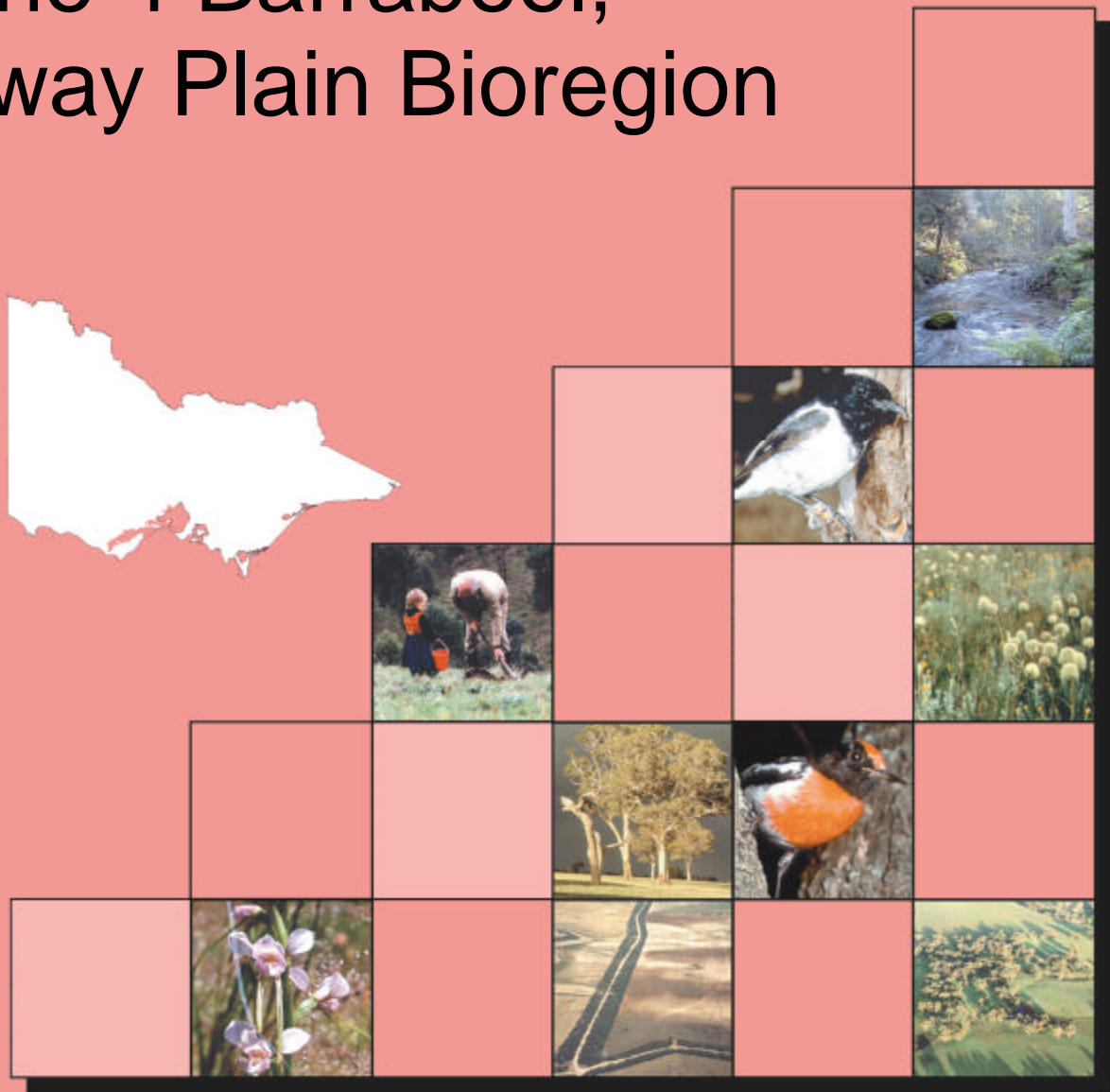


Biodiversity Action Planning

Landscape Plan for Zone 4 Barrabool, Otway Plain Bioregion



DRAFT FOR DISCUSSION
August 31, 2003

Biodiversity Action Planning Landscape Plan for Zone 4 Barrabool, Otway Plain Bioregion



31 August 2003

Cath Grant¹, Angela Duffy¹, and Kim Lowe²

¹*Flora and Fauna, South West Regional Services, DSE*

²*Public Land Stewardship and Biodiversity Division, DSE*

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Enquires to:

Dr Kim Lowe
Public Land Stewardship and Biodiversity Division
Department of Sustainability and Environment
14/8 Nicholson Street
PO Box 500
East Melbourne Victoria 3002

tel: (03) 9637 8463; fax: (03) 9637 8117

email: kim.lowe@dse.vic.gov.au

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Executive summary

1. *This Landscape Plan for the Barrabool zone within the Otway Plain bioregion translates the statewide biodiversity strategy to the regional scale, and provides the foundation for producing detailed local area biodiversity action plans to direct on-ground works by private landholders, community groups, corporations and all levels of Government, with the ultimate aim of achieving broadscale conservation of native biodiversity across the region. This plan incorporates the priorities for biodiversity conservation identified in the Strategic Overview for the bioregion (Duffy et al. 2002).*
2. *The Otway Plain bioregion covers approximately 238 thousand hectares extending over five local government areas and two catchment management regions. It extends from just east of Princetown to the Bellarine Peninsula, and includes outlying areas at Werribee, Glenaire and Apollo Bay. Most of the bioregion is private freehold dominated by agriculture and there are several large blocks of public land. Only 31% still has a cover of native vegetation, and less than 15% is in formal reserves. However, it still contains examples of most of its original vegetation types, and includes extensive areas of significant wetland habitat. Two species of fauna recorded in the bioregion are extinct, whilst of the remaining flora and fauna species, 118 flora species are considered rare or threatened, and 74 fauna species are considered near threatened or threatened in the Otway Plain bioregion. Of the 87 plants there are 55 Monocotyledons, 60 Dicotyledons, 1 Ferns and Allies and 2 Mosses. Of the 74 fauna species, there are 9 mammals, 57 birds, 4 reptiles/amphibians, 3 fish and 1 invertebrate. The bioregion is dominated by flat to gently undulating plains of Tertiary deposits. Soil types and fertility vary across the bioregion, with the coastal plains around Anglesea having soils of low fertility, and the volcanic soils of the Bellarine Peninsula having more fertile soils. A number of regionally important rivers transect the bioregion, mostly originating in the Otway Ranges and flowing down to the coast. These include the Barwon, Gellibrand, and Aire Rivers. The Moorabool and Werribee Rivers are exceptions, in that they originate in the Victorian Midlands. A number of large lakes and wetlands occur in the bioregion, including Lake Connewarre/Reedy Lake, Swan Bay, Lake Borrie, the Werribee sewage treatment lagoons, Lake Modewarre and Wurdiboluc Reservoir.*
3. *The Barrabool Landscape zone is part of the Otway Plain bioregion and comprises a landscape with gentle sedimentary hills and undulating plains. The zone is partly bordered in the north by the Barwon River and is dissected in the south by Waurm Ponds Creek, both of which have been ranked in the index of stream condition as being in marginal and poor condition respectively. Prior to 1750, Grassy Woodland dominated the zone, intersected by Floodplain Riparian Woodland, Shrubland Riparian Woodland, Swampy Riparian Woodland and Sedgy Riparian Woodland along the watercourses. Virtually all native vegetation has been cleared for agricultural purposes. The riparian vegetation along the Barwon River remains the only significant remnant in the zone and must be a priority in biodiversity action. The Barwon River not only supports threatened EVCs but also provides important habitat for a number of native birds, amphibians, mammals, reptiles and fish, including the vulnerable Australian Grayling. There are no major blocks of public land in this zone, so protection of the remaining biodiversity assets will rely on the cooperation of private landholders.*

4. *Conservation of biodiversity is formally recognised at international, national, and state levels as critically important for sustainability. Action to conserve the biodiversity of the Otway Plain bioregion will need to include, among other measures:*
- *protection of viable remnant habitats and their flora and fauna;*
 - *management to enhance the condition of these habitats and populations; and*
 - *restoration of at least some of their former extent by revegetation, re-introduction or re-installing water regimes.*
5. *The aims of this document are to:*
- *summarise the remaining biodiversity assets for each land tenure in the landscape zone;*
 - *identify priorities for conservation and restoration of biodiversity;*
 - *identify mechanisms for more efficiently conserving the bioregion's key biodiversity assets, including threatened vegetation communities, threatened taxa, wetlands and rivers;*
 - *provide a resource for further biodiversity planning at increasingly finer scales, such as local areas; and*
 - *assist communication and integration of conservation activities by private landholders, community groups, corporations and all levels of Government.*
6. *It presents a summary of the methodology behind bioregional and landscape-scale biodiversity action planning, including:*
- *the strategic planning framework provided by the state biodiversity strategy and Native Vegetation Management Framework, the River Health Strategy and the wetlands policy, and how this fits with the regional catchment strategy process;*
 - *tools including Bioregional Network Analysis (BNA) for identifying priority species for action, threatening processes affecting biodiversity, the habitat-hectare approach for assessing native vegetation quality, and the focal species concept whereby management targeted at particular species can be used as a cost-effective approach for broader biodiversity conservation;*
 - *the scientific basis underpinning biodiversity conservation management, particularly the direct and indirect effects of habitat loss and fragmentation on local extinction, and some of the critical thresholds; and*
 - *guidelines for compiling local area biodiversity action plans, which will direct on-ground actions by the community and other stakeholders, and are the next stage.*

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Cover photograph: Barrabool Hills, DSE Colac.

1. Introduction

1. Introduction

1.1 The biodiversity action planning framework

Biodiversity is the natural variety of life: it is the sum of our native plants and animals, the genetic variation they contain, and the natural ecosystems that they form (NRE 1997).

1.1.1 Different plans for different scales of operation.

The need for biodiversity action planning (BAP) is recognised as urgent by all levels of government, and there is a need for an integrated series of plans from the international scale to the local scale. Australia is a signatory to the international Biodiversity Convention (1992), and has a National Strategy for the Conservation of Australia's Biological Diversity (1996). The State of Victoria published its statewide strategy for Victoria's Biodiversity in 1997. Complementary regional, landscape and local plans are also required to coordinate actions at all necessary scales (Figure 1).

Integrated catchment management is coordinated through Victoria's 10 catchment authorities. This provides a primary mechanism for delivery of biodiversity action planning. Local government also has a pivotal role in biodiversity action planning.

1.1.2 The state biodiversity framework

The State biodiversity strategy (*Victoria's Biodiversity*, NRE 1997) fulfils a statutory requirement under Section 17 of the *Flora and Fauna Guarantee Act 1988* and provides the *top level* biodiversity action plan for the State. However, the effective planning of actions for native biodiversity also requires more detailed planning at a bioregional level and also at a landscape level.

These subsequent bioregional and landscape plans will complement Victoria's Native Vegetation Management Framework (NRE 2002a), which establishes the strategic direction for conserving the native vegetation component of biodiversity across the State, and the Regional Native Vegetation Plans being developed for each Catchment Management Authority (CMA) region.

The Victorian River Health Strategy (NRE 2002b) provides a complementary framework for managing and restoring rivers, streams and floodplains in Victoria.

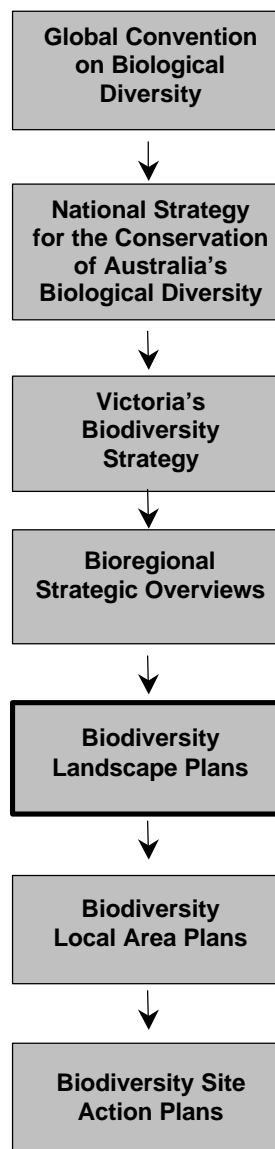


Figure 1. Biodiversity planning process

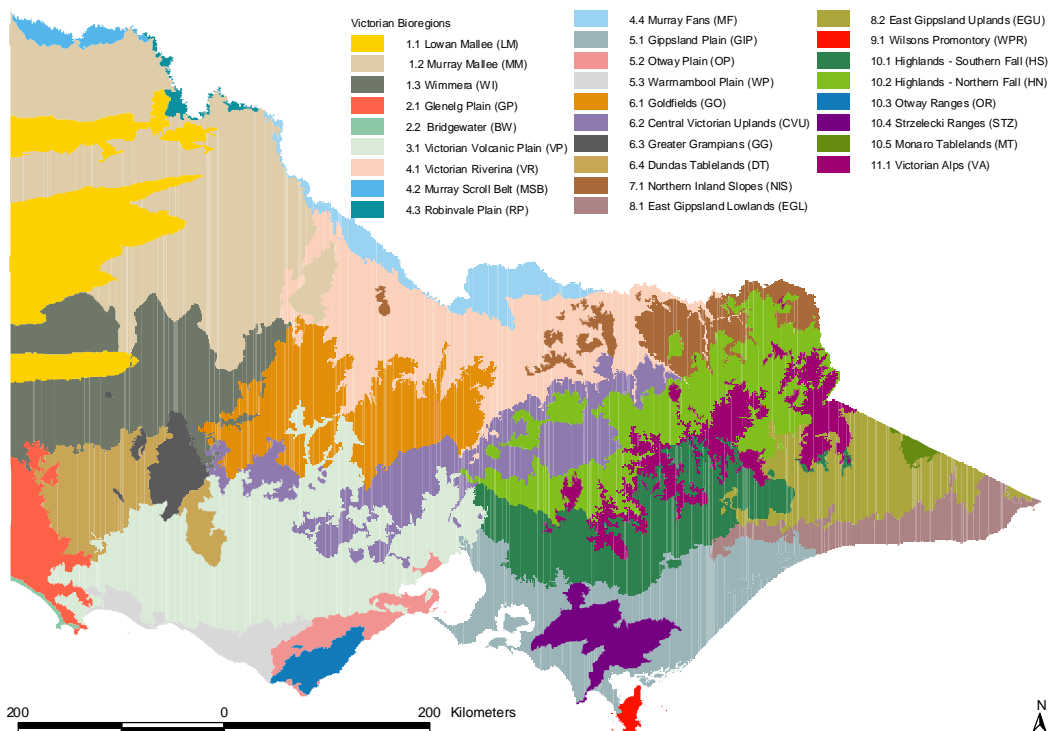
1. Introduction

1.1 The biodiversity action planning framework (cont'd)

1.1.3 Bioregional conservation priorities

Bioregions are promoted for regional-scale planning because they are based on the patterns of ecological characteristics and the underlying environmental features. They therefore reflect natural boundaries and relationships between biodiversity assets and natural resource based activities (NRE 1997). It is an objective of the National Strategy for the Conservation of Australia's Biodiversity to use bioregional planning for the effective conservation of biodiversity (Commonwealth of Australia 1996). Bioregions have been adopted in the Federal *Environment Protection and Biodiversity Conservation Act 1999* and in Victoria's Biodiversity Strategy (Map 1).

In Victoria, bioregional conservation priorities are guided by the State biodiversity strategy, the Native Vegetation Management Framework, the River Health Strategy, and wetlands policy. These policies spell out the priorities by assigning conservation significance to each biodiversity asset type. Significance of each asset type is assessed on the basis of the extent of depletion, the condition of the asset relative to its natural condition and its use by significant species. Further details on the priority setting processes is given in the Strategic Overview for the Otway Plain bioregion (Duffy *et al.* 2002).



Map 1. Location of Victoria's bioregions

1. Introduction

1.1 The biodiversity action planning framework (cont'd)

1.1.4 Bioregional biodiversity assets

Biodiversity assets include:

- *native vegetation communities;*
- *native species of plants and animals;*
- *wetlands; and*
- *rivers.*

1.1.5 Bioregional actions

Priority bioregional actions include:

- *protection of viable remnant habitats, and the flora and fauna populations they contain;*
- *management to enhance the condition of these habitats and populations; and*
- *restoration of at least some of the former extent of these habitats by revegetation, re-introduction or restoring water regimes.*

1.1.6 Bioregional tools

Bioregional planning actions will be underpinned using a variety of tools including:

- *legislative tools - e.g. the use of local government planning schemes;*
- *voluntary tools - e.g. voluntary agreements with landholders, or adoption of a cost-sharing framework that will lead to wide adoption of on-ground works by private landholders; and*
- *market tools - e.g. new policy instruments employing social choice and market forces to encourage land use change and development of more environmentally benign agricultural systems.*

A summary of the Biodiversity Action Planning framework can be seen in Figure 2.

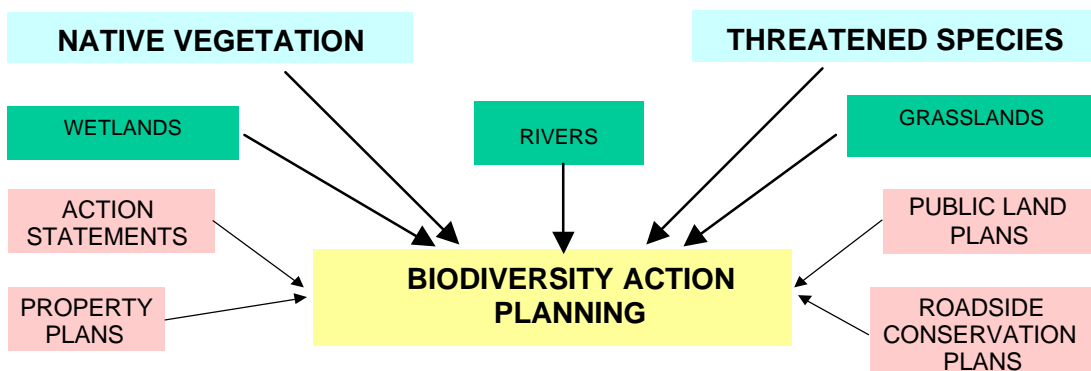


Figure 2. Biodiversity action planning framework

1. Introduction

1.1 The biodiversity action planning framework (cont'd)

1.1.7 Bioregional biodiversity action planning

The purpose of bioregional biodiversity action planning is to summarise the key biodiversity assets of the bioregion, and the actions and tools that are required to achieve statewide biodiversity goals.

They are intended as preliminary plans to stimulate discussions and action planning within the regional community and to identify options for intervention that the local community can select from. The plans will be developed in stages and with component parts that can be aggregated or separated depending upon the users area of interest.

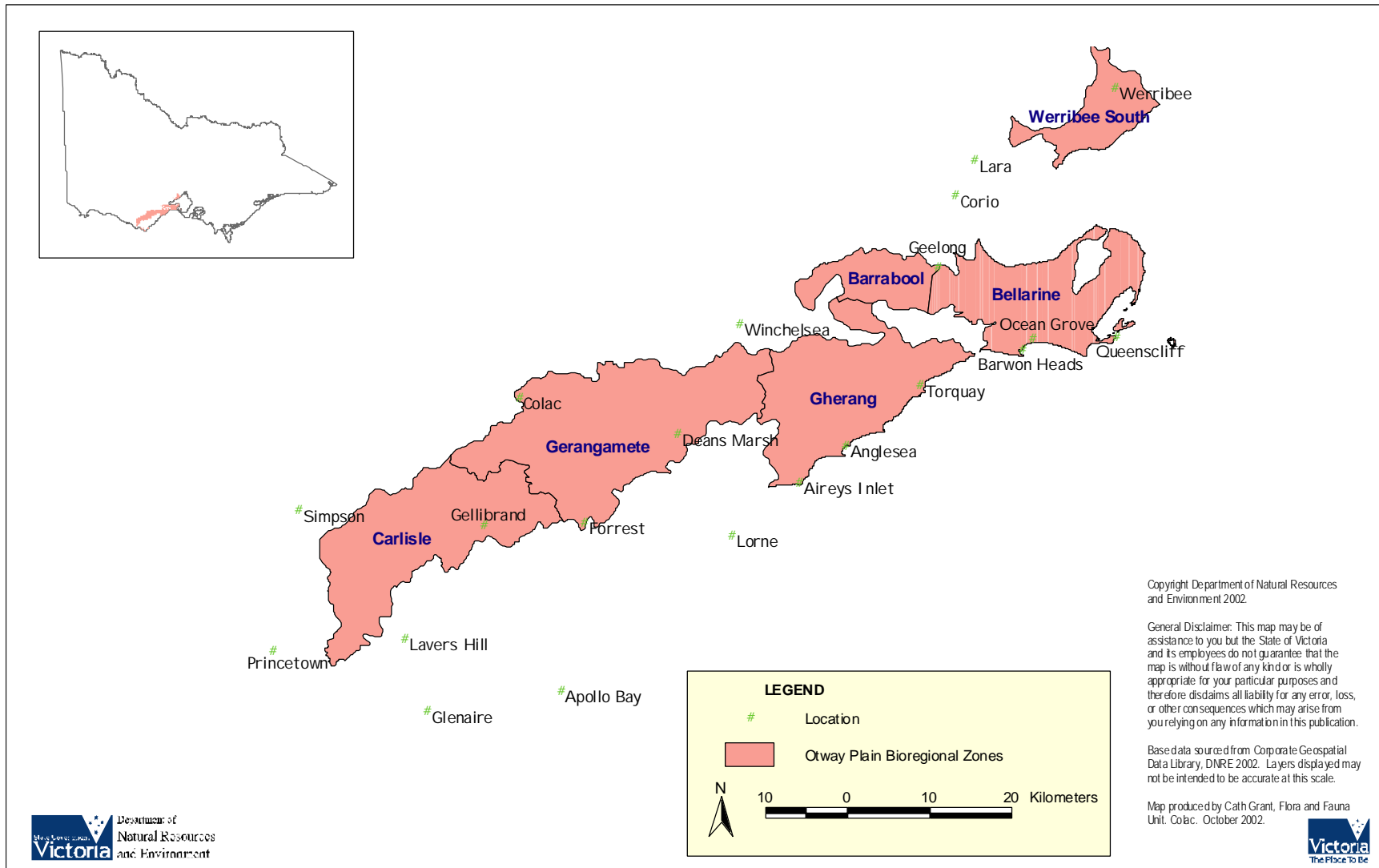
The **Strategic Overview** provides details of the framework and methodology used in developing bioregional biodiversity action planning (BAP) and an overview of the features and assets of the bioregion. Specific information on assets and priorities for actions within landscape zones is assembled in the **Landscape Plans**. Landscape plans include the native vegetation priorities identified in the regional Native Vegetation Plans (NVP) and identify the best options for restoring native vegetation to recover biodiversity at a more detailed scale than is possible in the NVPs. The biodiversity information provided in Landscape Plans is a resource input to **Local Area Plans**, or other planning processes such as Landcare plans, which may be developed through community engagement processes, and cover the range of natural resource issues.

1.1.8 Landscape zone selection

In considering biodiversity across broad regions (eg. >100 km wide), it is useful to define manageable sub-units (zones <100 km across) within which common features of landscape and biota are identifiable. This will also make it easier to identify the roles of local participants—land managers, stakeholders and the wider community in the conservation of biodiversity.

The Otway Plain bioregion has been divided into 6 smaller zones for landscape-scale action plans (Map 2) and are based largely on landscape, land-use and pre-1750 ecological vegetation class distribution. These zones are Carlisle, Gerangamete, Gherang, Barrabool, Bellarine and Werribee South. Two small outlying areas of the Otway Plain bioregion, found along the coast at Apollo Bay and from Cape Otway to Johanna, are located in the middle of the Otway Ranges bioregion. These outliers are therefore included in the Otway Landscape zone, which is one of the Otway Ranges bioregion zones.

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 2. Location of the local landscape zones within the Otway Plain bioregion

2. Aims

2. Aims

2.1 Aims of biodiversity action planning

2.1.1 Ultimate aim

The ultimate aim of biodiversity action planning is to achieve broad-scale conservation of native biodiversity in the bioregion.

2.1.2 Aims of this document

This Landscape Plan for the Otway Plain bioregion translates the principles and processes identified in Victoria's Biodiversity strategy (1997) to the *landscape* level.

The aims of this document are to:

- summarise the remaining biodiversity assets for each land tenure in the landscape zone;
- identify priorities for conservation and restoration of biodiversity;
- identify mechanisms for more efficiently conserving the bioregion's key biodiversity assets, including threatened vegetation communities, threatened taxa, wetlands and rivers;
- provide a resource for further biodiversity planning at increasingly finer scales, such as local areas; and
- assist communication and integration of conservation activities by private landholders, community groups, corporations and all levels of Government.

3. The Bioregional Landscape

3. The bioregional landscape

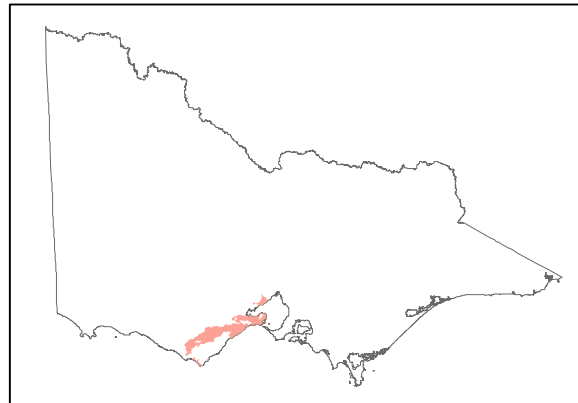
3.1 Location and administrative units

3.1.1 Bioregional overview

An extended summary of the Otway Plain bioregion, its natural and human assets, threats to these assets and management responses to conserve the assets is provided in the Otway Plain Bioregional Action Planning Strategic Overview (Duffy *et al.* 2002). Brief excerpts are given here to provide the bioregional context for the Barrabool Landscape Plan.

3.1.2 Location

The Otway Plain is located in south-west Victoria (Map 3) and covers approximately 238, 000 hectares (1% of the State). It extends from east of Princetown to the Bellarine Peninsula, and includes outlying areas at Werribee, Glenaire and Apollo Bay.



Map 3. Location of the Otway Plain bioregion

3.1.3 Surrounding bioregions

The Otway Plain bioregion is surrounded by the Victorian Volcanic Plain bioregion to the north and north-east, Warrnambool bioregion to the west, and Otway Ranges bioregion to the south-east (Map 1).

3.1.4 Administrative units

The majority of the bioregion falls within the Corangamite Catchment Management Authority (CMA) area, with a small section around Werribee falling within the Port Phillip and Westernport CMA (Map 4). The bioregion also overlays part or all of six Local Government areas, listed in the table below and seen in Map 5.

CMA/CALP regions	Local Government Areas
Corangamite CMA	Borough of Queenscliffe, City of Greater Geelong, Corangamite Shire, Colac Otway Shire, Surf Coast Shire
Port Phillip and Westernport CMA	City of Greater Geelong, Wyndham City

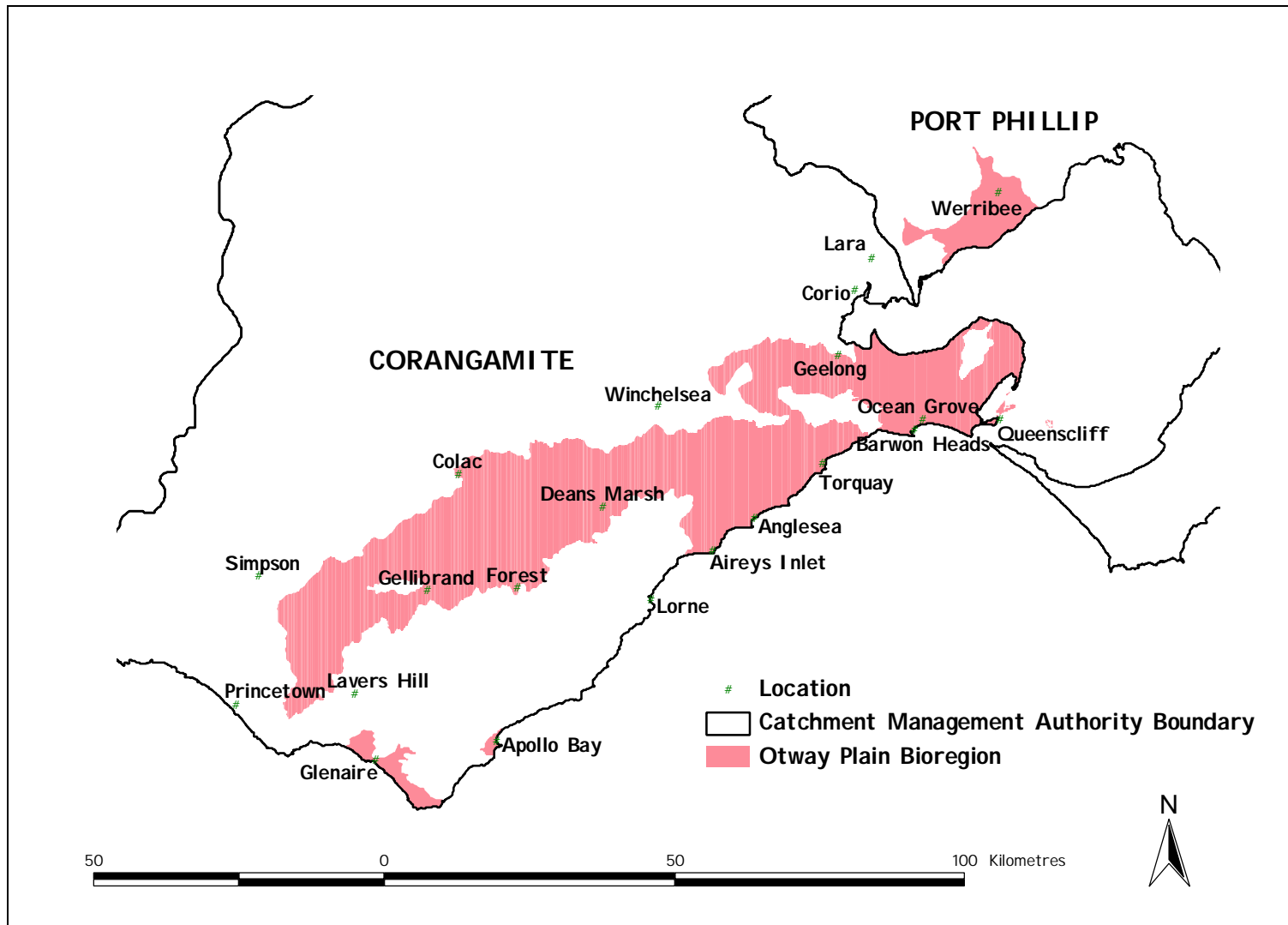
3. The bioregional landscape

3.1 Location and administrative units (cont'd)

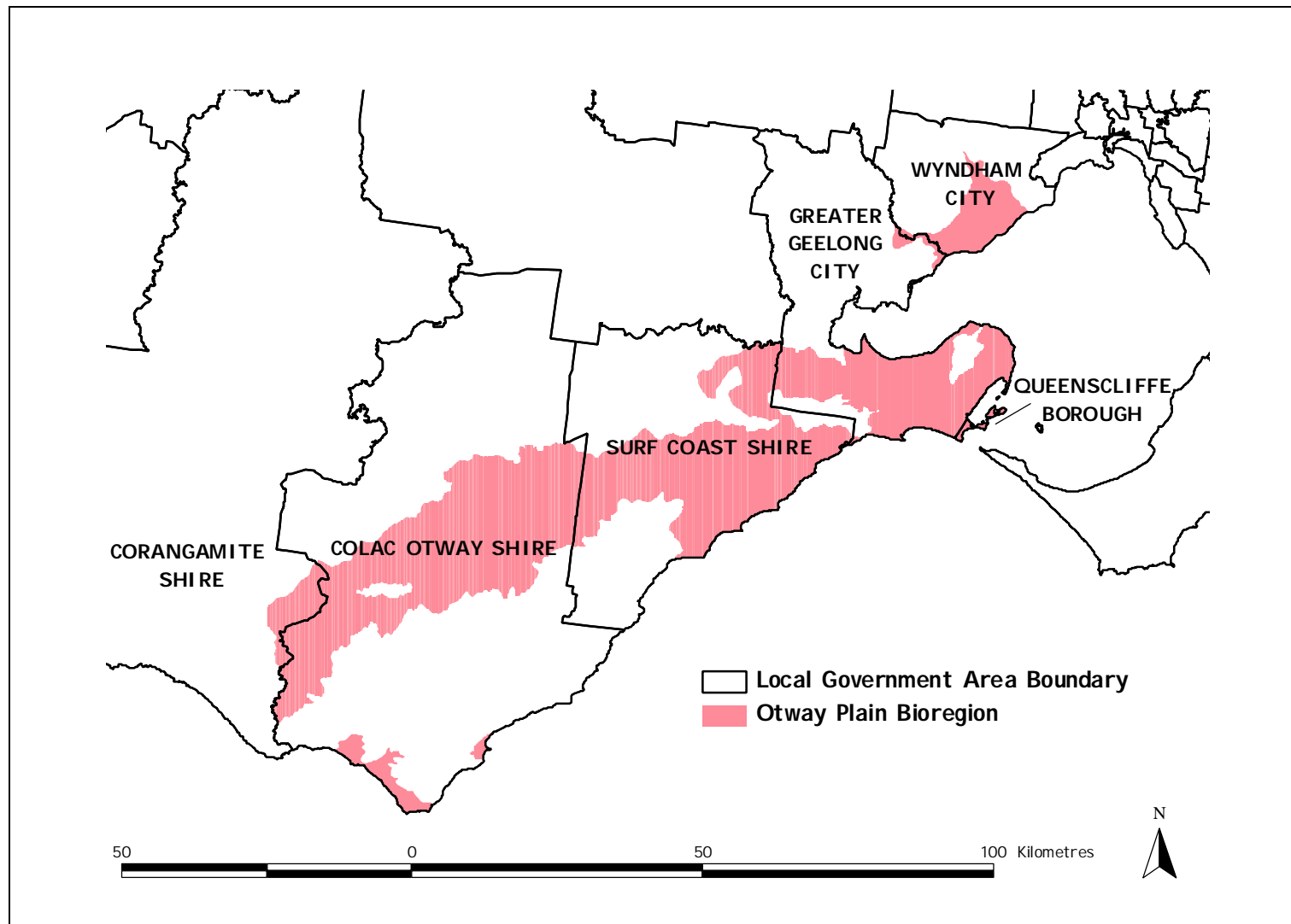
The bioregion includes parts of the Otway FMA and Midlands FMA and is covered by the West Victoria RFA. The Otway Plain bioregion is mostly administered by the West Coast and Port Phillip districts of Parks Victoria, although a small area extends into the Basalt Plains District.

There are approximately 34 Landcare groups in this bioregion, covering 6 different Landcare networks.

Major cities and towns in the bioregion include Colac, Apollo Bay, Anglesea, Torquay, Barwon Heads, Ocean Grove, Queenscliff, Geelong and Werribee.



Map 4. Location of Otway Plain bioregion, showing Catchment Management Authority areas



Map 5. Location of the Otway Plain bioregion, showing Local Government areas

3. The bioregional landscape

3.2 Physical features

3.2.1 Geology

The Otway Plain is dominated by flat to gently undulating plains of Tertiary deposits. Soil types and fertility vary across the bioregion. The soils of the western half of the bioregion are generally acidic and of variable fertility. The coastal plains around Anglesea have sandy soils of low fertility, while the volcanic soils of the Bellarine Peninsula and clay soils around Werribee are more fertile.

3.2.2 Landscape and landuse

The bioregion comprises a series of coastal plains, river valleys and foothills, mainly sedimentary in origin, extending from east of Princetown to the Bellarine Peninsula and Werribee, and surrounding the Otway Ranges. Since European settlement, there has been extensive clearing of all vegetation types, particularly those on the deeper, more fertile soils.

Seventy per cent of the bioregion is privately owned, and the major landuses on freehold are grazing, cropping and dairy farming. Impacts from salinity have limited agricultural development in some areas. The foothill forests support a minor forest industry based on timber, firewood and tea tree cutting (NRE 1997), and several blue gum and pine plantations have been established on private land in the western half of the bioregion. Brown coal is mined on leased public land near Anglesea, and there is a large sewage treatment facility at Werribee. Sub-divisions have developed strongly in a number of areas, especially in coastal areas and around Geelong and Werribee. Recreation is another major landuse of coastal areas.

3.2.3 Implications for biodiversity conservation

The Otway Plain is of high conservation value due to its remaining native vegetation cover (about 30%) and important wetland habitat. It has a high requirement for land protection and restoration work, particularly along degraded waterways.

Fire management plays an important role on biodiversity conservation, as historically wildfire has been an important feature of the bioregion. The heathy dry forest complexes that cover much of the bioregion have evolved with relatively frequent fires.

Subdivisions and coastal development require sound planning guidelines and strong voluntary conservation incentives in order to avoid an effective loss of biodiversity values through habitat degradation and fragmentation, eutrophication of waterways and increased urban runoff. Predation and disturbance from domestic cats and dogs is becoming a significant issue with the increase in intensive subdivision close to native vegetation remnants and wetland areas.

3. The bioregional landscape

3.2 Physical features (cont'd)

3.2.4 New and emerging landuse trends

There has been a marked increase in residential subdivisions in recent years, particularly in coastal areas. Current pressure from subdivision and urban development is particularly intensive within and surrounding the townships of Ocean Grove and Torquay. Tourism developments are also increasing, particularly along the coast around Apollo Bay and Lorne. Increases in visitor numbers to the Otway Plain are expected to continue over the next ten years, particularly in areas close to the Great Ocean Road, and a growth in nature based tourism is predicted (Connell Wagner 2001). The Department of Infrastructure is currently preparing a strategy for the Great Ocean Road Region which aims to identify future development needs, the regions in which future development should occur, and the areas in which further residential expansion should be minimised.

Raised-bed cropping is an emerging agricultural trend that is leading to the drainage of wetlands and the loss of native grassland remnants. Viticulture has also become more widespread, particularly in the Geelong and Bellarine Peninsula region, and broccoli farming has recently been introduced in the Geelong region.

Large-scale commercial forestry on private land by investor-funded companies is a growing land use; blue gums and Radiata Pine are the most commonly grown species. Smaller farm forestry enterprises of a range of hardwood species, including Sugar Gum and Spotted Gum, are also on the increase in the Otway Plain (L. Hamilton, *pers. comm.*). The growth of private forestry in the region is being encouraged through a new statewide strategy for the industry (NRE 2002c) and the Otway Agroforestry Network.

There is an increasing influx of new residents to the Otway Plain seeking 'lifestyle properties', including some absentee landholders that occupy these properties on a temporary basis. New property owners interested in nature conservation have created a demand for information and advice on environmental management and enhancement of these holdings.

The Werribee Plains – *A Vision for Sustainable Growth* initiative by the State Government will directly affect the way land is used in some areas of the Otway Plain bioregion in the future. This project, which was announced in August 2002, has the vision to create a major green region which will be renowned for sustainable agricultural, industrial and urban development, sustainable management of resources and a community culture based on sustainability (NRE 2002e). Within the Otway Plain bioregion the Werribee outlier and part of the Bellarine Peninsula fall within the area targeted for this project.

It is important to note that public land, and therefore public land management, within this bioregion may change from the current situation, as the Victorian Environment Assessment Council is reviewing all public land along the Anglesea to Princetown coast, and inland to Colac. A single large Otways National Park, and the inclusion of public land currently managed as State Forests for addition to existing or inclusion in new State Parks or conservation is being considered (VEAC 2003).

3. The bioregional landscape

3.3 Native vegetation

In structural terms, the pre-1750 vegetation of the bioregion was characterised by coastal heathlands and woodlands, and open heathy forests dominated by Brown Stringybark and Messmate. Dry sclerophyll forest dominated by Mountain Grey Gum and Messmate occurred around the Otway foothills. River Red Gum woodlands occurred along some drainage lines (NRE 1997). Today, large sections of the bioregion have been cleared of their original vegetation, particularly in the more fertile areas, and the remaining native vegetation in these areas has been extensively fragmented.

3.3.1 Type

The pre-European native vegetation of this bioregion can be characterised by the following Ecological Vegetation Class (EVC) groups (Map 6):

1. *Lower Slopes or Hills Woodlands – grassy*: Grassy Woodland
2. *Lowland Forest*
3. *Heathy Woodlands – dry and/or better drained*: Heathy Woodland, Heathy Woodland/Sand Heath Mosaic
4. *Plains Grassy Woodlands or Forests – freely draining*: Plains Grassy Woodland, Stony Rises Herb-rich Woodland
5. *Riparian and/or Swampy Scrubs or Woodlands* – Riparian Scrub Complex, Swampy Riparian Woodland, Swamp Scrub, Wet Sands Thicket, Stream-bank Shrubland
6. *Riverine Grassy Woodlands or Forests – creekline and/or swampy*: Floodplain Riparian Woodland, Sedgy Riparian Woodland, Floodplain Reedbed, Creekline Grassy Woodland
7. *Dry Forests – sheltered and/or high altitude*: Herb-rich Foothill Forest, Grassy Forest, Shrubby Foothill Forest, Shrubby Dry Forest
8. *Coastal Scrubs, Grasslands and Woodlands* – Calcarene Dune Woodland, Coastal Headland Scrub, Coastal Dune Scrub Mosaic, Coastal Tussock Grassland

3.3.2 Extent

Native vegetation now covers around 31% of the Otway Plain bioregion. Modelling of pre-1750 native vegetation indicates 48 different ecological vegetation classes would have been present. Forty-seven of these have been identified in extant native vegetation. About 6% of this extant native vegetation is Endangered, 11% Vulnerable, 48% Depleted and 1% Rare in the Bioregion (Map 7, Table 1). Details of extant EVCs for the Otway Plain bioregion are listed in Appendix 1.

Table 1. Definition of conservation status of native vegetation

Status	Definition*
<i>Endangered (E)</i>	On verge of extinction. 90% or more cleared. Less than 10% of its pre-European (1750) extent remains.
<i>Vulnerable (V)</i>	Moving towards extinction. 70% or more has been cleared. 10-30% of its pre-European (1750) extent remains.
<i>Depleted (D)</i>	Likely to become threatened if clearing or other threatening processes continue. 50-70% has been cleared. 30-50% of its pre-European (1750) extent remains.
<i>Rare (R)</i>	Vegetation that is inherently rare and naturally restricted in range. Total range less than 10 000 ha, and/or area less than 1000 ha, and/ or patch size < 100 ha.
<i>Least Concern (LC)</i>	More than 50% of pre-European (1750) extent remaining.

* this is a brief definition only – see Appendix 2 and Victoria's Native Vegetation Management: A Framework for Action (NRE 2002a) for the full version.

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

3. The bioregional landscape

3.3 Native vegetation (cont'd)

The remaining native vegetation in the bioregion by conservation status and tenure can be seen in Table 2 and Figure 3.

Table 2. Proportions of native vegetation in each tenure and each conservation status in the Otway Plain bioregion (as at June 2002).

Conservation status – native vegetation	Endangered	Vulnerable	Depleted	Rare	Least Concern	Cleared / unknown	Total Area Native Vegetation	Total area (ha)
Conservation Reserve (C)	2% (8%)	17% (46%)	28% (16%)	1% (42%)	43% (33%)	9% (1%)	91% (25%)	19955 (8%)
Special Protection Zone (S)	0% (0%)	6% (8%)	37% (11%)	2% (37%)	54% (21%)	0% (0%)	100% (14%)	9999 (4%)
Other Public land (O)	2% (19%)	4% (19%)	35% (40%)	0% (7%)	17% (26%)	42% (10%)	58% (31%)	38946 (16%)
Private (P)	2% (72%)	1% (26%)	7% (32%)	0% (13%)	3% (19%)	88% (88%)	12% (29%)	167610 (71%)
Unknown (U)	5% (2%)	5% (1%)	15% (1%)	0% (0%)	7% (0%)	68% (1%)	32% (1%)	1314 (1%)
Total area in bioregion (ha)	4109 2%	7528 3%	34046 14%	649 0%	25627 11%	165865 70%	71310 30%	237824

% = percent of each tenure of each conservation status (across)

(%) = percent of each conservation status in the bioregion in each tenure (down)

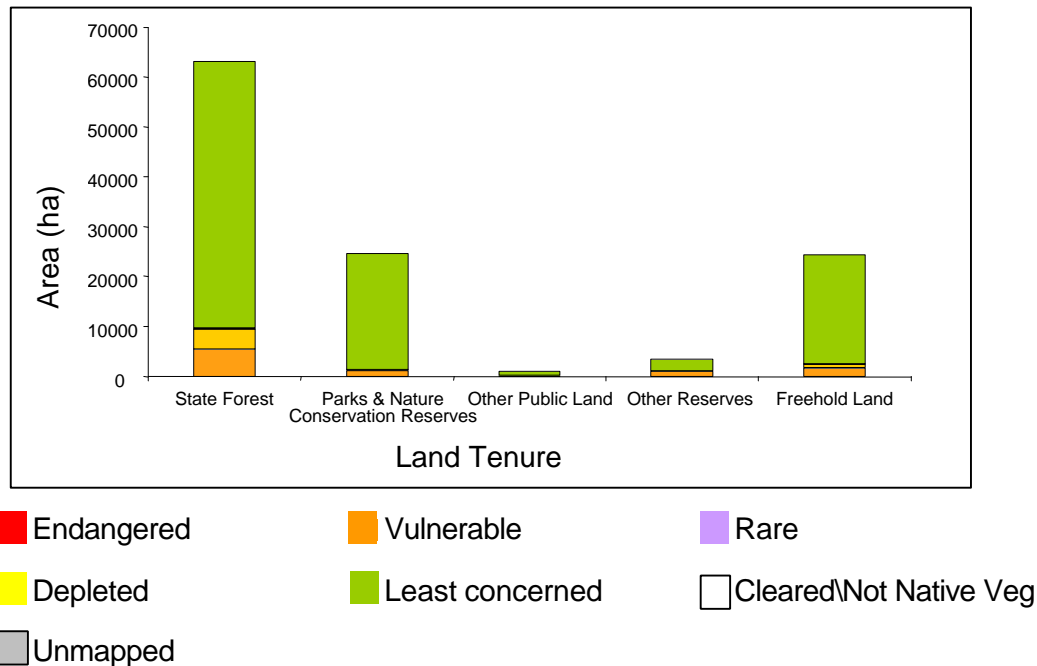
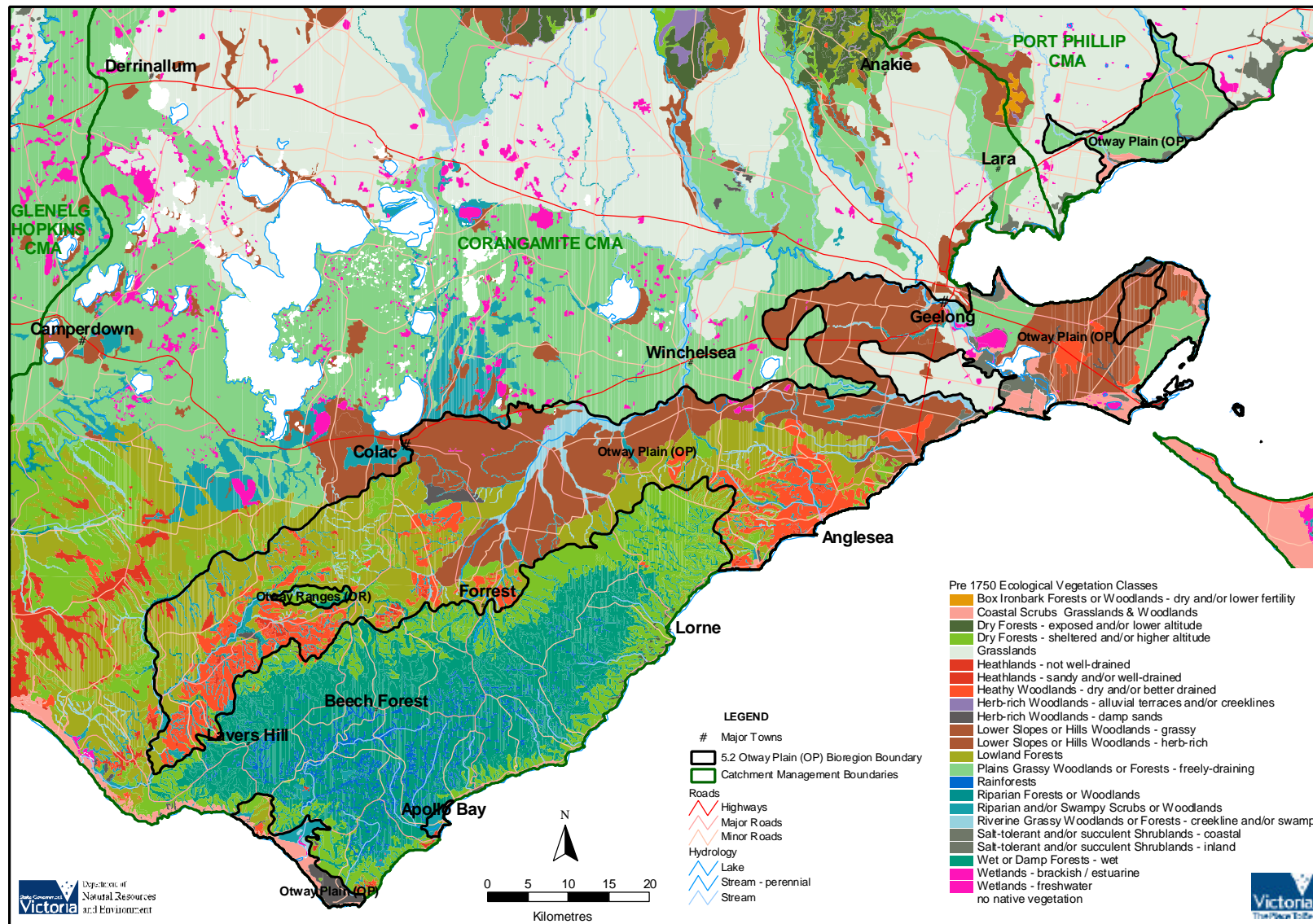


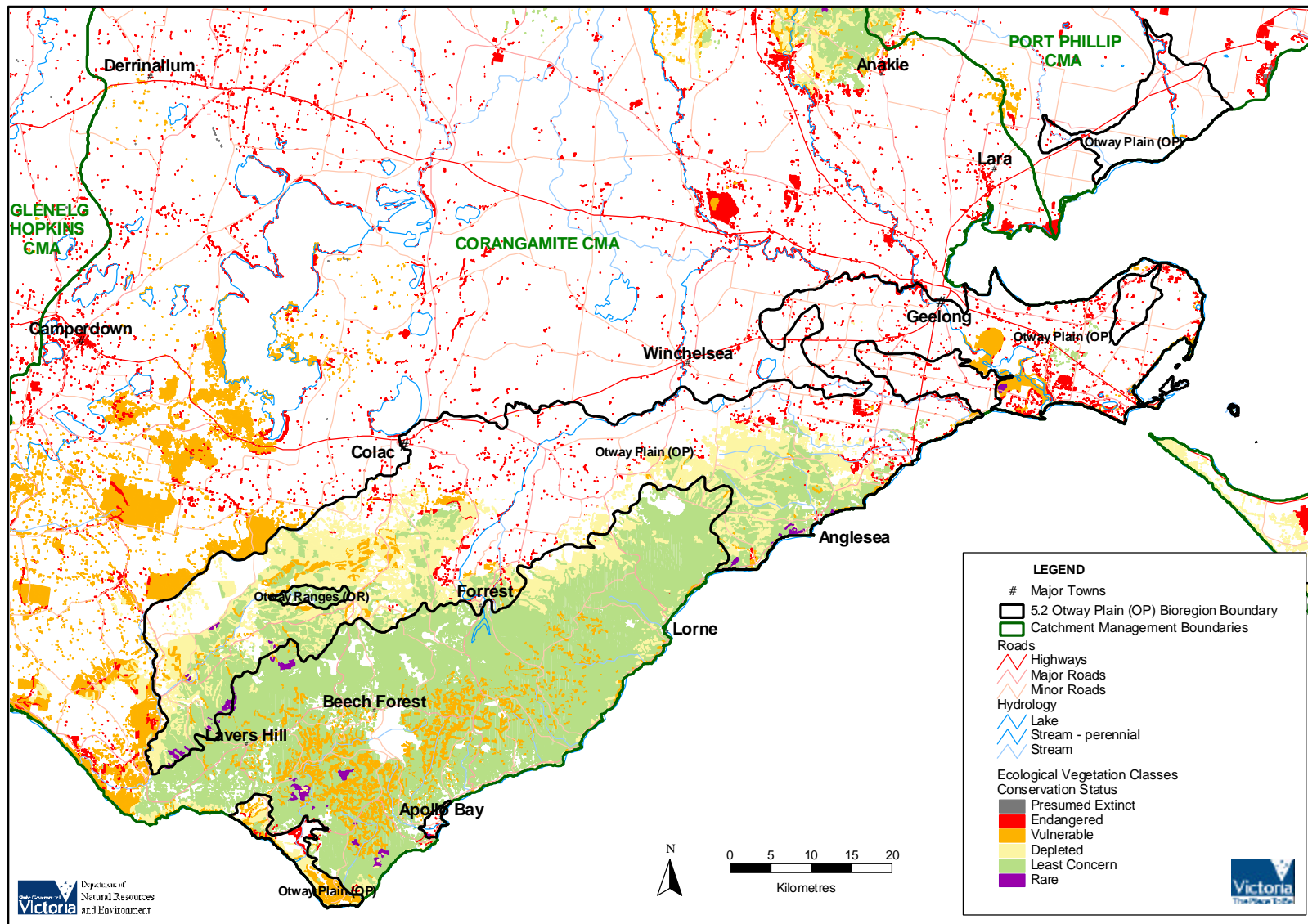
Figure 3. Remaining native vegetation area in the Otway Plain bioregion, by conservation status and tenure (as at June 2002).

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 6. Generalised pre 1750 Ecological Vegetation Class (EVC) groups within the Otway Plain bioregion

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 7. Conservation status of the current Ecological Vegetation Classes of the Otway Plain bioregion

3. The bioregional landscape

3.4 Threatened flora and fauna

3.4.1 Threatened flora and fauna

Two species of fauna which have been recorded in the bioregion are extinct, whilst of the remaining flora and fauna species, 118 flora species are considered rare or threatened, and 74 fauna species are considered near threatened or threatened in the Otway Plain bioregion. Of the 87 plants there are 55 Monocotyledons, 60 Dicotyledons, 1 Ferns and Allies and 2 Mosses (Table 3) (NRE 2002d). Of the 74 fauna species, there are 9 mammals, 57 birds, 4 reptiles/amphibians, 3 fish and 1 invertebrates (Table 4) (DSE 2003). The definition of Victorian flora and fauna threat categories can be found in Appendix 3a.

Of all threatened species in Victoria, 11% have been recorded in the bioregion (Parks Victoria 2001). The full list of the rare, near threatened or threatened species, including species that have been deemed data deficient, for the bioregion is provided in Appendix 3b & 3c.

Table 3. Number of threatened flora by threatened conservation status and by division in the Otway Plain bioregion (as at November 2002, NRE 2002d).

Division	Extinct	Critically endangered	Endangered	Vulnerable	Rare	Grand total	FFG Listed
Dicotyledons			7	14	26	47	5
Ferns and Allies					1	1	
Monocotyledons			5	14	20	39	3
Mosses							
Flora Total			12	28	47	87	

Table 4. Number of threatened fauna by threatened conservation status and by taxonomic group in the Otway Plain bioregion (as at November 2002, DSE 2003).

Division	Extinct	Critically endangered	Endangered	Vulnerable	Near Threatened	Grand total	FFG Listed
Amphibians			1			1	1
Birds		5	14	21	17	57	35
Fish		1		1	1	3	3
Invertebrates				1		1	
Mammals	2		4	1	4	11	5
Reptiles			1	1	1	3	2
Fauna Total	2	6	20	25	23	76	46

3.4.2 Threatened flora and fauna assessed in the BNA

The following sections list number of individual species classified in the Bioregional Network Analysis (BNA), which is a subset of all known threatened species in the bioregion (Lowe et al. 2000). Table 5 & 6 outlines the number of fauna and flora species respectively in each BNA category for the Otway Plain bioregion. Further details on the full list of species assessed in the BNA analysis, are given in Appendix 4a, 4b & 4c.

3. The bioregional landscape

3.4 Threatened flora and fauna (cont'd)

Table 5. Number of fauna species in each BNA category for the Otway Plain bioregion

		RISK RANKING IN BIOREGION			Total	
		More Concern		Less Concern		
		A	B	C		
Occurrence	More Important	1	7	5	2	14
		2	5	3	1	9
	Less Important	3	3	6	1	10
		4	2	2	1	5
Total			17	16	5	38

NB: There were 64 fauna species, which were not assessed for the BNA analysis for the Otway Plain bioregion (see Appendix 3c for details).

The following lists represent threatened fauna in categories '1A', '1B' and '1C' as a result of the Bioregional Network Analysis. These are characteristic species for the bioregion.

1A, 1B, 1C Threatened birds in the bioregion (total = 12)

Australasian Bittern	<i>Botaurus poiciloptilus</i>
Blue-billed Duck	<i>Oxyura australis</i>
Caspian Tern	<i>Sterna caspia</i>
Fairy Tern	<i>Sterna nereis</i>
Grey Goshawk	<i>Accipiter novaehollandiae</i>
Ground Parrot	<i>Pezoporus wallicus</i>
Hooded Plover	<i>Thinornis rubricollis</i>
Orange-bellied Parrot	<i>Neophema chrysogaster</i>
Pied Cormorant	<i>Phalacrocorax varius</i>
Powerful Owl	<i>Ninox strenua</i>
Rufous Bristlebird (Otways)	<i>Dasyornis broadbenti caryochrous</i>
White-faced Storm-petrel	<i>Pelagodroma marina</i>



White-faced Storm-Petrel (Photo: Menkhurst/NRE, Viridians Biological Database)

3. The bioregional landscape

3.4 Threatened flora and fauna (cont'd)

1A, 1B, 1C Threatened mammals in the bioregion

(total=1)

Swamp Antechinus

Antechinus minimusSwamp Antechinus
(Photo: Menkhorst NRE,
Viridians Biological
Database)

1A, 1B, 1C Threatened fish in the bioregion (total=1)

River Blackfish

Gadopsis marmoratus

Table 6. Number of flora species in each BNA category for Otway Plain bioregion

		RISK RANKING IN BIOREGION			Total	
		More Concern	←————→	Less Concern		
		A	B	C		
Occurrence	More Important	1	4	3	0	7
	↑	2	2	2	1	5
		3	2	4	0	6
	Less Important	4	1	0	0	1
Total			9	9	1	19

NB: There were 103 flora species, which were not assessed for the BNA analysis for the Otway Plain bioregion (see Appendix 3b for details).

The following lists represent threatened flora in categories '1A', '1B' and '1C' as a result of the Bioregional Network Analysis. These are characteristic species for the bioregion.

1A, 1B, 1C Threatened Shrubs in the bioregion (total=2)

Anglesea Grevillea

Grevillea infecunda

Glenelg Pomaderris

Pomaderris halmaturina ssp. continentis

1A, 1B, 1C Threatened Ground Layer plants in the bioregion

(total=5)

Dense Leek-orchid

Prasophyllum spicatum

Otway Midge-orchid

Corunastylis sp. aff. nudiscapum

Merran's Sun-orchid

Thelymitra merraniae

Red-beard Midge-orchid

Corunastylis sp. aff. morrisii

Southern Spider-orchid

Caladenia australisMerran's Sun-orchid (Photo:
Clive Trigg, Viridians
Biological Database)

3. The bioregional landscape

3.5 Wetlands

3.5.1 Wetlands

Wetlands (freshwater, saline and estuarine) are an important natural feature of the Otway Plain. They are important for conservation of many species, the ecosystem services they provide, including social and economic benefits and for cultural and spiritual reasons. The wetlands of Port Phillip Bay (Western Shoreline) and the Bellarine Peninsula are listed as a site of international importance under the Ramsar Convention due to their relatively natural state, their importance as habitat for migratory birds, and sites of geomorphological significance. Sections of these wetlands (Werribee-Avalon area, Lake Connewarre State Wildlife Reserve, Swan Bay and Swan Island, and Mud Islands) are also listed in the Directory of Nationally Important Wetlands (Environment Australia 2001), along with the Aire River and Lower Aire River Wetlands.

There are several wetlands on private land, which are generally small and vulnerable to grazing and drainage. Seasonal wetlands such as shallow freshwater marshes have been significantly reduced in number, size and quality because of agricultural practices associated with draining, clearing and grazing. By comparison, the number and area covered by permanent open freshwater wetlands has increased as a result of the creation of farm dams for agriculture. The Corangamite CMA is currently surveying to assess the condition and biodiversity values of wetlands in selected catchments.

Numerous threatened species that occur in the bioregion are dependent on wetland habitat, key examples include Orange-bellied Parrot, Brolga and Wavy Swamp Wallaby-grass.

3. The bioregional landscape

3.6 Rivers

3.6.1 Rivers

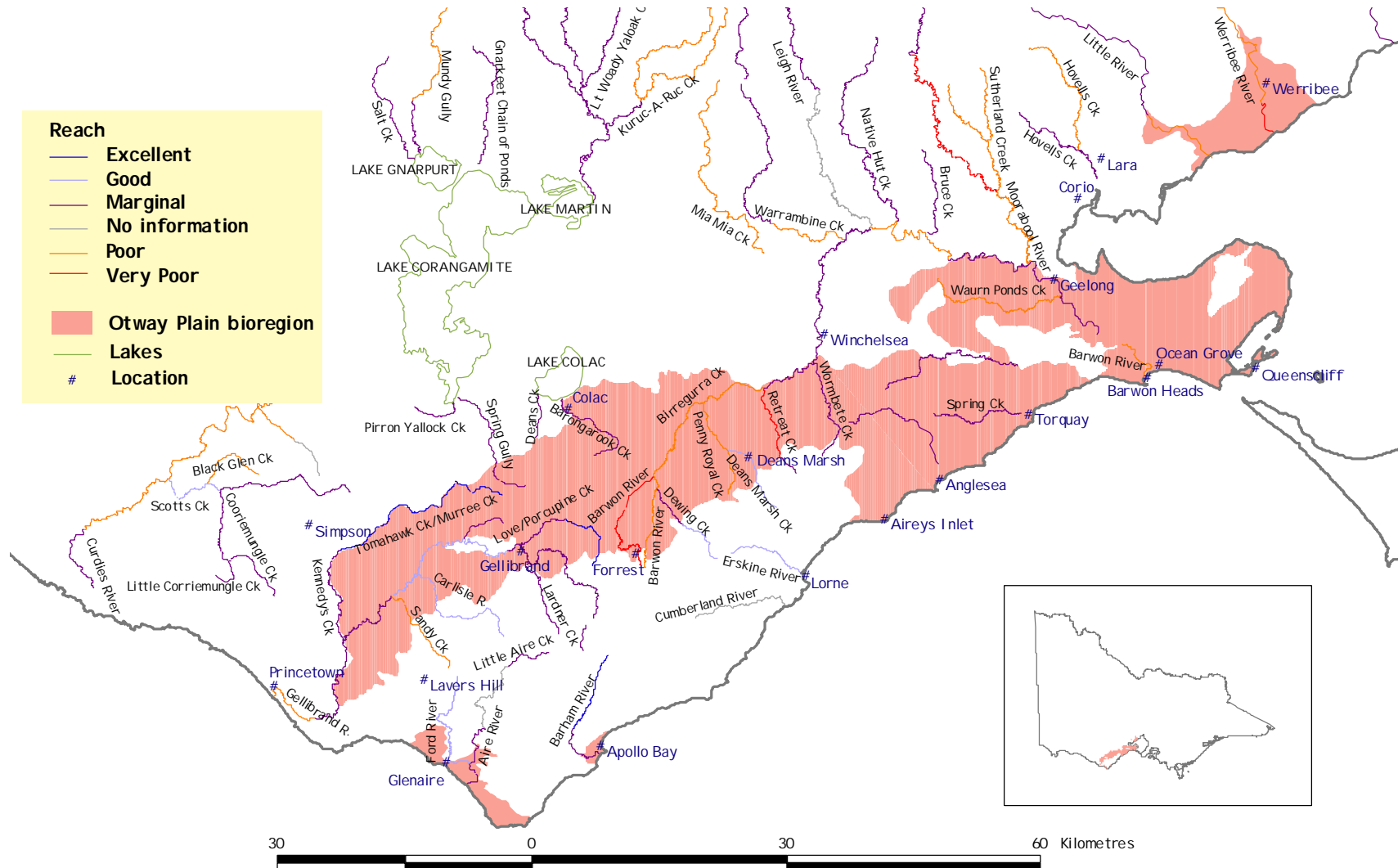
Five major river systems pass through the Otway Plain - they have been assessed for the biophysical condition using the Index of Stream Condition and are generally in marginal or poor condition (Table 7, Map 8). Few reaches are in good or excellent condition principally due to the loss of native riparian vegetation, siltation from accelerated erosion, nutrient run-off from agricultural land, and the alteration of natural flow regimes. Most banks have been denuded of native vegetation and replaced by introduced pasture grasses, willows and Gorse. Many are unfenced and subject to grazing by domestic stock.

The Aire River has been identified as a Victorian Heritage River (LCC 1991). As part of the Waterway Health Strategy for Corangamite CMA, the condition of waterways in the Corangamite CMA area is currently being assessed against the criteria for ecologically healthy rivers (sensu River Health Strategy, NRE 2002b).

Table 7. Index of Stream Condition for each catchment running through the Otway Plain bioregion (% of stream length) (not all reaches listed in this table occur in the bioregion).

	<i>Excellent</i>	<i>Good</i>	<i>Marginal</i>	<i>Poor</i>	<i>Very Poor</i>
Otway	8	14	38	22	0
Barwon	0	7	39	33	15
Corangamite	0	0	74	26	0
Moorabool	0	0	29	52	18
Werribee	8	16	22	37	9

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 8. Otway Plain bioregion showing Index of Stream Condition (1999)

3. The bioregional landscape

3.7 Condition of the Otway Plain landscape

Before European settlement, there were over 40 ecological vegetation classes (EVCs) in the Otway Plain bioregion. The most abundant EVCs were Grassy Woodland (79,131 ha), Lowland Forest (56,825 ha) and Heathy Woodland (26,526 ha). Lowland Forest, though reduced to about 47% of its original area, is today the most extensive EVC (26,992 ha) in the bioregion, followed closely by Heathy Woodland (21,807 ha) which has only been reduced to 82% of its original area. Grassy Woodland has been the most heavily reduced EVC, now covering only 2,025 ha (3% of original).

About 73,780 ha (about 69%) of the bioregion has been cleared of its original vegetation. Most of this cleared land is privately owned, and used for agricultural production. However, there are still significant areas of native vegetation remnants occurring on private land, particularly in the west of the bioregion. These remnants provide habitat linkages between larger public land blocks, and act as a buffer against edge effects where they adjoin public land.

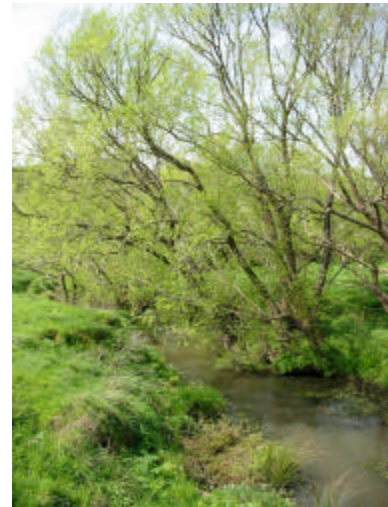
Creeklines on private land are generally degraded, although some retain significant biodiversity values in localised parts of the bioregion due to their riparian vegetation and instream habitat.

Large public land blocks support the vast majority of remaining native vegetation in the bioregion. These blocks are mainly within two of the zones (Carlisle and Gherang) and consist variously of State Forests; National, State or Regional Parks; Nature Conservation Reserves; Natural Features Reserves; and other Crown Land reserves. Significant existing or potential threats to biodiversity values, resulting from human activities occurring on or near these blocks, include timber and firewood harvesting, grazing, cropping, residential subdivision, development of infrastructure, off-road vehicle use, feral animals, pest plants, and inappropriate fire regimes.

Other public land tenures important for their strategic connective potential across the rural landscape include roadsides, Public Land Water Frontage Reserves and unreserved stream frontages. These mostly linear remnants are often highly degraded, particularly by overgrazing, weed invasion, and an associated lack of natural plant regeneration. Salinity, siltation, nutrients, altered flow regimes, erosion and other disturbances are additional threats that degrade aquatic ecosystems. Roadside habitat values are frequently diminished by mowing or slashing, grazing, road-making and road maintenance activities, firewood removal, inappropriate burning, loss of understorey, and fragmentation of tree cover. The most important value of these linear remnants in the Otway Plain bioregion is the presence of mature trees, and the continuity of canopy and shrub cover provided by this resource.

Major environmental issues in the Otway Plain bioregion include:

- clearing of remnant vegetation
- degradation of waterways and wetlands through increased nutrients, sedimentation, bank destabilisation and salinity
- residential subdivisions and tourism development in ecologically sensitive areas



Willow infestation along waterways in the Otway Plain bioregion (Photo: DSE, Colac)

3. The bioregional landscape

3.7 Condition of the Otway Plain landscape

- weed invasion
- predation of native wildlife by foxes and cats
- lack of regeneration in remnant vegetation due to grazing
- drainage of wetlands
- alterations of natural flow regimes
- inappropriate fire regimes
- fragmentation of habitats through incremental clearing
- loss of mature and hollow-bearing trees
- impacts from recreational use of forests, wetlands and coastal areas
- Cinnamon Fungus



Lack of regeneration of remnant vegetation due to grazing within the Otway Plain bioregion (Photo: DSE, Colac)

4. Guiding principles for biodiversity action

4. Guiding principles for biodiversity action

4.1 Goals at the landscape-scale

This section provides summaries of the principles which can guide action to conserve native biodiversity. Further detail on each aspect is provided in Duffy *et al.* (2002).

4.1 Goals at the landscape-scale

In order of priority:

- protect viable remnant habitats, and the flora and fauna populations they contain;
- manage to enhance the condition of these remnant habitats; and
- restore at least some of their former extent by revegetation, re-introduction or re-installing water regimes.

Also use the principles in the Native Vegetation Management Framework (NRE 2002a) and the River Health Strategy (NRE 2002b); which include:

- protection and enhancement of remnant habitat and populations is the primary way to conserve biodiversity across the landscape;
- all native vegetation, natural wetlands and rivers have some value; an adequate proportion of each type must be managed principally for conservation;
- all viable habitats and populations of threatened species should be protected through voluntary and regulatory means;
- large natural areas of remnant vegetation are of fundamental importance for nature conservation and are irreplaceable; all other things being equal large remnants are inherently more valuable than groups of small patches that total the same area;
- multiple patches of the same vegetation community should be retained or enhanced across the landscape;
- position in the landscape affects their conservation value;
- natural is best; restoration of an asset through revegetation or re-introduction is unlikely to return the asset to its original condition with all of its inherent ecological processes and resilience; and
- restoration should be targeted to areas which maintain natural resilience / restoration efforts should harness natural resilience.

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

Protection - reservation, covenants, management agreements, statutory planning and fencing.

Enhancement - management by controlling threats such as weeds, introduced predators, inappropriate/uncontrolled grazing by stock and native animals, salinity, and encouraging natural regeneration and revegetation of the understorey.

Restoration - revegetation to create corridors, buffers, patches of habitat, reintroduction of individual plants and animals into depleted populations.

4. Guiding principles for biodiversity action

4.2 Landscape-scale mechanisms

Previous sections have described the state of the natural assets of the bioregion, and the tools that are available to provide information about these assets and assist with planning, priority setting and decision making. This part covers what actions are needed to protect, enhance and restore the assets. The actions are organised according to the mechanisms and institutional arrangements in place to assist this (to support understanding of the accountabilities).

It includes the:

- *protection* mechanisms - conservation reserves, forest planning, local government planning, covenants, Land for Wildlife and incentives including fencing for stock and pest animal exclusion;
- *enhancement* mechanisms - Flora & Fauna Guarantee Action Statements, Threatened Species Recovery Plans, public land management planning, Regional Catchment Strategies, research on market instruments and agricultural systems and incentives; and
- *restoration* mechanisms - native vegetation planning, regional action plans, community education and Landcare activities and incentives.

The institutional arrangements that deliver these mechanisms include:

- public land - Parks and Reserves, State Forest, Crown Land;
- local Government;
- private landholders; and
- Catchment Management Authorities.

4. Guiding principles for biodiversity action

4.3 Identifying viable remnants for protection – documentary sources

Identifying key remnants, river reaches and wetlands for protection is essential. A number of documents may help:

- DSE maps showing locations for rare and threatened species;
- DSE maps showing the conservation significance of Ecological Vegetation Classes;
- DSE BioSites database;
- DSE maps of the Index of Stream Condition;
- studies of the flora, fauna and biodiversity significance of rail corridors, rail trail reserves, and of shire and VicRoads roads;
- Victorian Environment Assessment Council (formerly Environment Conservation Council and Land Conservation Council) recommendations;
- park and other conservation reserve management plans;
- DSE Forest Management Plans;
- environmental impact assessments for proposed developments;
- consultant's reports on particular sites, commissioned by landholders/managers, especially by larger landholders for some of their blocks;
- assessments covering public and private land such as studies of Sites of Zoological Significance and Botanical Significance; and
- reports of field naturalists clubs and other environmental groups.

These sources of information have been used to summarise the key assets and actions in the later sections of this document.

4. Guiding principles for biodiversity action

4.4 Identifying viable remnants for protection – field assessment techniques

Once the 'desk-top' analysis of what biodiversity assets occur in a landscape, field assessments may be needed to determine the conservation significance of a remnant, river reach or wetland. Some of these field assessment techniques include:

- *Using habitat hectares.* The habitat hectare approach provides a consistent approach to rating the vegetation quality of remnants. Quality is critical for many species.
- *Patch size.* Bigger patches hold more species and more individuals, and bigger populations are less likely to die out. These can be identified from maps, aerial photos and local knowledge.
- *Presence of rare or threatened species, or focal species, or unmapped patches of high conservation status ecological vegetation classes.* The DSE databases are incomplete, and local knowledge of where species or patches or native vegetation occur is a good indicator of important remnants.
- *Mapping remnant vegetation that has not been detected in the Ecological Vegetation Class (EVC) mapping.* For example, native grasslands are not easily detected in the satellite imagery that is used in mapping EVCs.
- *The habitat quality of river reaches was assessed for the Index of Stream Condition in broad quality classes before the habitat hectares technique was available.* Field assessments of the river reaches may be required.

4. Guiding principles for biodiversity action

4.5 Where to focus restoration efforts

Restoration of biodiversity assets needs to be guided by some simple principles so that our efforts can be targeted rather than spread thinly (and hence less effectively) across the landscape. Some guiding principles include:

- *Restoring and reconnecting sites in the best condition.* Sites with mature trees, a native ground layer, diverse structure and flora will support more biodiversity. Restoration should be focussed around groups of remnants of high conservation significance close to each other. Similarly, reaches of streams in best condition provide for in-stream and riparian restoration.
- *The “lowest cost” options.* Experiment with reducing grazing (by native and introduced herbivores and stock) to see if natural regeneration occurs – this is a cheaper means for restoration compared with revegetation.
- *Priority taxa.* Priority should go to actions for taxa with existing recovery plans, and for those which may have a strong influence on the *quality* of the vegetation community with which they are associated.
- *Endangered and Vulnerable ecological vegetation classes.*
- *Focal species.* DSE has produced a list of bird species and their requirements for habitat size and quality. Those with more demanding requirements and typical of the area make good focal species for management efforts. Managing the area for one or more focal species will provide for a wide range of other species associated with those conditions.

Increase the size of patches of remnant vegetation. Some key thresholds relevant to this zone are shown in Table 8.

Table 8. Thresholds for 30% probability of species being present for the Otway Plain bioregion (from Appendix 5).

Species	Patch size	Patch quality*	Patch connectivity
New Holland Honeyeater	0 – 3 ha	Habitat complexity ≥ 11	not isolated (< 200m from like habitat)
Grey Currawong	3-10 ha	Habitat complexity > 13	semi-isolated (approx. 200m from like habitat)
White-throated Treecreeper	100 – 400 ha	Habitat complexity > 13	not isolated (< 200m from like habitat)

*Habitat quality score: <6 = heavily disturbed, >12 = close to natural.

These values can be used when planning on-ground enhancement and restoration works. For example, changing the grazing management of a remnant so that the patch quality is increased above a score of 11, increases the chances of the New Holland Honeyeater using the remnant. By also removing weeds and replanting particular plant species to increase the size of the patch, the score can be increased above 11 and so does the chance of the Grey Currawong using the remnant.

4. Guiding principles for biodiversity action

4.5 Where to focus restoration efforts (cont'd)

A range of other species, such as the White-throated Treecreeper are very unlikely to be found in patches less than 100 ha in area. Patches of this size can be restored to the landscape by fostering habitat regeneration between neighbouring smaller patches - once the area threshold is achieved the treecreeper is more likely to use the patch. Griffioen *et al.* (2002) showed the relationship between the number of bird species likely to occur in a remnant and the size or habitat quality of the remnant for this bioregion.

- Increase corridors and stepping stones. This makes it easier and safer for species to move across the landscape, and therefore both withstand catastrophic events and recover from them. When designing wildlife corridors it has been found that most bird species would use corridors if they were at least 27m in width. Corridors narrower than this did not support the full range of native bird species and noxious species like Noisy Miners were able to dominate narrow corridors.
- Increase tree cover. Tree cover is a good predictor of the number of woodland bird species. Below 10% tree cover bird species decline is rapid and exponential. 10% tree cover should be a *minimum* goal in productive rural landscapes.
- Provide buffers around remnant vegetation. This protects from unseasonal or extreme weather, invasion by weeds, colonisation by introduced predators, and run-off of soil into wetlands and streams, as well as providing additional habitat.

4. Guiding principles for biodiversity action

4.6 Guidelines for revegetation

An EVC Guide is currently being prepared for the Corangamite region in a joint project with the Corangamite CMA, DSE/DPI and key community contacts. This guide will be a user friendly interactive computer based product, and will include information on the native vegetation that occurs in the region, a guide to self assessment of EVC identification and quality, list key threatening processes for each EVC and produce appropriate revegetation species lists for each EVC.

5. Asset **summary**

5. Asset summary

5.1 Explanation of asset summaries

5.1.1 Explanation of asset summaries and recommended actions

For the Barrabool zone, an *asset summary* has been compiled with the following information:

- land tenure type and details;
- land manager and stakeholders;
- threatened biodiversity assets;
- actions to protect existing remnants;
- management to enhance remnants for threatened taxa;
- actions to restore strategic tracts of vegetation; and
- other policies, plans or programs supporting the recommended actions.

For threatened biodiversity assets, the codes used in brackets are:

- Conservation status Aust - upper case, Vic - lower case; followed by
- BNA priority / risk rankings for threatened taxa = 1A, 2B, etc., or un - unranked).

Each asset summary presents information on key biodiversity assets (that is, both significant remnants and significant taxa), management or stewardship responsibilities pertaining to these assets, and actions recommended to protect and conserve them. The following sections (5.1.2 to 5.1.10) correlate with the above items of the asset summary, and explain how details are compiled.

Sub-section 6.2, is a summary of *priority* biodiversity actions for this landscape zone.

5.1.2 Land tenure type and details

A major aim of the plan is to focus on the management of threats to biodiversity *across* land tenures. This requires some understanding of the relative significance of biodiversity values and environmental threats on each land tenure type, to permit identification of priorities for conservation effort.

Owners and managers of particular land tenures need to be able to identify their potential role in biodiversity conservation within their district or region—not just on the land they manage but also with respect to adjacent tenures. To encourage this breadth of vision, asset summaries (Chapter 6) were organised primarily on the basis of land tenure. For each land tenure category, available details are provided of the relative coverage of the tenure, configuration of the landscape, status of vegetation remnants, and other attributes or significant features of the land involved.

5. Asset summary

5.1 Explanation of asset summaries (cont'd)

The interpretation of taxon occurrence on land tenure was necessarily based heavily upon records from DSE databases. At the mapping scale used (1:100,000), and considering that the records originate from many different Atlas contributors, the accuracy of this process has appreciable limits. Records of taxa occurring on most tenures (such as Parks and Reserves, State Forests and Public Land Water Frontage) presented little confusion. However, difficulty in determining tenure was sometimes encountered with records originating on or near boundaries between roadsides and freehold land. In these cases, the likely tenure for the record has been determined on the basis of local knowledge of habitat distribution and the characteristic occurrence of particular taxa within habitats. Taxa recorded in the plan area from Public Land Water Frontage or Water Production—tenures which were not specifically considered under the BNA process—are allocated the same ranking as for Other State Government (of which they may be considered sub-sets). Streamside Reserves, though technically distinct from Public Land Water Frontage, are included with the latter tenure.

Records from creeklines¹ running through freehold and occurring outside of Public Land Water Frontage have, for practical purposes, been included with records from *freehold* tenure, as most such creeklines could only be effectively managed with the cooperation of the adjoining landholders. However, it should be noted that the *stream beds and banks* of all creeklines (with or without Public Land Water Frontage) remain Crown Land and therefore are subject to government land use recommendations (LCC 1985).

5.1.3 Land managers and stakeholders

Land managers and stakeholders are listed in Appendix 6 with a brief outline of the role of each. (This list may not be exhaustive.)

The agency or party listed as land manager is the usual manager for that tenure. However, this varies for some land tenures (e.g. coastal reserves which can be managed by Committee of Management). Where management of a tenure is potentially multiple, each potential manager is listed.

Stakeholders (parties having an interest in, rather than responsibility for, tenure management) are split into two types: *key* and *other*. *Key stakeholders* have a direct or vested interest in tenure management, often as a lesser partner also contributing to the management process (e.g. other government agencies having resource management responsibilities). *Other stakeholders* are agencies or organisations having an advocacy role for particular interest or user groups, or taking a monitoring role to ensure that the tenure is appropriately managed in the public interest.

A number of the listed *stakeholders* in fact represent programs and/or organisations through which a range of guidelines and resource support is available to land managers wishing to implement the *recommended actions* shown in the Appendix 6. These programs or organisations include Land for Wildlife, Greening Australia (Victoria), Good Neighbour Program, Landcare, Botanic Guardians, Conservation Volunteers Australia, Threatened Species Network and Trust for Nature.

¹ The lead management role for public land water frontage, streamside areas, streamside reserves and stream beds and banks (*sensu* LCC 1985) is still under negotiation between CMAs and other relevant agencies (Land Victoria, PV, Committees of Management). For the present strategy, Land Victoria is assumed to be the current manager of all the above categories of Crown Land. However, the reader is advised to check this information on a local basis.

5. Asset summary

5.1 Explanation of asset summaries (cont'd)

5.1.4 Threatened biodiversity assets

Under the heading of *threatened biodiversity assets*, the asset summary contains an outline of the relative significance of the main Ecological Vegetation Classes (broad habitats) remaining in the zones, briefly contrasted with the pre-1750 vegetation coverage. Also included in the column is an inventory of the taxa of threatened flora and fauna, for each land tenure type. BNA species that have been ranked for particular tenures are listed in *italics*.

Various reports dealing with biodiversity assets occurring in the plan area were drawn upon for supplementary information on the quality, condition and local significance of particular habitat remnants, and on the status of individual colonies of threatened taxa. Particularly relevant references were LCC (1973, 1977, 1985), ID&A (2000), Pescott (2002), Centre for Environmental Management (2001), Zampatti and Koster (2002), Serena *et al.* (2001), Serena *et al.* (2002).

5.1.5 Habitats

For planning at the regional level, one way of identifying the biodiversity value of habitats is to consider the conservation status of Ecological Vegetation Classes (EVCs). The definition of each EVC is based on a wide range of factors including vegetation structure and floristics, life forms of plants, land systems, ecological responses to disturbance, and other environmental parameters (such as aspect, slope, elevation, rainfall and fire frequency). Communities and sub-communities are further defined sub-units (that is, they form a hierarchy) below EVCs. By comparison, Broad Vegetation Types (BVTs), as previously used in the statewide plan (NRE 1997), are based on a narrower set of parameters (largely land systems and structure). BVTs provide a somewhat coarser vegetation classification system, under which EVCs do not form a direct hierarchy (ECC 1997).

Since EVC mapping is complete for the plan area, the EVC vegetation classification system was adopted for these plans. EVC mapping can display the conservation status *extinct, endangered, vulnerable, depleted, rare* or *least concern* (abbreviated in this report as *x, e, v, d, r* and *lc*) for each EVC (based upon the criteria of JANIS 1997) within the relevant bioregion (Map 13) as well as the distribution of individual EVCs (at 1:100 000 scale) (Map 12).

Brief comments on habitats and their status in the Barrabool zone are included in Chapters 6 (zone descriptions, asset summaries and recommended actions).

5.1.6 Taxa

Maps showing the distribution (at 1:100 000 scale) of threatened flora and fauna across the plan area have been included (Maps 14 & 15), along with the BNA species and some relevant management actions identified in the BNA analysis (Map 16). These maps gave a good indication of the occurrence of taxa within particular land tenure types.

In order to provide a sharper focus on 'priority' threatened taxa, DSE has compiled, for each bioregion, lists which include only those taxa estimated to have > 5% of their State population represented within the bioregion. The lists, which were a product of Bioregional Network Analysis workshops, are presented in the Strategic Overview for Otway Plain bioregion (Duffy *et al.* 2002), and Appendix 4a, 4b & 4c.

5. Asset summary

5.1 Explanation of asset summaries (cont'd)

Species were determined as *threatened* in Victoria based on DSE (2003) (for vertebrate fauna), DSE Atlas of Victorian Wildlife database (for invertebrate fauna) and DSE Flora Information System database (for flora) NRE 2002d. Species were determined as *threatened* nationally based on Schedules to the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. Although *non-threatened* species were not detailed, the fact that the strategy strives to enhance a wide and diverse range of biodiversity values across the plan area strongly suggests that management actions recommended for threatened taxa and communities are, in general, likely to also benefit the wider flora and fauna complement of the area. Threatened taxa are only dealt with under the land tenure types from which they have so far been recorded.

5.1.7 Protecting existing remnants

This is the first of three categories appearing under *recommended actions* in Chapter 6. These categories reflect the three main types of actions (*protection, management and restoration*) already referred to in the Strategic Overview as necessary to achieve biodiversity conservation.

Actions provide direction for *protecting* viable (or potentially viable) remnant habitats and the flora and fauna they contain. Where possible, specific important parcels (or categories) of Crown land, or areas containing highly significant freehold remnants, are identified.

Emphasis is placed upon preventative action, to avoid or forestall a worsening of environmental status on the land tenure concerned. For public land, this is probably best achieved by improving (either temporarily or permanently) the statutory controls applying to public access and resource use on the land tenure type involved (e.g. by upgrading reserve status). For private land, application of municipal planning controls or voluntary conservation programs (or both) may be the most effective options. These actions are also discussed in the Strategic Overview.

5.1.8 Management to enhance remnants (for threatened taxa)

This is the second category under *recommended actions*.

For many threatened taxa, specific ecological requirements remain poorly understood. In habitats where specific management requirements of taxa are not always clear, an ecological approach to management, rather than a single-species approach, may be the best way to ensure optimal conservation benefits. The strategy therefore tends to group taxa under common management actions aimed at addressing ecological issues affecting the habitats in which these taxa occur.

These *management* actions are expected to benefit the status of threatened species if applied to remnants on the land tenure type in which those taxa occur. Some of these actions have been recommended by DSE staff, through the process of BNA workshops (Strategic Overview). Inclusion of the BNA priority / risk rating after each taxon [e.g. Great Egret (3)] provides a measure of response priority, relative to other taxa listed for the same action. Hence, management to *implement appropriate fire management programs to benefit Ground Parrot (2) and Rufous Bristlebird (1)* would indicate that action for Ground Parrot would take priority over that for Rufous Bristlebird, where separate input of effort and/or resourcing was required to benefit each taxon.

5. Asset summary

5.1 Explanation of asset summaries (cont'd)

Most management actions given are targeted primarily at tenure type rather than specific sites, to encourage implementation of these measures in response to the occurrence of threatened taxa across the zone, whether or not that occurrence is confirmed by existing Atlas or FIS records. Where individual sites are mentioned, it should be remembered that these are locations from which records have come—it does not necessarily mean that the taxon is absent at other sites from which there are no records.

Where available, information on the ecological requirements of threatened taxa has been incorporated into this section, as appropriate.

5.1.9 Restoration of strategic vegetation (blocks or linkages)

This is the third category under *recommended actions*.

Restorative actions are targeted at areas in the zone where the greatest potential exists for biodiversity gains through replacing lost native vegetation blocks or linkages. Actions in this column take account of current biodiversity strongholds across each zone, and highlight any potential to further enhance and extend that biodiversity, by re-establishing vegetative connection with nearby high-quality remnants.

Areas identified as needing protection (Sub-section 5.1.7) are likely to also be the subject of restoration proposals under this section. Moreover, management actions recommended to enhance habitat for threatened taxa (Sub-section 5.1.8) are likely to be important in shaping the goals and strategies used to restore habitats across the zone. These actions are further discussed in Strategic Overview.

5. Asset summary

5.1 Explanation of asset summaries (cont'd)

5.1.10 Existing policies, plans or programs

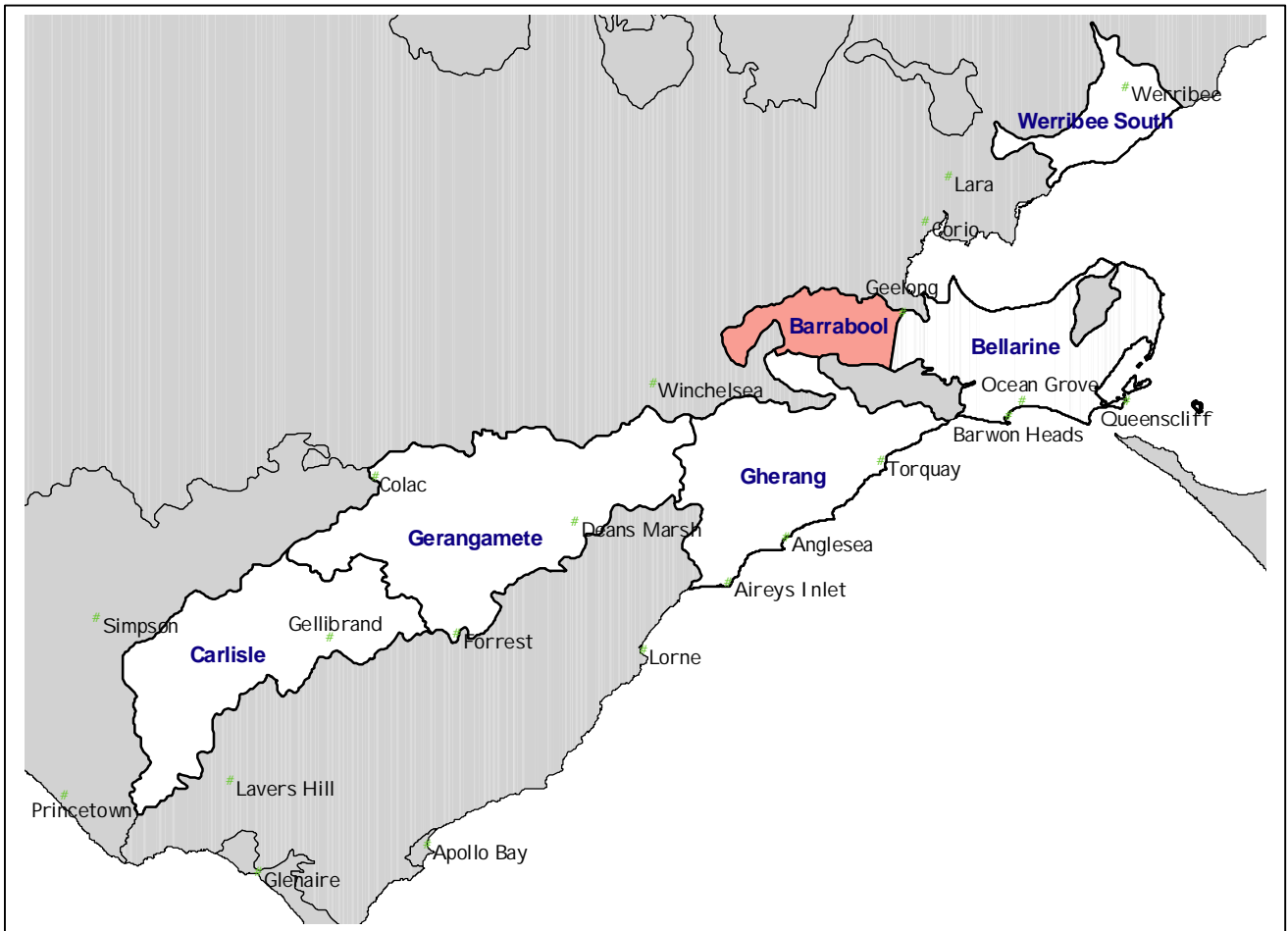
Where actions recommended under *protection, management or restoration* categories are supported by established *policies, plans or programs* of the State or Commonwealth governments, or other recognised agency or voluntary group, these supporting documents have been cited (in brief) at the end of each asset summary:

A number of taxa in the plan areas are listed under the *Flora and Fauna Guarantee Act 1988*. Those listed taxa for which Action Statements have been prepared are indicated in this section.

Sites or land tenure types supporting bird taxa listed under the Japan–Australia Migratory Bird Agreement (JAMBA) or the China–Australia Migratory Bird Agreement (CAMBA) are also indicated. These agreements require that, for certain listed migratory species, the State will protect both the status and the habitat of the species, and (through the Commonwealth) will meet specified monitoring and data exchange requirements.

Other published or officially recognised policy or planning statements (e.g. recovery plans, management plans) are indicated. A number of the actions in each asset summary also comply with other wide-reaching government policies and agreements, such as the Corangamite Regional Catchment Strategy, Corangamite Native Vegetation Plan (*in prep.*) and statewide biodiversity plan (all referenced in the Strategic Overview), and the national biodiversity strategy (Commonwealth of Australia 1996).

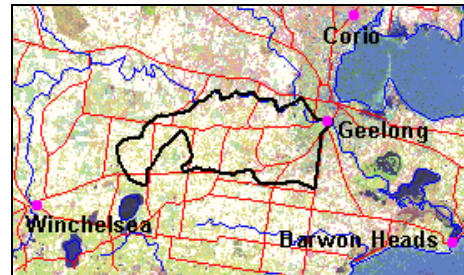
6. Barrabool Landscape Zone



6. Barrabool Landscape Zone

6.1 Barrabool Landscape Zone description

The Barrabool Landscape Zone occupies 13,929 ha and is bounded to the north and west by the Victorian Volcanic Plain bioregion. The southern boundary is roughly aligned with the Princes Highway, and the zone extends as far as Belmont in the east. It takes in the south-west of Geelong, including the suburbs of Belmont, Highton and Glastonbury. There are no other major townships in the zone. Local Government Areas in the zone include Surf Coast Shire and the City of Greater Geelong. The zone is entirely within Corangamite CMA area.



Much of the landscape consists of a series of gentle sedimentary hills that have developed on Lower Cretaceous sandstone, covering the area east of Gnarwarre and known as the Barrabool hills. South of Gnarwarre the landscape is flatter having developed on the Pliocene Moorabool Viaduct Sands (ID&A 2000).

Most of the zone drains eastwards via the Barwon River and Waurm Ponds Creek. The Barwon River provides part of the northern boundary for the zone, whilst the Waurm Ponds Creek dissects the southern part of the zone. The reaches of the Barwon River and Waurm Ponds Creek within the zone have been assessed for their biophysical condition using the Index of Stream Condition (1999), and found to be in a marginal and poor condition respectively. The Waurm Ponds Creek is in such a condition principally due to a combination of issues such as the loss of native riparian vegetation, siltation from accelerated erosion and nutrient runoff from agricultural land. The Barwon River faces similar issues but has also had significant alterations to the water flow due to the Lake Colac/Lough Calvert drainage scheme and Woody Yaloak River diversion scheme. Both schemes were established in the mid 1900's to assist in flood control by removing water from the Corangamite basin and diverting water into the Barwon basin. Due to the community concern for the river's health, the Barwon River Health Strategy, which will soon be released, has investigated the factors that contribute to the environmental condition of the river and aims to create a healthier river through understanding and then action.

There are no major blocks of public land in this zone. On freehold land, the major land use is grazing of sheep and cattle. The fertile soils and high rainfall of the zone are favourable for agriculture, and the zone has been almost entirely cleared of native vegetation, with the exception of riparian vegetation along the Barwon River. This riparian zone is now of substantial value in providing remnant habitat for native birds, fish, mammals, amphibians and reptiles. In particular, Platypus and the vulnerable Australian Grayling are highly dependent on river health. The endangered Floodplain Riparian Woodland and Stream-bank Shrubland communities, which occur along the Barwon River, are high priorities for protection and enhancement.

Prior to European settlement the zone supported vast tracts of Grassy Woodland, which were dissected only by Floodplain Riparian Woodland and Shrubland Riparian Woodland along the Barwon River, and Swampy Riparian Woodland and Sedgy Riparian Woodland along the Waurm Ponds Creek.

The critical issues for biodiversity conservation within the zone include the extensive depletion of native vegetation and habitat for flora and fauna, pest plants and animals, salinity and nutrient management. Conservation actions to protect the remaining native biodiversity assets within the zone are required and will need the cooperation and assistance of private landholders.

6. Barrabool Landscape Zone

6.1 Barrabool Landscape Zone description (cont'd)

There are 4 Landcare groups wholly or partially working in this zone, including the Barrabool Hills Landcare Group, Greening Connewarre Landcare Group, Thompsons Creek Landcare Group and Leigh and District Landcare Group (Map 9). There are also a number of other community groups, such as various Friends groups which play an integral role in activities to protect and enhance biodiversity.

Detailed information comparing pre-1750 EVC area with current EVC area and a list of threatened species found in the zone can be seen in Tables 9-12. Detailed maps showing public land (Map 10), the locations of pre-1750 EVCs (Map 11), current EVCs (Map 12), EVC conservation status and public land (Map 13), threatened fauna (Map 14), threatened flora (Map 15), and BNA threatened species and management actions (Map 16) are at the end of this document.

6. Barrabool Landscape Zone

6.1 Barrabool Landscape Zone description (cont'd)

Table 9. Total area of pre 1750 and extant EVCs in the Barrabool Landscape zone

EVC Group	EVC Number	EVC Bioregional Conservation Status	EVC Name	Pre-1750 Area (ha)	Current Area (ha)
14	55	E	Plains Grassy Woodland	124	1
15	56	E	Floodplain Riparian Woodland	468	139
8	83	E	Swampy Riparian Woodland	216	5
13	132	E	Plains Grassland	63	1
5	175	E	Grassy Woodland	12899	162
15	198	D	Sedgy Riparian Woodland	115	2
19	647	X	Plains Sedgy Wetland	15	0
8	851	E	Stream-bank Shrubland	29	14
TOTAL				13929	324
0	996	NA	Not assessed to date	0	1
0	997	NA	Private Land No Tree Cover	0	13604

Table 10. Total area and number of current EVCs in each conservation status in the Barrabool Landscape zone.

EVC Bioregional Conservation Status	Hectares	Number of EVCs
Endangered	322	6
Vulnerable	0	0
Depleted	2	1
Rare	0	0
Least Concern	0	0
Presumed Extinct	0	0

6. Barrabool Landscape Zone

6.1 Barrabool Landscape Zone description (cont'd)

Table 11. List of current rare or threatened flora and their conservation status in the Barrabool Landscape zone (as at December 2002, Environment Australia 2003*, NRE 2002d^, SAC 2002?).

NB: FFG listed taxa includes only species listed as individual species, not as part of communities.

Latin name	English name	Australian Status*	Victorian Status^	FFG Listed?	FFG Action ^ Statement number	Recovery Plan*	BNA Unassessed	Species number^
<i>Callitriche palustris</i>	Swamp Water-starwort		k				Un	572
<i>Cardamine tenuifolia</i>	Slender Bitter-cress		k				Un	617
<i>Eucalyptus leucoxylon ssp. connata</i>	Melbourne Yellow Gum		v				Un	4484
<i>Rhagodia parabolica</i>	Fragrant Saltbush		r				Un	2929
<i>Tripogon loliiformis</i>	Rye Beetle-grass		r				Un	3455

6. Barrabool Landscape Zone

Barrabool Landscape Zone description (cont'd)

Table 12. List of current threatened or near threatened fauna and their conservation status in the Barrabool Landscape zone (as at December 2002, EA 2003*, DSE 2003^, SAC 2002?).

NB: FFG listed taxa includes only species listed as individual species, not as part of communities.

English name	Latin name	Australian Status*	Victorian Status^	FFG Listed?	FFG Action^ Statement number	Recovery Plan*	BNA Unassessed	Species number^
Australian Grayling	<i>Prototroctes maraena</i>	V	v	L				4031
Australasian Bittern	<i>Botaurus poiciloptilus</i>		e	L				197
Australasian Shoveller	<i>Anas rhynchos</i>		v				Un	212
Azure Kingfisher	<i>Alcedo azurea</i>		lr				Un	319
Baillon's Crake	<i>Porzana pusilla palustris</i>		v	L			Un	50
Barking Owl	<i>Ninox connivens connivens</i>		e	L	116		Un	246
Black-faced Cormorant	<i>Phalacrocorax fuscescens</i>		lr					98
Blue-billed Duck	<i>Oxyura australis</i>		e	L	yes			216
Brown Quail	<i>Coturnix ypsilophora australis</i>		lr				Un	10
Caspian Tern	<i>Sterna caspia</i>		lr	L				112
Diamond Firetail	<i>Stagonopleura guttata</i>		v	L			Un	652
Fairy Tern	<i>Sterna nereis nereis</i>		e	L				118
Great Egret	<i>Ardea alba</i>		v	L	120			187
Grey Goshawk	<i>Accipiter novaehollandiae</i>		v					220
Growling Grass Frog	<i>Litoria raniformis</i>	V	e	L			Un	3207
Hardhead	<i>Aythya australis</i>		v				Un	215
Intermediate Egret	<i>Ardea intermedia</i>		cen	L	120		Un	186
Latham's Snipe	<i>Gallinago hardwickii</i>		lr				Un	168
Lewin's Rail	<i>Rallus pectoralis pectoralis</i>		v	L			Un	45
Musk Duck	<i>Biziura lobata</i>		v				Un	217
Nankeen Night Heron	<i>Nycticorax caledonicus hillii</i>		lr				Un	192
Pacific Gull	<i>Larus pacificus pacificus</i>		lr				Un	126
Pied Cormorant	<i>Phalacrocorax varius</i>		lr					99
River Blackfish	<i>Gadopsis marmoratus</i>		Ins					4127
Royal Spoonbill	<i>Platalea regia</i>		v				Un	181
Spotted Harrier	<i>Circus assimilus</i>		lr				Un	218
Swift Parrot	<i>Lathamus discolor</i>	E	e	L	169	R	Un	309
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>		v	L	60		Un	226
Yarra Pigmy Perch	<i>Nannoperca obscura</i>	V	lr	L	yes		Un	4100

6. Barrabool Landscape Zone

6.2 Barrabool Landscape Zone priorities

6.2.1 Summary of priority biodiversity actions for Barrabool Landscape zone

The focus for biodiversity management in the Barrabool Landscape zone should be to:

- Protect, enhance and restore the habitat of the Barwon River. This is of priority as it supports a number of threatened fauna, including River Blackfish, Yarra Pigmy Perch and Australian Grayling, and contains the largest remaining native vegetation patch left within the zone.
- Encourage landowners adjacent to the Barwon River to create an ecological buffer to provide protection to existing remnants.
- Identify any remnant areas of grassy ecosystems on private land through survey work and an educational program for landholders.
- Undertake comprehensive salinity, erosion and pest plant and animal mapping to identify where these threats are of greatest impact on native biodiversity.
- Protect, restore and extend the roadside vegetation linkages.

6. Barrabool Landscape Zone

6.3 Private land

Land tenure details:

This tenure includes all freehold land in the zone, with associated creeklines. The tenure is almost entirely devoid of native vegetation with only 1 % mapped cover remaining. The remnant vegetation mostly occurs as riparian vegetation along the Barwon River, however tiny pockets of grassland scattered across the zone have also been mapped.



Photo: Barwon River, DSE Colac

Land manager:

Private

Stakeholders:

Key: CCMA, DPI, DSE, LV, Surf Coast Shire, City of Greater Geelong.

Other: GAV, TSN, LFW, Lc, TFN, VFF, CVA, WAG, RAG, BA, BOCA, BG, WAC, CFA, PV.

Threatened Biodiversity Assets (Italics: BNA ranked species for this tenure. In brackets: Cons status Vic - lower case, Aust - upper case; followed by BNA priority / risk rankings for threatened taxa = 1A, 2B, etc., or un - unassessed):

EVCs: Before European Settlement the vegetation in the zone consisted almost entirely of *Grassy Woodland* (e). *Floodplain Riparian Woodland* (e) and *Shrubland Riparian Woodland* (e) extended along the Barwon River and *Swampy Riparian Woodland* (e) and *Sedgy Riparian Woodland* (d) along the Waurm Ponds Creek. Today, *Grassy Woodland* has been reduced to just 1 % of its former range as the highly fertile soils this EVC occurred were very conducive to agriculture. Remnants of *Floodplain Riparian Woodland* and *Shrubland Riparian Woodland* still occur along the Barwon River, however native vegetation along the Waurm Ponds Creek has been predominantly cleared.

Threatened fauna: *Caspian Tern* (lr, 3B), *Great Egret* (v, 3A), *Grey Goshawk* (v, 4C), *Australian Grayling* (Vv, 3B), *River Blackfish* (ins, 1B), *Black-faced Cormorant* (lr, un), *Pied Cormorant* (lr, un), *Baillon's Crake* (v, un), *Fairy Tern* (e, un), *Nankeen Night Heron* (lr, un), *Australasian Bittern* (e, un), *Blue-billed Duck* (e, un), *Musk Duck* (v, un), *Spotted Harrier* (lr, un), *White-bellied Sea-eagle* (v, un), *Swift Parrot* (Ee, un), *Azure Kingfisher* (lr, un), *Diamond Firetail* (v, un), *Barking Owl* (e, un), *Yarra Pigmy Perch* (Vlr, un).



Australian Grayling (Photo: NRE, Viridians Biological Database)

6. Barrabool Landscape Zone

6.3 Private land (cont'd)

Threatened flora: Swamp Water-starwort (k, un), Slender Bitter-cress (k, un), Melbourne Yellow Gum (v, un).

Recommended actions:

Protection of existing remnants:

- Encourage landowners to adopt a Best Management Practice (BMP) approach and utilise such tools as the Corangamite Risk Mitigation Protocol, the Corangamite Seed Framework, the Corangamite EVC Guide once produced, and the Surf Coast Shire Revegetation List.
- Undertake an extensive survey on private land to identify grassy ecosystem remnants. Encourage community involvement.
- Encourage protection of remnants on freehold land and apply voluntary programs, incentives, management agreements and/or planning controls, as appropriate. Give priority to the high-value grassy ecosystems identified from the aforementioned survey.
- Increase landowner awareness of grassy ecosystems and provide information on the identification of characteristic species and best management practices.
- Liaise with local naturalists, educational institutions and conservation groups to collate and document their knowledge of significant species found within this land tenure.
- Encourage the community to report sightings/localities of threatened species to DSE to include in the Atlas of Victorian Wildlife and Flora Information System.
- Conduct community education for private landholders to ensure secondary poisoning of *Grey Goshawk* doesn't occur when baiting foxes/rabbits etc.
- Undertake survey work to determine if Barking Owl and White-bellied Sea-eagle are still present in the zone.
- Monitor the occurrence and habitat use of this tenure by Swift Parrot.
- Protect and enhance the status of unreserved stream frontages. Using LFW and Landcare, encourage and assist landholders to establish a program of habitat protection, particularly along the Barwon River, to benefit species such as *River Blackfish*, Yarra Pigmy Perch and *Australian Grayling*.
- Monitor the threatened fish populations in the Barwon River, including Yarra Pigmy Perch (which was recorded just outside the zone boundary).
- Liaise with authorities and agencies (including water authorities and local government) to protect the habitat and ensure adequate flows within the Barwon River.
- Work with DPI to conduct community education for landowners to reduce the nutrient runoff entering waterways to protect *River Blackfish*, *Australian Grayling*, Yarra Pigmy Perch and *Great Egret*.



Grassland Survey (Photo: DSE, Colac)

6. Barrabool Landscape Zone

6.3 Private land (cont'd)

- Undertake erosion, salinity and pest plant and animal mapping, and input this information into the BAP local area plans to identify the areas where these threats are of greatest impact upon the native biodiversity.
- Increase community education on both noxious and environmental weeds, including their identification and removal techniques.
- Ensure Shire planning staff are aware of the locations and importance of freehold remnants that have high biodiversity values.
- Assist Shire to align freehold remnants with strategic connective value or potential value with their roadside management plan.
- Encourage landowners adjacent to high-value roadsides to build boundary fences at least 5 m inside their boundary line. This will allow roadside vegetation to regenerate naturally and thus extend the width, and lessen edge effects of significant roadside corridors. Also encourage landowners to create firebreaks inside their properties rather than along roadsides.
- Work with the local CFA to develop and implement appropriate wildfire management strategies on private land.

Management to enhance remnants for threatened taxa (BNA response level in brackets: 4 = full commitment, 3 = substantive participation, 2 = opportunistic action, 1 = watching brief):

- Supplement habitat for *Great Egret*, *River Blackfish*, *Australian Grayling*, Black-faced Cormorant, Pied Cormorant, Fairy Tern, Baillon's Crake, *Caspian Tern*, Musk Duck, Blue-billed Duck and Yarra Pigmy Perch by improving quality and extent of riparian vegetation.
- Investigate the potential to re-snap rivers for *River Blackfish* habitat supplementation.
- Enhance flow regimes in streams and wetlands to improve habitat for *River Blackfish* (1), *Australian Grayling*, Yarra Pigmy Perch, *Great Egret*, Pied Cormorant, Black-faced Cormorant, *Caspian Tern*, Musk Duck, Blue-billed Duck, Australasian Bittern and Baillon's Crake.
- Ensure free passage in waterways for *River Blackfish* and *Australian Grayling*.
- Exclude grazing, undertake weed control and control erosion in riparian zones to reduce siltation and excessive nutrient loads from entering waterways, and thus improve the habitat for *River Blackfish*, *Australian Grayling* (1), Yarra Pigmy Perch, *Great Egret*, Pied Cormorant, Black-faced Cormorant, Musk Duck, Blue-billed Duck, Australasian Bittern and Baillon's Crake.
- Exclude disturbance near known *Grey Goshawk*, *Caspian Tern*, *Great Egret*, Blue-billed Duck, Nankeen Night Heron and Black-faced Cormorant roosting, nesting or breeding sites.
- Control and reduce firewood and fallen timber collection from areas where *Grey Goshawk* occur.

- Control cats and foxes to curtail predation on Baillon's Crane, *Caspian Tern*, Pied Cormorant, Black-faced Cormorant, Australasian Bittern, Nankeen Night Heron, *Great Egret*, Blue-billed Duck, Musk Duck, Azure Kingfisher and Diamond Firetail.



Red Fox (Photo: Peter Menkhorst, Viridians Biological Database)

- Coordinate actions between landholders and land managers to enhance remnant habitat patches through programs such as Landcare and Land for Wildlife.

Restoration of strategic vegetation blocks or linkages:

- Ensure restoration and revegetation of blocks and linkages is based on pre-1750 EVCs.
- Encourage the landowners adjacent to the Barwon River to create an ecological buffer to protect existing remnants.
- Revegetate the riparian zone along watercourses and natural drainage lines to maintain natural function, provide stream habitat and wildlife corridors and to minimise erosion of stream banks. Give priority to the Barwon River and Waurm Ponds Creek.
- Establish a network of corridors and revegetation works beginning with the linking of the high-value roadsides and then the linking of the remnant grassy ecosystems identified from the comprehensive survey.
- Assist Landcare groups and LFW program to inform landholders of their potential role in conserving biodiversity, and to coordinate their involvement for the best possible outcome. Encourage landholders to restore and expand native vegetation cover using a variety of methods such as fencing, grazing exclusion, weed control, erosion control, revegetation and regeneration.
- Coordinate restoration and revegetation initiatives to assist landholders, shires, extension officers and program coordinators to consolidate local remnant networks. Giving priority to threatened EVC remnants.
- Once produced, work with landholders to use and implement the Corangamite EVC Guide and the Surf Coast Shire Revegetation list.

6. Barrabool Landscape Zone

6.3 Private land (cont'd)

EXISTING POLICIES, PLANS OR PROGRAMS supporting one or more of the recommended actions:

- FFG Action Statement – Predation by Red Fox (44)
- FFG Action Statement – Predation by Cat (80)
- FFG Action Statement – Barking Owl (116)
- FFG Action Statement – Great Egret (120)
- CAMBA – Great Egret, Caspian Tern
- JAMBA – Great Egret, Caspian Tern
- Corangamite Native Vegetation Plan (CCMA *in prep.* 2003)
- Corangamite Regional Nutrient Management Plan (CCMA 2000)
- Barrabool to Batesford Catchment Management Plan (ID&A 2000)
- City of Greater Geelong Biodiversity Strategy (COGG 2003)

6. Barrabool Landscape Zone

6.4 Public Land Water Frontage

Land tenure details:

This tenure includes Public Land Water Frontage occurring along the Barwon River upstream from Geelong to Fyansford. The water frontage occurring downstream of Buckley Falls Reserve is generally in poorer condition than upstream because it traverses through residential areas and has been denuded of any native vegetation.

Land manager:

Land Victoria

Stakeholders:

Key: CCMA, DPI, DSE, PV, City of Greater Geelong, CFA, SRW, BW.

Other: Private, VFF, TSN, GAV, CVA, BG, WAC, GNP, BOCA, BA, Lc, PV.

Threatened Biodiversity Assets (Italics: BNA ranked species for this tenure. In brackets: Cons status Vic - lower case, Aust - upper case; followed by BNA priority / risk rankings for threatened taxa = 1A, 2B, etc., or un - unassessed):

EVCs: Before settlement, *Floodplain Riparian Woodland* (e) extended along this tenure. Upstream of Buckley Falls Reserve linear remnants of this EVC still persist, however downstream only small and modified pockets remain.

Threatened fauna: *Pied Cormorant* (lr, 1A), Intermediate Egret (cen, un), Grey Goshawk (v, un), Australian Grayling (Vv, un), Great Egret (v, 3A), Nankeen Night Heron (lr, un), Baillon's Crake (v, un).



Great Egret (Photo: Viridians Biological Database)

Threatened flora: None recorded.

Recommended actions:

Protection of existing remnants:

- Protect and enhance status of Public Land Water Frontage in the zone, particularly upstream of Buckley Falls.
- Maintain the fences along Barwon River which exclude stock access.
- Improve awareness of landholders and key stakeholders of the potential linkage value of these frontages, once restored.
- Undertake further survey work to determine if any threatened flora species are present.

6. Barrabool Landscape zone

6.4 Public Land Water Frontage (cont'd)

Management to enhance remnants for threatened taxa (BNA response level in brackets: 4 = full commitment, 3 = substantive participation, 2 = opportunistic action, 1 = watching brief):

- Supplement habitat for Great Egret, Intermediate Egret, Australian Grayling, *Pied Cormorant*, Nankeen Night Heron and Baillon's Crake by improving quality and extent of riparian vegetation.
- Supplement habitat for Grey Goshawk by increasing the abundance of mature and hollow-bearing trees, mitigating against tree dieback and enhancing connectivity.
- Enhance flow regimes in streams and wetlands to improve habitat for Australian Grayling, Great Egret, Intermediate Egret, *Pied Cormorant* and Baillon's Crake.
- Ensure free passage in waterways for Australian Grayling.
- Control cats and foxes, particularly on adjoining properties, to reduce predation on Great Egret, Intermediate Egret, *Pied Cormorant* and Baillon's Crake.
- Undertake weed control work in association with community groups.
- Maintain the fences along the water frontage upstream of Buckley Falls.



Pied Cormorant
(Photo: Viridians
Biological Database)

Restoration of strategic vegetation blocks or linkages:

- Undertake restoration and revegetation of the riparian zone to extend the linkage along the Barwon River. Ensure this revegetation is based on pre-1750 EVCs.

EXISTING POLICIES, PLANS OR PROGRAMS supporting one or more of the recommended actions:

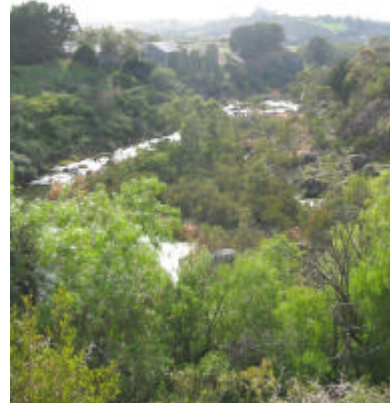
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – Predation by Cat (80).
- CAMBA – Great Egret.
- JAMBA – Great Egret.
- Corangamite Regional Nutrient Management Plan (CCMA 2000).
- City of Greater Geelong Biodiversity Strategy (COGG 2003).

6. Barrabool Landscape Zone

6.5 Local Government

Land tenure details:

The tenure includes municipal roads and township land, including the Buckley Falls Reserve and Balyang Sanctuary. The Buckley Falls Reserve mostly incorporates a public golf course, however of significance is the riparian vegetation that persists along the Barwon River. The Balyang Sanctuary, which was once a natural swamp but is now a man-made lake and islands, provides a permanent source of water in which a number of threatened waterbirds have been recorded. The lack of natural habitat remaining and the current management of the sanctuary as a public park, means this site is not of priority for *protection*, *enhancement* and *restoration* actions. Given that there has been extensive clearing of freehold land in the zone, the road networks (along with streamside remnants) provide a starting point for restoring and securing biodiversity assets in this zone.



Buckley Falls Reserve (Photo: DSE, Colac)

Land manager:

Surf Coast Shire, City of Greater Geelong

Stakeholders:

Key: DPI, DSE, CCMA, Priv, PV, RCC, VicRoads, CFA.

Other: Lc, LFW, GAV, FNC, TSN, CVA, Lc, VFF, WAC.

Threatened Biodiversity Assets (Italics: BNA ranked species for this tenure. In brackets: Cons status Vic - lower case, Aust - upper case; followed by BNA priority / risk rankings for threatened taxa = 1A, 2B, etc., or un - unassessed):

EVCs: Prior to European settlement the road network would have traversed *Grassy Woodland* (e), today the roadsides have been severely modified with only a few roadsides supporting remnants of this EVC. Buckley Falls Reserve has lost the *Grassy Woodland* (e) which would have been present where the golf course is, however *Floodplain Riparian Woodland* (e) still persists along the Barwon River. Prior to the complete modification of the Balyang Sanctuary, *Floodplain Riparian Woodland* (e) would have been present.

Threatened fauna: Grey Goshawk (v, un), Pacific Gull (lr, un), Royal Spoonbill (v, un), Intermediate Egret (cen, un), Great Egret (v, un), Nankeen Night Heron (lr, un), Australian Grayling (Vv, un), Hardhead (v, un).

Threatened flora: Fragrant Saltbush (r, un), Rye Beetle-grass (r, un).

6. Barrabool Landscape Zone

6.5 Local Government (cont'd)

Recommended actions:

Protection of existing remnants:

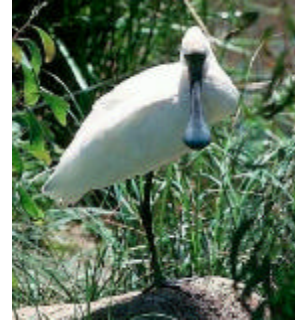
- Encourage the adoption of a Best Management Practice (BMP) approach and utilise such tools as the Corangamite Risk Mitigation Protocol, the Corangamite Native Vegetation Guide and the Corangamite Seed Framework.
- Encourage the community to report sightings/localities of threatened species to DSE to include in the Atlas of Victorian Wildlife and Flora Information System.
- Ensure the City of Greater Geelong thoroughly assess the potential impacts of development nearby to Buckley Falls on the biodiversity values before approvals are given.
- Liaise and provide assistance to the Friends of the Buckley Falls group on the management of the Buckley Falls Reserve, focussing on continued weed removal and revegetation.
- Protect existing roadside remnants, giving priority to any high-value roadsides identified including Pollocksford Bridge Rd, Barrabool Rd and Hendy Main Rd. Signpost these significant roadside reserves.
- Ensure Shire staff (especially road maintenance crews), and the CFA are aware of significant roadsides and actions required to protect them.
- Establish an accreditation course for road maintenance crews on roadside vegetation management, and how to undertake works in an environmentally sensitive manner.
- Implement the City of Greater Geelong Roadside Management Plan and assist Surf Coast Shire in the development of their Rural Roadside Management Strategy. Promote voluntary programs (e.g. Land for Wildlife) and planning overlays, as tools to assist Shires in protecting and managing roadsides.
- Review and update the conservation significance of roadsides within the Surf Coast Shire and prepare Roadside Management Plans for identified high conservation roadsides.
- Manage and control pest plants in this tenure. This should include eradication of existing weeds and prevention of new infestations. In this regard, a survey of environmental weed sites, particularly on roadsides, should be undertaken. Ensure proper hygiene procedures are undertaken by road maintenance crews so limit weed spread.
- Undertake further survey work to determine if any other threatened species are present.

6. Barrabool Landscape Zone

6.5 Local Government (cont'd)

Management to enhance remnants for threatened taxa (BNA response level in brackets: 4 = full commitment, 3 = substantive participation, 2 = opportunistic action, 1 = watching brief):

- Control cats and foxes to curtail predation on Royal Spoonbill, Intermediate Egret, Great Egret and Hardhead.
- Increase the abundance of large and mature trees to benefit Grey Goshawk.
- Supplement habitat for Hardhead, Great Egret, Nankeen Night Heron, Intermediate Egret, Australian Grayling and Royal Spoonbill by improving quality and extent of riparian vegetation.
- Enhance flow regimes and restore natural drainage systems to benefit Great Egret, Intermediate Egret, Hardhead, and Australian Grayling.
- Control weeds to benefit remnant vegetation.



Royal Spoonbill (Photo: Peter Menkhorst, Viridians Biological Database)

Restoration of strategic vegetation blocks or linkages:

- Undertake restoration works to expand the vegetation linkages along roadsides.
- Encourage adjoining landholders to undertake complementary management practices and restoration works, particularly those adjoining high value roadsides.
- Ensure restoration and revegetation of blocks and linkages is based on pre-1750 EVCs.

EXISTING POLICIES, PLANS OR PROGRAMS supporting one or more of the recommended actions:

- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Great Egret (120).
- CAMBA – Great Egret.
- JAMBA – Great Egret.
- City of Greater Geelong Biodiversity Strategy (COGG 2003).
- City of Greater Geelong Roadside Weed Management Guidelines (Turcinov 2000).

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9. References

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9.2 Personal Communications

Hamilton, L. DPI, Colac, Victoria

9. References**9.3 Acronyms**

BAP	Biodiversity Action Planning
BMP	Best management practice
BNA	Bioregional Network Analysis
BVT	Broad Vegetation Type
CAMBA	China–Australia Migratory Bird Agreement
CFA	Country Fire Authority
CMA	Catchment Management Authority
CVA	Conservation Volunteers Australia
D	Depleted
DPI	Department of Primary Industries (Victoria)
DSE	Department of Sustainability and Environment (Victoria)
E	Endangered
EA	Environment Australia
ECC	Environment Conservation Council
EPBC	Environmental Protection & Biodiversity Conservation
EVC	Ecological Vegetation Class
FFG	Flora & Fauna Guarantee
ISC	Index of Stream Condition
JAMBA	Japan–Australia Migratory Bird Agreement
LC	Least concerned
LCC	Land Conservation Council
LGA	Local Government Authority
NRE	Department of Natural Resources and Environment (Victoria)
NVP	Native Vegetation Plans
PV	Parks Victoria
R	Rare
RFA	Regional Forest Agreements
V	Vulnerable
VEAC	Victorian Environment Assessment Council

10. Acknowledgments

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10.1 Acknowledgments:

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11. Appendices

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

11. Appendices

Appendix 1. Details of EVCs with more than 100 ha extant in the Otway Plain bioregion

Map Unit Description	Pre1750 Area (ha) (a)	Cons. Res. (C)	Forest Special Prot. Zone (S)	Total Cons. (C+S)	Other Public land (O)	Private (P)	Unknown (U)	Total Extant Area (ha) (b)	Extant /Pre1750 (%) (b/a)	Con Res /Extant (%) (C+S)/b	EVC Bior. Cons Status
Lowland Forest	56,825	3,405	1,939	5,345	11,803	9,693	151	26,992	47%	20%	D
Heathy Woodland	26,526	7,356	4,532	11,888	6,298	3,536	85	21,807	82%	55%	LC
Riparian Scrub Complex	5,662	1,150	1,287	2,437	854	826	2	4,118	73%	59%	D
Grassy Woodland	79,131	22		22	238	1,764	2	2,025	3%	1%	E
Herb-rich Foothill Forest	3,330	129	415	544	774	601		1,919	58%	28%	V
Coastal Saltmarsh	4,775	1,778		1,788	58	49	49	1,920	49%	93%	V
Sedgy Riparian Woodland	2,382	181	427	608	424	459	5	1,497	63%	41%	D
Coastal Dune Scrub Mosaic	2,050	792	50	843	502	61	34	1,439	70%	59%	D
Wet Heathland	1,781	671	569	1,239	65	88	1	1,393	78%	89%	LC
Damp Sands Herb-rich Woodland	3,711	436		436	131	717	0	1,285	35%	34%	V
Shrubby Foothill Forest	1,625	244	193	437	221	542		1,201	74%	36%	LC
Riparian Forest	2,031	102	145	247	42	514	4	807	40%	31%	V
Shrubby Dry Forest	1,063	266		266	6	469		741	70%	36%	LC
Coastal Headland	799	277		277	332	55		663	83%	35%	R
Calcarene Dune Woodland	4,093	79		79	160	254	26	519	13%	15%	E
Reed Swamp	565	517		517				517	92%	91%	V
Wet Sands Thicket	452	120	242	362	12	50		424	65%	87%	R
Swampy Riparian Woodland	2,799		0	0	6	326	7	339	12%	0%	E
Floodplain Riparian Woodland	6,564			0	147	165	1	310	5%	0%	E
Wet Forest	308		111	111	121	40		272	3%	1%	LC
Swamp Scrub	1,888	54		54	83	78		215	11%	25%	E
Plains Grassy Woodland	20,543	58		58	36	99	3	196	1%	30%	E
Sand Heathland	176	96		96	35	36		167	55%	100%	R
Grassy Forest	1,593			0		138		138	9%	0%	E
Shrubby Wet Forest	155	4	31	35	71	25		130	63%	41%	LC

Appendix 2. Identifying conservation significance for native vegetation (NRE 2002a)

CONSERVATION SIGNIFICANCE	BIODIVERSITY ATTRIBUTES			
	VEGETATION TYPES		OR SPECIES	OR OTHER ATTRIBUTES
	Conservation Status ²	Habitat Score ³		
VERY HIGH	Endangered Vulnerable Rare	0.4 - 1 0.5 - 1 0.6 - 1	<ul style="list-style-type: none"> best 50% of habitat for each threatened species² in a Victorian bioregion 	<ul style="list-style-type: none"> sites with unique National Estate values sites identified as being of national significance as a relict, endemic, edge of range or other non-species values Ramsar Sites East Asian-Australasian Shorebird Site Network sites other wetlands of international significance for migratory waterbirds areas identified as providing refuges (eg. during drought) for threatened species
HIGH	Endangered Vulnerable Rare Depleted	< 0.4 0.3 – 0.5 0.5 – 0.6 0.6 - 1	<ul style="list-style-type: none"> the remaining 50% of habitat for threatened species² in a Victorian bioregion best 50% of habitat for rare species in a Victorian bioregion 	<ul style="list-style-type: none"> sites with rare National Estate values sites identified as being of state significance for relictual, endemic, edge of range or other non-species values wetlands listed in 'A Directory of Important Wetlands in Australia' wetlands of national significance for migratory waterbirds areas identified as providing refuges (eg. during drought) for rare species priority areas for the re-establishment of habitat for a threatened species (eg. as determined in biodiversity action planning)
MEDIUM	Vulnerable Rare Depleted Least Concern	< 0.3 < 0.3 0.3 – 0.6 0.6 - 1	<ul style="list-style-type: none"> the remaining 50% of habitat for rare species² in a Victorian bioregion best 50% of habitat for regionally significant species 	<ul style="list-style-type: none"> sites with uncommon National Estate values sites identified as being of regional significance for edge of range or other non-species values wetlands of bioregional significance (based on application of National Land and Water Resources Audit criteria).
LOW	Depleted Least Concern	< 0.3 < 0.6		

² see Appendix 2 (NRE 2002a)

³ Conservation status of species determined with reference to NRE Victorian Rare or Threatened Flora and Fauna lists, as supplemented by the relevant Native Vegetation Plan. The relative quality and suitability of habitat for threatened species depends on particular requirements and therefore must be estimated on a species-by-species and location-by-location basis by the relevant planning authority using the best available information.

Appendix 3a. Victorian flora and fauna threat categories.***Fauna Threat categories (DSE 2003)****Extinct*

A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Regionally Extinct

As for Extinct but within a defined region that does not encompass the entire geographic range of the taxon. A taxon is presumed Regionally Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout the region have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Extinct in the Wild

A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

Critically Endangered

A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Species Survival Commission 2001), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

Endangered

A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Species Survival Commission 2001), and it is therefore considered to be facing a very high risk of extinction in the wild.

Vulnerable

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Species Survival Commission 2001), and it is therefore considered to be facing a high risk of extinction in the wild.

Near Threatened

A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

Data Deficient

A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more

information is required and acknowledges the possibility that future research will show that threatened classification is appropriate.

Flora Threat categories (NRE 2002d)

Extinct

Presumed extinct in Victoria, i.e. no post-1950 records from Victoria, in spite of field searches specifically for the plant; or intensive field searches (since 1950) at known sites have failed to record the plant. The plant's status elsewhere in Australia is not considered in this category.

Endangered

Endangered in Victoria, i.e. rare and at risk of disappearing from the wild state if present land use and other causal factors continue to operate. The plant's status elsewhere in Australia is not considered in this category.

Vulnerable

Vulnerable in Victoria, i.e. rare, not presently endangered but likely to become so soon due to continued depletion, or which largely occur on sites likely to experience changes in land use which would threaten the survival of the plant in the wild. The plant's status elsewhere in Australia is not considered in this category.

Rare

Plants which are rare in Victoria but which are not considered otherwise threatened (the status elsewhere in Australia not being considered). This category does not necessarily imply that the plants are substantially threatened, but merely that there are relatively few known stands.

Poorly Known

Species poorly known and are suspected, but not definitely known, to belong to any of the above categories within Victoria (i.e. x, e, v or r). At present accurate field distribution information is inadequate.

Appendix 3b. Current threatened flora in the Otway Plain bioregion as at November 2002 (EA 2003*, NRE 2002d^, SAC 2002).

Scientific name	English name	Aust status*	Vic Status^	FFG-listed	FFG Action Statement^	Recovery plan (R) or draft (d)*	BNA Unassessed	NRE code
<i>Acacia nano-dealbata</i>	Dwarf Silver Wattle		r				Un	64
<i>Acacia retinodes</i> var. <i>uncifolia</i>	Coast Wirilda		r				Un	4210
<i>Adriana quadripartita</i> (pubescent form)	Coast Bitter-bush		v				Un	137
<i>Adriana quadripartita</i> s.s. (glabrous form)	Rare Bitter-bush		e	L				138
<i>Agrostis avenacea</i> var. <i>perennis</i>	Wetland Blown-grass		k				Un	4220
<i>Amphibiholis antarctica</i>	Sea Nymph		k				Un	207
<i>Amphibromus sinuatus</i>	Wavy Swamp Wallaby-grass		v				Un	3625
<i>Atriplex australasica</i>	Native Orache		k				Un	3621
<i>Atriplex paludosa</i> ssp. <i>paludosa</i>	Marsh Saltbush		r				Un	326
<i>Austrofestuca littoralis</i>	Coast Fescue		r				Un	1361
<i>Austrostipa gibbosa</i>	Spurred Spear-grass		r				Un	3277
<i>Avicennia marina</i> ssp. <i>australasica</i>	White Mangrove		r				Un	345
<i>Baeckea ramosissima</i> ssp. <i>prostrata</i>	Rosy Baeckea		r				Un	4258
<i>Ballantinia antipoda</i>	Southern Shepherd's Purse	E	e	L	102	R	Un	359
<i>Boronia nana</i> var. <i>nana</i>	Dwarf Boronia		r				Un	4277
<i>Boronia nana</i> var. <i>pubescens</i>	Dwarf Boronia		r				Un	4278
<i>Bossiaea cordigera</i>	Wiry Bossiaea		r				Un	435
<i>Bracteantha palustris</i>	Swamp Everlasting	V	v	L				3763
<i>Burnettia cuneata</i>	Lizard Orchid	R	r				Un	513
<i>Caesia parviflora</i> var. <i>minor</i>	Pale Grass-lily		k				Un	4340
<i>Calacenia oenochila</i>	Wine-lipped Spider-orchid	K	v				Un	3694
<i>Caladenia australis</i>	Southern Spider-orchid		k					743
<i>Caladenia dilatata</i> s.s	Green-comb Spider-orchid		k				Un	1019
<i>Caladenia flavovirens</i>	Summer Spider-orchid		r				Un	541
<i>Caladenia parva</i>	Small Spider-orchid		k				Un	4476
<i>Caladenia valida</i>	Robust Spider-orchid	R	e					1022
<i>Caladenia venusta</i>	Large White Spider-orchid	R	r				Un	533
<i>Caladenia X variabilis</i>	Variable Spider-orchid		e				Un	3655
<i>Callitriche palustris</i>	Swamp Water-starwort		k				Un	572
<i>Calochilus gracillimus</i>	Slender Beard-orchid		k				Un	505
<i>Calorophus elongatus</i>	Long Rope-rush		v					591
<i>Cardamine tenuifolia</i>	Slender Bitter-cress		k				Un	617
<i>Caustis restiacea</i>	Slender Twist-rush		r				Un	690
<i>Chorizandra australis</i>	Southern Bristle-sedge		k				Un	766
<i>Comesperma polygaloides</i>	Small Milkwort		v	L	96		Un	798
<i>Correa backhouseana</i> var. <i>backhouseana</i>	Coast Correa		v				Un	4369

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

Scientific name	English name	Aust status*	Vic Status [^]	FFG-listed [†]	FFG Action Statement [^]	Recovery plan (R) or draft (d)*	BNA Unassessed	NRE code
<i>Corybas fordhamii</i>	Swamp Helmet-orchid		r				Un	840
<i>Daltonia splachnoides</i>	Moss		k				Un	6190
<i>Dipodium pardalinum</i>	Spotted Hyacinth-orchid		r				Un	324
<i>Eucalyptus aff. cypellocarpa (Anglesea)</i>	Otway Grey-gum		v				Un	4557
<i>Eucalyptus leucoxyton ssp. bellarinensis</i>	Yellow Gum		e	L			Un	4891
<i>Eucalyptus leucoxyton ssp. connata</i>	Yellow Gum		v				Un	4484
<i>Eucalyptus maculata</i>	Spotted Gum		v				Un	1295
<i>Eucalyptus yarraensis</i>	Yarra Gum	R	k				Un	1326
<i>Exocarpus syrticola</i>	Coast Ballart		r				Un	1354
<i>Galium compactum</i>	Compact Bedstraw		r				Un	1406
<i>Genoplesium ciliatum</i>	Fringed Midge-orchid		k				Un	2040
<i>Genoplesium pumilum</i>	Green Midge-orchid		r				Un	2727
<i>Genoplesium sp. aff. morrisii</i>	Red-beard Midge-orchid		v					4690
<i>Genoplesium sp. aff. nudiscapum</i>	Otway Midge-orchid		e					5263
<i>Grevillea infecunda</i>	Anglesea Grevillea	V	v					3744
<i>Halophila australis</i>	Oval Sea-wrack		k				Un	1578
<i>Halophila decipiens</i>	Devious Sea-wrack		k				Un	1577
<i>Helichrysum aff. rutidolepsis (lowland swamps)</i>	Pale Swamp Everlasting		v				Un	4655
<i>Hypoxis vaginata var. brevistigmata</i>	Yellow Star		k				Un	4583
<i>Isolepis wakefieldiana</i>	Tufted Club-sedge		r				Un	1789
<i>Ixiolaena sp. 1</i>	Woolly Buttons		r				Un	1945
<i>Juncus revolutus</i>	Creeping Rush		r				Un	1839
<i>Lawrencia spicata</i>	Salt Lawrencia		r				Un	1888
<i>Lepidium aschersonii</i>	Spiny Pepper-cress	V	e	L	111		Un	1897
<i>Lepidium pseudohyssopifolium</i>	Native Pepper-cress		k				Un	1908
<i>Lepidosperma canescens</i>	Hoary Rapier-sedge		r				Un	1915
<i>Lepidosperma gunnii</i>	Slender Sword-sedge						Un	4699
<i>Lepilaena marina</i>	Sea Water-mat		v				Un	3845
<i>Leptorhynchus gatesii</i>	Wrinkled Buttons	V	v	L	98		Un	1942
<i>Leptospermum turbinatum</i>	Shiny Tea-tree		r				Un	1963
<i>Limonium australe</i>	Yellow Sea-lavender		r				Un	2006
<i>Lobelia beaugleholei</i>	Showy Lobelia	R	r				Un	2733
<i>Lotus australis</i>	Austral Trefoil		k				Un	2057
<i>Lycopodiella serpentina</i>	Bog Clubmoss		r				Un	2083
<i>Malva sp. aff. australiana</i>	Coast Hollyhock		v				Un	4696
<i>Microlepidium pilosulum</i>	Hairy Shepherd's Purse	K	v				Un	2180
<i>Monotoca glauca</i>	Currant-wood		r				Un	3859
<i>Nematolepis squamea ssp. squamea</i>	Satinwood		r				Un	4814
<i>Olearia pannosa ssp. cardiophylla</i>	Velvet Daisy-bush	R	v	L			Un	2317
<i>Olearia picridifolia</i>	Rasp Daisy-bush		v				Un	2320
<i>Olearia speciosa</i>	Netted Daisy-bush		k				Un	2326

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Scientific name	English name	Aust status*	Vic Status [^]	FFG-listed [†]	FFG Action Statement [^]	Recovery plan (R) or draft (d)*	BNA Unassessed	NRE code
<i>Olearia stellulata</i>	Starry Daisy-bush		k				Un	3899
<i>Olearia tubuliflora</i>	Rayless Daisy-bush		r				Un	2330
<i>Ozothamnus rogersianus</i>	Nunniong Everlasting		r				Un	1623
<i>Pelargonium littorale</i>	Coast Stork's-bill		k				Un	2447
<i>Pimelea spinescens</i>	Spiny Rice-flower		e	L	yes		Un	3894
<i>Pomaderris halmaturina ssp. continentis</i>	Glenelg Pomaderris	R	r					3944
<i>Prasophyllum affine</i>	Heathland Leek-orchid	E	k				Un	2726
<i>Prasophyllum correctum</i>	Gaping Leek-orchid	E	e	L	57		Un	4850
<i>Prasophyllum lindleyanum</i>	Green Leek-orchid		v				Un	2702
<i>Prasophyllum patens</i>	Broad-lip Leek-orchid		r				Un	2721
<i>Prasophyllum spicatum</i>	Dense Leek-orchid	V	v					4506
<i>Pterostylis cucullata</i>	Leafy Greenhood	V	v	L	54		Un	2790
<i>Pterostylis tasmanica</i>	Southern Bearded-orchid		k				Un	4853
<i>Pterostylis tenuissima</i>	Swamp Greenhood	V	v			R		2819
<i>Pultenaea canaliculata</i>	Coast Bush-pea		r				Un	2839
<i>Pultenaea prolifera</i>	Otway Bush-pea		r				Un	2868
<i>Ranunculus diminutus</i>	Lesser River Buttercup		k				Un	4314
<i>Ranunculus pumilio var. politus</i>	Ferny Small-flower Buttercup		k				Un	4909
<i>Rhagodia parabolica</i>	Fragrant Saltbush		r				Un	2929
<i>Ruppia tuberosa</i>	Tuberous Tassel		k				Un	2980
<i>Rutidosis leptorhynchoides</i>	Button Wrinklewort	E	e	L	28			2982
<i>Sagina maritima*</i>	Sea Pearlwort						Un	2986
<i>Salsola kali aff. ssp. tragus</i>	Coast Saltwort		r				Un	5308
<i>Schoenus turbinatus</i>	Top Bog-sedge		r				Un	3057
<i>Senecio macrocarpus</i>	Large-fruit Fireweed	V	e	L				3116
<i>Stackhousia spathulata</i>	Coast Stackhousia		k				Un	3246
<i>Thelionema umbellatum</i>	Clustered Lily		r				Un	4007
<i>Thelymitra benthamiana</i>	Blotched Sun-orchid		v				Un	3369
<i>Thelymitra cirumsepta</i>	Naked Sun-orchid		v				Un	3383
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	V	v	L				3378
<i>Thelymitra merraniae</i>	Merran's Sun-orchid		e	L	155			4005
<i>Thelymitra mucida</i>	Plum Orchid		v				Un	3380
<i>Thelymitra sp. aff. pauciflora</i>	Anglesea Sun-orchid		v				Un	4009
<i>Thomasia petalocalyx</i>	Paper Flower		r				Un	3392
<i>Trematodon mackayii</i>	Moss		k				Un	6723
<i>Triglochin minutissimum</i>	Tiny Arrowgrass		r				Un	3446
<i>Triglochin mucronatum</i>	Prickly Arrowgrass		r				Un	3447
<i>Tripogon loliiformis</i>	Rye Beetle-grass		r				Un	3455
<i>X Calassodia tutelata</i>	Bluebeard Waxlip Hybrid Orchid		r				Un	550
<i>Xanthorrhoea semiplana ssp. semiplana</i>	Yacca		r				Un	3590
<i>Xanthosia tasmanica</i>	Southern Xanthosia		r				Un	4088

Abbreviations used

cen	critically endangered (Vic)
e / E	endangered (Vic) / (Aust) (EPBC Act 1999)
k/K	inadequately known (Vic)/(Aust)
L	listed under FFG Act 1988 (Vic)
N	nominated to be listed under FFG Act 1988 (Vic)
r/R	rare (Vic)/(Aust)
v / V	vulnerable (Vic) / (Aust) (EPBC Act 1999)
x / X	extinct (Vic) / (Aust) (rejected or deemed ineligible to be listed under FFG Act 1988 (Vic))
R	Recovery plan - published
Un	Unassessed in the BNA Analysis 1997/98

NB: FFG listed taxa includes only species listed as individual species, not as part of communities

Appendix 3c. Current threatened fauna in the Otway Plain bioregion as at November 2002 (EA 2003*, DSE 2003^, NRE 2002c?, SAC 2002).

English name	Scientific name	Aust status*	Vic Status^	FFG-listed	FFG Action Statement?	Recovery plan (R) or draft (d)*	BNA Unassessed	NRE code
Australasian Bittern	<i>Botaurus poiciloptilus</i>		e	L				197
Australasian Shoveller	<i>Anas rhynchos</i>		v				Un	212
Australian Grayling	<i>Prototroctes maraena</i>	V	v	L				4031
Australian Mudfish	<i>Neochanna cleaveri</i>		cen	L	115			4033
Baillon's Crake	<i>Porzana pusilla palustris</i>		v	L			Un	50
Barking Owl	<i>Ninox connivens connivens</i>		e	L	116		Un	246
Black-faced Cormorant	<i>Phalacrocorax fuscescens</i>		lr					98
Black Falcon	<i>Falco subniger</i>		v				Un	238
Blue-billed Duck	<i>Oxyura australis</i>		e	L	yes			216
Broad-toothed Rat	<i>Mastacomys fuscus mordicus</i>		lr				Un	1438
Brolga	<i>Grus rubicunda</i>		v	L	119		Un	177
Brown Quail	<i>Coturnix ypsilophora australis</i>		lr				Un	10
Bush Stone-curlew	<i>Burhinus grallarius</i>		e	L	78		Un	174
Cape Barren Goose	<i>Cereopsis novaehollandiae</i>		lr				Un	198
Caspian Tern	<i>Sterna caspia</i>		lr	L				112
Common Bent-wing Bat	<i>Miniopterus schreibersii ssp. unknown</i>		v/e	L			Un	1341
Chestnut-rumped Heathwren	<i>Hylacola pyrrhopygia</i>		v	L			Un	498
Common Diving-Petrel	<i>Pelecanoides urinatrix</i>		lr				Un	85
Diamond Dove	<i>Geopelia striata cuneata</i>		lr	L			Un	31
Diamond Firetail	<i>Stagonopleura guttata</i>		v	L			Un	652
Eastern Curlew	<i>Numenius madagascariensis</i>		lr				Un	149
Fairy Prion	<i>Pachyptila turtur</i>	V	v				Un	83
Fairy Tern	<i>Sterna nereis nereis</i>		e	L				118
Fat-tailed Dunnart	<i>Sminthopsis crassicaudata</i>		lr				Un	1072
Freckled Duck	<i>Stictonetta naevosa</i>		e	L	105		Un	214
Glossy Grass Skink	<i>Pseudemoia rawlinsoni</i>		lr					2683
Glossy Ibis	<i>Plegadis falcinellus</i>		lr				Un	178
Great Egret	<i>Ardea alba</i>		v	L	120			187
Grey Goshawk	<i>Accipiter novaehollandiae novaehollandiae</i>		v					220
Grey-headed Flying Fox	<i>Pteropus poliocephalus</i>		v	N			Un	1280
Ground Parrot	<i>Pezoporus wallicus wallicus</i>		e	L				311
Growling Grass Frog	<i>Litoria raniformis</i>	V	e	L			Un	3207
Gull-billed Tern	<i>Sterna nilotica</i>		e	L			Un	111
Hardhead	<i>Aythya australis</i>		v				Un	215
Hooded Plover	<i>Thinornis rubricollis</i>		e	L	9			138
Intermediate Egret	<i>Ardea intermedia</i>		cen	L	120		Un	186
Lewin's Rail	<i>Rallus pectoralis pectoralis</i>		v	L			Un	45
Little Bittern	<i>Ixobrychus minutus dubius</i>		e	L			Un	195
Little Egret	<i>Egretta garzetta nigripes</i>		e	L	120		Un	185
Little Tern	<i>Sterna albifrons sinensis</i>		v	L	51			117
Long-nosed Potoroo	<i>Potorous tridactylus tridactylus</i>	V	e	L			Un	1175
Magpie Goose	<i>Anseranas semipalmata</i>		v				Un	217

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English name	Scientific name	Aust status*	Vic Status^	FFG-listed	FFG Action Statement?	Recovery plan (R) or draft (d)*	BNA Unassessed	NRE code
Masked Owl	<i>Tyto novaehollandiae novaehollandiae</i>		e	L	yes		Un	250
Mountain Galaxias	<i>Galaxias olidus</i>		Ins	L			Un	4036
Musk Duck	<i>Biziura lobata</i>		v				Un	217
Nankeen Night Heron	<i>Nycticorax caledonicus hillii</i>		lr				Un	192
New Holland Mouse	<i>Pseudomys novaehollandiae</i>		e	L	74			1455
Northern Giant-Petrel	<i>Macronectes halli</i>	V	lr	L		R	Un	937
Orange-bellied Parrot	<i>Neophema chrysogaster</i>		cen	L	43	R		305
Otway Black Snail	<i>Victaphanta compacta</i>		v				Un	5050
Pacific Gull	<i>Larus pacificus pacificus</i>		lr				Un	126
Painted Snipe	<i>Rostratula benghalensis australis</i>		cen	L			Un	170
Pectoral Sandpiper	<i>Calidris melanotos</i>		lr				Un	978
Pied Cormorant	<i>Phalacrocorax varius</i>		lr					99
Plains Wanderer	<i>Pedionomus torquatus</i>	V	cen	L	66		Un	20
Powerful Owl	<i>Ninox strenua</i>		v	L	92			248
Regent Honeyeater	<i>Xanthomyza phrygia</i>	E	cen	L	41	R	Un	603
River Blackfish	<i>Gadopsis marmoratus</i>		Ins					4127
Royal Spoonbill	<i>Platalea regia</i>		v				Un	181
Rufous Bristlebird (Otways)	<i>Dasyornis broadbenti caryochrous</i>		lr	L	49			521
Shy Albatross	<i>Diomedea cauta</i>	V	v	L		R	Un	91
Sooty Albatross	<i>Phoebetria fusca</i>	V	v	L		R	Un	92
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	E	lr				Un	1092
Southern Giant-Petrel	<i>Macronectes giganteus</i>	E	v	L		R	Un	929
Speckled Warbler	<i>Chthonicola sagittata</i>		v	L			Un	504
Spotted Harrier	<i>Circus assimilus</i>		lr				Un	218
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	V	e	L	15		Un	1008
Striped Legless Lizard	<i>Delma impar</i>	V	e	L	17		Un	2159
Swamp Antechinus	<i>Antechinus minimus maritimus</i>		lr	L				1034
Swamp Skink	<i>Egernia coventryi</i>		v	L				2407
Swift Parrot	<i>Lathamus discolor</i>	E	e	L	169	R	Un	309
Wandering Albatross	<i>Diomedea exulans</i>	V	e	L		R	Un	86
Whiskered Tern	<i>Chlidonias hybridus javanicus</i>		lr				Un	110
White-bellied Sea-eagle	<i>Haliaeetus leucogaster</i>		v	L	60		Un	226
White-faced Storm-Petrel	<i>Pelagodroma marina</i>		lr					65
Yarra Pigmy Perch	<i>Nannoperca obscura</i>	V	lr	L	yes		Un	4100

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

Abbreviations used

cen	critically endangered (Vic)
e / E	endangered (Vic) / (Aust) (EPBC Act 1999)
ins	inadequately known (Vic)/(Aust)
L	listed under FFG Act 1988 (Vic)
N	nominated to be listed under FFG Act 1988 (Vic)
lr	near threatened (Vic)
v / V	vulnerable (Vic) / (Aust) (EPBC Act 1999)
x / X	extinct (Vic) / (Aust) (rejected or deemed ineligible to be listed under FFG Act 1988 (Vic))
R	Recovery plan - published
Un	Unassessed in the BNA Analysis 1997/98

NB: FFG listed taxa includes only species listed as individual species, not as part of communities

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Appendix 4a. Guidelines for Bioregional Network Analysis

CRITERIA Parcel = % State (Species, Bioregion, Tenure)
= Size and Risk

		Risk In Bioregion		
		More Concern		Less Concern
<p>More Important</p> <p>Parcel Size</p> <p>Largest</p> <p>Smallest</p> <p>Less Important</p>	<p>Cr</p> <p>En ↓ → ?</p> <p>Vu ↓</p> <p>Parcels > 50%</p>	<p>En ↑</p> <p>Vu → ?</p> <p>Insuff. Known Data Deficient</p>	<p>Vu ↑</p> <p>Rare Depleted Near Threatened</p>	
	Top 50% of the States Population	Full Commitment	Substantive Participation	Planning Awareness / Opportunistic Action
	Middle 25%	Substantive Participation	Planning Awareness / Opportunistic Action	Planning Awareness / Watching Brief
	Lowest 25%	Substantive Participation	Planning Awareness / Watching Brief	Planning Awareness / Watching Brief
	Tiny Parcels	Planning Awareness / Opportunistic Action	Planning Awareness / Watching Brief	Planning Awareness / Watching Brief

RESPONSE LEVELS

Planning

Planning Awareness / Watching Brief	- ensure that known occurrences are specifically catered for by planning zones and/or by environment assessment processes for development.
Planning Awareness / Opportunistic Action	- as above plus, ensure that management requirements are explicitly described where Forest Management Plans, Regional Vegetation Plans and Environment Action Plans are prepared.
Substantive Participation	- all above plus, participate in preparation of Action Statements / Recovery Plans (where they do not already exist).
Full Commitment	- all above plus, participate in finalisation of Action Statements / Recovery Plans.

Inventory / Monitoring

Planning Awareness / Watching Brief	- incorporate data from <i>ad hoc</i> observations.
Planning Awareness / Opportunistic Action	- as above plus, locate and confirm presence of known records and/or conduct targeted survey to ensure adequate coverage of occurrences.
Substantive Participation	- all above plus, initiate or continue surveillance monitoring of appropriate selection of populations.
Full Commitment	- lead substantial implementation of inventory / monitoring requirements from published or final draft Action Statements / Recovery Plans, or (if these documents do not exist) of all of the above.

On-ground Management

Planning Awareness / Watching Brief	- no priority actions within 3 year horizon
Planning Awareness / Opportunistic Action	- facilitate progressive implementation of critical actions as external funding and partnership opportunities arise
Substantive Participation	- ensure progressive implementation of relevant actions from published or final draft Action Statements / Recovery Plans, or (if these documents do not exist) of all critical and most important actions identified through discussions in Bioregional Networks
Full Commitment	- lead substantial implementation of relevant actions from published or final draft Action Statements / Recovery Plans, or (if these documents do not exist) of all critical and most important actions identified through discussions in Bioregional Networks

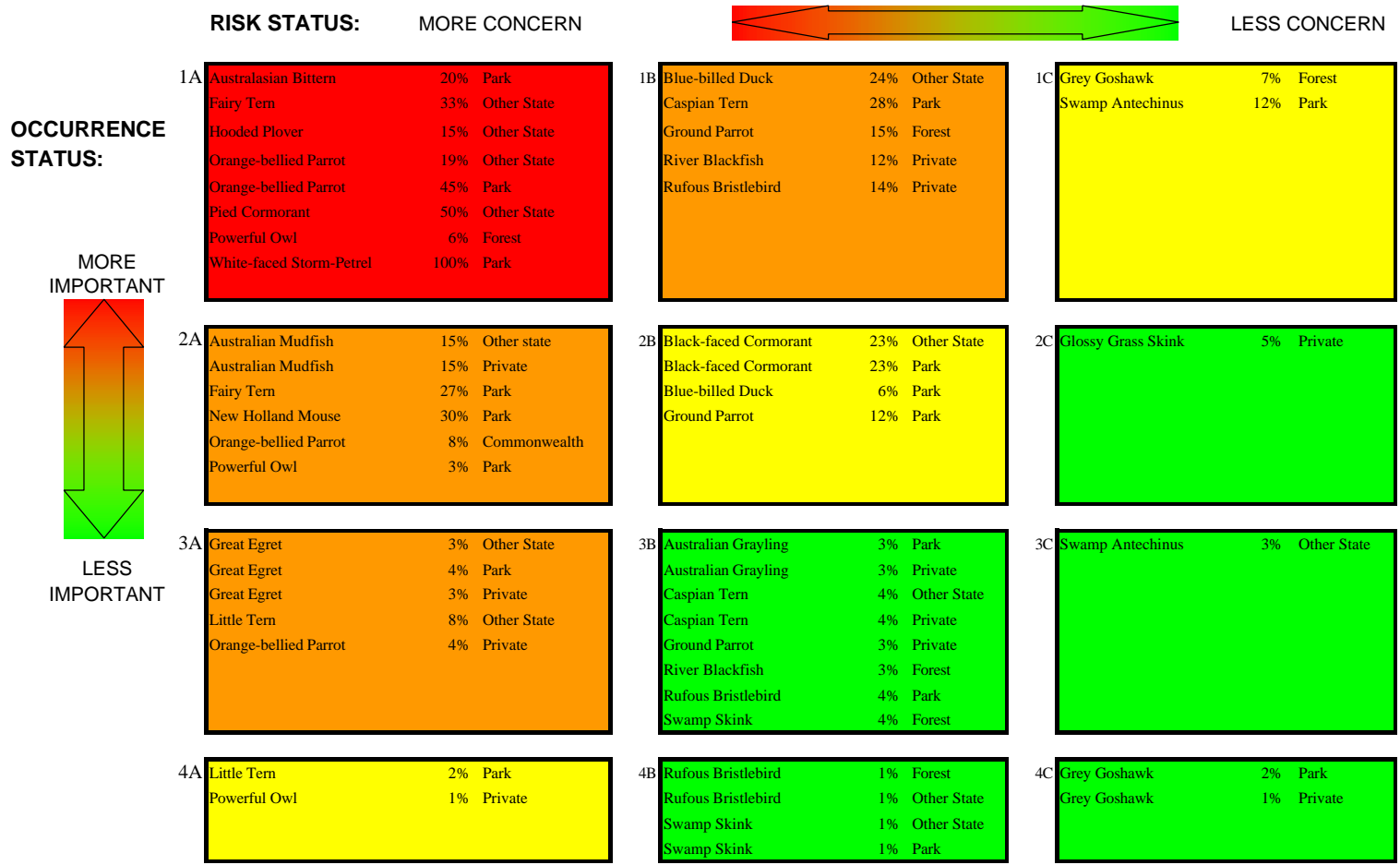
Research

Planning Awareness / Watching Brief	- no priority actions within 3 year horizon
Planning Awareness / Opportunistic Action	- facilitate progressive implementation of critical actions as external funding and partnership opportunities arise
Substantive Participation	- ensure progressive implementation of relevant actions from published or final draft Action Statements / Recovery Plans, or (if these documents do not exist) of all critical actions identified through discussions in Bioregional Networks
Full Commitment	- lead substantial implementation of relevant actions from published or final draft Action Statements / Recovery Plans, or (if these documents do not exist) of all critical and selected important actions identified through discussions in Bioregional Networks

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

Appendix 4b. Bioregional Network Analysis priority/risk rankings for threatened or near threatened fauna in Otway Plain bioregion

OTWAY PLAIN BIOREGION - THREATENED FAUNA - PRIORITIES



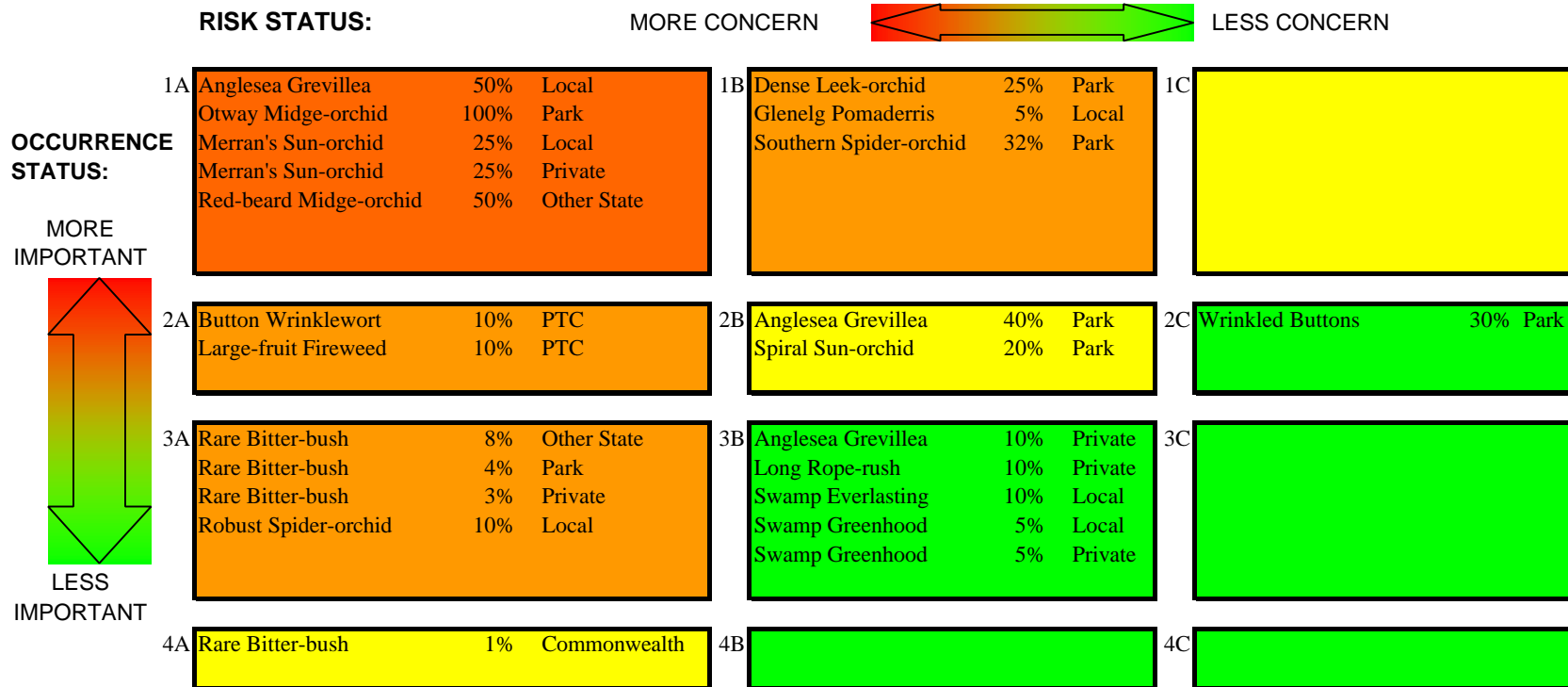
Legend

1A	Full Commitment
1B, 2A, 3A	Substantive Participation
1C, 2B, 4A	Planning Awareness / Opportunistic Action
2C, 3B, 3C, 4B, 4C	Planning Awareness / Watching Brief

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Appendix 4c. Bioregional Network Analysis priority/risk rankings for rare or threatened flora in Otway Plain bioregion

OTWAY PLAIN BIOREGION - THREATENED FLORA - PRIORITIES



Legend

1A	Full Commitment
1B, 2A, 3A	Substantive Participation
1C, 2B, 4A	Planning Awareness / Opportunistic Action
2C, 3B, 3C, 4B, 4C	Planning Awareness / Watching Brief

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

Appendix 5. Threshold values based on 30% reporting rate for Otway Plain bioregion species - Species with 10 or more observations from statewide analysis of Birds Australia database (from Lowe et al 2002).

Habitat Score	0 – 3 ha	3 – 10 ha	10 – 30 ha	30 – 100ha	100 – 400 ha	400+ ha
6						
7						
8						
9						
10						
11	Australian Magpie Common Myna Common Starling Eastern Rosella European Greenfinch Fan-tailed Cuckoo Grey Fantail Grey Shrike-thrush Little Raven Magpie-lark New Holland Honeyeater Red Wattlebird Spotted Turtle-Dove Superb Fairy-wren White-browed Scrubwren Willie Wagtail				Blue-winged Parrot Brown Thornbill Red-browed Finch Skylark White-plumed Honeyeater	Australian Raven Dusky Woodswallow Eastern Yellow Robin European Goldfinch Striated Pardalote Swamp Harrier
12	Common Blackbird Laughing Kookaburra Yellow-rumped Thornbill Australian King-Parrot Black-faced Cuckoo-shrike Brown-headed Honeyeater Common Bronzewing Crested Shrike-tit Crimson Rosella Eastern Spinebill				Jacky Winter Rufous Whistler Silvereye	
13	Galah Gang-gang Cockatoo Golden Whistler Grey Butcherbird House Sparrow Little Wattlebird Long-billed Corella Noisy Miner Spotted Pardalote	Grey Currawong			Brown Goshawk White-throated Treecreeper	
Total	35	1	0	0	6	2

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion

Appendix 6. Land managers and stakeholders

Manager		Land management role
Local Government Authority (LGA)	Surf Coast Shire, Shire and City of Greater Geelong	Minor road reserves, township land, Recreation Reserves, cemeteries and other public land, including through implementation of Planning Schemes and Roadside Management Plans (Local Government municipalities)
Land Victoria (DSE)	LV	Unreserved or Uncategorised Crown Land, Gravel Reserves, Streamside Reserves, Streamside Areas, Stream beds and banks, and Public land Water Frontage (see footnote 1).
Private	Priv	Freehold land used for rural residential, cropping, grazing, mining, hobby farming, recreation and conservation (Landholders)
Stakeholder		Main role or interest in land management
Barwon Water	BW	Provision of water for urban purposes for City of Greater Geelong, the Borough of Queenscliffe, Surf Coast and Colac/Otway Shires and parts of Golden Plains Shire
Bird Observers Club Australia	BOCA	Survey, monitor and conduct conservation projects to benefit bird species
Birds Australia	BA	Survey, monitor and conduct conservation projects to benefit bird species
Botanic Guardians	BG	Vegetation protection and monitoring on public land (DSE coordinated)
Conservation Volunteers Australia	CVA	On-ground conservation services on public and private land
Corangamite Catchment Management Authority	CCMA	Integration of existing advisory mechanisms related to catchment management (especially on private land). Also waterway and floodplain management, coordination of rural drainage, and aspects of Crown frontage management.
Country Fire Authority	CFA	Prevention and suppression of fire on lands not managed by Parks Victoria or DSE.
Departments of: Sustainability and Environment and Primary Industries (DSE & DPI). Formerly NRE.	DSE/DPI	Management of natural resources, pest plants and animals, and Native Vegetation Retention Controls (Catchment & Agriculture Services); protection and conservation of native flora and fauna, including through establishment of Public Authority Management Agreements for sites of remnant vegetation, such as cemeteries, rail and road reserves (Parks, Flora & Fauna)
Field Naturalists Clubs	FNC	Survey and monitoring of flora and fauna
Good Neighbour Program	GNP	Protection of private land by controlling pest plants and animals on public land
Greening Australia Victoria	GAV	Sustainable vegetation management
Land for Wildlife	LFW	Habitat retention and enhancement on private land (jointly coordinated by DSE and Bird Observers Club of Australia)
Landcare	Lc	On-ground environmental management and revegetation in an agricultural context
Parks Victoria	PV	Parks and Conservation Reserves; also other categories (e.g. Historic Area, Education Area, Streamside Reserve) where designated by LCC or subsequently determined by government.
Roadside Conservation Advisory Committee	RCC	With local committees and VicRoads, assessment of roadside biodiversity values and appropriate conservation strategies for roadside management.
Southern Rural Water	SRW	Provision of water for irrigation, industry, regional distribution, private diverters, and 'stock and domestic' consumers. Maintenance of relevant infrastructure.
Threatened Species Network	TSN	Coordination of "friends of threatened species" groups
Trust for Nature	TFN	Protection of significant freehold bushland with covenanting (Victoria)
VicRoads	VicRds	Manages major road reserves.
Victorian Farmers Federation	VFF	Representation of farming community and co-sponsorship of Landcare
Wathaurong Aboriginal Co-operative	WAC	Representation of indigenous community cultural heritage
Weed and Rabbit Control Action Groups	WAG RAG	Weed and rabbit management on private land

Appendix 7. Non-threatened taxa referred to in text

English name	Scientific name
FAUNA	
Cat*	<i>Felis catus</i>
Dog*	<i>Canis familiaris</i>
Fox *†	<i>Canis vulpes</i>
Grey Currawong	<i>Strepera versicolor</i>
New Holland Honeyeater	<i>Phylidonyris novaehollandiae</i>
Noisy Miner	<i>Manorina melanocephala</i>
Platypus	<i>Ornithorhynchus anatinus</i>
Rabbit*†	<i>Oryctolagus cuniculus</i>
White-throated Treecreeper	<i>Cormobates leucophaeus</i>
FLORA	
Brown Stringybark	<i>Eucalyptus baxteri</i>
Tea-tree	<i>Leptospermum</i> sp.
Cinnamon Fungus *	<i>Phytophthora cinnamomi</i>
Gorse*†	<i>Ulex europaeus</i>
Messmate	<i>Eucalyptus obliqua</i>
Mountain Grey Gum	<i>Eucalyptus cypellocarpa</i>
Radiata Pine*	<i>Pinus radiata</i>
River Red Gum	<i>Eucalyptus camaldulensis</i>
Spotted Gum**	<i>Corymbia maculata</i>
Sugar Gum**	<i>Eucalyptus cladocalyx</i>
Willow*	<i>Salix</i> sp.

*introduced

**native but not local

†proclaimed vermin or noxious in Victoria

Appendix 8. Sources of additional information (Internet Web sites)**Catchment Management Authority:**

- Corangamite Catchment Management Authority Web site: <http://www.ccma.vic.gov.au>

Department of Sustainability and Environment & the Department of Primary Industries:

Access to general information held by the Department of Sustainability and Environment & the Department of Primary Industries:

- DSE Web site: <http://www.dse.vic.gov.au>
- DPI Web site: <http://www.dpi.vic.gov.au>
- 'Index of Stream Condition' Web site: <http://www.vicwaterdata.net/isc>

Access to Biodiversity Information held by the Parks Flora & Fauna Division, Information Management Section of DSE including:

- BioMap
- BioSites
- Detailed site specific data
- Generalised flora and fauna distribution data
- Key biodiversity datasets in GIS Format

Bureau of Meteorology

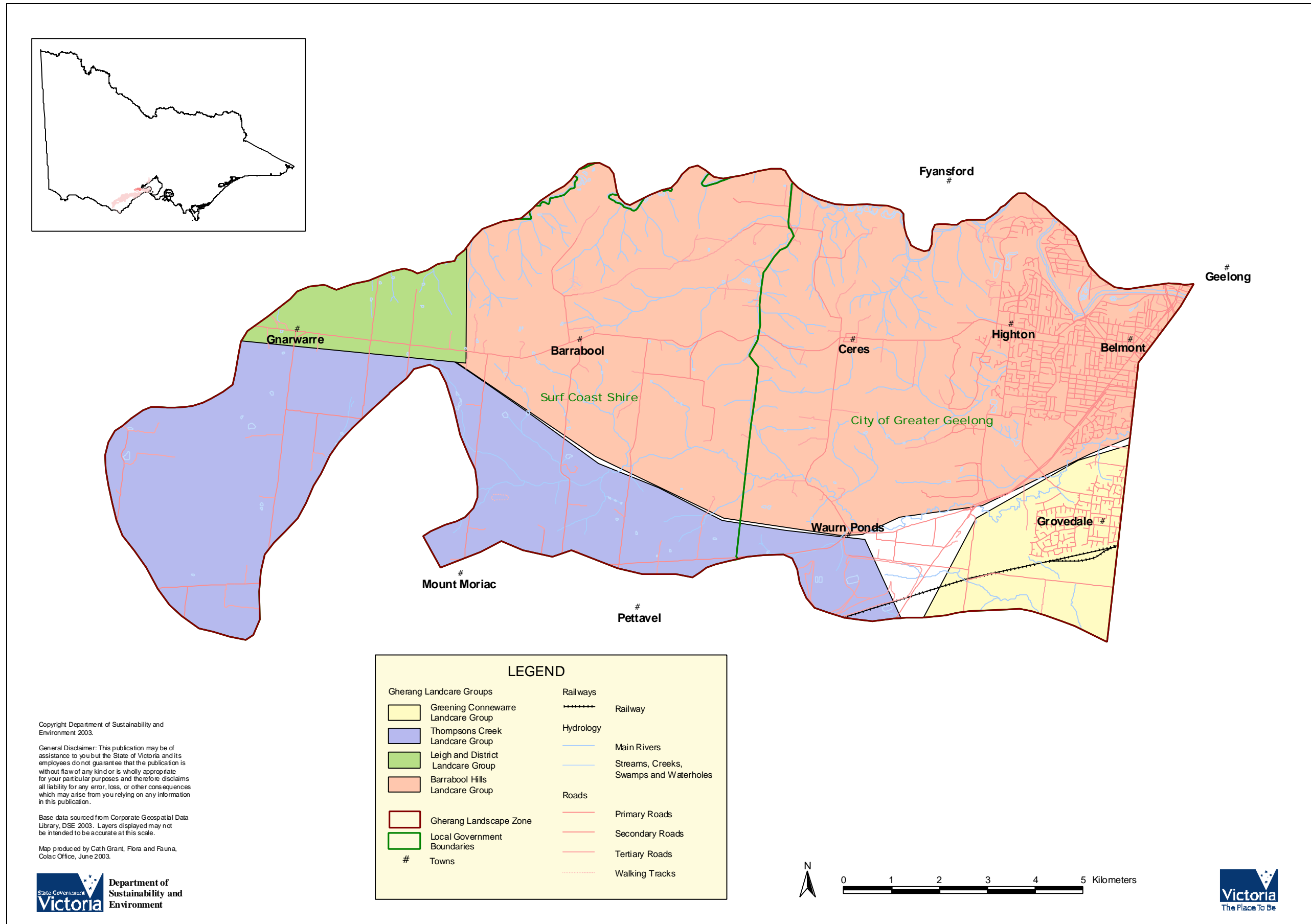
- <http://www.bom.gov.au>

Environment Australia:

- EA Web site: <http://www.ea.gov.au>

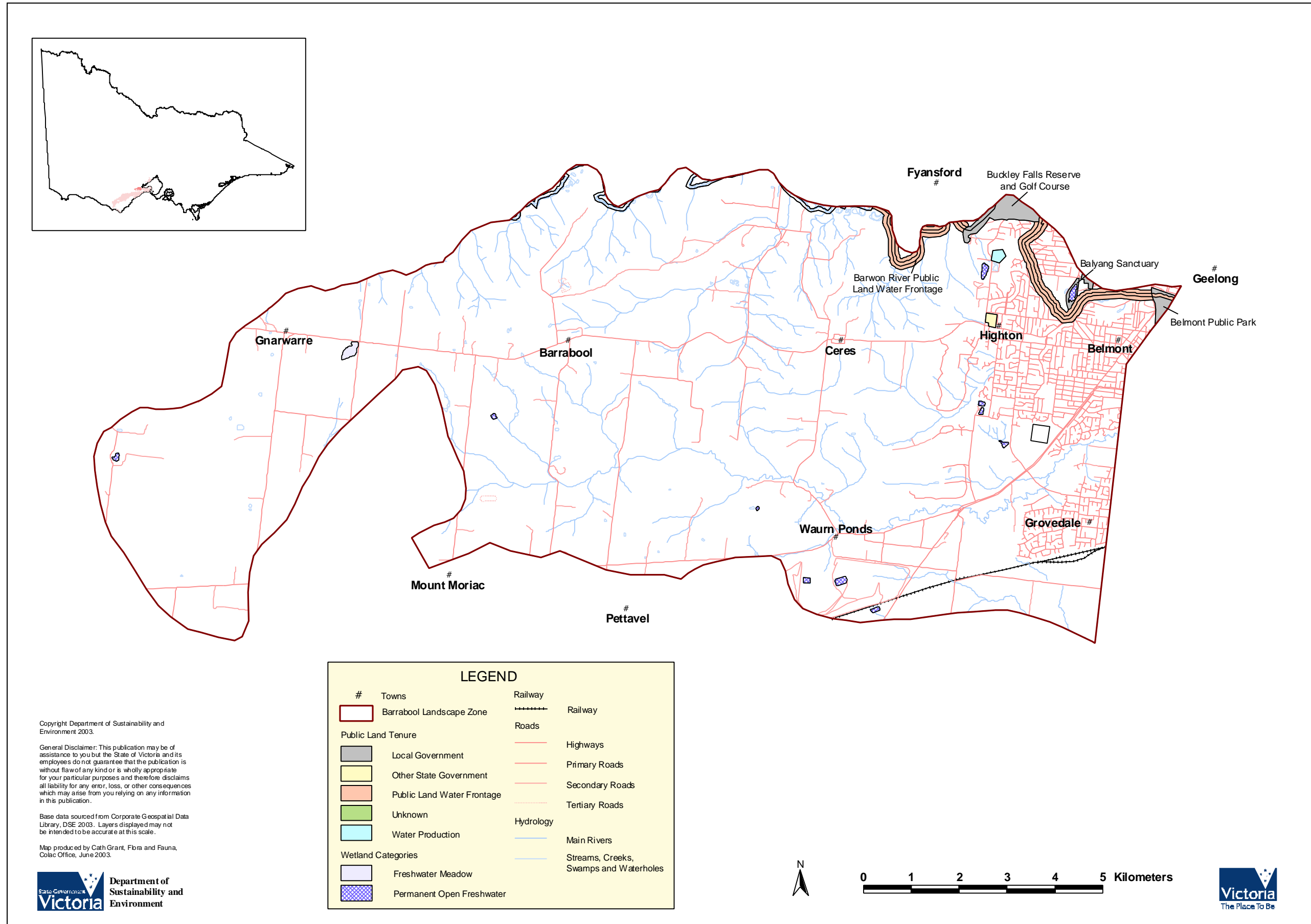
Victorian Environmental Protection Authority:

- EPA Web site: <http://www.epa.vic.gov.au>

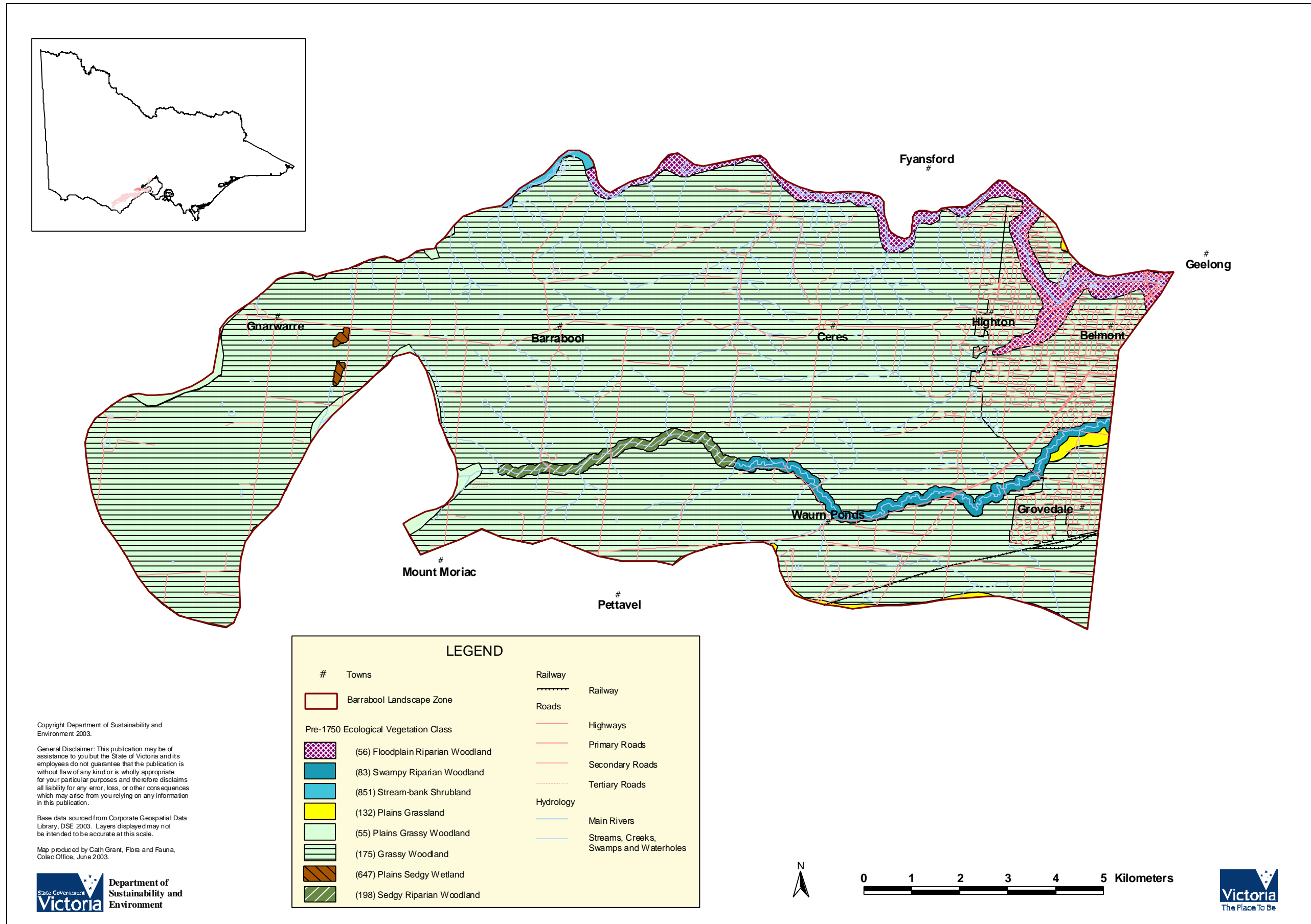


Map 9. Local Government Authority boundaries and Landcare group boundaries in the Barrabool Landscape Zone

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 10. Public Land in the Barrabool Landscape Zone



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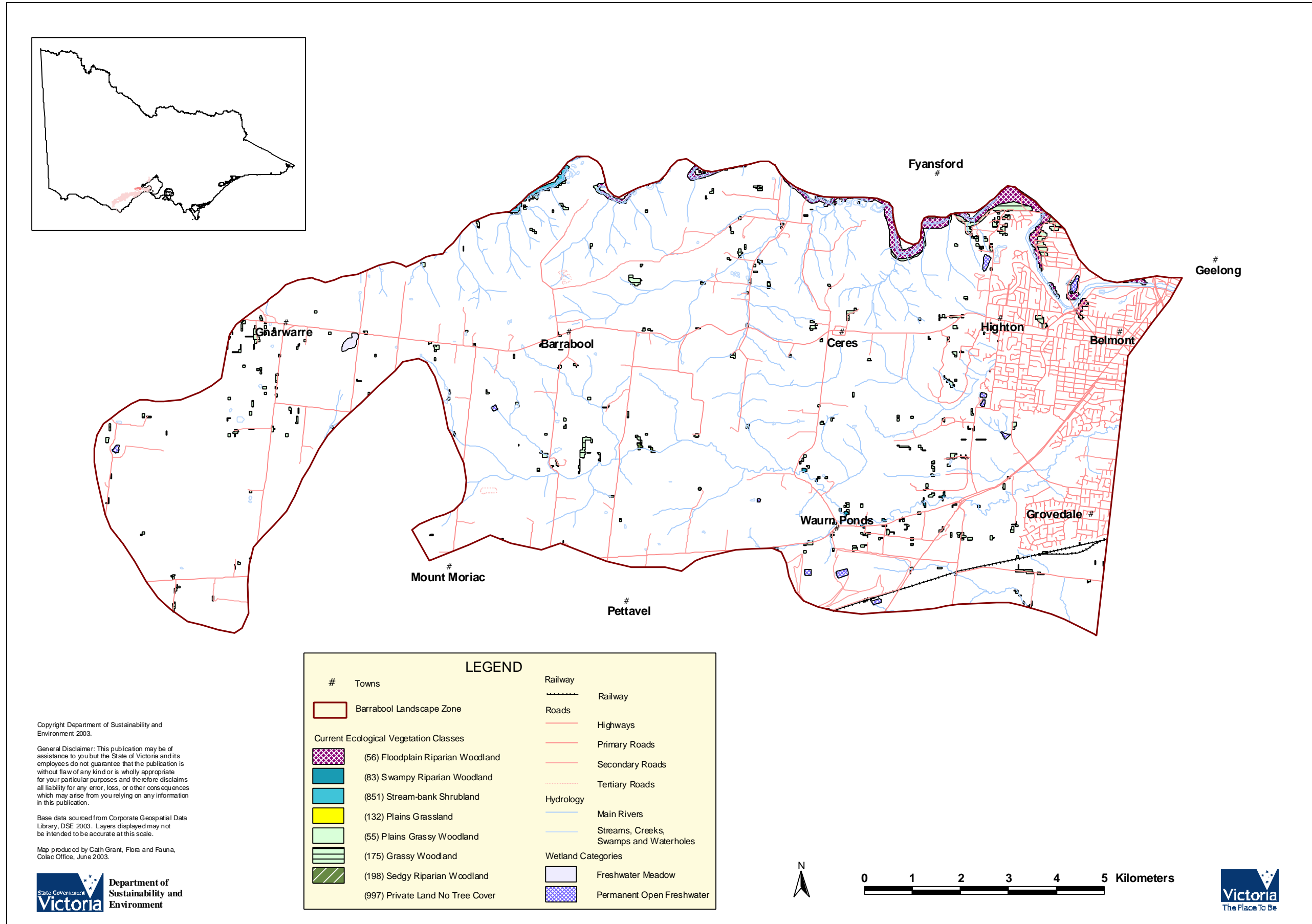
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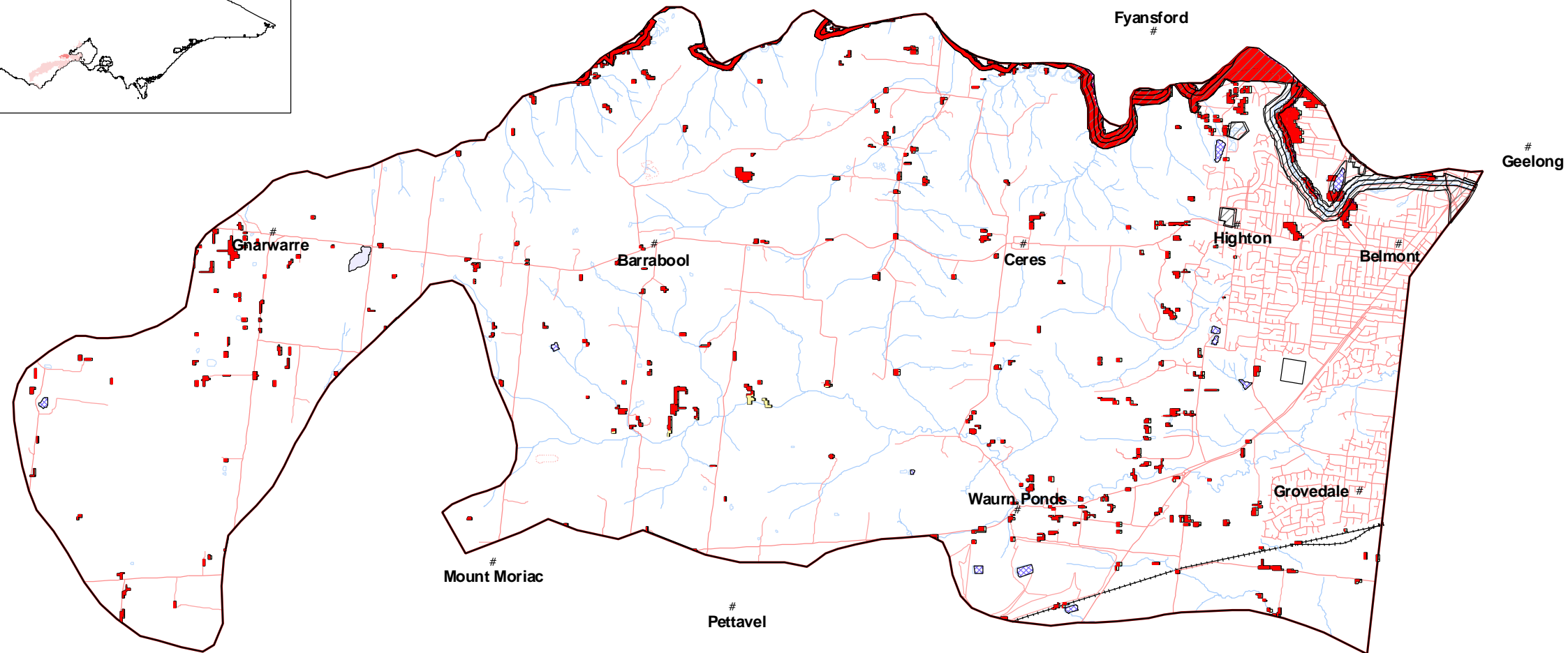
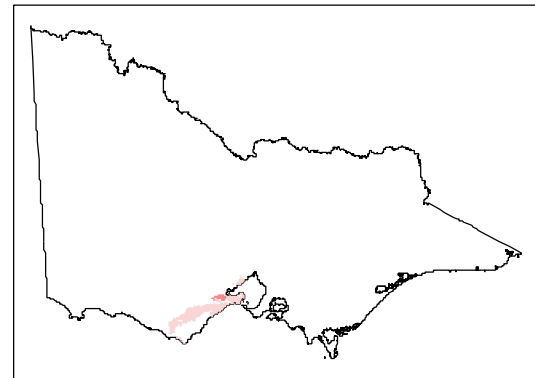
Map produced by Cath Grant, Flora and Fauna, Colac Office, June 2003.



Map 11. Pre-1750 EVCs in the Barrabool Landscape Zone



Map 12. Current EVCs in the Barrabool Landscape Zone

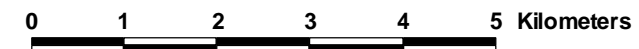


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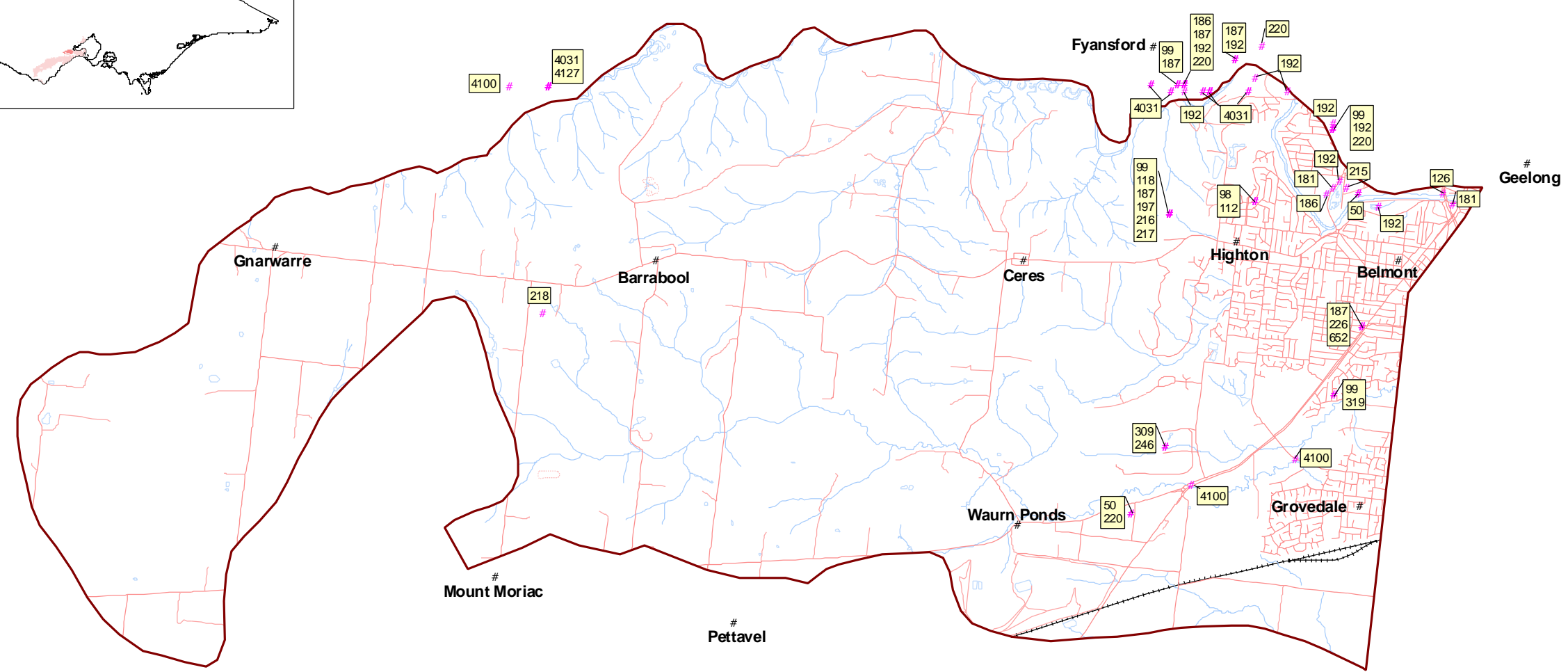
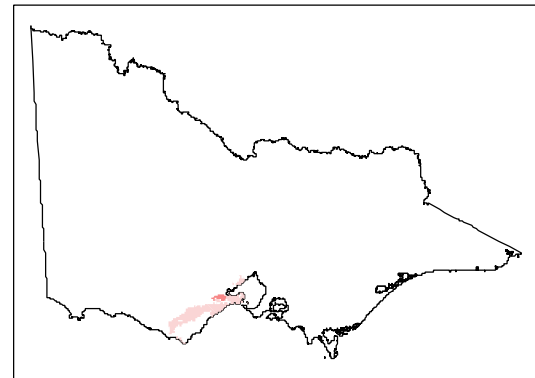
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Map 13. Current EVC Conservation Significance and Public Land boundaries in the Barrabool Landscape Zone

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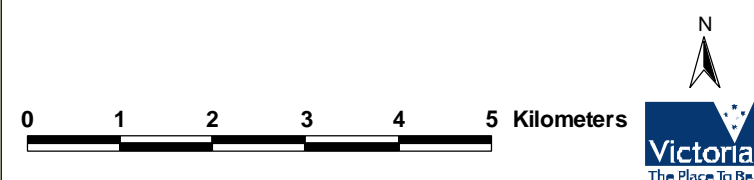
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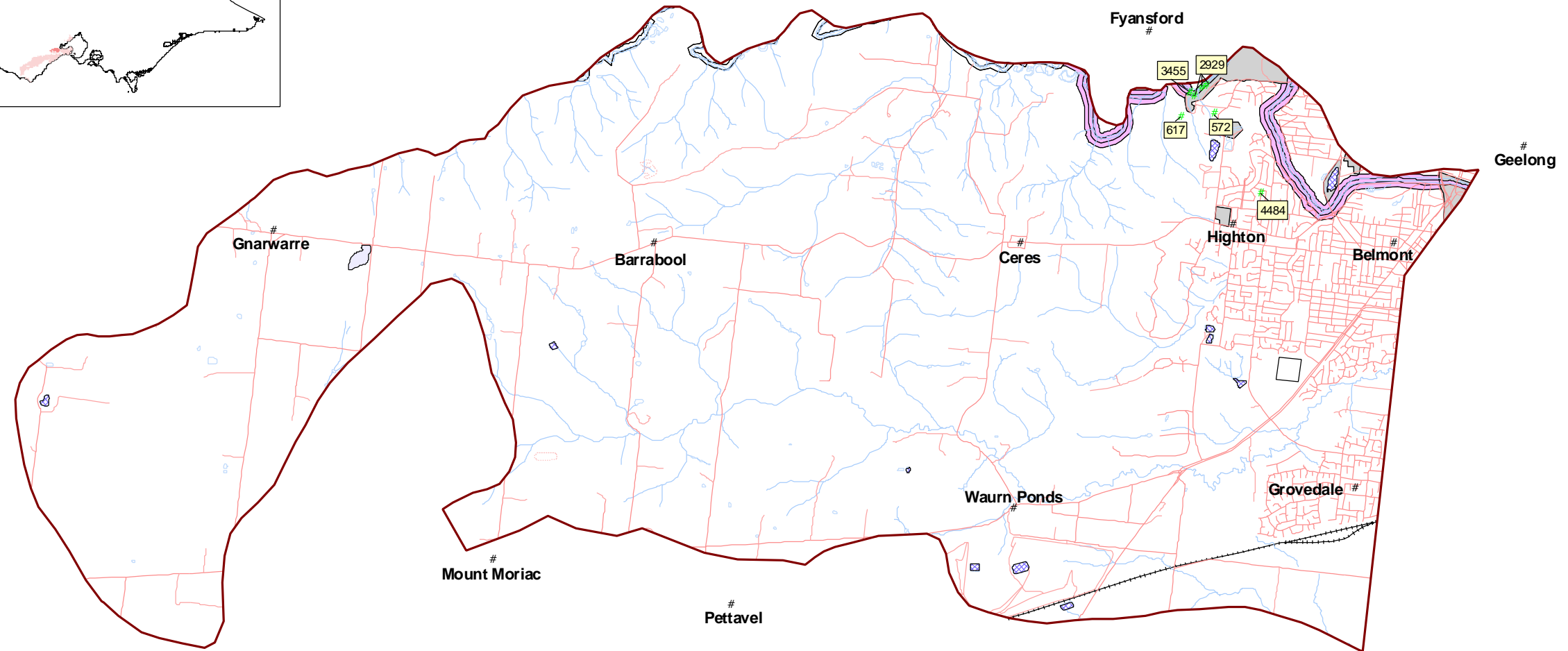
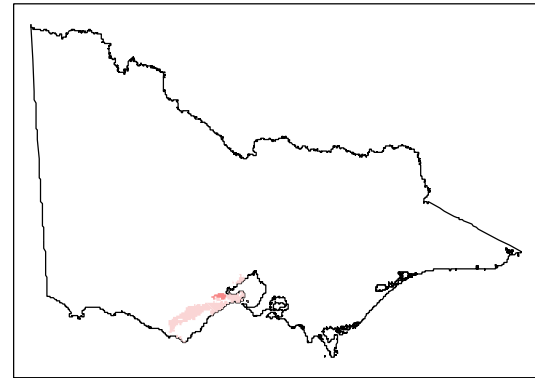
Map produced by Cath Grant, Flora and Fauna, Colac Office, June 2003.



# Threatened Fauna		# Towns		Roads	
50	Baillon's Crake (v)	218	Spotted Harrier (lr)	—	Highways
98	Black-faced Cormorant (lr)	220	Grey Goshawk (v)	—	Primary Roads
99	Pied Cormorant (lr)	246	Barking Owl (e)	—	Secondary Roads
112	Caspian Tern (lr)	309	Swift Parrot (E,e)	—	Tertiary Roads
118	Fairy Tern (e)	319	Azure Kingfisher (lr)	—	Hydrology
126	Pacific Gull (lr)	652	Diamond Firetail (v)	—	Main Rivers
181	Royal Spoonbill (v)	4031	Australian Grayling (V,v)	—	Streams, Creeks, Swamps and Waterholes
186	Intermediate Egret (cen)	4100	Yarra Pigmy Perch (V, lr)	—	Railway
187	Great Egret (v)	4127	River Blackfish (ins)	—	Railway
192	Nankeen Night Heron (lr)				
197	Australasian Bittern (e)				
215	Hardhead (v)				
216	Blue-billed Duck (e)				
217	Musk Duck (v)				



Map 14. Threatened Fauna in the Barrabool Landscape Zone



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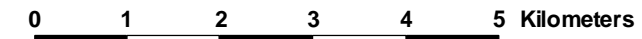
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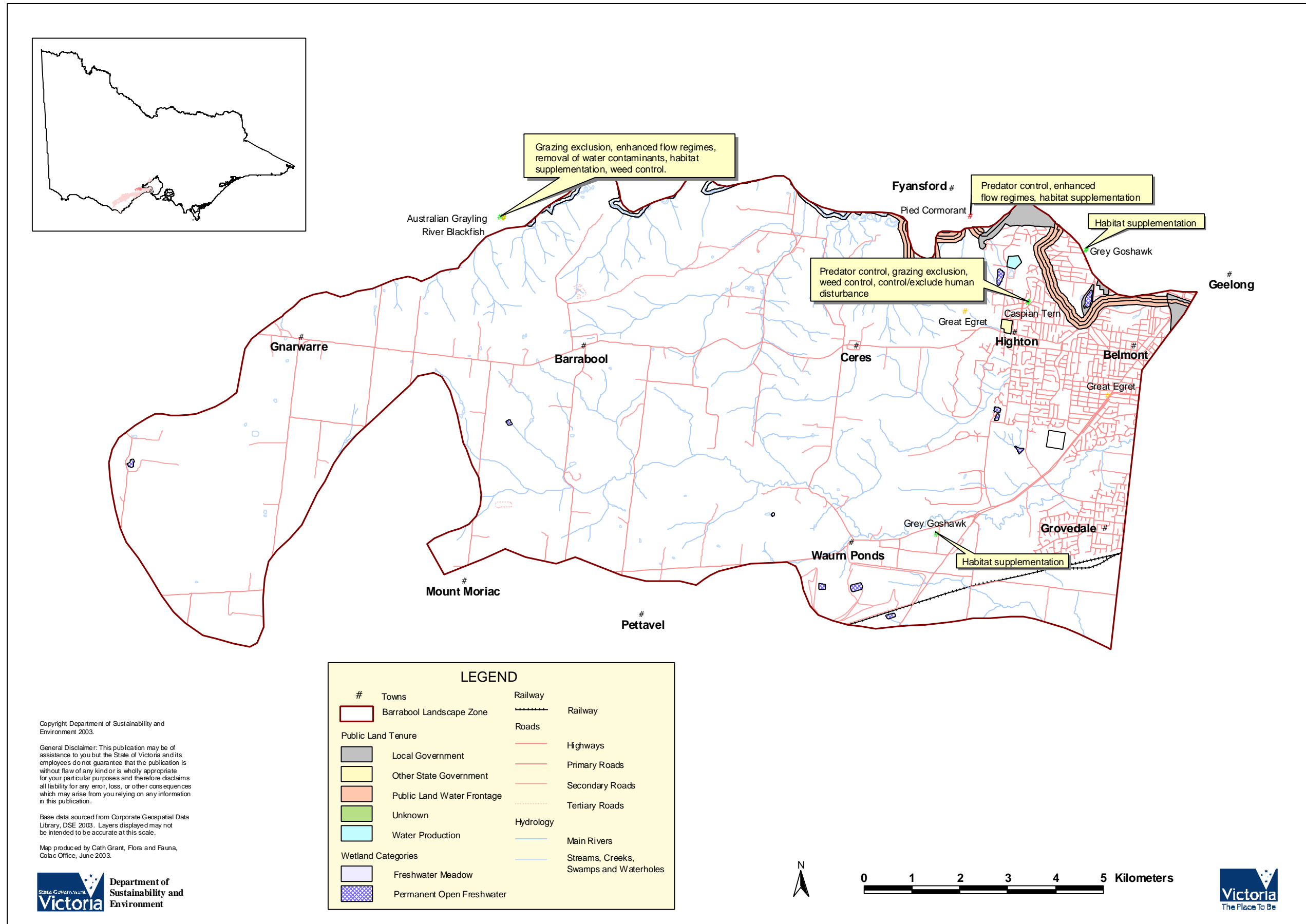


Threatened Flora		LEGEND		Roads	
#	Towns	[Red outline]	Barrabool Landscape Zone	[Red line]	Highways
[Green dot]	Threatened flora point localities	[Grey box]	Public Land	[Red line]	Primary Roads
Threatened flora codes and status (ARO T/vrot)		Wetland Categories		[Red line]	Secondary Roads
572	Swamp Water-starwort (k)	[Light blue box]	Freshwater Meadow	[Red line]	Tertiary Roads
617	Slender Bitter-cress (k)	[Blue hatched box]	Permanent Open Freshwater	[Red line]	Hydrology
2929	Fragrant Saltbush (r)	[Black dashed line]	Railway	[Blue line]	Main Rivers
3455	Rye Beetle-grass (r)	[Black dashed line]	Railway	[Blue line]	Streams, Creeks, Swamps and Waterholes
4484	Melbourne Yellow Gum (v)				



Map 15. Threatened Flora in the Barrabool Landscape Zone

Biodiversity Action Planning – Landscape plan for Barrabool Zone, Otway Plain Bioregion



Map 16. BNA species and their management actions in the Barrabool Landscape Zone

