habitat links in the bioregion as well as providing habitat for most of the threatened species within the zone. These areas are priority for protection due to their extent, connectivess and the high priority vegetation types and threatened flora and fauna that they contain. Most of the Waterways along the Goulburn River is crown land and should therefore be managed for the benefit of native flora and fauna.

The Waterways in the Zone occurs along the following waterways—Broken River, Pine Lodge Creek, Honeysuckle Creek, Seven Creeks and Castle Creek.

3B) Photographic Example – Waterways:

Example of Waterways along the Goulburn River - Southern Goulburn Zone

Good recruitment of River Red Gums (*Eucalyptus camaldulensis*) can be seen on the far side of the river. Silver Wattle (*Acacia dealbata*) is also present and is an important food source for Squirrel Gliders (*Petaurus norfolcensis*). Dead, hollow bearing trees are visible, which may provide nesting habitats for a range of fauns. The river banks sloping towards the waters edge are vegetated, indicating that little or no stock is accessing the river and causing erosion in the area.

Photo: Waterways - a Key Biodiversity Asset - Southern Goulburn Landscape Zone

3C) Actions – Waterways:

Size/Extent:

- **Revegetate** those remnant sites that are lacking understorey and native grasses or herbs.
- **Encourage** landowners to revegetate adjacent to Waterways reserves as a way of increasing the area of remnants and providing a buffer to weed invasion.
- **Create buffers** around Waterways to manage cattle impacts on banks and vegetation such as Congupna Bushland Reserve on Pine Lodge Creek.

Condition:

Education/Extension

- Produce site **management plans** for all Waterways in the Zone.
- Provide opportunities for **education** of landholders and school children regarding the benefits of healthy creeks.
- Provide extension to all landholders with land adjoining creeklines in the zone, to assist with recognition of the benefits of healthy creeklines on their properties and to assist with **identification of plants and animals**.
- Identify a **demonstration site** (showcasing a very high value site) for educational purposes.

On-ground Works

- Liaise with Parks Victoria, committees of management and adjacent landholders, regarding current **management** of the Waterways reserves.
- Through incentive schemes such as the waterways incentives (for more information about waterways contact the GBCMA – Shepparton) fence off and **regenerate** the Waterways.
- Install **solar pumps** and off stream watering points to reduce the impacts of stock.
- **Encourage or replant** native Water-milfoils (*Myriophyllum* spp.) in slow moving pools which help filter out suspended sediments and nutrients.
- **Re-snag** creeklines with logs to provide habitat for aquatic species.
- **Protect** waterways sites at risk of high watertable levels as identified in the HVEF project (DPI 2006) such as Daunts Bend River Reserve.

Threatened Species

- Waterways forms important habitat for threatened fauna (16 of the 24 threatened fauna species recorded in the Southern Goulburn Zhave been recorded within 500m of a Waterways) and therefore protection and restoration of these sites are essential.

Pest Plant and Animals

- Remove weeds such as Willows (*Salix* sp), Parrot Feather (*Myriophyllum aquaticum*) and Arrow Head (*Sagittaria breviorstrata*).
- Encourage the removal of Carp (*Cyprinus carpio*) and other introduced fish species.

Landscape Processes (ie. hydrological regime, habitat connectivity):

- Where possible the above actions should be applied upstream so that the benefits can flow downstream and improve the health of the whole Zone.
- **Protect or revegetate** areas along waterways to connect fragments of Waterways.
- **Protect or revegetate** areas where roads intersect with Waterways to create larger areas of habitat.

8.0 FURTHER INFORMATION - PRIORITY SITES

Priority Site Data:
Information on the 166 priority BAP sites within the Southern Goulburn Landscape Zone has been derived using the Geographical Information System - Arcview 3.3. It is intended that the priority site information and other information detailed in this plan, will allow groups and staff (ie. extension staff and community groups) to:

- Be pro-active in targeting sites,
- Act as a basis for informed management of the site,
- Provide a 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 organisational, agency and community groups, to assist with biodiversity conservation in the zone. It is particularly targeted towards agency extension officers. For example, it is anticipated that prior to or following a site visit, an extension officer will investigate the data associated with their site, including:

- 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 (ie. covenant, bush tender)?
- Are there threatened or significant species recorded at the site or nearby?
- What is the BAP rating of the site and those near it (ie. Very high, high, medium or low)?
- What is the overarching management recommendation for the site (ie. protect or restore)?
- What are the actions recommended for the site (ie. pest plant management)? (Negotiations need to occur to get the best possible outcome for all involved).
- What are the options available to the landholders to fulfil these actions (ie. fencing incentive)?
- What are the options for joining the site to public land (ie. widening roadsides to provide a corridor/link)?
- Using the Landscape Context Map (Appendix 8), 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 on site, where the best possible linkages could occur, and often this should include scattered vegetation, as although they generally have not been identified as a site in this plan, they form an important element for providing links between the identified sites.

Keeping Data Current:
The data contained in this report is by no means 'comprehensive', as this process relies on the regular updating of information, to keep it accurate and timely. Therefore this plan is adaptive, to enable management actions and information to be modified in response to further information, including monitoring actions. The 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 and there are still a number of sites that require Vegetation Quality Assessments and Bird Surveys.

Further Information or To Provide Data:
BAP data relies on regular updating to keep the information relevant for users. For clarification of information or to provide further data, please refer to Appendix 10 (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.

9.0 ASSISTANCE AVAILABLE FOR LANDHOLDERS

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

LOCAL AREA PLANS	WHOLE FARM PLANS
This Conservation Plan will provide an extra resource for the Bunbartha Kaarimba Zeerust Local Area Planning group by providing further information for conducting biodiversity planning in their area.	Protecting biodiversity on a 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.

Advice and Information:
Please contact your local Department of Primary Industries/Department of Sustainability and Environment Office, the Goulburn Broken Catchment Management Authority or the Goulburn Murray Landcare Network, 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 is a range of incentives available for landholders within the Shepparton Irrigation Region for catchment works, including:

- Environmental incentives - 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 (e.g. Whole Farm Planning, Automatic Irrigation, Reuse systems)

For the above three points, contact the Department of Primary Industries, Tatura (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 Goulburn Broken Catchment Management Authority, Shepparton or Benalla office for further information.*

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. *Trust for Nature (Vic) is the managing organisation in regards to Conservation Covenants; visit the website at www.tfn.org.au*

Other Assistance:

- Goulburn Murray Landcare Network Shepparton – offers Landcare related advice (www.gmln.net.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 internet site at* www.dse.vic.gov.au.
- Local Government (Moira, City of Greater Shepparton and Strathbogie Shire) – managing authorities for native vegetation statutory planning requirements.

10.0 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 Southern Goulburn Landscape Zone. Where possible, this information will feed into the various Goulburn Broken Catchment monitoring programs. It identifies a general monitoring outline, including actions that may be conducted to determine progress towards achieving catchment biodiversity targets. It identifies the key biodiversity asset, key indicators for monitoring and the suggested frequency/intensity of monitoring.

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

A wide variety of monitoring actions are listed below. However this does not result in a binding commitment of those 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 future surveys). Interested persons can contact the Goulburn Broken Catchment Management Authority, Shepparton, or the Department of Primary Industries and Department of Sustainability and Environment Offices, Tatura, to discuss ideas and to ensure a coordinated approach (refer to Section 9.0 for contact information).

Whilst Table 4 outlines monitoring actions, evaluation of the BAP process also needs to occur to evaluate the effectiveness of the BAP process (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 - Southern Goulburn Landscape Zone			
Key Biodiversity Asset	**Key Indicators for Monitoring**	**Methodology**	**Frequency/ Intensity**
Grassy Woodland	Changes in extent	Remote sensing comparisons; CAMS inputs	Every 5 years
	Changes in condition – assumption based (area protected)	CAMS; Trust for Nature reporting; Parks Victoria reporting; Shire reporting	Every 5 years
	Changes in condition based on VQA at sites	Site-based assessments of protected and unprotected sites	Every 5 years
	Changes in landscape context	Remote sensing comparisons, LCAT comparisons	Every 5 years
	Changes in the matrix – land use, % native pasture, abundance of scattered trees	Remote-sensing	Every 5 years
	Changes in landscape functionality	Site-based assessments using LFA or likely fauna-response groups (e.g. woodland birds, terrestrial invertebrates)	Every 5 years
Wetlands	Changes in extent	Remote-sensing comparisons	Every 5 years
	Changes in condition (assumption-based) – area/number fenced; area/number with restored flows	CAMS; GBCMA reporting	Every 5 years
	Changes in condition – site-based	ISC-type assessments of a set of managed and unmanaged wetlands	Every 5 years
Waterways	Changes in condition and functionality (assumption-based) – area/number fenced; area/number with restored flows; area/number with added woody debris	CAMS inputs; ISC assessments	Every 5 years
	Changes in extent	Remote sensing; CAMS inputs	Every 5 years
	Changes in native fish community	Site-based surveys based on Monash University's current set of sampling sites	Every 5 years
	Changes in landscape functionality of the riparian zone	Site-based assessments using LFA or likely fauna-response groups (e.g. woodland birds, terrestrial invertebrates)	Every 5 years
	Tree Goanna (*Varanus varius*) population size and recruitment	Population surveys based on standard 1000 ha sampling unit used for Brush-tailed Phascogale (*Phascogale tapoatafa*) across Victoria. At least one such area established – one in the high quality Angle Road section and one in the southwestern section.	Every year initially to determine population variance from year to year

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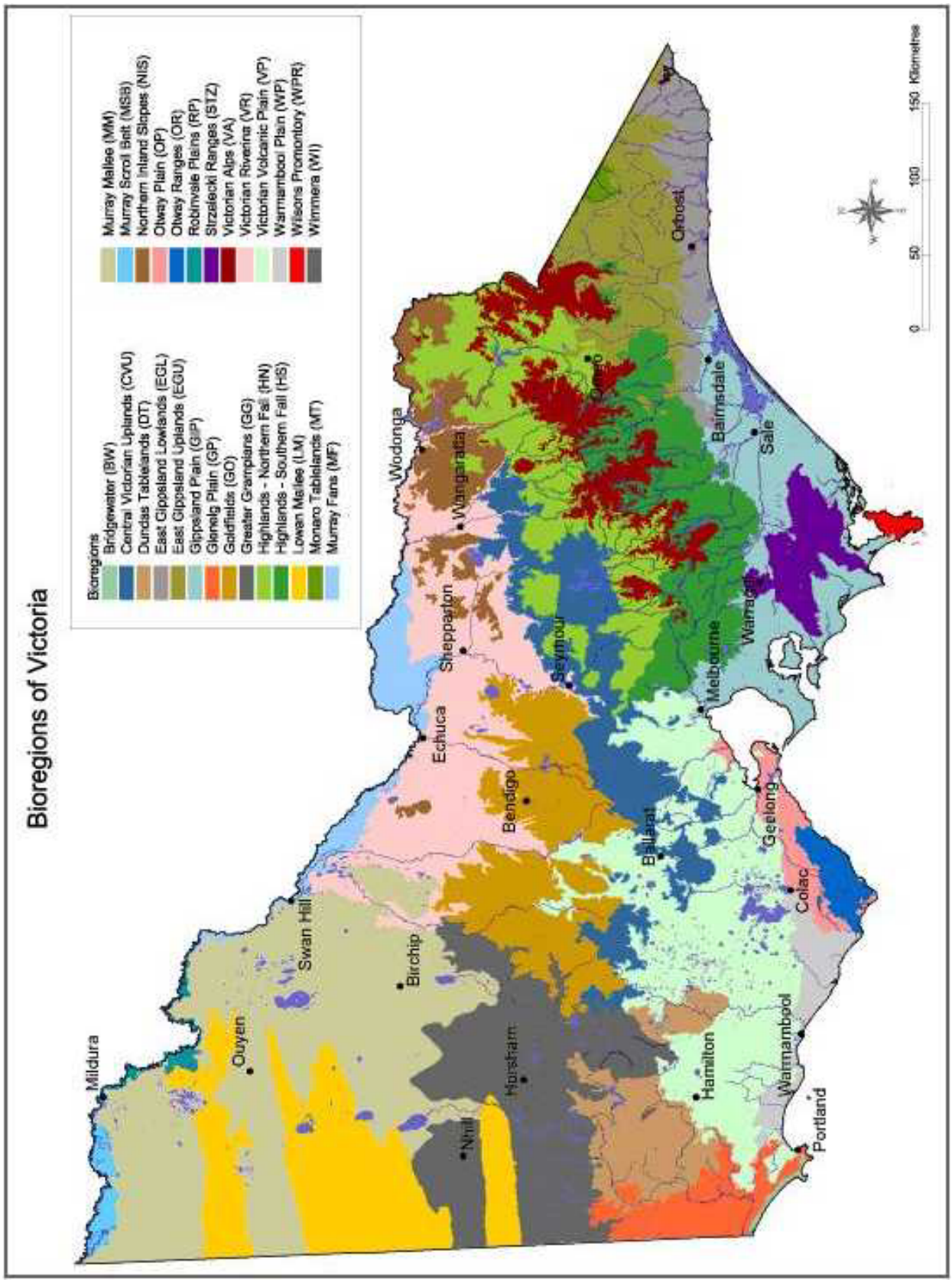
12.0 APPENDICES

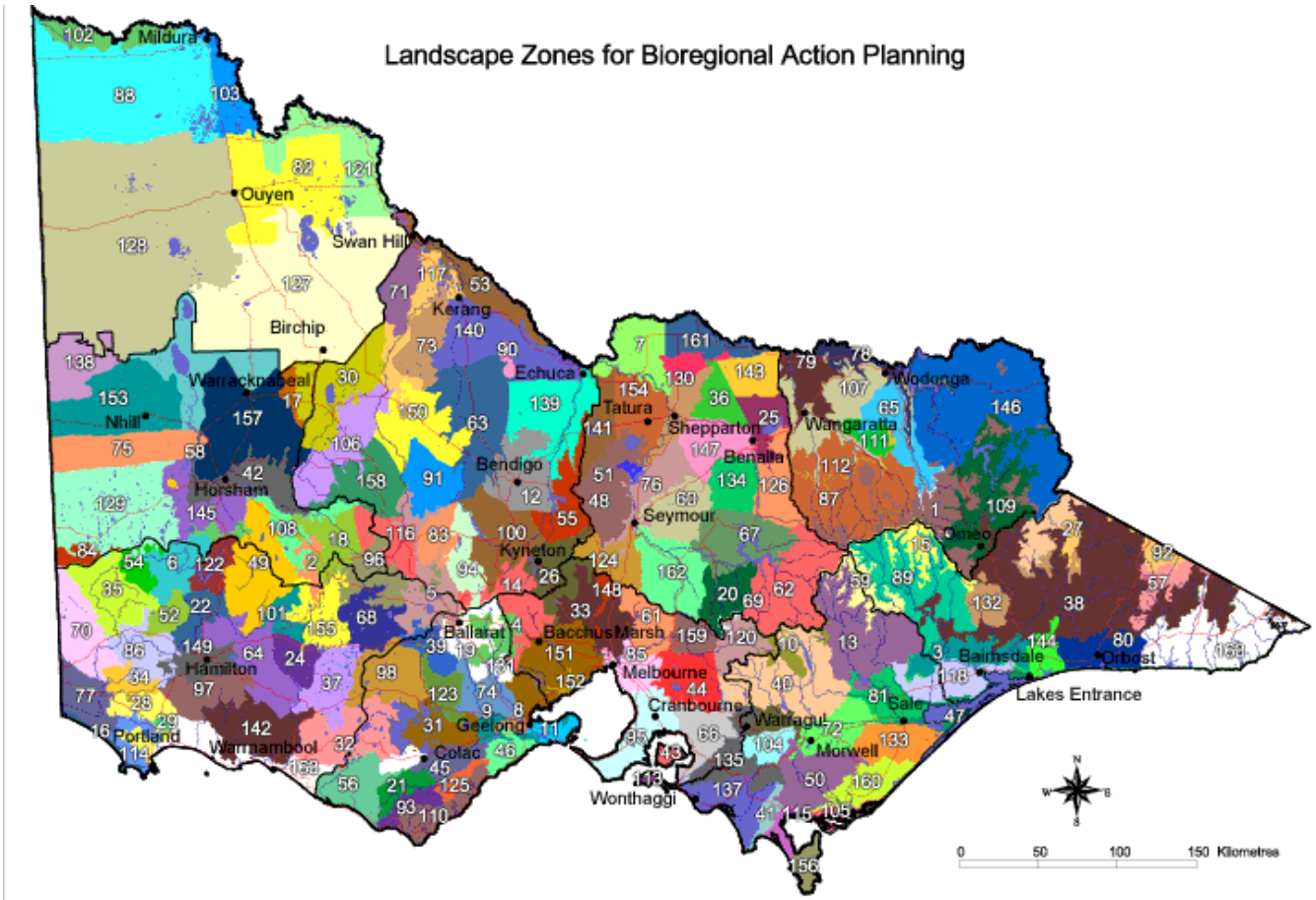
APPENDIX 1 – VICTORIAN BIOREGIONS

Source: www.dse.vic.gov.au



APPENDIX 2 – VICTORIAN LANDSCAPE ZONES

Source: www.dse.vic.gov.au



1. Alpine
2. Ararat Hills
3. Bairnsdale foothills
4. Ballan
5. Ballarat
6. Balmoral
7. Barmah Murray Fan
8. Barrabool
9. Barwon
10. Baw Baw
11. Bellarine
12. Bendigo
13. Black Range
14. Blackwood
15. Bogong
16. Bridgewater
17. Brim Lawler
18. Bulgara
19. Buninyong
20. Buxton
21. Carlisle
22. Cavendish
23. Central Creek
24. Chatsworth
25. Chesney
26. Cobaw
27. Cobbera
28. Cobboboonee
29. Codrington
30. Corack
31. Corangamite East
32. Corangamite West
33. Craigieburn
34. Crawford River
35. Dergholm
36. Dookie
37. Dundonnel
38. East Gippsland Uplands
39. Enfield
40. Erica
41. Fish Creek
42. Flat Grey Plains
43. French Island
44. Gembrook
45. Gerangamete
46. Gherang
47. Gippsland Lakes
48. Goldfields
49. Grampians
50. Grand Ridge
51. Graytown
52. Gringegalgona
53. Gunbower
54. Harrow
55. Heathcote
56. Heytesbury
57. Highlands - Far East
58. Hindmarsh
59. Howitt
60. Hughes Creek
61. Hurstbridge
62. Jamieson/Bulla
63. Jarklin
64. Karabeal
65. Kiewa
66. Koo Wee Rup
67. Lake Elidon
68. Lake Goldsmith
69. Lake Mountain
70. Lake Mundi
71. Lalbert
72. Latrobe
73. Leaghur
74. Leigh
75. Little Desert
76. Longwood
77. Lower Glenelg
78. Lower Kiewa
79. Lower Ovens
80. Lower Snowy
81. Macallister
82. Manangatang
83. Maryborough
84. Meerlieu
85. Melbourne
86. Merino
87. Mid King
88. Millewa - Carwarp
89. Mitchell
90. Mitiamo
91. Moliagul
92. Monaro Tableland
93. Moomowroong
94. Moorookyle
95. Mornington
96. Mount Cole
97. Mount Eccles
98. Mount Elephant
99. Mt Talbot
100. Muckelford
101. Muirhead
102. Murray Scroll Belt
103. Nangiloc - Colignan
104. Narracan
105. Nooramunga
106. North Central
107. North East
108. Northern Footslopes
109. Omeo
110. Otway
111. Ovens
112. Ovens & King
113. Phillip Island
114. Portland
115. Prom Plain
116. Pyrenees
117. Quambatook
118. Red Gum Plain
119. Reedy Lake
120. Reefton
121. Robinvale - Nyah
122. Rocklands
123. Rokewood
124. SW Goulburn
125. Sabine
126. Samaria/Lake Nillahcootie
127. South East Mallee
128. South West Mallee
129. South West Wimmera
130. Southern Goulburn
131. Steiglitz
132. Stirling
133. Stradbroke
134. Strathbogie
135. Strzelecki West
136. Tanjil
137. Tarwin/Powlett
138. Telopea Downs
139. Tennyson
140. Terrick
141. Timmering Dryland
142. Tower Hill
143. Tungamah
144. Tyres
145. Undulating Alluvial
146. Upper Murray Mitta
147. Violet Town
148. Wallan
149. Wannon
150. Wedderburn
151. Werribee
152. Werribee South
153. West Wimmera Plain
154. Western Goulburn
155. Willaura
156. Wilsons Promontory
157. Wimmera Plains
158. Wingallok
159. Yarra
160. Yarram
161. Yarrawonga Murray Fan
162. Yea
163. unnamed

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.

The Goulburn Broken Catchment Management 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 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 (ie through reservation, covenants, management agreements, fencing and statutory planning),
2. Enhancing the existing viable habitats that are degraded (management by controlling 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 – THREATENED FLORA

List of threatened flora and their conservation status in the Southern Goulburn Landscape Zone (Viridians 2005). Table from Ahern *et al* 2003.

Species Number	Scientific Name	Common Name	Australian Status	Victorian Status	FFG Listed	FFG Action Statement Number
27	*Acacia decora*	Western Silver Wattle		v		
35	*Acacia flexifolia*	Bent-leaf Wattle		r		
5096	*Alternanthera sp. 1 (Plains)*	Plains Joyweed		k		
4631	*Aristida jerichoensis var. subspinulifera*	Jericho Wire-grass		e		
3654	*Brachyscome chrysoglossa*	Yellow-tongue Daisy		v	L	
4643	*Craspedia canens*	Grey Billy-buttons		e		
2773	*Cullen parvum*	Small Scurf-pea	E	e	L	31
5085	*Dianella tarda*	Late-flower Flax-lily		v		
1583	*Elymus multiflorus*	Short-awned Wheat-grass		k		
1369	*Fimbristylis velata*	Veiled Fringe-sedge		r		
1836	*Juncus psammophilus*	Sand Rush		r		
4220	*Lachnagrostis filiformis var. 2*	Wetland Blown-grass		k		
1970	*Lespedeza juncea subsp. sericea*	Chinese Lespedeza		r		
2240	*Myoporum montanum*	Waterbush		r		
2317	*Olearia pannosa subsp. cardiophylla*	Velvet Daisy-bush		v	L	189

Definitions – E: Endangered in Australia, v: vulnerable in Victoria, r: rare in Victoria, k: status poorly known in Victoria, e: endangered in Victoria, L: Listed under Flora and Fauna Guarantee Act 1988

APPENDIX 5 – THREATENED FAUNA

List of threatened fauna and their conservation status in the Southern Goulburn Landscape Zone (Viridians 2005). Table from Ahern *et al* 2003.

Species Number	Scientific Name	Common Name	Australian Status	Victorian Status	FFG Listed	FFG Action Statement Number	CAMBA Listed	JAMBA Listed
319	*Alcedo azurea*	Azure Kingfisher		nt				
212	*Anas rhynchotis*	Australasian Shoveler		v				
187	*Ardea alba*	Great Egret		v	L	120	Y	Y
186	*Ardea intermedia*	Intermediate Egret		c	L	120		
215	*Aythya australis*	Hardhead		v				
4099	*Bidyanus bidyanus*	Silver Perch		c	L	202		
217	*Biziura lobata*	Musk Duck		v				
174	*Burhinus grallarius*	Bush Stone-curlew		e	L	78		
555	*Climacteris picumnus*	Brown Treecreeper		nt				
10	*Coturnix ypsilophora*	Brown Quail		nt				
168	*Gallinago hardwickii*	Latham's Snipe		nt			Y	Y
598	*Grantiella picta*	Painted Honeyeater		v	L	193		
226	*Haliaeetus leucogaster*	White-bellied Sea-Eagle		v	L	60	Y	
3059	*Limnodynastes fletcheri*	Barking Marsh Frog		d				
4093	*Maccullochella macquariensis*	Trout Cod	E	c	L	38		
4095	*Macquaria ambigua*	Golden Perch		v				
4060	*Melanotaenia fluviatilis*	Crimson-spotted Rainbowfish		d	L			
580	*Melithreptus gularis*	Black-chinned Honeyeater		nt				
246	*Ninox connivens*	Barking Owl		e	L	116		
248	*Ninox strenua*	Powerful Owl		v	L	92		
192	*Nycticorax comedonicus*	Nankeen Night Heron		nt				
216	*Oxyura australis*	Blue-billed Duck		e	L	174		
1137	*Petaurus norfolcensis*	Squirrel Glider		e	L	166		
99	*Phalacrocorax varius*	Pied Cormorant		nt				
1017	*Phascogale tapoatafa*	Brush-tailed Phascogale		v	L	79		
181	*Platalea regia*	Royal Spoonbill		v				
178	*Plegadis falcinellus*	Glossy Ibis		nt			Y	
2177	*Pogona barbata*	Eastern Bearded Dragon		d				
443	*Pomatostomus temporalis*	Grey-crowned Babbler		e	L	34		
50	*Porzana pusilla*	Baillon's Crake		v	L			
214	*Stictonetta naevosa*	Freckled Duck		e	L	105		
2283	*Varanus varius*	Tree Goanna		v				

Definitions – CAMBA (China-Australia Migratory Bird Agreement); JAMBA (Japan-Australia Migratory Bird Agreement; E: Endangered in Australia; e: endangered in Victoria; c: critically endangered in Victoria; v: vulnerable in Victoria; nt: near threatened in Victoria; d: data deficient L: listed under the Flora and Fauna Guarantee Act 1988

APPENDIX 6 – 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.

Conservation 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 7 –VEGETATION QUALITY ANALYSIS (VQA) ASSESSMENT FORM

There are four survey forms for vegetation types in the Southern Goulburn Landscape Zone (e.g. grassland, wetland, plains grassy woodlands or forests and riverine woodlands or forests). This example is the plains grassy forests or woodland sheet. Refer to DSE 2004 for further information.

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	

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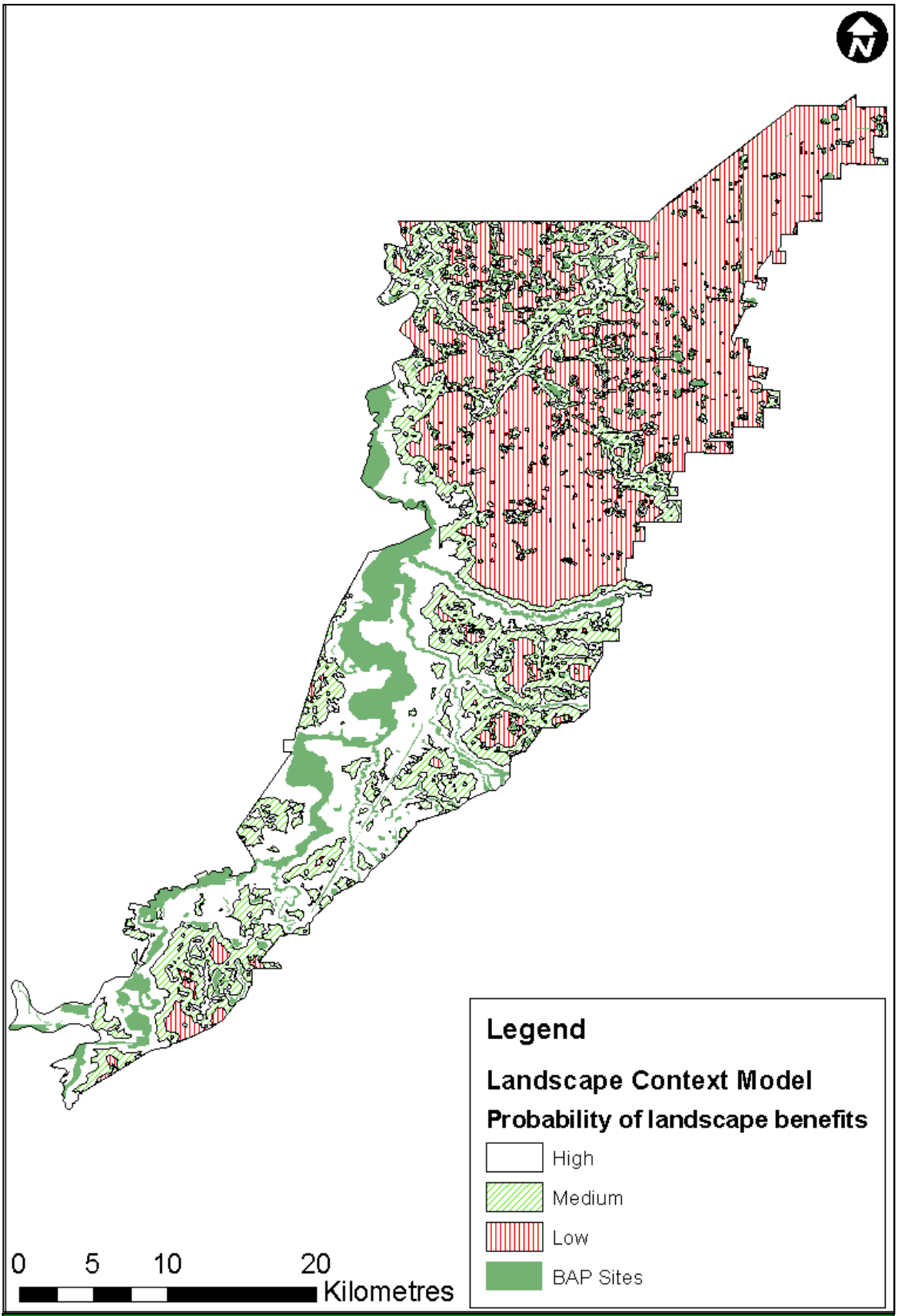
Assessment of Habitat Quality (total)

APPENDIX 8 – LANDSCAPE CONTEXT MODEL (LCM)

The LCM mapping is now 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.

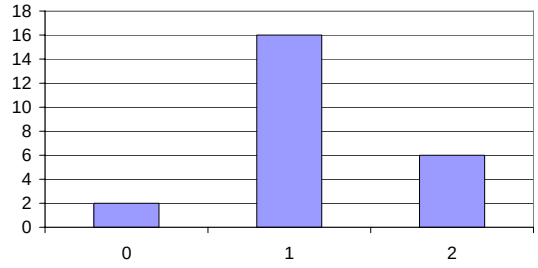


SOUTHERN GOULBURN LANDSCAPE ZONE LANDSCAPE CONTEXT MODEL

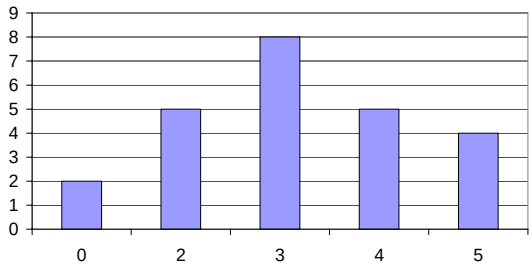
* To obtain copies of the BAP CD (Version 1, January 2008), or for further information on BAP, please contact bap@gbcma.vic.gov.au OR the Biodiversity Action Planning Officer, Department of Sustainability and Environment (DSE) Benalla at Ph: (03) 57 611 611

APPENDIX 9 – VEGETATION QUALITY ASSESSMENT RESULTS

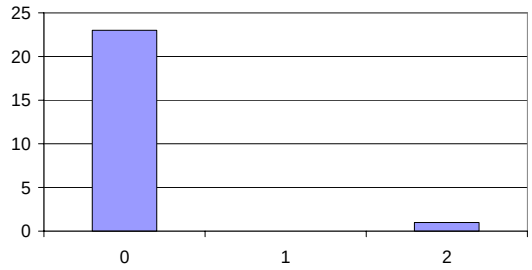
Large Trees



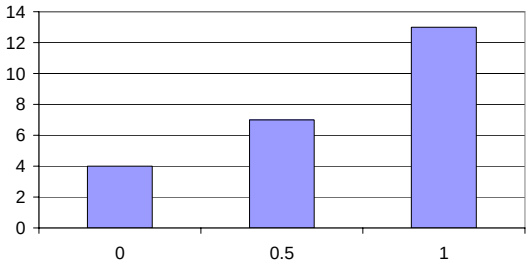
Understorey



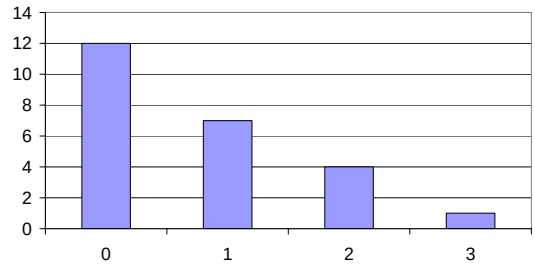
Recruitment



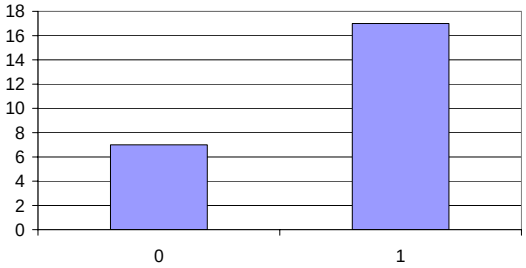
Canopy Cover



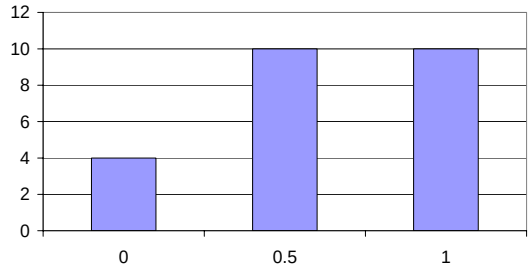
Weediness



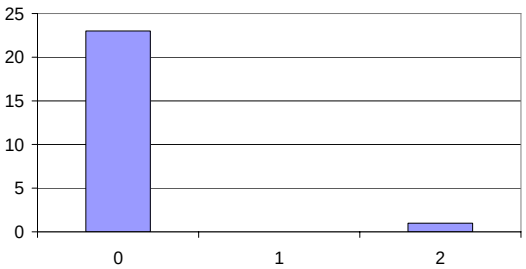
Organic Litter



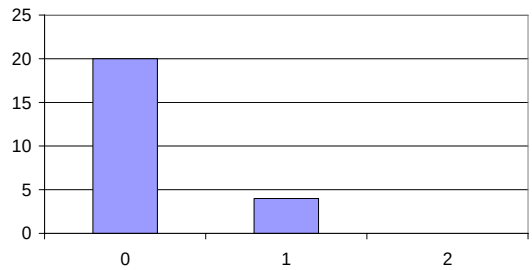
Logs



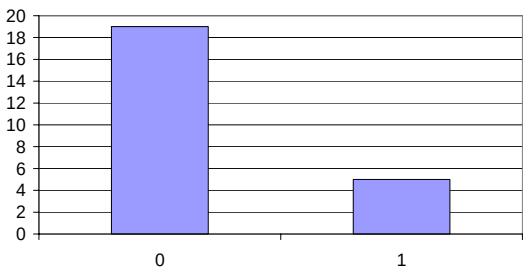
Patch Size



Neighbourhood



Distance to core habitat



APPENDIX 10 – PRIORTY 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

APPENDIX 11 – COMMUNITY 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 have led to the development of these plans (e.g. existing biodiversity management programs and strategies), only the most recent activities in relation to this Conservation Plan have been included. A number of these activities were also undertaken as part of the implementation of the Shepparton Irrigation Region Biodiversity Action Planning Communication Strategy.

- Goulburn Broken Biodiversity Action Planning Steering Committee Meetings (Quarterly). 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 (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).

- July 2006 - Field Surveying. Liaisons with Landholders regarding property access, background to BAP process, Field Surveys, Data Collection and Local Knowledge.

- Presentation/Meeting. July2006 – Bunbartha-Karimba-Zeerust (LAP) Group in conjunction with Barmah Landscape Zone Plan (Environmental Management Program, DPI Tatura).

- Newspaper Article. January 2006. SIR IC Land and Water Update Column, Country News (Environmental Management Program, DPI Tatura).

- Newspaper Article. March 28th 2006, 'Plans for Nature'. Country News. Also listed in DPI News-Notes and e-mailed to DPI Staff (Environmental Management Program, DPI Tatura).

- Biodiversity Celebration Day. September 2006 regarding Biodiversity Action Planning - launch of two Plans and background information.

- Meeting/Presentation. October 2006. Local Area Planning Facilitators regarding Biodiversity Action Planning. Nanneella Hall, Nanneella.

- Draft Plan Community Review – May - July 2007. Community Consultation (letters, phone calls, e-mails and/or meetings). Draft Conservation Plan for the Southern Goulburn Landscape Zone. Plan sent for comment to a number of representatives of the following agencies/community groups: SIR IC, SIRTEC, GBCMA, DPI, DSE and TfN (Vic).

- Final Plan Review/Approval. July 2007. Environmental Management Program, Steering Committee, SIRTEC and SIRIC.