

Lake Mokoan: additional flora and fauna survey

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Prepared for:

Beca Planning



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Summary

1. A survey of the flora and fauna of the Lake Mokoan area was undertaken over five days in late January 2006 to document values, identify issues and collect data to inform potential land-use options in all proposed land-use precincts. The survey greatly extended pre-existing knowledge of the flora and fauna values and their distribution.
2. A total of 234 plant species was recorded during this study, of which 121 (52 %) are indigenous and 113 (48%) are exotic. With the previous data, this brings the total flora recorded to 252 species (indigenous and exotic). This is considered to be a comprehensive inventory of the flora.
3. Data were collected at 38 quadrat sites to sample the range of vegetation communities present in the study area. The following Ecological Vegetation Classes (EVCs) were recorded and their distribution (according to precincts) ascertained:

Wetland vegetation

- EVC 961 Plains Rushy Wetland
- EVC 125 Plains Grassy Wetland
- EVC 82 Tall Marsh
- EVC 291 Cane-grass Wetland
- EVC 292 Red Gum Swamp
- EVC 168 Drainage-line Aggregate
- EVC 107 Lakebed Herbland
- EVC 918 Submerged Aquatic Herbland

These diverse wetlands are connected with the current Lake Mokoan and some are independent of it. Independent wetlands will remain with decommissioning (though status will vary with fluctuating water levels).

Dryland Vegetation

- EVC 55 Plains Grassy Woodland
- EVC 652 Lunette Woodland
- EVC 175 Grassy Woodland

Other Vegetation

- Red Gum Woodland with exotic grassy (Phalaris) understorey
- Exotic pasture and herbfields

4. Three state or nationally significant plant species were recorded, all with small populations. Two are listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*Goodenia macbarronii* (Vulnerable) and *Amphibromus fluitans* (Vulnerable)) and one (*G. macbarronii*) is listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act).
5. The conservation status of all Ecological Vegetation Classes in the Victorian Riverina Bioregion is Endangered, and the significance of all is High or Very High, depending upon vegetation condition.
6. One vegetation type EVC 175 Grassy Woodland (or EVC 652 Lunette Woodland) is listed under the EPBC Act as Grassy White Box Woodlands (Endangered).
7. Wetland vegetation (with six main EVC components) is represented by a ‘high-speed temporal mosaic’ in response to fluctuating water levels in Lake Mokoan. With decommissioning the extent of wetlands will contract and they may change in composition. Areas currently supporting most of these Wetland EVCs will be invaded by exotic species (weeds) predominantly *Phalaris* (**Phalaris aquatica*). Weed management is and will remain a major issue. This study recorded 12 regionally controlled species and one regionally Prohibited weed species listed under the *Catchment and Land Protection Act 1992*. Three willow (*Salix* spp.) taxa were recorded and they are Weeds of National Significance.
8. There may be significant implications under *Victoria’s Vegetation Management Framework* if indigenous vegetation is lost outright as a result of changed land-use, or if it is indirectly lost because of a changed hydrological regime. An appropriate response will be formulated by DSE.
9. Current vegetation of precinct E2 comprises very extensive Plains Rushy Wetland and Grassy Wetland in a complex temporal mosaic – natural values very high – Net Gain implications of changed land use are major. Similar comments apply to other precincts with similar wetland vegetation temporal mosaics driven by the current hydrological cycle.
10. The need for extensive intervention to revegetate ‘new’ wetlands post-decommissioning is likely to be low – the dynamic successional sequence of wetland vegetation will very likely be driven by the hydrological cycle in a manner similar to what is occurring now.
11. During the current study (and from incidental records collected by us in 2005) 113 fauna species were recorded within the study area at Lake Mokoan. Of these six (5.3%) are naturalised exotic (introduced) species. This represents just over half (circa 54%) of the species recorded in the Data Review Area (DRA), including a circa 500m buffer around the lake, during the twentieth century (from Atlas of Victorian Wildlife and other sources).
12. A total of 17 wetland and dryland fauna species of State and/or National conservation significance was recorded; one fauna community of State significance was recorded.

Notable fauna species include:

Lathams Snipe (migratory species under EPBC Act, Near Threatened in Victoria) - The Lake Mokoan area supports 300-600 birds and is likely to be a site of international significance for Latham's Snipe in its current condition (definitely of National significance for the species). Decommissioning may significantly impact on this species, and is therefore referable under the EPBC Act 1999 provisions for migratory species.

Freckled Duck (Endangered in Victoria; FFG listed) - 90 birds were seen in breeding plumage.

Intermediate Egret (Critically endangered in Victoria; FFG listed) - a number of birds observed in breeding plumage.

Great Egret (Endangered in Victoria, FFG listed) - Recorded in breeding plumage; study area is of State significance for the species.

Australian Little Bittern (Nationally Near Threatened; Endangered in Victoria, FFG listed) - Lake Mokoan is of State to National significance for the species

White-bellied Sea-Eagle (Vulnerable in Victoria; FFG listed) - resident and perhaps breeds at Lake Mokoan.

Victorian Temperate Woodland Bird Community

A number of species of this listed community were recorded: Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Painted Button Quail. The community will not be affected by decommissioning but invasion of *Phalaris* threatens the habitat of these birds.

Colonial Breeding Waterbirds

The presence of colonially nesting waterbirds breeding at least at two sites was noted (Little Black Cormorant and Little Pied Cormorant confirmed; Australian Pelican, Nankeen Night Heron, Great Egret and Intermediate Egret probable but unconfirmed).

13. Recommendations are made to realign boundaries of some of the provisional land-use precincts (Figure 2) to reflect the flora and fauna values documented by this study.
14. That the extent of snipe habitat within Lake Mokoan be modelled by or on behalf of DSE/GM-W under four scenarios, i.e.
 - a. current Lake Mokoan at 25% and 50% of full supply level; and
 - b. decommissioned lake at the 1-in-5 flood level and within the old 'Winton Swamp Complex' margins
 - c. to ascertain the likely impacts of decommissioning on the available area of snipe habitat.

1 Introduction

The proposed decommissioning of Lake Mokoan as a major water storage (Figure 1) will require reallocated land-uses in a range of precincts, into which the large area has been provisionally divided (Figure 2). Effective land-use decision making will involve the consideration of numerous environmental, social and economic factors. The previously available data on flora and fauna of the Lake Mokoan study area was reviewed in July 2005 by Ecology Australia – as the *Lake Mokoan Ecological Conditions Discussion Paper* (Conole, Roberts, Pettigrove and Carr 2005). That review concluded that there were large gaps in the data on the flora and fauna resources, management issues and implications on the biota of decommissioning the lake. In order to rectify this lack of information on the flora and fauna, a study was commissioned by the Department of Sustainability and Environment in December 2005 following a recommendation from the Lake Mokoan Future Land Use Steering Committee that such a study was required to fully inform the land use plan process. The brief for the study was as follows:

1. Collect a preliminary baseline data set of biodiversity values and their location along (principally) the southern and eastern Lake Mokoan shoreline and adjacent areas within the Goulburn-Murray Water (G-MW) land boundary; thereby overcoming the current lack of useable data for this area.
2. Collect a minimum dataset of sufficient detail and quality to be able to determine the extent and quality of biodiversity values in a manner which will be defensible in any forum (regulatory agencies, community, and peer review).
3. Collect the minimum dataset which will enable defensible decisions to be made about the location, nature and extent of future land-use precincts.
4. Collect a dataset which will minimise the risk of high-value sites being overlooked or undocumented.

The present report documents the results of this field-based survey undertaken in late January 2006 by Geoff Carr (flora) and Lawrie Conole (fauna).

2 Study Area

This report takes as the study area the existing Lake Mokoan water body and the surrounding Goulburn-Murray Water land out to the property boundary in all directions (Figures 1 and 2). The emphasis has been placed on the eastern and southern margins of the lake where the historical data deficit is greatest, but also discusses the northern, more accessible edge.

The primary study area falls mainly within the Victorian Riverina Bioregion, although part of the northern shore of Lake Mokoan extends into the adjacent Northern Inland Slopes Bioregion.

At the time of field work the water level in Lake Mokoan was at 46% of the Full Lake Supply (FLS). It had earlier been at the 50% FLS level following the large rain event in the catchment late last year. Summer draw down was advancing but field observations indicated the earlier higher water level. Much of the response in wetland vegetation (e.g. vigorous growth and recruitment of plant species) was due to this higher water level.

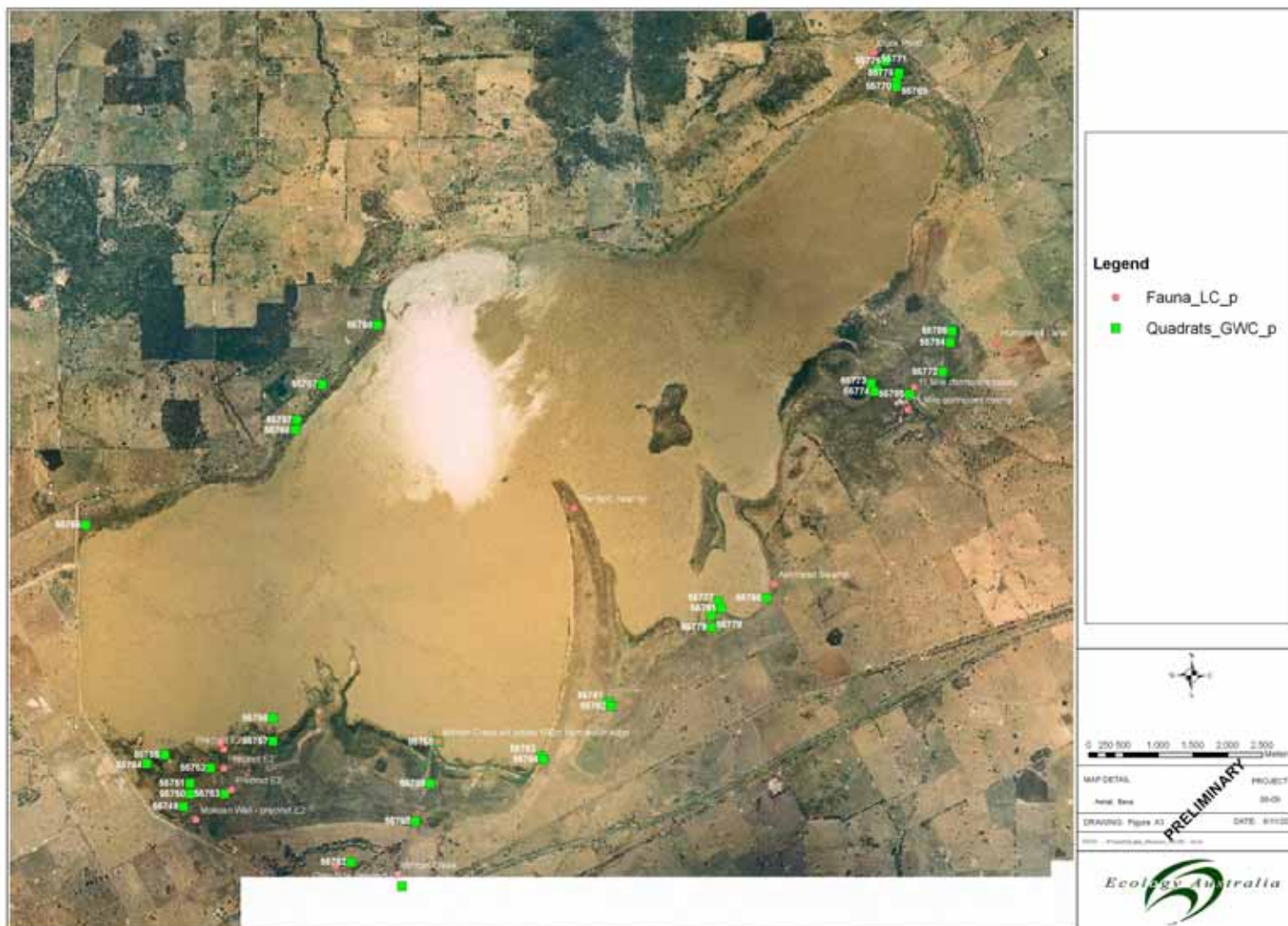


Figure 1 Lake Mokoan study area, flora and fauna sampling sites, January 2006

3 Methods

3.1 Flora

3.1.1 Existing data

Data on the flora and vegetation of Lake Mokoan and surrounds (Figure 1) available prior to the present study, were collated by Ecology Australia in the *Lake Mokoan Ecological Conditions Discussion Paper* in July 2005 (Conole, Roberts, Pettigrove and Carr 2005). The limited information available from the previous study has been incorporated into the present report. An additional brief report on the study area was also prepared by Davidson (2005) (commissioned by DSE) and the data from that report was also utilised in this study, including field notes that were made available by DSE/and Ian Davidson.

3.1.2 Field survey

A field survey of the vegetation was carried out by Geoff Carr from 25-29 January 2006. The objectives of the field survey were to:

- Sample the vegetation by collection of quadrat data to encompass as much floristic and structural variation as possible, and to compile a floristic inventory of the study area;
- Ascertain the distribution and location of vegetation types by air-photo interpretation and field truthing.

Quadrat data collection

Data were collected from 38 quadrats subjectively located to sample the range of floristic and structural variation in the vegetation; quadrat locations are given in Figure 1. In each quadrat (generally a circle of approximately 30 m diameter) all indigenous and exotic vascular plant species were recorded and assigned a cover/abundance value from the modified Braun-Blanquet cover/abundance scale (Gullan 1978) as follows:

Value	Cover / Abundance
+	cover <1%, few individuals
1	cover <5%, any number of individuals
2	cover 5-25%, any number of individuals
3	cover 25-50%, any number of individuals
4	cover 50-75%, any number of individuals
5	cover 75-100%, any number of individuals

At each quadrat location notes were compiled on the environment (e.g. hydrological regime, soil type), biotic influences (e.g. rabbit, stock, kangaroo, wallaby or waterfowl grazing), vegetation condition and management issues (e.g. invasions of serious weed species) and other attributes.

Photographs were taken in numerous locations (Plates 1-22). Quadrat data are given in Appendix 1; the 5-digit number preceded by F in Appendix 1 for each quadrat are unique Flora Information System (FIS) numbers. Quadrat data will be made available to the managers of the FIS database at Arthur Rylah Institute.

Floristic inventory

Plant species (indigenous, and naturalised exotic species) not observed in quadrats were listed, and locations recorded (hand-held GPS) where populations of significant species were noted.

Collections were made of some species of interest (including rare weeds); these will be lodged at the National Herbarium of Victoria. For the purposes of compiling a floristic checklist, the study area was extended to road reserves adjoining the perimeter fences of the study area; a significant proportion of additional species (mostly exotics) was thus recorded and some of these have management implications. All floristic data will be provided to the FIS managers.

Notes were also made on exotic (non-naturalised) plantings of exotic or indigenous trees at abandoned farmhouses or settlements. These may have cultural or management significance.

3.1.3 Data analysis

Quadrat data have been categorised to relate the vegetation thus sampled to the Ecological Vegetation Class (EVC) typology of DSE (2005a). This includes the dryland EVCs and the recent unpublished wetland EVC typology devised by Doug Frood (2006, pers.comm.).

3.1.4 Plant names

Plant names used in this report follow the most recent *Census of the Vascular Plants of Victoria* by Ross and Walsh (2003), Thompson (2004) (for *Senecio*) and Griffiths (1994) for a few exotic species. An asterisk (*) denotes exotic species and a hash-sign (#) indicates indigenous plant species which are likely to be non-natural occurrences (i.e. naturalised from planted sources).

3.1.5 Limitations

The timing of field survey (late January) means that some seasonal species will have been overlooked, for example indigenous summer-dormant lilies and orchids, and indigenous and exotic winter annuals and summer-dormant perennials. While the floristic inventory will not be complete, the omission of a few species will not influence the assessment of ecological values or significance, nor will this impact materially on the likely future recommendations for revegetation or management.

3.2 Fauna

3.2.1 Data review

The Victorian Fauna Display (DSE 2004b), a CD-ROM version of the Atlas of Victorian Wildlife (AVW), was searched for a list of fauna species previously recorded from an area of 10 km centred over the study area. This search area is hereafter referred to as the fauna Data Review Area (DRA) (see Appendix 3).

3.2.2 Habitat assessment

The site was also assessed for its fauna habitat values. This involved review of aerial photographs and preliminary plans provided by Beca to gain an appreciation of the vegetation cover and to place the study area in a broader landscape context.

During the site visit, the habitat assessment focused on the extent of native vegetation cover, composition, structure and other features important in determining habitat quality such as the presence or absence of nectar-producing trees, hollow-bearing trees, a shrubby understorey, the level of disturbance (e.g. weed invasion), and ground layer characteristics, including leaf litter, logs, rocks and fallen branches. Other habitat attributes were noted; these included:

- Size and shape of patch;
- Connectivity (habitat links or corridors);
- Presence of specific habitat features (e.g. streams, wetlands, cliffs); and
- Structural heterogeneity of vegetation.

Habitat types were assessed for their capacity to support indigenous fauna, particularly regarding the habitat requirements of threatened faunal species.

3.2.3 Fauna survey

The study area was surveyed between 24 – 27 January 2006. Surveys were conducted by Lawrie Conole. Reference was also made to data collected for the earlier Stage One review report (Conole et al. 2005).

An assessment of the fauna values and significance of the fauna of the study area was conducted using the methods outlined below. Fauna sampling sites are shown on Figure 1.

Reptile and amphibian survey

Active daytime searches were conducted for reptiles and frogs. This involved searching among fallen clumps of bark and litter, overturning rocks, logs, fallen branches and human-generated debris and searching on bare ground surfaces for reptiles and frogs moving during normal activities, or hiding.

Frog searches were also conducted at night using a spotlight and listening for calls.

Active searches

Active searching involves quartering large areas of ground in a zig-zag or series of linear traverses, making every attempt to record all presence of fauna, direct and indirect. All vertebrates (birds, mammals, reptiles, frogs, fish) seen or heard calling were recorded, as well as indirect evidence of vertebrates such as bones, scats, burrows, foraging marks or tracks. Active searches were carried out whenever observers were in the field.

Significance

Species of State and/or National conservation significance are determined by reference to DSE's advisory list of threatened vertebrates for Victoria (DSE 2003), listings under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) and the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and by reference to National Action Plans for vertebrates and invertebrates.

Criteria for assessing significance of faunal taxa (species and sub-species) and communities are given in Appendix 4.

Limitations

The survey was carried out over a relatively brief time-frame, therefore not all species that utilise the study area would have been recorded. In particular, the cryptic and rare species that are often the focus of threatened species legislation cannot always be expected to be detected. Other species would not have been recorded due to the seasonality of their occurrence in the study area (e.g. some nomadic or migratory bird species). This limitation is overcome to some extent through the information on species recorded from the DRA, sourced from the AVW database (DSE 2004).

Nomenclature

The scientific names, common names and systematic orders of vertebrates follow Christidis and Boles (1994) and Schodde and Mason (1999) for birds, and the 'Atlas of Victorian Wildlife' for all other taxa.

4 Values

4.1 Flora

4.1.1 Plant species

A total of 234 plant species was recorded during this study (Appendix 2). Of these 121 (52%) are indigenous and 113 (48%) are naturalised exotic (introduced) species. In the *Lake Mokoan Ecological Conditions Discussion Paper*, Conole et al. (2005) recorded a total of 76 taxa (not all identified to species level) from existing data in the flora Data Review Area approximately 500 m beyond the Lake Mokoan Full Supply Level. Rectification of that species list with the list of species recorded during this study (Appendix 2) indicates that 18 species previously recorded were not seen during this study, and that 177 additional species were recorded during the present study making a combined total of 252 taxa. The combined lists are given in Appendix 2 and Table 1 summarises the statistics on the flora of the Lake Mokoan study area.

Table 1: Statistics on the indigenous and exotic flora recorded from the Lake Mokoan study area, January 2006

	Taxa previously recorded from the Data Review Area	Taxa recorded in this study, January 2006
Liverworts	0	1
Ferns and fern allies	1	4
Conifers	0	3
Monocotyledons	28	96
Dicotyledons	48	130
	Total: 76	Total: 234
Total taxa: 252		

4.1.2 Vegetation types

The vegetation types recorded within the Lake Mokoan study area (Figure 1) have been assigned to 11 Ecological Vegetation Classes, as given below. The sampled vegetation (see quadrat data Appendix 1 and quadrat locations in Figure 1) however is not always readily assignable to EVCs, especially the wetland EVCs because of the temporal and spatial mosaics which develop in response to the changing directions of the ecological gradients on the shores of the lake.

Vegetation dynamics are outlined in Table 2 and discussed in Section 5. Four of the sampled

quadrats have not been assigned to EVCs (Quadrats 01, 02, 05 and 24 – see Figure 1) but all others are assigned to EVCs below and in Table 2.

The greater part of the highly turbid open water of Lake Mokoan does not support macrophyte vegetation and the vegetation types recorded are only around the perimeter of the lake.

Ecological Vegetation classes recorded are listed below and they are illustrated in Plates 1-22:

Wetland vegetation

EVC 961 Plains Rushy Wetland (Quadrats 06, 10, 11, 15, 17, 22, 29, 30 32)

EVC 125 Plains Grassy Wetland (Quadrats 03, 09, 14, 16, 23, 26, 28, 31, 36)

EVC 82 Tall Marsh (Quadrat 07)

EVC 291 Cane-grass Wetland (Quadrats 04, 08, 18)

EVC 292 Red Gum Swamp (Quadrats 13, 25, 27, 36, 37)

EVC 168 Drainage-line Aggregate (Quadrat 12)

EVC 107 Lakebed Herbland (Quadrat 21)

EVC 918 Submerged Aquatic Herbland (not sampled by quadrat)

These diverse wetlands are connected with the current Lake Mokoan and some are independent of it as indicated in Figure 1. Independent wetlands will remain with decommissioning (though their status will vary with fluctuating water levels).

Dryland vegetation

EVC 55 Plains Grassy Woodland (Quadrats 20, 34)

EVC 652 Lunette Woodland (not sampled by collection of quadrat data)

EVC 175 Grassy Woodland (Quadrats 19, 33)

Degraded or exotic vegetation

Red Gum Woodland with exotic grassy (*Phalaris*) understorey (Quadrat 35)

Exotic pasture and herbfields (not sampled by quadrat)

All vegetation types are described in Table 2 with the following information:

- Ecological Vegetation Class (or its former equivalent);
- Quadrats in which vegetation type was sampled (locations are shown in Figure 1);
- The distribution according to the provisional land-use precincts (Figure 2);
- An outline of the physical/hydrological environments;
- Notes on vegetation structure and indigenous and exotic floristic dominants (plant species);

- Plates (illustrations of each vegetation type); and
- Comments on the vegetation (e.g. ecological interpretation, distribution and vegetation condition).

Table 2: Ecological Vegetation Classes (EVCs) recorded from the Lake Mokoan study area

Note: This applies to vegetation sampled January/February 2006 when lake was 46% Full Lake Supply

EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
Drylands EVC 55 – Plains Grassy Woodland (Quadrats 20, 34)	A, C1, C2, D2, G	Alluvial plains and gentle colluvial lower slopes with freely draining or seasonally waterlogged fertile clay loams or sandy clay loams	Open woodland or forest, or scattered trees in pasture with a grassy understorey; occasional shrubs and small-trees	River Red Gum (<i>Eucalyptus camaldulensis</i>) or Grey Box (<i>E. microcarpa</i>) (restricted distribution) often as the only understorey species, with scattered Yellow Box (<i>E. melliodora</i>) and Hill Red Gum (<i>E. blakelyi</i>). Indigenous grasses often dominate the field layer, most abundantly Bristly Wallaby-grass (<i>Austrodanthonia setacea</i>), Velvet Wallaby-grass (<i>A. pilosa</i>), Common Wallaby-grass (<i>A. caespitosa</i>), Brown-back Wallaby-grass (<i>A. duttoniana</i>) and Copper-awned Wallaby-grass (<i>A. fulva</i>). Other common indigenous grasses include Brush Wire-grass (<i>Aristida behrii</i>), Knead Spear-grass (<i>Austrostipa bigeniculata</i>) and Windmill Grass (<i>Chloris truncata</i>). Annual and perennial exotic grasses are very abundant, most importantly Phalaris (<i>*Phalaris aquatica</i>), Fescue (<i>*Vulpia</i> spp.), Wimmera Rye-grass (<i>*Lolium rigidum</i>) and Bromes (<i>*Bromus</i> spp.).	Plates 14-17	This EVC includes remnant, though highly degraded, Grey Box Woodland with regular stock grazing (mostly sheep) and Red Gum Woodland, including large even-age recruitment cohorts at the margins of former high-level flood lines. Where stock is excluded Phalaris usually forms 100% cover in Red Gum Woodland.
EVC 652 Lunette Woodland (not sampled by quadrat)	B	Low ridge with very well-drained loamy soils	Open woodland with a dense cover of annual and perennial grasses in the understorey	Hill Red Gum (<i>Eucalyptus baskelyi</i>) with occasional Yellow Box (<i>E. melliodora</i>). Understorey grasses include Bromes (<i>*Bromus</i> spp.), Annual Veldt-grass (<i>*Ehrharta longiflora</i>), Panic Veldt-grass (<i>*E. erecta</i>), Wimmera Rye-grass (<i>*Lolium rigidum</i>) and Spear-grass (<i>Austrostipa bigeniculata</i>).	Plate 19	This very rare vegetation type occurs on the lunette consisting of aeolian material blown from the former lake-bed. Lunette Woodland is confined to one area and it is very highly degraded.
EVC 175 Grassy Woodland (Quadrats 19, 33)	D3, G	Lower (colluvial) slopes on moderately fertile loamy soils	Open woodland with a grassy understorey	Hill Red Gum (<i>Eucalyptus blakelyi</i>), ± Yellow Box (<i>E. melliodora</i>), Red Box (<i>E. polyanthemus</i>) and Grey Box (<i>E. microcarpa</i>) form the overstorey. Grassy understorey now very highly degraded with Velvet Wallaby-grasses (<i>Austrodanthonia pilosa</i>) the most common indigenous species. Exotic grasses (mostly annuals) are predominantly Bromes (<i>*Bromus</i> spp.), Fescue (<i>*Vulpia</i> spp.) and Wimmera Rye-grass (<i>*Lolium rigidum</i>). Numerous other weed species are common.	Plate 20	The remnants are of very restricted distribution and all are high degraded, often with only scattered eucalypts of the former overstorey. In all cases the indigenous understorey component is severely modified.
Pasture, exotic herbfields (not sampled by quadrat)	B, C1, C2, D3, E1, E2, G	Plains and lower slopes and ridges with fertile silty loam or clay loam soils	Dense to open grassland with very variable component of dicot and graminoid herbs	Exotic annual and perennial grasses dominate, notably Wimmera Rye-grass (<i>*Lolium rigidum</i>), Bromus (<i>*Bromus</i> spp.), Fescue (<i>*Vulpia</i> spp.), Phalaris (<i>*Phalaris aquatica</i>), Wild Oats (<i>*Avena</i> spp.) and Paspalum (<i>*Paspalum dilatatum</i>). Wallaby-grasses (<i>Austrodanthonia</i> spp., especially <i>A. duttoniana</i>) may have high cover. Dicot herbs include Paterson's Curse (<i>*Echium plantagineum</i>), Sheep Sorrel (<i>*Acetosella vulgaris</i>) and Spear Thistle (<i>*Cirsium vulgare</i>).	Plates 21, 22	These essentially exotic vegetation communities include grazed and ungrazed land, as well as slashed verges.



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>Lake Wetlands (margins of Lake Mokoan)</p> <p>EVC 961 Plains Rushy Wetland</p> <p>(Quadrats 06, 10, 11, 15, 17, 22, 29, 30, 32)</p>	<p>A, C1, D1, D2, E2, F, G</p>	<p>Margins of Lake Mokoan, seasonally waterlogged to standing water to c. 50 cm deep (usually much less) at least for relatively short periods; fertile silty to sandy clay loams or clay, cracking at the surface or not.</p>	<p>Closed to open rushland</p>	<p>Amphibious vegetation dominated by Plains Rush (<i>Juncus semisolidus</i>) at wetter end of hydrological gradient, characteristically with Hollow Rush (<i>J. amabilis</i>) at drier end of gradient. Frequent species, generally of low cover include Blown Grass (<i>Lachnagrostis filiformis</i>), Rigid Panic (<i>Whalleya prolata</i>), Common Spike-sedge (<i>Eleocharis acuta</i>), Lesser Joyweed (<i>Alternanthera denticulata</i>), Common Swamp Wallaby-grass (<i>Amphibromus nervosus</i>), Creeping Knotweed (<i>Persicaria prostrata</i>) and Aster-weed (*<i>Aster subulatus</i>).</p>	<p>Plates 1-3</p>	<p>The suite of wetland vegetation embracing the EVCs, Tall Marsh, Plains Grassy Wetland, Cane-grass Wetland and Lakebed Herbland occur in a changing mosaic of vegetation patterns governed by the hydrological regime. In a general sense the wetland vegetation is strongly zoned along a 'wetness' gradient but microtopographic relief produces a variable pattern. Because of the unpredictable and fluctuating lake levels (unlike a natural hydrological regime with more predictable timing and duration of inundation) wetland and dryland plants that establish along the gradient are periodically drowned (at the lower end of the gradient) or die because of drought stress (at the upper end of the gradient). In this way wetland vegetation moves directionally (up or down the gradients) and is highly dynamic; almost all wetland plant species encountered during the survey were relatively young (not more than about 5 years old). This highly dynamic vegetation has been termed a 'high-speed temporal mosaic' (D. Frood, consulting botanist, pers. comm.).</p>



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>EVC 82 Tall Marsh (Quadrat 07)</p>	<p>A, C1, D1, D2, E2, F</p>	<p>Similar to above but occurring in deeper seasonal to ± permanent water</p>	<p>Closed tall herbfield to c. 3 m high</p>	<p>Stands of Cumbungi (<i>Typha orientalis</i>) or uncommonly <i>T. domingensis</i>. A small suite of associated species include the obligate or facultative aquatics Upright Water-milfoil (<i>Myriophyllum crispatum</i>), Red Water-milfoil (<i>M. verrucosum</i>), Ferny Azolla (<i>Azolla pinnata</i>), Pacific Azolla (<i>A. filiculoides</i>), the liverwort Fringed Heartwort (<i>Ricciocarpus natans</i>), Eel Grass (<i>Vallisneria americana</i>) and Swamp Lily (<i>Ottelia ovalifolia</i>).</p>	<p>Plate 7</p>	<p>The suite of wetland vegetation embracing the EVCs Plains Rushy Wetland, Tall Marsh, Plains Grassy Wetland, Cane-grass Wetland and Lakebed Herbland occur in a changing mosaic of vegetation patterns governed by the hydrological regime. In a general sense the wetland vegetation is strongly zoned along a ‘wetness’ gradient but microtopographic relief produces a variable pattern. Because of the unpredictable and fluctuating lake levels (unlike a natural hydrological regime with predictable timing and duration of inundation) wetland and dryland plants that establish along the gradient are periodically drowned (at the lower end of the gradient) or die because of drought stress (at the upper end of the gradient). In this way wetland vegetation moves directionally (up or down the gradients) and is highly dynamic; almost all wetland plant species encountered during the survey were relatively young (not more than about 5 years old). This highly dynamic vegetation has been termed a ‘high-speed temporal mosaic’ (D. Flood, consulting botanist, pers. comm.).</p>



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>EVC 291 Cane-grass Wetland (Quadrats 04, 08, 18)</p>	<p>A, D1, D2, E1, E2, F</p>	<p>Similar to above but with seasonal standing water to c. 50 cm deep or seasonal waterlogging only</p>	<p>Closed grassland to c. 1.2 m high, of patchy distribution</p>	<p>Southern Cane-grass (<i>Eragrostis infecunda</i>) as a mono-specific sward (deeper water) or mixed with species of adjoining EVCs.</p>	<p>Plate 8</p>	<p>The suite of wetland vegetation embracing the EVCs Plains Rushy Wetland, Tall Marsh, Plains Grassy Wetland, Cane-grass Wetland and Lakebed Herbland occur in a changing mosaic of vegetation patterns governed by the hydrological regime. In a general sense the wetland vegetation is strongly zoned along a 'wetness' gradient but microtopographic relief produces a variable pattern. Because of the unpredictable and fluctuating lake levels (unlike a natural hydrological regime with predictable timing and duration of inundation) wetland and dryland plants that establish along the gradient are periodically drowned (at the lower end of the gradient) or die because of drought stress (at the upper end of the gradient). In this way wetland vegetation moves directionally (up or down the gradient) and is highly dynamic; almost all wetland plant species encountered during the survey were relatively young (not more than about 5 years old). This highly dynamic vegetation has been termed a 'high-speed temporal mosaic' (D. Flood, consulting botanist, pers. comm.).</p>



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>EVC 125 Plains Grassy Wetland (Quadrats 03, 09, 14, 16, 23, 26, 28, 31, 36)</p>	<p>B, C1, D1, D2, D3, E1, E2, F, G</p>	<p>Similar to EVC 291 above but drier and landward of Plains Rushy Wetland; soils seasonally waterlogged or shallowly inundated but drying fully in summer</p>	<p>Open to closed grassland to c. 1 m high.</p>	<p>The suite of indigenous grass species is characterised by Blown Grass (<i>Lachnagrostis filiformis</i>), Common Swamp Wallaby-grass (<i>Amphibromus nervosus</i>), Rigid Panic (<i>Whalleya proluta</i>), Weeping Love-grass (<i>Eragrostis parviflora</i>) and Close-headed Love-grass (<i>E. diandra</i>) in various combinations (dominance or co-dominance) sometimes forming extensive ± monospecific swards. Frequent associates include Brown-back Wallaby-grass (<i>Austrodanthonia duttoniana</i>), Aster-weed (<i>Aster subulatus</i>), Creeping Knotweed (<i>Persicaria prostrata</i>), Common Spike-sedge (<i>Eleocharis acuta</i>), Drain Flat-sedge (<i>Cyperus eragrostis</i>), Hollow Rush (<i>Juncus amabilis</i>), Couch (<i>Cynodon dactylon</i>), Yorkshire Fog (<i>Holcus lanatus</i>), Phalaris (<i>Phalaris aquatica</i>), Groundsel (<i>Senecio condylocarpus</i>), Sow-thistle (<i>Sonchus asper</i>), Small Loosestrife (<i>Lythrum hyssopifolia</i>), Hairy Willow-herb (<i>Epilobium hirtigerum</i>), Curled Dock (<i>Rumex crispus</i>), Clustered Dock (<i>R. conglomeratus</i>) and a large suite of predominantly exotic opportunistic colonisers generally confined to dryland situations.</p>	<p>Plates 4, 5, 6</p>	<p>The suite of wetland vegetation embracing the EVCs Plains Rushy Wetland, Tall Marsh, Plains Grassy Wetland, Cane-grass Wetland and Lakebed Herbland occur in a changing mosaic of vegetation patterns governed by the hydrological regime. In a general sense the wetland vegetation is strongly zoned along a 'wetness' gradient but microtopographic relief produces a variable pattern. Because of the unpredictable and fluctuating lake levels (unlike a natural hydrological regime with predictable timing and duration of inundation) wetland and dryland plants that establish along the gradient are periodically drowned (at the lower end of the gradient) or die because of drought stress (at the upper end of the gradient). In this way wetland vegetation moves directionally (up or down the gradient) and is highly dynamic; almost all wetland plant species encountered during the survey were relatively young (not more than about 5 years old). This highly dynamic vegetation has been termed a 'high-speed temporal mosaic' (D. Flood, consulting botanist, pers. comm.).</p>



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>EVC 107 Lakebed Herbland (Quadrat 21)</p>	<p>A, C1, D1, D2, E1, E2</p>	<p>Exposed substrates, mostly silty clay-loam, on the drying shores of the lake</p>	<p>Open herbland, largely ephemeral</p>	<p>Supports many of the species occurring in Plains Grassy Wetland, particularly <i>Whalleya prolata</i> and <i>Lachnagrostis filiformis</i> but with opportunistic colonising species characteristic of these environments – summer-growing or winter-growing annuals or short-lived perennials, e.g. Toad Rush (<i>Juncus bufonius</i>), Weeping Love-grass (<i>Eragrostis parviflora</i>), Barnyard Grass (*<i>Echinochloa colona</i>), Common Sneezeweed (<i>Centipeda cunninghamii</i>), Clammy Goosefoot (<i>Chenopodium pumilio</i>), Hairy Carpet-weed (<i>Glinus lotoides</i>), Small Knotweed (<i>Polygonum plebeium</i>) and Lesser Joyweed (<i>Alternanthera denticulata</i>).</p>	<p>Plate 11</p>	<p>The suite of wetland vegetation embracing the EVCs Plains Rushy Wetland, Tall Marsh, Plains Grassy Wetland, Cane-grass Wetland and Lakebed Herbland occur in a changing mosaic of vegetation patterns governed by the hydrological regime. In a general sense the wetland vegetation is strongly zoned along a ‘wetness’ gradient but microtopographic relief produces a variable pattern. Because of the unpredictable and fluctuating lake levels (unlike a natural hydrological regime with predictable timing and duration of inundation) wetland and dryland plants that establish along the gradient are periodically drowned (at the lower end of the gradient) or die because of drought stress (at the upper end of the gradient). In this way wetland vegetation moves directionally (up or down the gradient) and is highly dynamic; almost all wetland plant species encountered during the survey were relatively young (not more than about 5 years old). This highly dynamic vegetation has been termed a ‘high-speed temporal mosaic’ (D. Frood, consulting botanist, pers. comm.).</p>
<p>Wetlands independent of Lake Mokoan (includes natural and constructed wetlands (farm dams and borrow-pits)) that are not attached to Lake Mokoan, or that pond water when levels in the lake recede.</p>						



EVCs (or former EVC equivalent)	Distribution according to land-use precincts (Figure 2)	Environments and/or hydrological regime	Vegetation structure	Vegetation dominants	Plates	Comments
<p>EVC 292 Red Gum Swamp (Quadrats 13, 25, 27, 36, 37)</p>	<p>C1, D1, D3, F</p>	<p>Includes a suite of natural pre-existing, generally circular seasonal wetlands within the Lake Mokoan FSL formerly dominated by River Red Gums (<i>Eucalyptus camaldulensis</i>) that were drowned when the lake was first flooded. Some of these wetlands are subsumed by the lake at higher levels (c. 50% FSL) or are now at a distance from the 'normal' shores of the lake. Included here are several sites such as the 'Duckpond' where water is ponded by levees. Water ponds to c. 50 cm deep or more but probably fully dries in an average year; soils are fertile, organic-rich silty clay loams. The water quality is generally much higher than in Lake Mokoan, i.e. without the ± permanent turbidity</p>	<p>Aquatic and amphibious herbfields with very variable structure under dead (typically) or (rarely) live River Red Gums</p>	<p>High cover of Plains Rush (<i>Juncus semisolidus</i>) with a suite of aquatic or amphibious perennials or annuals, including Common Spike-sedge (<i>Eleocharis acuta</i>), Joint-leaf Rush (<i>Juncus holoschoenus</i>), Pacific Azolla (<i>Azolla filiculoides</i>), Star-fruit (<i>Damasonium minus</i>), Swamp Lily (<i>Ottelia ovalifolia</i>), Upright Water-milfoil (<i>Myriophyllum crispatum</i>), Narrow-leaf Nardoo (<i>Marsilea costulifera</i>), Moira Grass (<i>Pseudoraphis spinescens</i>), Water Plantain (<i>*Alisma lanceolata</i>), River Swamp Wallaby-grass (<i>Amphibromus fluitans</i>), Common Swamp Wallaby-grass (<i>A. nervosus</i>), Common Duckweed (<i>Lemna disperma</i>), Fringed Heartwort (<i>Ricciocarpos natans</i>), Water Couch (<i>*Paspalum distichum</i>), Lesser Joyweed (<i>Alternanthera denticulata</i>), Furrowed Pondweed (<i>Potamogeton sulcatus</i>), Marsh Yellow-cress (<i>*Rorippa palustris</i>) and Clove-strip (<i>Ludwigia peploides</i>).</p>	<p>Plates 5, 9</p>	<p>Red Gum Swamp vegetation would have occupied very large areas around the former Winton Swamp and associated wetlands – areas now with a landscape of dead (drowned) Red Gums. Because of current (February 2006) inundation, it is not possible to determine the vegetation of sites that will remain wetlands when the water level recedes sufficiently to isolate them from the lake (e.g. in Precincts C1, D1 and D3.).</p>
<p>EVC 168 Drainage-line Aggregate (Quadrat 12)</p>	<p>C2</p>	<p>Permanent water of inlet channels to Lake Mokoan, notably the channelised Winton Creek</p>	<p>Variable structure of opportunistic herbs forming generally narrow band of dense to open emergent vegetation</p>	<p>Species recorded include Moira Grass (<i>Pseudoraphis spinescens</i>), Tall Flat-sedge (<i>Cyperus exaltatus</i>), Water Couch (<i>*Paspalum distichum</i>), Cumbungi (<i>Typha orientalis</i>), River Club-sedge (<i>Bolboschoenus medianus</i>) and Drain Flat-sedge (<i>*Cyperus eragrostis</i>)</p>	<p>Plate 10</p>	<p>The drainage lines seen in this study are effectively constructed wetlands with permanent water of high turbidity. Only emergent aquatic or amphibious plant species can tolerate these environments. Several of the plant species (e.g. <i>Bolboschoenus medianus</i> and <i>Cyperus exaltatus</i>) appear ± confined to this type of wetland; they were not encountered (or rarely) in other wetlands.</p>



EVC Submerged Aquatic Herbland and unclassified wetland vegetation (constructed-wetland vegetation)

(Not sampled by quadrat) Plate 13

These include borrow-pits lakeward of the Lake Mokoan dam wall, and farm dams and other dams scattered through the study area (e.g. near the track into the Duckpond) (Plate 13). The environmental conditions vary greatly from wetland to wetland, particularly in relation to their hydrological regime and water quality. In farm dams, water tends to be permanent and of low turbidity, whereas the borrow-pits have turbid water (highly-dispersible clay substrates) which dry out seasonally.

The vegetation is correspondingly very variable. In the borrow pits and surrounds it consists of a mosaic of Plains Rushy Wetland, Plains Grassy Wetland and Cane-grass Wetland. At best development farm dams support emergent stands of Cumbungi (*Typha orientalis*) and submerged herbfields of the obligate aquatics Blunt Pondweed (*Potamogeton ochreatus*) and Eel Grass (*Vallisneria americana*).



Plate 1. Very extensive Plains Rushy Wetland dominated by Plains Rush (*Juncus semisolidus*). Drowned Red Gums are abundant (January 2006)



Plate 2. Plains Rushy Wetland on the silt jetty of Winton Creek (January 2006)



Plate 3. Characteristic Phalaris (P. aquatica*) invasion of Plains Rushy Wetland, near Winton Creek (January 2006)**



Plate 4. Plains Grassy Wetland, dominated here by Weeping Love-grass (*Eragrostis parviflora*), occupies a broad band landward of Plains Rushy Wetland (January 2006)



Plate 5. Extensive Plains Grassy Wetland dominated by Common Swamp Wallaby-grass (*Amphibromus nervosus*) with Red Gum Swamp vegetation and drowned Red Gums in the distance (January 2006)



Plate 6. A typical sequence of vegetation change across an elevational ('wetness') gradient, with Plains Grassy Wetland (foreground) grading into Plains Rushy Wetland (towards the lake). Phalaris is seen invading Plains Grassy Wetland in the foreground (January 2006)



Plate 7. Tall Marsh dominated by a dense Cumbungi (*Typha orientalis*) in water c. 35 cm deep (January 2006)



Plate 8. Cane-grass (*Eragrostis infecunda*) Wetland in water 30 – 40 cm deep. Drowned Red Gums dot the landscape (January 2006)



Plate 9. Red Gum Swamp vegetation at a site independent of Lake Mokoan (except at Full Supply Level). Vegetation dominants are Plains Rush (*Juncus semisolidus*), Moira Grass (*Pseudoraphis spinescens*), Common Spike-sedge (*Eleocharis acuta*), Water Couch (**Paspalum distichum*) and Ferny Azolla (*Azolla pinnata*) (January 2006)



Plate 10. Highly modified Drainage-line Aggregate, the aquatic and amphibious vegetation along Winton

Creek, the major inlet channel to Lake Mokoan. Red Gums are prominent in this location, the vegetation is otherwise dominated by Phalaris (*Phalaris aquatica*) (January 2006)



Plate 11. A mosaic of Lakebed Herbfield, Plains Rushy Wetland and Plains Grassy Wetland at the eastern end of Lake Mokoan (January 2006)



Plate 12. A borrow-pit wetland near Lake Mokoan dam wall supports elements of Plains Rushy Wetland. Drowned Red Gums (*Eucalyptus camaldulensis*) and a stand of recruits resulting from the death of parent trees are seen in the background (January 2006)



Plate 13. Submerged Aquatic Herbland of a dam near the Duckpond. The vegetation is dominated by a dense cover of submerged Eel Grass (*Vallisneria americana*) and a dense stand of Cumbungi (*Typha orientalis*). Lake Mokoan is seen in the distance (January 2006)



Plate 14. Plains Grassy Woodland with a scattered canopy of old-growth Grey Box (*Eucalyptus microcarpa*) trees. Native grasses (notably Wallaby-grasses, *Austrodanthonia* spp.) are abundant in the sheep-grazed understorey (January 2006)



Plate 15. Plains Grassy Woodland with an understorey dominated by Wallaby-grasses (*Austrodanthonia* spp.). All of this vegetation has colonised since flooding of Lake Mokoan at Full Supply Level caused the death of the former vegetation (indicated by dead Red Gums) (January 2006)



Plate 16. Plains Grassy Woodland, dominated by Red Gum with a Phalaris-invaded understorey, characterises the extreme eastern part of the study area (January 2006)



Plate 17. Plains Grassy Woodland with old Red Gums and an extensive even-aged cohort of dense young Red Gum which colonised following the death of vast stands of Red Gum soon after Lake Mokoan was flooded c. 30 years ago (when Full Lake Supply prevailed. Phalaris is now invading rapidly (January 2006)



Plate 18. Winton Creek with scattered young Red Gums and very extensive exotic grassland with full cover of Phalaris (Phalaris aquatica*) (January 2006)**



Plate 19 . Highly degraded Lunette Woodland with an overstorey of Hill Red Gum (*Eucalyptus blakelyi*) on The Spit. The grassy understorey vegetation is almost wholly exotic (January 2006)



Plate 20. Highly degraded remnant Grassy Woodland with a small stand of Hill Red Gum (*E. blakelyi*) with high cover of Wallaby-grasses (*Austrodanthonia* spp.) and Spear-grasses (*Austrostipa* spp.) (January 2006)



Plate 21. A striking cross-fence grazing comparison: the sheep-grazed foreground vegetation is dominated by indigenous Wallaby-grasses (*Austrodanthonia* spp.) whereas full cover of *Phalaris* occurs in the background, illustrating the effects of excluding sheep (January 2006)



Plate 22. Exotic pasture with scattered Red Gums is characteristic of the south-western part of the study area (January 2006)

Significant flora

Several plant species were recorded which have state or national conservation significance. These are given in Table 3 with their conservation status and listing (where relevant) under the *Flora and Fauna Guarantee Act 1988* (FFG) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC). A suite of species of regional significance also occurs within the study area, and Beauglehole (1986) for example, in his floristic survey of the Murray Valley area taking in Lake Mokoan, recorded seven 'rare, interesting or restricted' species which were recorded during this study. We have not attempted to list regionally significant species because of a dearth of data required to compile such a list.

Populations recorded of state or nationally significant species were all small or very small, with only a few plants in a given location (Table 3). Data on the distribution and population status of these species in the study area should not be regarded as definitive; they are likely to occur elsewhere and additional state or nationally significant species may be present.

Table 3: State and Nationally significant plant species recorded for the Lake Mokoan study area, January 2006

Species	Common name	Vegetation type	EPBC Act	FFG Act	DSE (2005)	Location
<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass	Red Gum Swamp	V	—	—	419760E, 5961957N
<i>Eleocharis macbarronii</i>	Grey Spike-sedge	Plains Rushy Wetland	—	—	k	414166E, 5961371N
<i>Goodenia macbarronii</i>	Narrow Goodenia	Plains Grassy Woodland	V	L	v	423801E, 5966060N

Vegetation communities

The regional conservation status of each of the Ecological Vegetation Classes relevant to Lake Mokoan, which is in the Victorian Riverina Bioregion, is given below.

Wetland vegetation

- EVC 961 Plains Rushy Wetland - endangered
- EVC 125 Plains Grassy Wetland - endangered
- EVC 82 Tall Marsh - endangered
- EVC 291 Cane-grass Wetland - endangered
- EVC 292 Red Gum Swamp - endangered
- EVC 168 Drainage-line Aggregate - endangered

EVC 107 Lakebed Herbland – endangered

EVC 918 Submerged Aquatic Herbland – conservation status unassigned

Dryland vegetation

EVC 55 Plains Grassy Woodland - endangered

EVC 652 Lunette Woodland - endangered

EVC 175 Grassy Woodland - endangered

Most are endangered in the Bioregion, hence the conservation significance of these EVCs is high or Very High under *Victoria's Native Vegetation Management Framework* (DNRE 2002) depending upon their condition score.

The remnant Grassy Woodland (EVC 175) and Lunette Woodland (EVC 652) (on The Spit) are listed under the *Environment Protection and Biodiversity Conservation Act 1999* as Grassy White Box Woodlands and this community is nationally Endangered. Its condition however within the study area is moderate to very poor, with little or no indigenous understorey remaining in the case of the Lunette Woodland.

Cane-grass Wetland, hitherto regarded as extinct in the bioregion currently occurs in small patches in a mosaic with Plains Rushy Wetland, Plains Grassy Wetland and Tall Marsh. The dominant, *Eragrostis infecunda*, occurs at Lake Mokoan at the geographic limit of its range in Victoria and regionally it may always have been scarce. The species was recorded in the Winton Swamp area before Lake Mokoan was created. Cane-grass Wetland is unquestionably very rare regionally but the 'extinct' status accorded the EVC is unsurprising; the data relating to EVCs is often unreliable because it was based on environmental modelling without adequate ground truthing and reliance on tree cover data to determine current extent of EVCs.

The 'endangered' status which applies to most wetland vegetation is a function of the small areal extent occupied by pre-European wetlands in the region (minute in comparison with dryland vegetation such as grasslands and woodlands) coupled with the massive loss sustained by wetlands as a result of draining, filling and modified hydrological regimes at local, regional or landscape scales.

4.1.3 Exotic flora

A large proportion of the flora of the study area – about 50% of the total flora – is exotic, and large expanses of vegetation are essentially exotic, this includes extensive grazed pastures as well as ungrazed woodland where *Phalaris* (**Phalaris aquatica*) has colonised very large areas beneath Red Gums, almost to the exclusion of all other species.

Invading weeds have seriously compromised the condition of much dryland and wetland vegetation and weeds will increasingly invade indigenous vegetation whatever the decommissioning scenario. The weed flora is not static but can be expected to continually change.

Apart from the current weed flora (see Appendix 2) additional weed species will colonise and potentially compromise indigenous vegetation and fauna habitats. Perhaps of greatest concern is the suite of regional wetland weed species (e.g. Arrowhead, **Sagittaria platyphylla*), and wetland weeds will be an important management issue for the decommissioned Lake Mokoan. Weed management is an important issue for all land-use options whether the primary land uses are for conservation of biodiversity or commercial agricultural or forestry enterprises.

The current weed flora includes agricultural and environmental weeds. Some 12 species recorded (Table 4) are Regionally Controlled species under the *Catchment and Land Protection Act 1992* (CaLP Act) and one species is Regionally Prohibited under the CALP Act. Overwhelmingly the most seriously invasive species are Phalaris (**Phalaris aquatica*) and St John's Wort (**Hypericum perforatum*). The latter is a recent arrival in the landscape and is explosively recruiting throughout much of the study area.

Several Weeds of National Significance (WONS) were also recorded (Table 4), the most serious of which are Willows (*Salix* spp.); one species, Black Willow (*S. nigra*), and two distinct hybrids were recorded (Appendix 2). Willows are major invaders of wetlands and regionally present a serious threat to wetlands.

Some cultivated species have become naturalised, e.g. *Melaleuca* and *Eucalyptus* species planted on the northern shore recreation areas (see Appendix 2).

Table 4 Regionally Controlled and Regionally Prohibited weed species listed under the *Catchment and Land Protection Act 1999* and Weeds of National Significance recorded in the Lake Mokoan study area, January 2006

Species name	Common name
<i>Cirsium vulgare</i> (C)	Spear Thistle
<i>Dittrichia graveolens</i> (C)	Stinkwort
<i>Echium plantagineum</i> (C)	Paterson's Curse
<i>Hypericum perforatum</i> (C)	St. John's Wort
<i>Juncus acutus</i> (C)	Spiny Rush
<i>Marrubium vulgare</i> (C)	Horehound
<i>Physalis viscosa</i> (P)	Prairie Ground Cherry
<i>Reseda luteola</i> (C)	Wild Mignonette
<i>Rosa rubiginosa</i> (C)	Sweet Briar
<i>Rubus fruticosus</i> spp. agg. (C, WONS)	Blackberry
<i>Salix hybrids</i> (WONS)	Hybrid Willows (several recorded)
<i>Salix nigra</i> (WONS)	Black Willow
<i>Xanthium spinosum</i> (C)	Bathurst Burr
<i>Xanthium strumarium</i> (C)	Noogoora Burr

C – Regionally Controlled; P – Regionally Prohibited
WONS – Weeds of National Significance

4.2 Fauna

4.2.1 Fauna habitats

The range of wetland habitats represented in Lake Mokoan can be broken down into six broad groupings:

- A. Open water – varying depths;
- B. Standing water with dead trees;
- C. Mud flats and lake edge;

- D. Drying wetland with rush or grass sward;
- E. Marsh with macrophytes (eg. Duck Pond); and
- F. Small pools with fringing macrophytes (eg. borrow pits).

In addition to these three major dryland habitats are also present:

- G. Grassy woodland (River Red Gum, Grey Box, other species);
- H. Grassland;
- I. Pasture.

4.2.2 Fauna species

During the current study (and from incidental records collected in 2005) a total of 113 fauna species was recorded within the study area at Lake Mokoan (Tables 5 and 6). This equates to just over half (circa 54%) of the species recorded in the Data Review Area (DRA), including a circa 500m buffer around the lake, during the twentieth century (DSE 2004).

Table 5: Lake Mokoan fauna statistics (* denotes introduced species)

	DRA	LM
<i>Birds</i>	179 (*6)	102 (*3)
<i>Mammals</i>	10 (*3)	6 (*3)
<i>Reptiles</i>	8	2
<i>Frogs</i>	6	2
<i>Fish</i>	8	1
TOTAL	211 (*9)	113 (*6)

Table 6: Fauna species recorded at Lake Mokoan during the current study, January 2006

Column legend:

1 Ashmead Swamp, precincts A, D2 & D3	5 11 Mile wetland, precinct C1
2 Dam wall, borrow pits, lake bed, precincts A & E1	6 The Spit, precincts A, B & D3
3 Duck Pond, precinct A	7 Winton Creek, precincts C2, E1 & E2
4 Humphries Lane River Red Gum, precinct C1	

Significant species shaded grey. An asterisk (*) denotes an introduced/feral species. A § denotes breeding recorded or suspected at Lake Mokoan during this study (direct or indirect evidence)

Common name	Scientific name	1	2	3	4	5	6	7
Stubble Quail	<i>Coturnix pectoralis</i>		+					
§Brown Quail	<i>Coturnix ypsilophora</i>		+		+	+		+
Plumed Whistling-Duck	<i>Dendrocygna eytoni</i>			+				
Black Swan	<i>Cygnus atratus</i>			+				+
§Freckled Duck	<i>Stictonetta naevosa</i>			+				
Australian Shelduck	<i>Tadorna tadornoides</i>		+	+				
§Australian Wood Duck	<i>Chenonetta jubata</i>	+				+		+
§Grey Teal	<i>Anas gracilis</i>	+	+	+				
§Chestnut Teal	<i>Anas castanea</i>			+		+		+
Pacific Black Duck	<i>Anas superciliosa</i>	+	+	+	+	+		+
Australasian Shoveler	<i>Anas rhynchotis</i>	+		+				+
Pink-eared Duck	<i>Malacorhynchus membranaceus</i>			+				
Hardhead	<i>Aythya australis</i>			+				
Musk Duck	<i>Biziura lobata</i>			+				
§Australasian Grebe	<i>Tachybaptus novaehollandiae</i>			+		+		
Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>			+		+		
§Darter	<i>Anhinga melanogaster</i>		+	+		+		+
§Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>					+		
Great Cormorant	<i>Phalacrocorax carbo</i>		+			+		+
§Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>		+	+		+		
Australian Pelican	<i>Pelecanus conspicillatus</i>		+	+		+	+	
White-necked Heron	<i>Ardea pacifica</i>	+	+	+			+	
Great Egret	<i>Ardea alba</i>		+	+		+	+	
§Intermediate Egret	<i>Ardea intermedia</i>		+	+				
White-faced Heron	<i>Egretta novaehollandiae</i>	+	+	+	+	+	+	+
Nankeen Night-Heron	<i>Nycticorax caledonicus</i>						+	
Australian Little Bittern	<i>Ixobrychus dubius</i>	+				+		
Australasian Bittern	<i>Botaurus poiciloptilus</i>					+		
Australian White Ibis	<i>Threskiornis molucca</i>	+	+	+		+		+
Straw-necked Ibis	<i>Threskiornis spinicollis</i>		+	+		+	+	
Yellow-billed Spoonbill	<i>Platalea flavipes</i>		+			+		
Black-shouldered Kite	<i>Elanus axillaris</i>		+	+				
Black Kite	<i>Milvus migrans</i>		+					
Whistling Kite	<i>Haliastur sphenurus</i>			+	+	+	+	
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		+					
Swamp Harrier	<i>Circus approximans</i>		+	+			+	
Brown Goshawk	<i>Accipiter fasciatus</i>			+				
Wedge-tailed Eagle	<i>Aquila audax</i>		+	+				

Common name	Scientific name	1	2	3	4	5	6	7
Little Eagle	<i>Hieraaetus morphnoides</i>		+					
Nankeen Kestrel	<i>Falco cenchroides</i>		+			+		
Brown Falcon	<i>Falco berigora</i>				+		+	+
Black Falcon	<i>Falco subniger</i>			+				
Peregrine Falcon	<i>Falco peregrinus</i>				+			
Purple Swamphen	<i>Porphyrio porphyrio</i>	+	+	+		+		+
Dusky Moorhen	<i>Gallinula tenebrosa</i>			+		+		
Black-tailed Native-hen	<i>Gallinula ventralis</i>		+			+		
Eurasian Coot	<i>Fulica atra</i>			+				
Painted Button-quail	<i>Turnix varia</i>					+		
Latham's Snipe	<i>Gallinago hardwickii</i>		+	+		+		+
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		+					
White-headed Stilt	<i>Himantopus leucocephalus</i>		+					
Masked Lapwing	<i>Vanellus miles</i>		+	+				
Black-fronted Dotterel	<i>Elseyonis melanops</i>					+		
Silver Gull	<i>Larus novaehollandiae</i>	+	+					
Common Bronzewing	<i>Phaps chalcoptera</i>		+			+		
Crested Pigeon	<i>Ocyphaps lophotes</i>		+	+	+			+
Peaceful Dove	<i>Geopelia striata</i>							+
Galah	<i>Cacatua roseicapilla</i>		+	+	+		+	
Little Corella	<i>Cacatua sanguinea</i>	+	+	+	+			
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	+	+	+	+		+	+
Musk Lorikeet	<i>Glossopsitta concinna</i>				+			
Eastern Rosella	<i>Platycercus eximius</i>		+	+	+		+	+
Red-rumped Parrot	<i>Psephotus haematonotus</i>	+	+	+	+			+
Fork-tailed Swift	<i>Apus pacificus</i>				+			
Laughing Kookaburra	<i>Dacelo novaeguineae</i>				+	+		
Sacred Kingfisher	<i>Todiramphus sanctus</i>				+			
Rainbow Bee-eater	<i>Merops ornatus</i>					+		
Brown Treecreeper	<i>Climacteris picumnus</i>	+	+	+	+		+	+
Superb Fairy-wren	<i>Malurus cyaneus</i>		+	+	+		+	+
Striated Pardalote	<i>Pardalotus striatus</i>				+	+	+	+
Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>		+	+			+	
White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>		+	+	+		+	+
Black-chinned Honeyeater	<i>Melithreptus gularis</i>				+			
Noisy Miner	<i>Manorina melanocephala</i>		+	+		+		+
Red Wattlebird	<i>Anthochaera carunculata</i>		+	+				
White-fronted Chat	<i>Epthianura albifrons</i>		+	+			+	+
Eastern Shrike-tit	<i>Falcunculus frontatus</i>					+		+
Grey Shrike-thrush	<i>Colluricincla harmonica</i>		+		+			
Restless Flycatcher	<i>Myiagra inquieta</i>				+		+	+
Magpie-lark	<i>Grallina cyanoleuca</i>	+	+	+	+		+	+
Willie Wagtail	<i>Rhipidura leucophrys</i>	+	+	+	+		+	+
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>				+			+
§White-breasted Woodswallow	<i>Artamus leucorhynchus</i>	+	+	+	+		+	+
Dusky Woodswallow	<i>Artamus cyanopterus</i>		+	+	+		+	+
Pied Butcherbird	<i>Cracticus nigrogularis</i>		+					
§Australian Magpie	<i>Gymnorhina tibicen</i>	+	+	+	+		+	+
Australian Raven	<i>Corvus coronoides</i>				+	+	+	
Little Raven	<i>Corvus mellori</i>				+	+		+
Singing Bushlark	<i>Mirafra javanica</i>	+	+					
Australian Pipit	<i>Anthus australis</i>		+					
*House Sparrow	<i>Passer domesticus</i>	+	+				+	
Diamond Firetail	<i>Stagonopleura guttata</i>				+	+	+	
*European Goldfinch	<i>Carduelis carduelis</i>				+		+	
Welcome Swallow	<i>Hirundo neoxena</i>	+	+	+	+		+	+
Tree Martin	<i>Petrochelidon nigricans</i>	+	+	+			+	+

Common name	Scientific name	1	2	3	4	5	6	7
Fairy Martin	<i>Petrochelidon ariel</i>	+	+					+
Australian Reed-Warbler	<i>Acrocephalus australis</i>	+	+	+	+	+		
Little Grassbird	<i>Megalurus gramineus</i>		+	+				
Brown Songlark	<i>Cincloramphus cruralis</i>	+	+					
Rufous Songlark	<i>Cincloramphus mathewsi</i>		+	+	+			
Golden-headed Cisticola	<i>Cisticola exilis</i>		+	+				+
*Common Starling	<i>Sturnus vulgaris</i>	+	+	+		+	+	
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>			+				
Eastern Grey Kangaroo	<i>Macropus giganteus</i>		+	+	+			
Swamp Wallaby	<i>Wallabia bicolor</i>				+			+
*Fox	<i>Vulpes vulpes</i>		+		+			+
*Brown Hare	<i>Lepus capensis</i>				+			
*Rabbit	<i>Oryctolagus cuniculus</i>		+					
Plains Froglet	<i>Crinia parinsignifera</i>		+	+	+			
Common Froglet	<i>Crinia signifera</i>		+	+	+			
Spotted Grass Frog NCR	<i>Limnodynastes tasmaniensis</i>		+		+			
Shingleback	<i>Tiliqua rugosa</i>		+					
Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>		+					+
*European Carp	<i>Cyprinus carpio</i>							+

4.2.3 Significant fauna

During the current study a total of 17 fauna species of State and/or National conservation significance, and one faunal community of State significance, were recorded at Lake Mokoan. This includes species typical of wetland and dryland habitats, reflecting the spread of biodiversity values across the landscape at Lake Mokoan.

Table 7: Significant fauna recorded at Lake Mokoan, this study, January 2006

§ denotes breeding recorded or suspected.

Common name	Scientific name	Habitats utilised	EPBC	NAP	FFG	DSE	W/D
§Brown Quail	<i>Coturnix ypsilophora</i>	G,H,I	M			NT	W/D
§Freckled Duck	<i>Stictonetta naevosa</i>	E	M		L	EN	W
Australasian Shoveler	<i>Anas rhynchotis</i>	E	M			VU	W
Hardhead	<i>Aythya australis</i>	E	M			VU	W
Musk Duck	<i>Biziura lobata</i>	E	M			VU	W
§Great Egret	<i>Ardea alba</i>	C,D,E,F	M		L	EN	W
§Intermediate Egret	<i>Ardea intermedia</i>	C,D,E,F	M		L	CR	W
Nankeen Night-Heron	<i>Nycticorax caledonicus</i>	C,D,E,F	M			NT	W
Australian Little Bittern	<i>Ixobrychus dubius</i>	B,E	M	NT	L	EN	W
Australasian Bittern	<i>Botaurus poiciloptilus</i>	B,E	M	VU	L	EN	W
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	A,B,C, D,E,F	M		L	VU	W
Black Falcon	<i>Falco subniger</i>	H,I	M			VU	D
Painted Button-quail	<i>Turnix varia</i>	G,H			L/C		D
Latham's Snipe	<i>Gallinago hardwickii</i>	C,D,E,F	M			NT	W
Brown Treecreeper	<i>Climacteris picumnus</i>	G		NT	L/C	NT	D
Black-chinned Honeyeater	<i>Melithreptus gularis</i>	G		NT	L/C	NT	D
Diamond Firetail	<i>Stagonopleura guttata</i>	G,H		NT	L/C	VU	D
Victorian Temperate Woodland Bird Community		G,H			L		D

Key:

EPBC	Federal <i>Environment Protection & Biodiversity Conservation Act 1999</i> ; EN = Endangered, VU = Vulnerable, M = migratory/marine overfly.
NAP	National action plans; EN = Endangered, VU = Vulnerable, NT = Near Threatened.
FFG	Victorian <i>Flora & Fauna Guarantee Act 1988</i> ; L = Listed threatened species or community; L/C = member of a listed community.
DSE	Advisory list of Victorian threatened fauna (DSE 2003); CR = Critically Endangered, EN = Endangered, VU = Vulnerable; NT = Near Threatened.
W/D	Predominantly wetland (W) or dryland (D) habitat resident.

Habitats utilised

A. Openwater - varying depths	G. Grassy woodland (River Red Gum, Grey Box, other species)
B. Standing water with dead trees	H. Grassland
C. Mud flats and lake edge	I. Pasture
D. Drying wetland with rush or grass sward	
E. Marsh with macrophytes (e.g. Duck Pond)	
F. Small pools with fringing macrophytes (e.g. borrow pits)	

A number of these significant species warrant further discussion.

Brown Quail *Coturnix ypsilophora*

Listed migratory species under the EPBC Act; Near Threatened in Victoria (DSE 2003).

Brown Quail are small ground birds of grasslands and grassy woodlands; usually in wetter and denser habitats beside or near water. Most records of this species in the past have been in near-coastal Victoria, but in the period from *circa* 2000 – 2006 more inland records (north of the Great Dividing Range in Victoria) than usual have been made (Lawrie Conole pers. obs.; Chris Tzaros pers. comm.). Brown Quail have been recorded in most grassy habitats around Lake Mokoan during this study period (2005 – 06), including evidence of breeding (adults with young at foot). The species is currently relatively abundant in the study area, and is favoured by the proliferation of a dense sward of the exotic grass **Phalaris aquatica*.

Latham's Snipe *Gallinago hardwickii*

Listed migratory species under the EPBC Act; Near Threatened in Victoria (DSE 2003).

Latham' Snipe is a small-medium sized wading bird (wader) which breeds in Hokkaido in northern Japan and far eastern Russian islands in the Japanese archipelago during the boreal summer, and migrates to south-eastern Australia (and stragglers to New Zealand) where it spends the boreal winter, arriving in Victoria from late August (Higgins and Davies 1996). Wetlands International (Delaney and Scott 2005) regards the species to be declining globally, and it is listed as Near Threatened in the 1996 Red List (Baillie and Groombridge 1996), but it is thought that the Russian population may be increasing (Nechaev 1994, cited in Garnett and Crowley 2000). The species is not regarded as nationally threatened in Australia (Garnett and Crowley 2000), but is listed under the Japan-Australia Migratory Bird Agreement (JAMBA treaty), and therefore under the migratory schedules of the Federal *EPBC Act 1999*. In Victoria the species is regarded as Near Threatened (DSE 2003), and it may have recovered slightly from its decline in the century preceding the 1980s

when it was still a game species shot in the thousands annually in Victoria (Garnett and Crowley 2000, Higgins and Davies 1996).

The global population of Latham's Snipe was estimated at 36,000 birds in 1986 based on counts at the Japanese breeding grounds (Naarding 1986). This conflicts with figures provided by Delaney and Scott (2005), who state that 37,000 breeding adults were found in Japan, of a total population of 55,500. This may reflect an attempt to factor in unknown numbers from the islands of far eastern Russia, but Delaney and Scott (2005) appear to misquote Garnett and Crowley (2000), who state that the breeding population in Hokkaido numbers 37,000 birds, of which 15,000 reach south-eastern Australia. As only the Japanese population has been censused, this number (36 – 37,000 birds) has generally been accepted as the global total (Watkins 1993; Garnett & Crowley 2000), and will be used here.

No sites of significance for Latham's Snipe have yet been designated in Australia because the birds disperse so widely over such a large area, and no individual sites meeting the significance threshold have previously been documented (Watkins 1993). Congregations of up to 100 birds in drying wetlands of southern Victoria (Geelong, Seaford and Sale) have been considered notable in the past (Emison et al. 1987).

However, the number of Latham's Snipe likely to occur at Lake Mokoan, based on extrapolations of numbers seen during the recent survey and the extent of suitable habitat, is in the order of 300 – 600 birds (about 1.0 – 1.3 birds per hectare in suitable habitat of circa 500 ha). Therefore the standard Ramsar criterion for site significance, ie. that the site regularly supports 1% or greater of the estimated population (Watkins 1993), is likely to be met at Lake Mokoan. We suggest that Lake Mokoan is probably a site of International significance for Latham's Snipe, because it is likely to support somewhere in the vicinity of 0.8 – 1.7% of the estimated global population of the species. Lake Mokoan is at least of National significance for Latham's Snipe (probably supporting 2 – 4% of the estimated Australian – East Asian Flyway population of 15,000 birds). The most important parts of Lake Mokoan for this species are the muddy shorelines on shallow gradients of the southern and eastern sectors.

It is likely that Lake Mokoan assumes particular importance as snipe habitat in late Summer, when the draw-down for irrigation purposes produces new areas of exposed mud, and when other ephemeral water bodies throughout the wider region have dried up. The cyclic process of wetting and drying as the lake fills and empties is an important one for producing and maintaining productive mud flat areas for waders such as Latham's Snipe, Sharp-tailed Sandpiper, etc.

Under the decommissioning scenario, it is a matter of uncertainty as to the precise quantity of habitat suitable for Latham's Snipe compared to that currently available. A simple model taking into account wetland perimeter, gradients and substrate suggests that the overall trend might be for less snipe habitat within the decommissioned 'end point' wetlands that currently exist within the fluctuating water storage. It is likely however that the decommissioned Lake Mokoan will support extensive areas of wetland habitat; some of which will be suitable for Latham's Snipe and other waterbirds.

The criteria for determining whether an action affecting migratory species might be considered significant under the *EPBC Act* are set out in Environment Australia (2000). The EPBC significance criterion for migratory species number one is engaged, as decommissioning will “...*substantially modify ... by ... altering hydrological cycles ... an area of important habitat of the migratory species ...*”, and Lake Mokoan satisfies the description of important habitat for Latham’s Snipe, viz. “...*habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species ...*”.

Thus we advise that the decommissioning of Lake Mokoan is a referable matter under the *EPBC Act*. A referral should be made to the Commonwealth Department of the Environment and Heritage (DEH), for a decision on whether the Minister’s approval under the *EPBC Act* is required.

Therefore, we recommend that:

- The decommissioning of Lake Mokoan is a referable matter under the *EPBC Act* because of the likely impacts on the habitat of Latham’s Snipe (and Murray Cod); and
- That the extent of snipe habitat within Lake Mokoan be modelled by or on behalf of DSE/GMW under four scenarios, i.e.
 - current Lake Mokoan at 25% and 50% of full supply level; and
 - a decommissioned lake at the 1-in-5 flood level and within the old ‘Winton Swamp Complex’ margins
 - to ascertain the likely impacts of decommissioning on the available area of snipe habitat.

Freckled Duck *Stictonetta naevosa*

Endangered in Victoria (DSE 2003), FFG listed.

A flock of *circa* 90 Freckled Ducks was encountered at the Duck Ponds during this survey. The flock included adult females and males, as well as immature birds, and most of the adult males were still displaying the bright scarlet upper-bill colour indicative of breeding condition. It is clear that this group had recently bred and produced offspring, but it is less clear whether this happened at Lake Mokoan or elsewhere. Freckled Duck breeding records for Victoria are few, with only five events documented in the Atlas of Victorian Wildlife (DSE 2004).

Suitable open water and ‘loafing’ habitat for the Freckled Duck will still be present in a decommissioned scenario.

Intermediate Egret *Ardea intermedia*

Critically Endangered in Victoria (DSE 2003), FFG listed.

A number of birds observed were in breeding condition (dorsal plumes, orange-red skin on legs), and frequented areas of River Red Gum near water – the preferred breeding location. Though

breeding by this species was not confirmed, it is regarded very likely that it took place recently at Lake Mokoan.

Suitable wetland habitat for the Intermediate Egret will still be present in a decommissioned scenario.

Great Egret *Ardea alba*

Endangered in Victoria (DSE 2003), FFG listed.

A number of birds observed were in breeding condition (dorsal plumes), and frequented areas of River Red Gum near water – the preferred breeding location. Though breeding by this species was not confirmed, it is regarded very likely that it took place recently at Lake Mokoan. It is also notable that relatively high numbers of this State endangered species were encountered, and Lake Mokoan is of State significance for the Great Egret.

Suitable wetland habitat for the Great Egret will still be present in a decommissioned scenario.

Australian Little Bittern *Ixobrychus (minutus) dubius*

Nationally Near Threatened (Garnett and Crowley 2000); Endangered in Victoria (DSE 2003), FFG listed.

Australian Little Bitterns were recorded by call at two locations (11 Mile Creek area and Ashmead Swamp). This species is infrequently recorded in Victoria, and much good habitat currently exists at Lake Mokoan. Lake Mokoan would be regarded as of State – National significance for the Australian Little Bittern.

Suitable habitat for the Australian Little Bittern will still be present in a decommissioned scenario.

White-bellied Sea-Eagle *Haliaeetus leucogaster*

Vulnerable in Victoria (DSE 2003); FFG listed.

The White-bellied Sea-Eagle is a prominent and emblematic species at Lake Mokoan, and widely known by the general public. There are claims for the species nesting at the lake, and though we are not aware of any documented breeding, this is to be expected. It may be that the sea-eagles utilising Lake Mokoan are not exclusive to that lake, as only one sighting was made during our field trip, and this is an unexpectedly low encounter rate if the lake was being used as a breeding site.

Suitable habitat for the White-bellied Sea-Eagle will still be present in a decommissioned scenario.

Victorian Temperate Woodland Bird Community

The full complement of this listed bird community includes the following species, many of which are of conservation significance in their own right: Barking Owl , Black-chinned Honeyeater , Brown Treecreeper , Brown-headed Honeyeater, Bush Stone-curlew , Diamond Firetail , Fuscous

Honeyeater, Grey-crowned Babbler, Hooded Robin, Red-capped Robin, Jacky Winter, Little Lorikeet, Painted Button-quail, Painted Honeyeater, Speckled Warbler, Swift Parrot, Turquoise Parrot, Western Gerygone, Yellow-tufted Honeyeater.

During the field trip for this study a number of species from this listed community were recorded (Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Painted Button-quail) and other members are known to occur within the broad study area (eg. Grey-crowned Babbler). Typically in the study area, these birds are found in River Red Gum and Grey Box woodland along the eastern and southern margins of the GM-W land, in Red Box woodland and plantations along the northern margin, and in scattered remnants of White Box, Red Box, Yellow Box and Hill Red Gum woodland at points along The Spit and elsewhere along the east side.

Suitable habitat for members of the Victorian Temperate Woodland Bird Community will still be present in a decommissioned scenario. However; habitat degradation through weed invasion (particularly *Phalaris*) is a significant potential threat to the viability of some of these dryland habitats in future land-use scenarios.

Colonially breeding waterbirds

Sites where waterbirds breed colonially (groups of nests ranging from 5-10 to thousands) in Victoria are limited generally to large, high-quality wetlands, and to more abundant species such as Straw-necked and Australian White Ibis, Silver Gulls, terns, etc. Otherwise abundant species such as Australian Pelicans and cormorants have few traditional, colonial breeding sites in Victoria which are used in most years. Rare or threatened species such as egrets and night-herons breed in few locations due both to their rarity and the scarcity of suitable locations.

Colonial breeding sites of Little Pied and Little Black Cormorants are not ubiquitous, and Lake Mokoan is of some significance for these species.

The moderate – high likelihood that Intermediate Egrets may have bred at Lake Mokoan in 2005/06 is significant, as this species is regarded as Critically Endangered in Victoria (DSE 2003). Known traditional breeding sites for this species are at Gunbower Island and Barmah Forest on the River Murray, with several scattered records from Lake Hume (Albury-Wodonga) and Lake Boga near Kerang (DSE 2004). Regular breeding at Lake Mokoan (if it occurs) would make it only the third known regular site in Victoria.

4.2.4 'Missing' fauna values

With some notable exceptions (Latham's Snipe, Great Egret), many significant fauna species are widespread in Lake Mokoan but in relatively low numbers. Overall, most waterfowl species are likewise widespread but numerically not well represented. The overall faunal species diversity of the dryland habitats is relatively low compared to other large wetland complexes in northern Victoria (eg. Kerang Lakes, Barmah and Gunbower forests), but is characterised by significant species.

Three species of frogs were recorded during opportunistic visits to Lake Mokoan during 2005, but none were recorded during the recent (January 2006) field trip. This lack of calling frogs, particularly those which are generally ubiquitous and call throughout the year such as the Common *Crinia signifera* and Plains Froglets *C. parinsignifera*, is difficult to explain. The impression gained from the recent survey is that frog diversity and abundance at Lake Mokoan is less than expected.

Mention was made by Conole et al. (2005) in our Stage One report of the widely reported mass die-off of Common Long-necked Turtles *Chelodina longicollis* during the frequent blue-green algae blooms of the early 1990s. The lack of encounters, either direct or indirect, with turtles during this survey suggests that recovery has been slow, and that turtle numbers are still at extremely low levels across the system. Typically, inland lake margins show abundant signs of turtle presence (tracks, pieces of carapace and other bones), and turtles are frequently encountered in pools and channels – but none of these signs were found at Lake Mokoan during this study. The habitats at Lake Mokoan presently appear suitable for this species, and are likely also to be suitable in the decommissioned scenario, and so it is expected that turtle numbers might eventually recover provided that habitat suitability is the only limiting factor.

5 Discussion

This study has documented high flora and fauna values based on field surveys over five days in late January 2006. Information previously available was scant and wholly inadequate to enable the formulation of land-use options. We believe that sufficient data have now been collected on the flora and fauna resources and values, their distribution, and conservation significance to enable supportable land-use decisions. These biological values are perhaps unexpectedly high given the general perceptions of a very large expanse of turbid water, periodic algal blooms and poor development of macrophyte vegetation and fauna habitats except on lake margins. While highly significant wetland and dryland vegetation and faunal habitats have been documented, large expanses of the study area carry wholly or substantially exotic vegetation (mostly sheep pasture) of little biological interest or significance.

The account of the vegetation types (categorised as Ecological Vegetation Classes) and their distribution and condition presented here mostly represents vegetation under conditions of relatively high water levels in the lake (c. 46% FLS recently receded from the 50% FLS). Emergent wetland vegetation which develops at the margin of the lake is highly dynamic and this wetland vegetation - most abundantly Plains Rushy Wetland and Plains Grassy Wetland - occupies wetness and elevation gradients on the shores of the lake at any given time. It has been described as a 'high speed temporal vegetation mosaic' (see Table 2). Very pronounced vegetation zonation with sharp or diffuse boundaries and changing structure and floristic composition along the gradients is evident everywhere throughout the area. Some of the wetlands (particularly Red Gum Swamp) are subsumed by the larger Lake Mokoan but are, or will become, independent wetlands with lake decommissioning and drawdown.

In projecting a scenario for the types and distribution of vegetation that may occupy shorelines of the reinstated Winton Swamp and other wetlands, it is necessary to extrapolate from existing conditions, particularly the elevational gradients and hydrological regime, that may exist in future. In respect of the hydrological regime, the depth of inundation and its periodicity and duration will be the major factors determining vegetation type and distribution. Variation in soil type is not considered to be a major determinant of wetland vegetation locally. We have utilised the data collected during field work to project wetland vegetation distribution when the lake draws down to its final configuration.

The extent of the 1 in 5 year floodplain around Winton Swamp and the other wetlands has been modelled by the hydrologists, and on the basis of the data collected during fieldwork for this study it is possible to predict vegetation types that are likely to occupy much intermittently inundated or waterlogged sites. This situation will broadly mirror the current conditions determining vegetation composition and structure on the margins of Lake Mokoan in the zone landward of the aquatic/amphibious Plains Rushy Wetland, that is vegetation described here as Plains Grassy Wetland. Currently these vegetation types 'migrate' in either direction along a wetness gradient determined by the fluctuating water levels. At the normal upper level of water in the reconfigured Winton Swamp, wetland vegetation is expected to be much more stable and it is expected to form

permanent wetland communities reliant on regular seasonal inundation and/or waterlogging. Landward of this zone the composition of the vegetation may be quite variable with alternating wet and dry cycles of variable duration. To this extent indigenous species tolerant of or reliant on seasonal waterlogging or shallow inundation may form the dominant vegetation (that is the current Plains Grassy Wetland) or dryland species, especially weeds such as *Phalaris*, will occupy sites where they are periodically drowned and excluded. The floristic composition and hence vegetation condition could fluctuate considerably, as it currently does.

With decommissioning it is probable that the area currently occupied by marginal wetland vegetation will be smaller, with a corresponding reduction in the fauna habitat of marginal wetlands. With the instatement of a more natural hydrological regime, it is expected that higher-quality wetland vegetation would become established, that is vegetation with more plant species and greater structural complexity. The current wetland flora is assumed to be species-poor because of water turbidity, high wave action, browsing of aquatic vegetation by European Carp and periodic elimination of wetland plant species by drowning or drying of substrates. Only highly resilient wetland plant species are likely to persist under the current erratic, aseasonal hydrological regime. A corollary of the wetland redistribution scenario (contraction of wetlands) will be that dryland vegetation will increase vastly in extent (areas currently flooded or carrying Plains Grassy Wetland). Determination of the boundaries of Precinct A (the conservation zone) will be determined in a general sense by the extent of the 1 in 5 year floodplain. On current trends, any indigenous vegetation that may occupy or colonise such areas will become dominated, and eventually eliminated, by invading *Phalaris*. This species forms 100% cover over very extensive areas at the outer edge of the Lake Mokoan system. Such vegetation, with or without a canopy of Red Gums, will have minimal biological values and may additionally present a significant fire hazard as it dries to provide high fuel loads.

This and other weed species currently recorded (Table 4), as well as species that may subsequently appear in the area, have very significant management implications.

All dryland and extant wetland native vegetation at Lake Mokoan is covered by Victoria's Native Vegetation Framework (DSE 2002), and has either high or very high significance. With decommissioning and changed land use there is likely to be outright loss of some vegetation, and elimination of other native vegetation because of changed hydrological conditions. This scenario may have significant Net Gain implications. The current vegetation type that dominates precinct E2 comprises extensive Plains Rushy Wetland and Plains Grassy Wetland in a complex temporal mosaic, which has very high natural values and as a result, the Net Gain implications of changed land use are an important consideration. Similar comments apply to other precincts (parts of Precinct A, C1, D1, D2, D3 and F) with similar wetland vegetation temporal mosaics driven by the current hydrological cycle. DSE will make a policy decision regarding Net Gain and a response is currently being formulated.

The evidence gleaned during this study suggests that the need for extensive intervention to revegetate 'new' wetlands, post decommissioning, is likely to be low – the dynamic successional sequence of wetland vegetation will very likely be driven by the hydrological cycle in a manner

similar to that occurring now. This observation suggests that the process for drawdown is therefore critical, and timing of that process will need to be investigated further to determine the optimal process to minimise the need for intervention.

This aspect needs further investigation, for example it is likely that the new wetlands arising from decommissioning may potentially support (to some extent) a different suite of wetland species – which will especially be the case if turbidity reduces sufficiently to allow the development of submerged macrophyte vegetation. It is assumed that development of such vegetation is not currently possible because of high turbidity, wave action, browsing by European Carp, and the erratic wetting and drying cycles. It is likely that strategic introduction of some wetland plant species currently “missing” from the system, but highly predictable on the basis of widespread regional models of wetland vegetation floristics (Frood 2005, Carr pers. obs.) will be desirable. Some of these plant species may naturally colonise via waterfowl dispersal over time. These aspects require more consideration, but are more detailed concerns that will not impact on the strategic nature of this land-use planning study.

With the high flora and fauna values now documented for the Lake Mokoan study area, it is evident that some EPBC listed items will need to be referred to the Commonwealth Department of Environment and Heritage and to the State government in the case of FFG-listed items. With outright loss of any native vegetation, indirectly for example via hydrological modification, there will be potentially major implications under Victoria’s Native Vegetation Management Framework. Achieving offsets for such losses under the Net Gain principle may be difficult.

6 Recommendations

We make the following recommendations based on our overview study:

- (i) The minimum area for Precinct A to protect the core conservation values should follow the contour above the 1-in-5 year flood event.
- (ii) Resolution of the boundary of Precinct A should be accompanied by resolution of other precinct boundaries encompassing areas of conservation significance (eg. independent wetlands, woodland stands).
- (iii) The land use in the precincts should be determined in consultation with the relevant experts (eg. hydrologists, archaeologists) and other members of the Lake Mokoan project team.
- (iv) Further studies are required, Viz.:
 - 1 More detailed flora and fauna surveys will be required in some areas, targeting threatened species and communities which may require active management;
 - 2 Establishment of baseline data on which future monitoring would be based (for evaluation of decommissioned wetland scenario);
 - 3 Determination of the protocols for decommissioning, e.g. timelines to accomplish maximum drawdown;
 - 4 Experimental introduction of indigenous wetland plant species believed to be currently missing from the system.
- (v) Land owner/managers must meet existing weed management obligations under the Victorian *Catchment and Land Protection Act* (CaLP Act).
- (vi) Additional priority weed species which require urgent management are:
 - 1 Willows (**Salix* spp.) – Weeds of National Significance which pose serious threats to wetland habitats;
 - 2 Phalaris (**Phalaris aquatica*) – currently threatens all dryland habitats within the study area;
 - 3 St John's Wort (**Hypericum perforatum*) – this is becoming a major weed in the study area;
- (vii) The implications of Net Gain under Victoria's Native Vegetation Management Framework will require investigation by DSE, and an appropriate response formulated.
- (viii) That the extent of snipe habitat within Lake Mokoan be modelled by or on behalf of DSE/GMW under four scenarios, i.e.
 - 1 current Lake Mokoan at 25% and 50% of full supply level; and
 - 2 a decommissioned lake at the 1-in-5 flood level and within the old 'Winton Swamp Complex' margins
 - 3 to ascertain the likely impacts of decommissioning on the available area of snipe habitat.

7 Information gaps

The data collected and collated during this study enables broad land-use decisions to be made and the precinct boundaries as currently existing (Figure 2) to be refined. For some precincts more detailed field work will be required at later stages to refine the boundaries for particularly land-use options and to delimit the distribution of particular attributes or issues, e.g. location of significant species and weed populations.

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Appendix 1. Quadrat data collected in the Lake Mokoan study area, April 1990 (3 quadrats) and January-February 2006 (38 quadrats) (see Figure 1 for location of quadrats).

Note: the five-digit number is the unique Flora Information System identifier

Quadrat 01 (F55749)

Recs 16 Date : 25 Jan 2006 Location : 146°02'09" 36°29'50" Altitude : 170 Collector : GWC			
2	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	297	* <i>Aster subulatus</i>	Aster-weed
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
1	1692	* <i>Holcus lanatus</i>	Yorkshire Fog
2	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	2260	<i>Myriophyllum verrucosum</i>	Red Water-milfoil
1	2431	* <i>Paspalum distichum</i>	Water Couch
1	2630	<i>Persicaria lapathifolia</i>	Pale Knotweed
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2949	* <i>Rorippa palustris</i>	Marsh Yellow-cress
1	9058	<i>Senecio campylocarpus</i>	Groundsel
2	3470	<i>Typha orientalis</i>	Broad-leaf Cumbungi

Quadrat 02 (F55750)

Recs 33 Date : 25 Jan 2006 Location : 146°02'13" 36°29'44" Altitude : 170 Collector : GWC V			
1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	4379	<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
+	705	* <i>Centaurium tenuiflorum</i>	Slender Centaury
1	756	<i>Chloris truncata</i>	Windmill Grass
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	948	* <i>Dactylis glomerata</i>	Cocksfoot
1	1048	* <i>Digitaria sanguinalis</i>	Summer Grass
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
2	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
+	2511	* <i>Helminthotheca echioides</i>	Ox-tongue
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2497	<i>Phragmites australis</i>	Common Reed
+	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
1	2970	* <i>Rumex crispus</i>	Curled Dock
+	3963	<i>Rumex tenax</i>	Narrow-leaf Dock

1	5713	* <i>Sonchus asper subsp. glaucescens</i>	Blue Sow-thistle
1	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3424	* <i>Trifolium arvense var. arvense</i>	Hare's-foot Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	2406	<i>Whalleya proluta</i>	Rigid Panic
1	2479	* <i>Phalaris minor</i>	Lesser Canary-grass

Quadrat 03 (F55751)

Recs 35 Date : 25 Jan 2006 Location : 146°02'13" 36°29'39" Altitude : 170 Collector : GWC

1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
2	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	500	* <i>Bromus diandrus</i>	Great Brome
2	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	702	* <i>Centaureum erythraea</i>	Common Centaury
1	756	<i>Chloris truncata</i>	Windmill Grass
2	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1123	* <i>Echium plantagineum</i>	Paterson's Curse
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
1	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
3	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
1	1189	<i>Eragrostis diandras</i>	Close-headed Love-grass
1	8427	<i>Euchiton spp.</i>	Cudweed
2	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	1895	* <i>Leontodon taraxacoides subsp. taraxacoides</i>	Hairy Hawkbit
1	2042	<i>Lomandra filiformis</i>	Wattle Mat-rush
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2970	* <i>Rumex crispus</i>	Curled Dock
+	5322	* <i>Solanum nigrum s.s.</i>	Black Nightshade
1	4923	* <i>Sonchus asper subsp. asper</i>	Rough Sow-thistle
2	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3424	* <i>Trifolium arvense var. arvense</i>	Hare's-foot Clover
2	3439	* <i>Trifolium striatum</i>	Knotted Clover
3	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 04 (F55752)

Recs 31 Date : 25 Jan 2006 Location : 146°02'25" 36°29'32" Altitude : 170 Collector : GWC

1	297	* <i>Aster subulatus</i>	Aster-weed
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	705	* <i>Centaureum tenuiflorum</i>	Slender Centaury
1	782	* <i>Cirsium vulgare</i>	Spear Thistle

1	810	* <i>Conyza sumatrensis</i>	Tall Fleabane
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
5	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
1	1189	<i>Eragrostis diandrus</i>	Close-headed Love-grass
1	8427	<i>Euchiton</i> spp.	Cudweed
1	4336	* <i>Gamochaeta purpurea</i> s.s.	Spiked Cudweed
1	1692	* <i>Holcus lanatus</i>	Yorkshire Fog
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	1895	* <i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2762	<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
1	3124	<i>Senecio quadridentatus</i>	Cotton Fireweed
1	4923	* <i>Sonchus asper</i> subsp. <i>asper</i>	Rough Sow-thistle
1	3423	* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
1	3425	* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
+	3558	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell

Quadrat 05 (F55753)

Recs 30 Date : 25 Jan 2006 Location : 146°02'33" 36°29'44" Altitude : 170 Collector : GWC

1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	4409	<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
1	4379	<i>Austrodanthonia setacea</i> var. <i>setacea</i>	Bristly Wallaby-grass
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
2	667	<i>Cassinia arcuata</i>	Drooping Cassinia
1	907	<i>Cynodon dactylon</i>	Couch
1	4445	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Grey Willow-herb
+	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	0164	<i>Eragrostis diandrus</i>	Close-headed Love-grass
1	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
1	1466	<i>Euchiton collinus</i> s.s.	Creeping Cudweed
1	4336	* <i>Gamochaeta purpurea</i> s.s.	Spiked Cudweed
1	1692	* <i>Holcus lanatus</i>	Yorkshire Fog
1	1741	<i>Hypericum gramineum</i>	Small St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1843	<i>Juncus subsecundus</i>	Finger Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
2	1895	* <i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
1	2189	<i>Microtis unifolia</i>	Common Onion-orchid
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
1	3124	<i>Senecio quadridentatus</i>	Cotton Fireweed
1	3134	* <i>Setaria pumila</i> subsp. <i>pumila</i>	Pale Pigeon-grass
1	3423	* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
1	3425	* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover

1	3429	* <i>Trifolium glomeratum</i>	Cluster Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	3558	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
+	2406	<i>Whalleya proluta</i>	Rigid Panic
Quadrat 06 (F55754)			
Recs 17 Date : 25 Jan 2006 Location : 146°01'48" 36°29'30" Altitude : 170 Collector : GWC			
1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
+	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
+	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
1	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot
+	782	* <i>Cirsium vulgare</i>	Spear Thistle
+	886	* <i>Cucumis myriocarpus subsp. leptodermis</i>	Paddy Melon
1	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
2	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush
5	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
+	2406	<i>Whalleya proluta</i>	Rigid Panic
Quadrat 07 (F55755)			
Recs 11 Date : 25 Jan 2006 Location : 146°01'58" 36°29'26" Altitude : 170 Collector : GWC			
1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	348	<i>Azolla pinnata</i>	Ferny Azolla
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1139	<i>Eleocharis acuta</i>	Common Spike-sedge
1	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1842	<i>Juncus semisolidus</i>	Plains Rush
1	2260	<i>Myriophyllum verrucosum</i>	Red Water-milfoil
1	6650	<i>Ricciocarpos natans</i>	Fringed Heartwort
4	3470	<i>Typha orientalis</i>	Broad-leaf Cumbungi
+	4040	<i>Vallisneria americana var. americana</i>	Eel Grass
Quadrat 08 (F55756)			
Recs 4 Date : 25 Jan 2006 Location : 146°03'01" 36°29'09" Altitude : 170 Collector : GWC			
+	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
4	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
+	1842	<i>Juncus semisolidus</i>	Plains Rush
+	4040	<i>Vallisneria americana var. americana</i>	Eel Grass
Quadrat 09 (F55757)			
Recs 16 Date : 25 Jan 2006 Location : 146°03'01" 36°29'20" Altitude : 170 Collector : GWC			
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
+	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
1	907	<i>Cynodon dactylon</i>	Couch
2	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	4445	<i>Epilobium billardierianum subsp. cinereum</i>	Grey Willow-herb
1	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
1	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
4	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass

1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush
1	1837	<i>Juncus radula</i>	Hoary Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed

Quadrat 10 (F55758)

Recs 20 Date : 26 Jan 2006 Location : 146°04'37" 36°29'21" Altitude : 170 Collector : GWC

1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot
+	782	* <i>Cirsium vulgare</i>	Spear Thistle
+	886	* <i>Cucumis myriocarpus subsp. leptodermis</i>	Paddy Melon
2	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	919	<i>Cyperus exaltatus</i>	Tall Flat-sedge
1	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1803	<i>Juncus amabilis</i>	Hollow Rush
4	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
2	2431	* <i>Paspalum distichum</i>	Water Couch
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
2	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
1	2970	* <i>Rumex crispus</i>	Curled Dock
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
+	9058	<i>Senecio campylocarpus</i>	Groundsel
1	3585	* <i>Xanthium strumarium spp. agg.</i>	Noogoora Burr species aggregat

Quadrat 11 (F55759)

Recs 23 Date : 26 Jan 2006 Location : 146°04'32" 36°29'40" Altitude : 170 Collector : GWC

1	297	* <i>Aster subulatus</i>	Aster-weed
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
1	500	* <i>Bromus diandrus</i>	Great Brome
+	623	<i>Carex appressa</i>	Tall Sedge
2	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1692	* <i>Holcus lanatus</i>	Yorkshire Fog
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
2	1803	<i>Juncus amabilis</i>	Hollow Rush
2	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
2	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
1	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
1	2970	* <i>Rumex crispus</i>	Curled Dock
1	3124	<i>Senecio quadridentatus</i>	Cotton Fireweed
1	9058	<i>Senecio campylocarpus</i>	Groundsel
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue

Quadrat 12 (F55760)

Recs 10 Date : 26 Jan 2006 Location : 146°04'23" 36°29'58" Altitude : 170 Collector : GWC

1	417		<i>Bolboschoenus medianus</i>	Marsh Club-sedge
1	918	*	<i>Cyperus eragrostis</i>	Drain Flat-sedge
1	919		<i>Cyperus exaltatus</i>	Tall Flat-sedge
2	1258		<i>Eucalyptus camaldulensis</i>	River Red-gum
1	2037	*	<i>Lolium rigidum</i>	Wimmera Rye-grass
1	2430	*	<i>Paspalum dilatatum</i>	Paspalum
1	2431	*	<i>Paspalum distichum</i>	Water Couch
1	2476	*	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
4	2764		<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
1	3468		<i>Typha domingensis</i>	Narrow-leaf Cumbungi

Quadrat 13 (F55761)

Recs 12 Date : 26 Jan 2006 Location : 146°06'15" 36°29'03" Altitude : 170 Collector : GWC

1	5097		<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3623	V	<i>Amphibromus fluitans</i>	River Swamp Wallaby-grass
1	3628		<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
2	348		<i>Azolla pinnata</i>	Ferny Azolla
1	907		<i>Cynodon dactylon</i>	Couch
1	950		<i>Damasonium minus</i>	Star Fruit
1	1139		<i>Eleocharis acuta</i>	Common Spike-sedge
2	1842		<i>Juncus semisolidus</i>	Plains Rush
1	3867		<i>Myriophyllum crispatum</i>	Upright Water-milfoil
1	2375		<i>Ottelia ovalifolia subsp. ovalifolia</i>	Swamp Lily
2	2431	*	<i>Paspalum distichum</i>	Water Couch
1	5272		<i>Potamogeton sulcatus</i>	Furrowed Pondweed

Quadrat 14 (F55762)

Recs 11 Date : 26 Jan 2006 Location : 146°06'17" 36°29'05" Altitude : 170 Collector : GWC

5	3628		<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	963		<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
2	907		<i>Cynodon dactylon</i>	Couch
2	1139		<i>Eleocharis acuta</i>	Common Spike-sedge
+	4674	k	<i>Eleocharis macbarronii</i>	Grey Spike-sedge
+	1803		<i>Juncus amabilis</i>	Hollow Rush
1	1821		<i>Juncus holoschoenus</i>	Joint-leaf Rush
1	151		<i>Lachnagrostis filiformis</i>	Common Blown-grass
2	2431	*	<i>Paspalum distichum</i>	Water Couch
1	2635		<i>Persicaria prostrata</i>	Creeping Knotweed
+	3963		<i>Rumex tenax</i>	Narrow-leaf Dock

Quadrat 15 (F55763)

Recs 10 Date : 26 Jan 2006 Location : 146°05'36" 36°29'28" Altitude : 170 Collector : GWC

+	3628		<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	3731	*	<i>Cortaderia jubata</i>	Pink Pampas-grass
1	907		<i>Cynodon dactylon</i>	Couch
1	918	*	<i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1139		<i>Eleocharis acuta</i>	Common Spike-sedge
1	3708		<i>Eragrostis infecunda</i>	Southern Cane-grass
3	1842		<i>Juncus semisolidus</i>	Plains Rush
1	151		<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2431	*	<i>Paspalum distichum</i>	Water Couch
1	2764		<i>Pseudoraphis spinescens</i>	Spiny Mud-grass

Quadrat 16 (F55764)

Recs 38 Date : 25 Jan 2006 Location : 146°05'38" 36°29'29" Altitude : 170 Collector : GWC

1	2966	*	<i>Acetosella vulgaris</i>	Sheep Sorrel
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1	166	* <i>Aira elegantissima</i>	Delicate Hair-grass
2	261	<i>Aristida behriana</i>	Brush Wire-grass
1	960	<i>Austrodanthonia auriculata</i>	Lobed Wallaby-grass
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	4409	<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
3	975	<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	4379	<i>Austrodanthonia setacea</i> var. <i>setacea</i>	Bristly Wallaby-grass
1	8098	* <i>Avena</i> spp.	Oat
1	444	<i>Bothriochloa macra</i>	Red-leg Grass
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	501	* <i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
+	623	<i>Carex appressa</i>	Tall Sedge
1	756	<i>Chloris truncata</i>	Windmill Grass
1	907	<i>Cynodon dactylon</i>	Couch
+	4445	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Grey Willow-herb
1	1185	<i>Eragrostis brownii</i>	Common Love-grass
1	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
1	8427	<i>Euchiton</i> spp.	Cudweed
1	1741	<i>Hypericum gramineum</i>	Small St John's Wort
+	1744	* <i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1859	* <i>Lactuca saligna</i>	Willow-leaf Lettuce
1	1895	* <i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
+	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2561	* <i>Plantago lanceolata</i>	Ribwort
1	4113	* <i>Romulea rosea</i> var. <i>australis</i> s.s.	Common Onion-grass
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
1	3204	* <i>Sonchus oleraceus</i>	Common Sow-thistle
2	3423	* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
1	3425	* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue

Quadrat 17 (F55765)

Recs 27 Date : 27 Jan 2006 Location : 146°01'14" 36°27'38" Altitude : 170 Collector : GWC

1	5097	<i>Alternanthera denticulata</i> s.s.	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	8098	* <i>Avena</i> spp.	Oat
+	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
2	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1123	* <i>Echium plantagineum</i>	Paterson's Curse
2	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
2	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1438	* <i>Gladiolus undulatus</i>	Wild Gladiolus
1	1442	<i>Glinus lotoides</i>	Hairy Carpet-weed
2	1803	<i>Juncus amabilis</i>	Hollow Rush

4	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2634	<i>Polygonum plebeium</i>	Small Knotweed
1	2968	<i>Rumex brownii</i>	Slender Dock
1	2970	* <i>Rumex crispus</i>	Curled Dock
+	9000	<i>Rumex spp.</i>	Dock
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
1	3204	* <i>Sonchus oleraceus</i>	Common Sow-thistle
1	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 18 (F55766)

Recs 17 Date : 27 Jan 2006 Location : 146°03'16" 36°26'55" Altitude : 170 Collector : GWC

1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	297	* <i>Aster subulatus</i>	Aster-weed
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
2	907	<i>Cynodon dactylon</i>	Couch
1	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
5	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
+	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
+	1298	<i>Eucalyptus microcarpa</i>	Grey Box
2	1803	<i>Juncus amabilis</i>	Hollow Rush
2	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2431	* <i>Paspalum distichum</i>	Water Couch
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
1	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 19 (F55767)

Recs 51 Date : 27 Jan 2006 Location : 146°03'17" 36°26'50" Altitude : 170 Collector : GWC

1	56	<i>Acacia mearnsii</i>	Black Wattle
+	5138	<i>Acacia verniciflua (common variant)</i>	Common Varnish Wattle
1	2966	* <i>Acetosella vulgaris</i>	Sheep Sorrel
1	166	* <i>Aira elegantissima</i>	Delicate Hair-grass
1	218	<i>Amyema miquelii</i>	Box Mistletoe
1	261	<i>Aristida behriana</i>	Brush Wire-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	964	<i>Austrodanthonia eriantha</i>	Hill Wallaby-grass
1	4409	<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
2	975	<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	4379	<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	500	* <i>Bromus diandrus</i>	Great Brome
1	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	623	<i>Carex appressa</i>	Tall Sedge
1	642	<i>Carex inversa</i>	Knob Sedge
2	651	<i>Carex tereticaulis</i>	Poong'ort
1	702	* <i>Centaureum erythraea</i>	Common Centaury
1	756	<i>Chloris truncata</i>	Windmill Grass
1	782	* <i>Cirsium vulgare</i>	Spear Thistle

1	1129	*	<i>Ehrharta longiflora</i>	Annual Veldt-grass
1	4445		<i>Epilobium billardierianum subsp. cinereum</i>	Grey Willow-herb
2	1252		<i>Eucalyptus blakelyi</i>	Blakely's Red-gum
2	1258		<i>Eucalyptus camaldulensis</i>	River Red-gum
1	1297		<i>Eucalyptus melliodora</i>	Yellow Box
3	1298		<i>Eucalyptus microcarpa</i>	Grey Box
+	1310		<i>Eucalyptus polyanthemos</i>	Red Box
1	1692	*	<i>Holcus lanatus</i>	Yorkshire Fog
1	1744	*	<i>Hypericum perforatum subsp. veronense</i>	St John's Wort
1	1748	*	<i>Hypochoeris radicata</i>	Cat's Ear
1	1803		<i>Juncus amabilis</i>	Hollow Rush
1	1817		<i>Juncus filicaulis</i>	Thread Rush
1	1843		<i>Juncus subsecundus</i>	Finger Rush
1	1860	*	<i>Lactuca serriola</i>	Prickly Lettuce
2	2037	*	<i>Lolium rigidum</i>	Wimmera Rye-grass
+	2042		<i>Lomandra filiformis</i>	Wattle Mat-rush
1	2430	*	<i>Paspalum dilatatum</i>	Paspalum
1	8879	*	<i>Petrorhagia spp.</i>	Pink
1	2476	*	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	4113	*	<i>Romulea rosea var. australis s.s.</i>	Common Onion-grass
1	2968		<i>Rumex brownii</i>	Slender Dock
1	2969	*	<i>Rumex conglomeratus</i>	Clustered Dock
1	3039		<i>Schoenus apogon</i>	Common Bog-sedge
1	4923	*	<i>Sonchus asper subsp. asper</i>	Rough Sow-thistle
1	3204	*	<i>Sonchus oleraceus</i>	Common Sow-thistle
2	3423	*	<i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3424	*	<i>Trifolium arvense var. arvense</i>	Hare's-foot Clover
1	3427	*	<i>Trifolium dubium</i>	Suckling Clover
1	3544	*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	2406		<i>Whalleya proluta</i>	Rigid Panic

Quadrat 20 (F55768)

Recs 34 Date : 27 Jan 2006 Location : 146°04'04" 36°26'07" Altitude : 170 Collector : GWC

1	12		<i>Acacia aspera</i>	Rough Wattle
1	45		<i>Acacia implexa</i>	Lightwood
1	166	*	<i>Aira elegantissima</i>	Delicate Hair-grass
+	218		<i>Amyema miquelii</i>	Box Mistletoe
1	261		<i>Aristida behriana</i>	Brush Wire-grass
1	961		<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963		<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	4409		<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
2	975		<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	4379		<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	8098	*	<i>Avena spp.</i>	Oat
+	609		<i>Calytrix tetragona</i>	Common Fringe-myrtle
+	623		<i>Carex appressa</i>	Tall Sedge
1	651		<i>Carex tereticaulis</i>	Poong'ort
1	667		<i>Cassinia arcuata</i>	Drooping Cassinia
1	756		<i>Chloris truncata</i>	Windmill Grass
1	907		<i>Cynodon dactylon</i>	Couch
1	1160		<i>Enteropogon acicularis</i>	Spider Grass
1	3708		<i>Eragrostis infecunda</i>	Southern Cane-grass
2	1258		<i>Eucalyptus camaldulensis</i>	River Red-gum
1	1747	*	<i>Hypochoeris glabra</i>	Smooth Cat's-ear
1	1843		<i>Juncus subsecundus</i>	Finger Rush

2	2037	*	<i>Lolium rigidum</i>	Wimmera Rye-grass
1	2092		<i>Lythrum hyssopifolia</i>	Small Loosestrife
+	2233		<i>Muellerina eucalyptoides</i>	Creeping Mistletoe
1	2430	*	<i>Paspalum dilatatum</i>	Paspalum
1	2476	*	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2855		<i>Pultenaea largiflorens</i>	Twiggy Bush-pea
1	4113	*	<i>Romulea rosea var. australis s.s.</i>	Common Onion-grass
+	2969	*	<i>Rumex conglomeratus</i>	Clustered Dock
1	3423	*	<i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
2	3424	*	<i>Trifolium arvense var. arvense</i>	Hare's-foot Clover
2	3544	*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	2406		<i>Whalleya proluta</i>	Rigid Panic

Quadrat 21 (F55769)

Recs 20 Date : 27 Jan 2006 Location : 146°09'05" 36°24'15" Altitude : 170 Collector : GWC

1	5097		<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628		<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	*	<i>Aster subulatus</i>	Aster-weed
1	707		<i>Centipeda cunninghamii</i>	Common Sneezeweed
1	748		<i>Chenopodium pumilio</i>	Clammy Goosefoot
1	907		<i>Cynodon dactylon</i>	Couch
1	918	*	<i>Cyperus eragrostis</i>	Drain Flat-sedge
+	8372	*	<i>Echinochloa colona</i>	Barnyard Grass
1	1139		<i>Eleocharis acuta</i>	Common Spike-sedge
1	1442		<i>Glinus lotoides</i>	Hairy Carpet-weed
1	1803		<i>Juncus amabilis</i>	Hollow Rush
1	1842		<i>Juncus semisolidus</i>	Plains Rush
1	151		<i>Lachnagrostis filiformis</i>	Common Blown-grass
+	2430	*	<i>Paspalum dilatatum</i>	Paspalum
1	2630		<i>Persicaria lapathifolia</i>	Pale Knotweed
1	2635		<i>Persicaria prostrata</i>	Creeping Knotweed
1	2634		<i>Polygonum plebeium</i>	Small Knotweed
+	5713	*	<i>Sonchus asper subsp. glaucescens</i>	Blue Sow-thistle
1	3439	*	<i>Trifolium striatum</i>	Knotted Clover
2	2406		<i>Whalleya proluta</i>	Rigid Panic

Quadrat 22 (F55770)

Recs 4 Date : 27 Jan 2006 Location : 146°09'05" 36°24'17" Altitude : 170 Collector : GWC

1	1139		<i>Eleocharis acuta</i>	Common Spike-sedge
1	1803		<i>Juncus amabilis</i>	Hollow Rush
5	1842		<i>Juncus semisolidus</i>	Plains Rush
1	3963		<i>Rumex tenax</i>	Narrow-leaf Dock

Quadrat 23 (F55771)

Recs 44 Date : 26 Jan 2006 Location : 146°08'54" 36°24'09" Altitude : 170 Collector : GWC Vegetation : Not known

1	166	*	<i>Aira elegantissima</i>	Delicate Hair-grass
1	261		<i>Aristida behriana</i>	Brush Wire-grass
+	264		<i>Aristida ramosa</i>	Cane Wire-grass
1	960		<i>Austrodanthonia auriculata</i>	Lobed Wallaby-grass
1	961		<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963		<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
2	4409		<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
3	975		<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	8098	*	<i>Avena spp.</i>	Oat
+	496	*	<i>Briza minor</i>	Lesser Quaking-grass
1	500	*	<i>Bromus diandrus</i>	Great Brome
1	623		<i>Carex appressa</i>	Tall Sedge

1	642	<i>Carex inversa</i>	Knob Sedge
+	651	<i>Carex tereticaulis</i>	Poong'ort
+	667	<i>Cassinia arcuata</i>	Drooping Cassinia
1	846	<i>Chloris truncata</i>	Windmill Grass
+	1160	<i>Enteropogon acicularis</i>	Spider Grass
1	4445	<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Grey Willow-herb
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
2	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
1	1744	* <i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
+	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1805	<i>Juncus aridicola</i>	Tussock Rush
1	1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush
1	1843	<i>Juncus subsecundus</i>	Finger Rush
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2214	* <i>Moenchia erecta</i>	Erect Chickweed
+	2386	<i>Oxalis perennans</i>	Grassland Wood-sorrel
+	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
2	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2480	* <i>Phalaris paradoxa</i>	Paradoxical Canary-grass
1	4113	* <i>Romulea rosea</i> var. <i>australis</i>	Common Onion-grass
+	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
2	3423	* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
1	3424	* <i>Trifolium arvense</i> var. <i>arvense</i>	Hare's-foot Clover
2	3425	* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 24 (F55772)

Recs 36 Date : 27 Jan 2006 Location : 146°09'30" 36°26'31" Altitude : 170 Collector : GWC

2	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	651	<i>Carex tereticaulis</i>	Poong'ort
+	705	* <i>Centaurium tenuiflorum</i>	Slender Centaury
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
2	1139	<i>Eleocharis acuta</i>	Common Spike-sedge
1	1145	<i>Eleocharis pusilla</i>	Small Spike-sedge
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
4	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
1	8427	<i>Euchiton</i> aff. <i>sphaericus</i>	Cudweed
1	4336	* <i>Gamochaeta purpurea</i> s.s.	Spiked Cudweed
1	1499	<i>Goodenia gracilis</i>	Slender Goodenia
+	2511	* <i>Helminthotheca echioides</i>	Ox-tongue
1	1741	<i>Hypericum gramineum</i>	Small St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1821	<i>Juncus holoschoenus</i>	Joint-leaf Rush
1	1843	<i>Juncus subsecundus</i>	Finger Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass

1	1859	* <i>Lactuca saligna</i>	Willow-leaf Lettuce
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	1895	* <i>Leontodon taraxacoides subsp. taraxacoides</i>	Hairy Hawkbit
1	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2169	* <i>Mentha pulegium</i>	Pennyroyal
+	3867	<i>Myriophyllum crispatum</i>	Upright Water-milfoil
+	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	3970	* <i>Rosa canina</i>	Dog Rose
1	2968	<i>Rumex brownii</i>	Slender Dock
1	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
1	2970	<i>Rumex crispus</i>	Curled Dock
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
1	3056	<i>Schoenus tesquorum</i>	Soft Bog-sedge
+	3325	<i>Swainsona procumbens</i>	Broughton Pea
1	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 25 (F55773)

Recs 22 Date : 27 Jan 2006 Location : 146°08'49" 36°26'36" Altitude : 170 Collector : GWC

+	173	* <i>Alisma lanceolata</i>	Water Plantain
1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
2	297	* <i>Aster subulatus</i>	Aster-weed
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
+	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1139	<i>Eleocharis acuta</i>	Common Spike-sedge
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
1	1442	<i>Glinus lotooides</i>	Hairy Carpet-weed
5	1842	<i>Juncus semisolidus</i>	Plains Rush
3	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2169	* <i>Mentha pulegium</i>	Pennyroyal
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	5272	<i>Potamogeton sulcatus</i>	Furrowed Pondweed
1	2949	* <i>Rorippa palustris</i>	Marsh Yellow-cress
2	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
1	2970	* <i>Rumex crispus</i>	Curled Dock
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
1	3468	<i>Typha domingensis</i>	Narrow-leaf Cumbungi

Quadrat 26 (F55774)

Recs 60 Date : 28 Jan 2006 Location : 146°08'51" 36°26'40" Altitude : 170 Collector : GWC

1	166	* <i>Aira elegantissima</i>	Delicate Hair-grass
1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
2	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	223	* <i>Anagallis arvensis</i>	Pimpernel
1	297	* <i>Aster subulatus</i>	Aster-weed
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
2	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	4379	<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
2	496	* <i>Briza minor</i>	Lesser Quaking-grass
+	642	<i>Carex inversa</i>	Knob Sedge

1	667	<i>Cassinia arcuata</i>	Drooping Cassinia
+	756	<i>Chloris truncata</i>	Windmill Grass
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	8252	<i>Convolvulus spp.</i>	Bindweed
1	812	* <i>Conyza bonariensis</i>	Flaxleaf Fleabane
1	810	* <i>Conyza sumatrensis</i>	Tall Fleabane
1	907	<i>Cynodon dactylon</i>	Couch
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
+	1023	<i>Deyeuxia quadriseta</i>	Reed Bent-grass
1	1123	* <i>Echium plantagineum</i>	Paterson's Curse
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
1	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
+	3708	<i>Eragrostis infecunda</i>	Southern Cane-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
1	1466	<i>Euchiton collinus s.s.</i>	Creeping Cudweed
1	1471	<i>Euchiton sphaericus</i>	Annual Cudweed
1	4336	* <i>Gamochaeta purpurea s.s.</i>	Spiked Cudweed
1	1744	* <i>Hypericum perforatum subsp. veronense</i>	St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1817	<i>Juncus filicaulis</i>	Thread Rush
1	1818	<i>Juncus flavidus</i>	Gold Rush
1	1843	<i>Juncus subsecundus</i>	Finger Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1859	* <i>Lactuca saligna</i>	Willow-leaf Lettuce
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
1	1895	* <i>Leontodon taraxacoides subsp. taraxacoides</i>	Hairy Hawkbit
1	2728	<i>Lobelia concolor</i>	Poison Pratia
1	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
+	2169	* <i>Mentha pulegium</i>	Pennyroyal
1	2420	* <i>Parentucellia latifolia</i>	Red Bartsia
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2561	* <i>Plantago lanceolata</i>	Ribwort
1	2762	<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
1	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
1	2970	* <i>Rumex crispus</i>	Curled Dock
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
1	3056	<i>Schoenus tesquorum</i>	Soft Bog-sedge
1	3124	<i>Senecio quadridentatus</i>	Cotton Fireweed
+	9058	<i>Senecio campylocarpus</i>	Groundsel
+	4923	* <i>Sonchus asper subsp. asper</i>	Rough Sow-thistle
2	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3425	* <i>Trifolium campestre var. campestre</i>	Hop Clover
1	3427	* <i>Trifolium dubium</i>	Suckling Clover
1	3440	* <i>Trifolium subterraneum</i>	Subterranean Clover
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	3558	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell

Quadrat 27 (F55775)

Recs 13 Date : 27 Jan 2006 Location : 146°08'59" 36°24'06" Altitude : 170 Collector : GWC Vegetation : Not known

+	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass

2	347	<i>Azolla filiculoides</i>	Pacific Azolla
+	623	<i>Carex appressa</i>	Tall Sedge
3	1842	<i>Juncus semisolidus</i>	Plains Rush
1	3224	<i>Landoltia punctata</i>	Thin Duckweed
1	1893	<i>Lemna disperma</i>	Common Duckweed
1	2063	<i>Ludwigia peploides subsp. montevidensis</i>	Clove-strip
1	2431	* <i>Paspalum distichum</i>	Water Couch
3	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
+	2969	* <i>Rumex conglomeratus</i>	Clustered Dock
+	3963	<i>Rumex tenax</i>	Narrow-leaf Dock
1	4040	<i>Vallisneria americana var. americana</i>	Eel Grass

Quadrat 28 (F55776)

Recs 25 Date : 27 Jan 2006 Location : 146°09'06" 36°24'11" Altitude : 170 Collector : GWC

1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
1	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
1	2511	* <i>Helminthotheca echioides</i>	Ox-tongue
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
2	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
+	2630	<i>Persicaria lapathifolia</i>	Pale Knotweed
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2480	* <i>Phalaris paradoxa</i>	Paradoxical Canary-grass
+	2764	<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
+	5713	* <i>Sonchus asper subsp. glaucescens</i>	Blue Sow-thistle
1	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
2	3439	* <i>Trifolium striatum</i>	Knotted Clover
3	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 29 (F55777)

Recs 17 Date : 29 Jan 2006 Location : 146°07'20" 36°28'17" Altitude : 170 Collector : GWC

1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
2	907	<i>Cynodon dactylon</i>	Couch
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
+	919	<i>Cyperus exaltatus</i>	Tall Flat-sedge
+	1023	<i>Deyeuxia quadriseta</i>	Reed Bent-grass
1	1185	<i>Eragrostis brownii</i>	Common Love-grass
2	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
+	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
2	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1810	<i>Juncus bufonius</i>	Toad Rush
4	1842	<i>Juncus semisolidus</i>	Plains Rush

1	1843	<i>Juncus subsecundus</i>	Finger Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
2	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
Quadrat 30 (F55778)			
Recs 4 Date : 29 Jan 2006 Location : 146°07'15" 36°28'23" Altitude : 170 Collector : GWC			
1	297	* <i>Aster subulatus</i>	Aster-weed
1	1803	<i>Juncus amabilis</i>	Hollow Rush
5	1842	<i>Juncus semisolidus</i>	Plains Rush
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
Quadrat 31 (F55779)			
Recs 14 Date : 29 Jan 2006 Location : 146°07'15" 36°28'29" Altitude : 170 Collector : GWC			
5	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
2	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
2	907	<i>Cynodon dactylon</i>	Couch
1	1179	<i>Epilobium hirtigerum</i>	Hairy Willow-herb
+	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1842	<i>Juncus semisolidus</i>	Plains Rush
3	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	8688	<i>Lotus spp.</i>	Trefoil
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
+	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	3424	* <i>Trifolium arvense var. arvense</i>	Hare's-foot Clover
1	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
Quadrat 32 (F55780)			
Recs 10 Date : 29 Jan 2006 Location : 146°07'47" 36°28'15" Altitude : 170 Collector : GWC			
2	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	297	* <i>Aster subulatus</i>	Aster-weed
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
2	907	<i>Cynodon dactylon</i>	Couch
1	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
2	1803	<i>Juncus amabilis</i>	Hollow Rush
5	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
Quadrat 33 (F55781)			
Recs 30 Date : 29 Jan 2006 Location : 146°07'21" 36°28'20" Altitude : 170 Collector : GWC			
1	255	* <i>Arctotheca calendula</i>	Cape Weed
1	261	<i>Aristida behriana</i>	Brush Wire-grass
1	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
1	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
3	975	<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	977	<i>Austrodanthonia racemosa var. racemosa</i>	Striped Wallaby-grass
2	4379	<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	3266	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
1	8098	* <i>Avena spp.</i>	Oat
1	500	* <i>Bromus diandrus</i>	Great Brome
2	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	756	<i>Chloris truncata</i>	Windmill Grass
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
+	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass

2	1298	<i>Eucalyptus microcarpa</i>	Grey Box
1	3695	* <i>Hordeum murinum s.l.</i>	Barley-grass
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
+	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1860	* <i>Lactuca serriola</i>	Prickly Lettuce
2	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	2122	* <i>Malva parviflora</i>	Small-flower Mallow
1	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	4113	* <i>Romulea rosea var. australis s.s.</i>	Common Onion-grass
1	2968	<i>Rumex brownii</i>	Slender Dock
1	3027	* <i>Schinus molle</i>	Pepper Tree
1	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue

Quadrat 34 (F55782)

Recs 31 Date : 29 Jan 2006 Location : 146°03'46" 36°30'16" Altitude : 170 Collector : GWC

2	961	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
2	963	<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
1	975	<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
1	4379	<i>Austrodanthonia setacea var. setacea</i>	Bristly Wallaby-grass
1	8098	* <i>Avena spp.</i>	Oat
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
2	501	* <i>Bromus hordeaceus subsp. hordeaceus</i>	Soft Brome
1	503	* <i>Bromus madritensis</i>	Madrid Brome
1	642	<i>Carex inversa</i>	Knob Sedge
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	912	* <i>Cynosurus echinatus</i>	Rough Dog's-tail
1	948	* <i>Dactylis glomerata</i>	Cocksfoot
1	146	<i>Elymus scaber var. scaber</i>	Common Wheat-grass
1	1239	<i>Eryngium ovinum</i>	Blue Devil
3	1298	<i>Eucalyptus microcarpa</i>	Grey Box
1	1699	* <i>Hordeum hystrix</i>	Mediterranean Barley-grass
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1805	<i>Juncus aridicola</i>	Tussock Rush
1	1817	<i>Juncus filicaulis</i>	Thread Rush
1	1818	<i>Juncus flavidus</i>	Gold Rush
1	1843	<i>Juncus subsecundus</i>	Finger Rush
3	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
1	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
2	4113	* <i>Romulea rosea var. australis s.s.</i>	Common Onion-grass
1	2968	<i>Rumex brownii</i>	Slender Dock
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
1	3423	* <i>Trifolium angustifolium var. angustifolium</i>	Narrow-leaf Clover
1	3429	* <i>Trifolium glomeratum</i>	Cluster Clover
1	3439	* <i>Trifolium striatum</i>	Knotted Clover
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue

Quadrat 35 (F55783)

Recs 14 Date : 29 Jan 2006 Location : 146°04'15" 36°30'28" Altitude : 170 Collector : GWC

+	261	<i>Aristida behriana</i>	Brush Wire-grass
2	8098	* <i>Avena spp.</i>	Oat
1	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	500	* <i>Bromus diandrus</i>	Great Brome

1	501	* <i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
+	705	* <i>Centaurium tenuiflorum</i>	Slender Centaury
+	782	* <i>Cirsium vulgare</i>	Spear Thistle
3	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
2	2037	* <i>Lolium rigidum</i>	Wimmera Rye-grass
+	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2430	* <i>Paspalum dilatatum</i>	Paspalum
5	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	4113	* <i>Romulea rosea</i> var. <i>australis</i> s.s.	Common Onion-grass
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue

Quadrat 36 (F55784)

Recs 29 Date : 28 Jan 2006 Location : 146°09'35" 36°26'17" Altitude : 170 Collector : GWC

1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	297	* <i>Aster subulatus</i>	Aster-weed
1	8098	* <i>Avena</i> spp.	Oat
2	496	* <i>Briza minor</i>	Lesser Quaking-grass
1	642	<i>Carex inversa</i>	Knob Sedge
1	705	* <i>Centaurium tenuiflorum</i>	Slender Centaury
1	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	8252	<i>Convolvulus</i> spp.	Bindweed
+	812	* <i>Conyza bonariensis</i>	Flaxleaf Fleabane
1	810	* <i>Conyza sumatrensis</i>	Tall Fleabane
1	1077	* <i>Dittrichia graveolens</i>	Stinkwort
1	4336	* <i>Gamochaeta purpurea</i> s.s.	Spiked Cudweed
1	2511	* <i>Helminthotheca echioides</i>	Ox-tongue
1	1692	* <i>Holcus lanatus</i>	Yorkshire Fog
1	1744	* <i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort
1	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1818	<i>Juncus flavidus</i>	Gold Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
1	2169	* <i>Mentha pulegium</i>	Pennyroyal
2	2476	* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
1	2561	* <i>Plantago lanceolata</i>	Ribwort
1	3039	<i>Schoenus apogon</i>	Common Bog-sedge
2	3423	* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
1	3425	* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
2	3544	* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
1	3558	<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
2	2406	<i>Whalleya proluta</i>	Rigid Panic

Quadrat 37 (F55785)

Recs 16 Date : 28 Jan 2006 Location : 146°09'11" 36°26'41" Altitude : 170 Collector : GWC

4	173	* <i>Alisma lanceolata</i>	Water Plantain
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	651	<i>Carex tereticaulis</i>	Poong'ort
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
+	907	<i>Cynodon dactylon</i>	Couch
1	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
2	1139	<i>Eleocharis acuta</i>	Common Spike-sedge
3	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
1	1803	<i>Juncus amabilis</i>	Hollow Rush
1	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass

1	2063	<i>Ludwigia peploides subsp. montevidensis</i>	Clove-strip
1	2126	<i>Marsilea costulifera</i>	Narrow-leaf Nardoo
1	3867	<i>Myriophyllum crispatum</i>	Upright Water-milfoil
1	2431	* <i>Paspalum distichum</i>	Water Couch
1	3470	<i>Typha orientalis</i>	Broad-leaf Cumbungi

Quadrat 38 (F55786)

Recs 13 Date : 28 Jan 2006 Location : 146°09'36" 36°26'12" Altitude : 170 Collector : GWC

1	5097	<i>Alternanthera denticulata s.s.</i>	Lesser Joyweed
1	3623	V <i>Amphibromus fluitans</i>	River Swamp Wallaby-grass
1	3628	<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
1	347	<i>Azolla filiculoides</i>	Pacific Azolla
1	1139	<i>Eleocharis acuta</i>	Common Spike-sedge
4	1842	<i>Juncus semisolidus</i>	Plains Rush
1	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
1	2063	<i>Ludwigia peploides subsp. montevidensis</i>	Clove-strip
1	2431	* <i>Paspalum distichum</i>	Water Couch
1	2630	<i>Persicaria lapathifolia</i>	Pale Knotweed
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	6650	<i>Ricciocarpos natans</i>	Fringed Heartwort
1	3963	<i>Rumex tenax</i>	Narrow-leaf Dock

Quadrat 39 (FIS #??)

Recs 33 Date : 19 Apr 1990 Location : 146°02'42" 36°27'08" Altitude : 170 Collector : DF;JMM

+	651	<i>Carex tereticaulis</i>	Poong'ort
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
2	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot
+	756	<i>Chloris truncata</i>	Windmill Grass
+	782	* <i>Cirsium vulgare</i>	Spear Thistle
1	907	<i>Cynodon dactylon</i>	Couch
1	1048	* <i>Digitaria sanguinalis</i>	Summer Grass
+	1174	<i>Epilobium billardierianum</i>	Variable Willow-herb
2	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
2	1258	<i>Eucalyptus camaldulensis</i>	River Red-gum
+	1298	<i>Eucalyptus microcarpa</i>	Grey Box
1	1442	<i>Glinus lotoides</i>	Hairy Carpet-weed
2	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
+	1805	<i>Juncus aridicola</i>	Tussock Rush
1	1818	<i>Juncus flavidus</i>	Gold Rush
2	1842	<i>Juncus semisolidus</i>	Plains Rush
+	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
+	4219	<i>Lachnagrostis filiformis var. 1</i>	Common Blown-grass
+	2036	* <i>Lolium perenne</i>	Perennial Rye-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
+	8852	<i>Panicum spp.</i>	Panic
+	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2431	* <i>Paspalum distichum</i>	Water Couch
1	2628	<i>Persicaria hydropiper</i>	Water Pepper
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
1	3954	* <i>Polygonum arenastrum</i>	Wireweed
+	3124	<i>Senecio quadridentatus s.l.</i>	Cotton Fireweed
+	9059	* <i>Setaria spp. (naturalised)</i>	Pigeon Grass
+	3183	* <i>Solanum nigrum sensu Willis (1972)</i>	Black Nightshade
1	3203	* <i>Sonchus asper s.l.</i>	Rough Sow-thistle
+	3424	* <i>Trifolium arvense var. arvense</i>	Hare's-foot Clover

1	3429	* <i>Trifolium glomeratum</i>	Cluster Clover
2	3440	* <i>Trifolium subterraneum</i>	Subterranean Clover
Quadrat 40 (F32002)			
Recs 20 Date : 19 Apr 1990 Location : 146°02'35" 36°27'12" Altitude : 170 Collector : DF;JMM			
+	297	* <i>Aster subulatus</i>	Aster-weed
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
1	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot
1	907	<i>Cynodon dactylon</i>	Couch
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
2	1114	<i>Dysphania glomulifera ssp. glomulifera</i>	Globular Pigweed
2	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
+	1442	<i>Glinus lotoides</i>	Hairy Carpet-weed
2	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
+	1805	<i>Juncus aridicola</i>	Tussock Rush
+	1818	<i>Juncus flavidus</i>	Gold Rush
3	1842	<i>Juncus semisolidus</i>	Plains Rush
2	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
2	4219	<i>Lachnagrostis filiformis var. 1</i>	Common Blown-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
+	2430	* <i>Paspalum dilatatum</i>	Paspalum
2	2431	* <i>Paspalum distichum</i>	Water Couch
+	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
+	3203	* <i>Sonchus asper s.l.</i>	Rough Sow-thistle
1	3440	* <i>Trifolium subterraneum</i>	Subterranean Clover
Quadrat 41 (F32003)			
Recs 28 Date : 19 Apr 1990 Location : 146°02'37" 36°27'10" Altitude : 170 Collector : DF;JMM			
1	707	<i>Centipeda cunninghamii</i>	Common Sneezeweed
2	748	<i>Chenopodium pumilio</i>	Clammy Goosefoot
+	8253	* <i>Conyza spp.</i>	Fleabane
+	918	* <i>Cyperus eragrostis</i>	Drain Flat-sedge
3	1114	<i>Dysphania glomulifera ssp. glomulifera</i>	Globular Pigweed
+	1174	<i>Epilobium billardierianum</i>	Variable Willow-herb
+	1189	<i>Eragrostis diandra</i>	Close-headed Love-grass
1	1193	<i>Eragrostis parviflora</i>	Weeping Love-grass
+	1442	<i>Glinus lotoides</i>	Hairy Carpet-weed
2	8484	<i>Glossostigma spp.</i>	Mud Mat
+	1748	* <i>Hypochoeris radicata</i>	Cat's Ear
1	1780	<i>Isolepis marginata</i>	Little Club-sedge
1	8581	<i>Isolepis spp.</i>	Club Sedge
1	1810	<i>Juncus bufonius</i>	Toad Rush
2	8601	<i>Juncus spp.</i>	Rush
+	151	<i>Lachnagrostis filiformis</i>	Common Blown-grass
+	4219	<i>Lachnagrostis filiformis var. 1</i>	Common Blown-grass
1	2092	<i>Lythrum hyssopifolia</i>	Small Loosestrife
+	2430	* <i>Paspalum dilatatum</i>	Paspalum
1	2628	<i>Persicaria hydropiper</i>	Water Pepper
1	2635	<i>Persicaria prostrata</i>	Creeping Knotweed
+	2762	<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
+	9000	<i>Rumex spp.</i>	Dock
1	3203	* <i>Sonchus asper s.l.</i>	Rough Sow-thistle
+	3204	* <i>Sonchus oleraceus</i>	Common Sow-thistle
1	3429	* <i>Trifolium glomeratum</i>	Cluster Clover
1	3440	* <i>Trifolium subterraneum</i>	Subterranean Clover
+	3491	* <i>Vellereophyton dealbatum</i>	White Cudweed

Appendix 2. Plant species recorded for the Lake Mokoan study area, 1968-2006.

LIVERWORTS

Ricciaceae

Ricciocarpos natans

Fringed Heartwort

FERNS AND ALLIES

Azollaceae

Azolla filiculoides

Pacific Azolla

Azolla pinnata

Ferny Azolla

Isoetaceae

Isoetes muelleri

Rock Quillwort

Marsileaceae

Marsilea costulifera

Narrow-leaf Nardoo

Marsilea drummondii

Common Nardoo

CONIFERS

Cupressaceae

**Callitris glaucophylla*

White Cypress-pine

**Callitris gracilis* subsp. *murrayensis*

Slender Cypress-pine

Pinaceae

**Pinus pinea*

Stone Pine

MONOCOTYLEDONS

Alismataceae

**Alisma lanceolata*

Water Plantain

Damasonium minus

Star Fruit

Arecaceae

**Phoenix canariensis*

Canary Island Date-palm

Cyperaceae

Bolboschoenus medianus

Marsh Club-sedge

Carex appressa

Tall Sedge

Carex inversa

Knob Sedge

Carex tereticaulis

Poong'ort

**Cyperus eragrostis*

Drain Flat-sedge

Cyperus exaltatus

Tall Flat-sedge

Cyperus gymnocaulos

Spiny Flat-sedge

Eleocharis acuta

Common Spike-sedge

k Eleocharis macbarronii

Grey Spike-sedge

Eleocharis pusilla

Small Spike-sedge

**Isolepis hystrix*

Awned Club-sedge

Isolepis marginata

Little Club-sedge

Isolepis sp.

Club Sedge

Schoenus apogon

Common Bog-sedge

Schoenus tesquorum

Soft Bog-sedge

Hydrocharitaceae

Ottelia ovalifolia subsp. *ovalifolia*

Swamp Lily

Vallisneria americana var. *americana*

Eel Grass

Iridaceae

**Gladiolus undulatus*

Wild Gladiolus

**Romulea rosea* var. *australis*

Common Onion-grass

Juncaceae

**Juncus acutus* subsp. *acutus*

Sharp Rush

Juncus amabilis

Hollow Rush

Juncus aridicola

Tussock Rush

Juncus bufonius

Toad Rush

Juncus filicaulis

Thread Rush

Juncus flavidus

Gold Rush

Juncus holoschoenus

Joint-leaf Rush

Juncus radula

Hoary Rush

Juncus semisolidus

Plains Rush

Juncus sp.

Rush

Juncus subsecundus

Finger Rush

Lemnaceae

Landoltia punctata

Thin Duckweed

Lemna disperma

Common Duckweed

Orchidaceae	
<i>Microtis parviflora</i>	Slender Onion-orchid
<i>Microtis unifolia</i>	Common Onion-orchid
Phormiaceae	
<i>Dianella admixta</i>	Black-anther Flax-lily
<i>Stypandra glauca</i>	Nodding Blue-lily
Poaceae	
* <i>Agrostis capillaris</i> s.l.	Brown-top Bent
* <i>Aira caryophyllea</i>	Silvery Hair-grass
* <i>Aira elegantissima</i>	Delicate Hair-grass
V <i>Amphibromus fluitans</i>	River Swamp Wallaby-grass
<i>Amphibromus nervosus</i>	Common Swamp Wallaby-grass
<i>Aristida behriana</i>	Brush Wire-grass
<i>Aristida ramosa</i>	Cane Wire-grass
<i>Austrodanthonia auriculata</i>	Lobed Wallaby-grass
<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
<i>Austrodanthonia duttoniana</i>	Brown-back Wallaby-grass
<i>Austrodanthonia eriantha</i>	Hill Wallaby-grass
<i>Austrodanthonia fulva</i>	Copper-awned Wallaby-grass
<i>Austrodanthonia pilosa</i>	Velvet Wallaby-grass
<i>Austrodanthonia racemosa</i> var. <i>racemosa</i>	Stiped Wallaby-grass
<i>Austrodanthonia setacea</i> var. <i>setacea</i>	Bristly Wallaby-grass
<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
<i>Austrostipa scabra</i>	Rough Spear-grass
* <i>Avena</i> sp.	Oat
<i>Bothriochloa macra</i>	Red-leg Grass
* <i>Briza maxima</i>	Large Quaking-grass
* <i>Briza minor</i>	Lesser Quaking-grass
* <i>Bromus diandrus</i>	Great Brome
* <i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
* <i>Bromus madritensis</i>	Madrid Brome
<i>Chloris truncata</i>	Windmill Grass
* <i>Cortaderia jubata</i>	Pink Pampas-grass
<i>Cynodon dactylon</i>	Couch
* <i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch
* <i>Cynosurus echinatus</i>	Rough Dog's-tail
* <i>Dactylis glomerata</i>	Cocksfoot
<i>Deyeuxia quadriseta</i>	Reed Bent-grass
<i>Dichanthium sericeum</i> subsp. <i>sericeum</i>	Silky Blue-grass
* <i>Digitaria sanguinalis</i>	Summer Grass
* <i>Echinochloa crus-galli</i>	Barnyard Grass
* <i>Echinochloa muricata</i> var. <i>microstachya</i>	Prickly Barnyard-grass
* <i>Echinochloa colona</i>	Barnyard Grass
* <i>Ehrharta longiflora</i>	Annual Veldt-grass
<i>Elymus scaber</i> var. <i>scaber</i>	Common Wheat-grass
<i>Enteropogon acicularis</i>	Spider Grass
<i>Eragrostis brownii</i>	Common Love-grass
* <i>Eragrostis cilianensis</i>	Stink Grass
<i>Eragrostis diandra</i>	Close-headed Love-grass
<i>Eragrostis infecunda</i>	Southern Cane-grass
<i>Eragrostis parviflora</i>	Weeping Love-grass
* <i>Holcus lanatus</i>	Yorkshire Fog
* <i>Holcus setosus</i>	Annual Fog
* <i>Hordeum hystrix</i>	Mediterranean Barley-grass
* <i>Hordeum murinum</i> s.l.	Barley-grass
<i>Lachnagrostis filiformis</i>	Common Blown-grass
<i>Lachnagrostis filiformis</i> var. <i>1</i>	Common Blown-grass
* <i>Lolium perenne</i>	Perennial Rye-grass
* <i>Lolium rigidum</i>	Wimmera Rye-grass
* <i>Nassella trichotoma</i>	Serrated Tussock
<i>Panicum</i> sp.	Panic
* <i>Paspalum dilatatum</i>	Paspalum
* <i>Paspalum distichum</i>	Water Couch
* <i>Phalaris aquatica</i>	Toowoomba Canary-grass
* <i>Phalaris paradoxa</i>	Paradoxical Canary-grass
<i>Phragmites australis</i>	Common Reed
<i>Pseudoraphis spinescens</i>	Spiny Mud-grass
* <i>Setaria pumila</i> subsp. <i>pumila</i>	Pale Pigeon-grass
* <i>Setaria</i> spp. (naturalised)	Pigeon Grass
<i>Themeda triandra</i>	Kangaroo Grass
* <i>Vulpia bromoides</i>	Squirrel-tail Fescue
<i>Whalleya proluta</i>	Rigid Panic

Potamogetonaceae	
* <i>Gamochoaeta purpurea</i> s.s.	Spiked Cudweed
<i>Potamogeton ochreatus</i>	Blunt Pondweed
<i>Potamogeton sulcatus</i>	Furrowed Pondweed
Typhaceae	
<i>Typha domingensis</i>	Narrow-leaf Cumbungi
<i>Typha orientalis</i>	Broad-leaf Cumbungi
Xanthorrhoeaceae	
<i>Lomandra filiformis</i> s.l.	Wattle Mat-rush
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Mat-rush
DICOTYLEDONS	
Amaranthaceae	
<i>Alternanthera denticulata</i>	Lesser Joyweed
Anacardiaceae	
* <i>Schinus molle</i>	Pepper Tree
Apiaceae	
<i>Eryngium ovinum</i>	Blue Devil
Apocynaceae	
* <i>Nerium oleander</i>	Oleander
Asclepiadaceae	
* <i>Gomphocarpus fruticosus</i> subsp. <i>fruticosus</i>	Swan Plant
Asteraceae	
* <i>Arctotheca calendula</i>	Cape Weed
* <i>Aster subulatus</i>	Aster-weed
<i>Brachyscome basaltica</i> var. <i>gracilis</i>	Woodland Swamp-daisy
<i>Cassinia aculeata</i>	Common Cassinia
<i>Cassinia arcuata</i>	Drooping Cassinia
<i>Centipeda cunninghamii</i>	Common Sneezeweed
* <i>Cirsium vulgare</i>	Spear Thistle
* <i>Conyza bonariensis</i>	Flaxleaf Fleabane
* <i>Conyza sumatrensis</i>	Tall Fleabane
<i>Cotula australis</i>	Common Cotula
* <i>Dittrichia graveolens</i>	Stinkwort
<i>Euchiton collinus</i> s.s.	Creeping Cudweed
<i>Euchiton sphaericus</i>	Annual Cudweed
<i>Euchiton</i> sp. aff. <i>sphaericus</i>	Cudweed
* <i>Helminthotheca echioides</i>	Ox-tongue
* <i>Hypochoeris glabra</i>	Smooth Cat's-ear
* <i>Hypochoeris radicata</i>	Cat's Ear
* <i>Lactuca saligna</i>	Willow-leaf Lettuce
* <i>Lactuca serriola</i>	Prickly Lettuce
* <i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
<i>Pseudognaphalium luteoalbum</i>	Jersey Cudweed
<i>Senecio quadridentatus</i>	Cotton Fireweed
<i>Senecio</i> sp. <i>campylocarpus</i>	Groundsel
* <i>Sonchus asper</i> subsp. <i>asper</i>	Rough Sow-thistle
* <i>Sonchus asper</i> subsp. <i>glaucescens</i>	Blue Sow-thistle
* <i>Sonchus oleraceus</i>	Common Sow-thistle
* <i>Vellereophyton dealbatum</i>	White Cudweed
* <i>Xanthium spinosum</i>	Bathurst Burr
* <i>Xanthium strumarium</i> spp. agg.	Noogoora Burr species aggregate
Boraginaceae	
* <i>Echium plantagineum</i>	Paterson's Curse
<i>Heliotropium europaeum</i>	Common Heliotrope
Brassicaceae	
* <i>Lepidium africanum</i>	Common Peppergrass
* <i>Rorippa palustris</i>	Marsh Yellow-cress
Caesalpiniaceae	
* <i>Gleditsia triacanthos</i>	Honey Locust
Callitrichaceae	
* <i>Callitriche hamulata</i>	Thread Water-starwort
Campanulaceae	
<i>Lobelia concolor</i>	Poison Pratia
* <i>Lobelia pratioides</i>	Poison Lobelia
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell
Caryophyllaceae	
* <i>Moenchia erecta</i>	Erect Chickweed
* <i>Petrorhagia</i> sp.	Pink
Casuarinaceae	

<i>Allocasuarina verticillata</i>	Drooping Sheoak
<i>Allocasuarina luehmannii</i>	Buloak
Chenopodiaceae	
<i>Chenopodium pumilio</i>	Clammy Goosefoot
<i>Dysphania glomulifera</i> ssp. <i>glomulifera</i>	Globular Pigweed
Clusiaceae	
<i>Hypericum gramineum</i>	Small St John's Wort
* <i>Hypericum perforatum</i> subsp. <i>veronense</i>	St John's Wort
Convolvulaceae	
<i>Convolvulus</i> sp. <i>erubescens</i> s.l.	Bindweed
Cucurbitaceae	
* <i>Citrullus lanatus</i>	Camel Melon
* <i>Cucumis myriocarpus</i> subsp. <i>leptodermis</i>	Paddy Melon
Euphorbiaceae	
* <i>Euphorbia peplus</i>	Petty Spurge
Fabaceae	
* <i>Chamaecytisus palmensis</i>	Tree Lucerne
<i>Daviesia ulicifolia</i> subsp. <i>ulicifolia</i>	Gorse Bitter-pea
* <i>Lotus angustissimus</i>	Slender Bird's-foot Trefoil
* <i>Lotus</i> sp.	Trefoil
<i>Pultenaea largiflorens</i>	Twiggy Bush-pea
* <i>Robinia pseudoacacia</i>	Locust Tree
<i>Swainsona procumbens</i>	Broughton Pea
* <i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Narrow-leaf Clover
* <i>Trifolium arvense</i> var. <i>arvense</i>	Hare's-foot Clover
* <i>Trifolium campestre</i> var. <i>campestre</i>	Hop Clover
* <i>Trifolium dubium</i>	Suckling Clover
* <i>Trifolium glomeratum</i>	Cluster Clover
* <i>Trifolium striatum</i>	Knotted Clover
* <i>Trifolium subterraneum</i>	Subterranean Clover
Gentianaceae	
* <i>Centaurium erythraea</i>	Common Centaury
* <i>Centaurium tenuiflorum</i>	Slender Centaury
Goodeniaceae	
<i>Goodenia maebarronii</i>	Narrow Goodenia
Haloragaceae	
<i>Myriophyllum crispatum</i>	Upright Water-milfoil
<i>Myriophyllum verrucosum</i>	Red Water-milfoil
Lamiaceae	
* <i>Marrubium vulgare</i>	Horehound
* <i>Mentha pulegium</i>	Pennyroyal
Loranthaceae	
<i>Amyema miquelii</i>	Box Mistletoe
<i>Muellerina eucalyptoides</i>	Creeping Mistletoe
Lythraceae	
<i>Lythrum hyssopifolia</i>	Small Loosestrife
Malvaceae	
* <i>Lagunaria patersonia</i> subsp. <i>patersonia</i>	Pyramid Tree
* <i>Malva parviflora</i>	Small-flower Mallow
Mimosaceae	
<i>Acacia acinacea</i>	Gold-dust wattle
<i>Acacia aspera</i>	Rough Wattle
* <i>Acacia baileyana</i>	Cootamundra Wattle
<i>Acacia implexa</i>	Lightwood
<i>Acacia mearnsii</i>	Black Wattle
<i>Acacia paradoxa</i>	Hedge Wattle
* <i>Acacia podalyriifolia</i>	Queensland Silver Wattle
<i>Acacia pycnantha</i>	Golden Wattle
<i>Acacia verniciflua</i> (common variant)	Common Varnish Wattle
Molluginaceae	
<i>Glinus lotoides</i>	Hairy Carpet-weed
Myrtaceae	
* <i>Callistemon rugulosus</i>	Scarlet Bottlebrush
* <i>Callistemon salignus</i>	Willow Bottlebrush
<i>Calytrix tetragona</i>	Common Fringe-myrtle
* <i>Corymbia citriodora</i> subsp. <i>citriodora</i>	Lemon-scented Gum
* <i>Corymbia maculata</i>	Spotted Gum
<i>Eucalyptus blakelyi</i>	Blakely's Red-gum
<i>Eucalyptus camaldulensis</i>	River Red-gum
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus microcarpa</i>	Grey Box

<i>Eucalyptus polyanthemus</i>	Red Box
* <i>Kunzea ericoides</i> spp. agg.	Burgan
<i>Leptospermum continentale</i>	Prickly Tea-tree
* <i>Melaleuca armillaris</i> subsp. <i>armillaris</i>	Giant Honey-myrtle
* <i>Melaleuca decussata</i>	Totem-poles
* <i>Melaleuca parvistaminea</i>	Rough-barked Honey-myrtle
* <i>Melaleuca styphelioides</i> var. <i>styphelioides</i>	Prickly Paperbark
Oleaceae	
* <i>Fraxinus angustifolia</i>	Desert Ash
Onagraceae	
<i>Epilobium billardierianum</i>	Variable Willow-herb
<i>Epilobium billardierianum</i> subsp. <i>cinereum</i>	Grey Willow-herb
<i>Epilobium hirtigerum</i>	Hairy Willow-herb
<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Clove-strip
Oxalidaceae	
<i>Oxalis perennans</i>	Grassland Wood-sorrel
Pittosporaceae	
* <i>Pittosporum undulatum</i>	Sweet Pittosporum
Plantaginaceae	
* <i>Plantago lanceolata</i>	Ribwort
Polygonaceae	
* <i>Acetosella vulgaris</i>	Sheep Sorrel
<i>Persicaria hydropiper</i>	Water Pepper
<i>Persicaria lapathifolia</i>	Pale Knotweed
<i>Persicaria prostrata</i>	Creeping Knotweed
* <i>Polygonum arenastrum</i>	Wireweed
<i>Polygonum plebeium</i>	Small Knotweed
<i>Rumex brownii</i>	Slender Dock
* <i>Rumex conglomeratus</i>	Clustered Dock
* <i>Rumex crispus</i>	Curled Dock
<i>Rumex tenax</i>	Narrow-leaf Dock
Portulacaceae	
<i>Portulaca oleracea</i>	Common Purslane
Primulaceae	
* <i>Anagallis arvensis</i>	Pimpernel
Proteaceae	
* <i>Grevillea robusta</i>	Silky Oak
Punicaceae	
* <i>Punica granatum</i>	Pomegranate
Resedaceae	
* <i>Reseda luteola</i>	Weld
Rosaceae	
* <i>Malus pumila</i>	Apple
* <i>Prunus cerasifera</i>	Cherry Plum
* <i>Prunus persica</i>	Peach
* <i>Rosa canina</i>	Dog Rose
* <i>Rosa rubiginosa</i>	Sweet Briar
* <i>Rubus polyanthemus</i>	Blackberry
Salicaceae	
* <i>Populus</i> sp.	Poplar
* <i>Salix nigra</i>	Black Willow
* <i>Salix nigra</i> x * <i>S. x sepulcralis</i> var. <i>sepulcralis</i>	Willow
* <i>Salix fragilis</i> l x <i>rubens</i> x * <i>S. matsudana</i>	Tortuosa
Santalaceae	
<i>Exocarpos cupressiformis</i>	Cherry Ballart
Scrophulariaceae	
* <i>Bartsia trixago</i>	Bellardia
<i>Glossostigma</i> spp.	Mud Mat
* <i>Parentucellia latifolia</i>	Red Bartsia
* <i>Verbascum virgatum</i>	Twiggy Mullein
Solanaceae	
* <i>Lycium barbarum</i>	Chinese Box-thorn
* <i>Physalis viscosa</i>	Sticky Ground-cherry
* <i>Solanum nigrum</i>	Black Nightshade
Ulmaceae	
* <i>Ulmus</i> aff. <i>procera</i>	Common Elm

Data From: Flora Information System, Biodiversity and Natural Resources, DSE - May 2005 - © Viridans Biological Databases

Appendix 3. Fauna recorded from a 10km radius data review area (DRA) centred on Lake Mokoan

Lake Mokoan 10km radius fauna DRA

Species list from irregular area bounded by the rectangle :

Latitude: -36°22'06" to -36°32'30" Longitude: +146°00'28" to +146°12'19"

Number of Surveys in Search Area = 542

Species range : 1 - 5999 Number of species found = 235

Data from Atlas of Victorian Wildlife - 24 March 2004

Key:

Last Most recent record (1970 to 2004 = AVW; 2005 = this study)

Recs Number of records

EPBC Federal *Environment Protection & Biodiversity Conservation Act 1999*; EN = Endangered, VU = Vulnerable.

DSE Advisory list of Victorian threatened fauna (DSE 2003); CR = Critically Endangered, EN = Endangered, VU = Vulnerable; NT = Near Threatened, DD = Data Deficient.

FFG Victorian *Flora & Fauna Guarantee Act 1988*; L = Listed threatened species.

Last	Recs	EPBC	DSE	FFG	Common Name	Scientific Name
2005	6		NT		Brown Quail	<i>Coturnix ypsilophora</i>
2001	4				Painted Button-quail	<i>Turnix varia</i>
1977	1		VU	L	Red-chested Button-quail	<i>Turnix pyrrhоторax</i>
2001	33				Peaceful Dove	<i>Geopelia striata</i>
2005	31				Common Bronzewing	<i>Phaps chalcoptera</i>
2005	27				Crested Pigeon	<i>Ocyphaps lophotes</i>
1978	1				Black-tailed Native-hen	<i>Gallinula ventralis</i>
2001	21				Dusky Moorhen	<i>Gallinula tenebrosa</i>
1990	7				Purple Swamphen	<i>Porphyrio porphyrio</i>
2003	50				Eurasian Coot	<i>Fulica atra</i>
1988	25				Great Crested Grebe	<i>Podiceps cristatus</i>
2005	31				Australasian Grebe	<i>Tachybaptus novaehollandiae</i>
2005	20				Hoary-headed Grebe	<i>Poliiocephalus poliocephalus</i>
2005	38				Great Cormorant	<i>Phalacrocorax carbo</i>
2001	41				Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>
1999	14		NT		Pied Cormorant	<i>Phalacrocorax varius</i>
2005	62				Little Pied Cormorant	<i>Phalacrocorax melanoleucos</i>
2005	50				Darter	<i>Anhinga melanogaster</i>
2005	54				Australian Pelican	<i>Pelecanus conspicillatus</i>
1981	1		NT		Whiskered Tern	<i>Chlidonias hybridus</i>
2001	32				Silver Gull	<i>Larus novaehollandiae</i>
2000	9				Red-kneed Dotterel	<i>Erythronyctes cinctus</i>
2005	75				Masked Lapwing	<i>Vanellus miles</i>
1990	1				Red-capped Plover	<i>Charadrius ruficapillus</i>
2001	27				Black-fronted Dotterel	<i>Elsayornis melanops</i>
2005	5				Black-winged Stilt	<i>Himantopus himantopus</i>
1980	1				Common Greenshank	<i>Tringa nebularia</i>
1997	1				Curlew Sandpiper	<i>Calidris ferruginea</i>
1990	5		NT		Latham's Snipe	<i>Gallinago hardwickii</i>
2001	7		EN	L	Bush Stone-curlew	<i>Burhinus grallarius</i>
1991	2		VU	L	Brolga	<i>Grus rubicunda</i>
1991	1		NT		Glossy Ibis	<i>Plegadis falcinellus</i>
2005	66				Australian White Ibis	<i>Threskiornis molucca</i>
2005	47				Straw-necked Ibis	<i>Threskiornis spinicollis</i>
2000	14		VU		Royal Spoonbill	<i>Platalea regia</i>
2005	50				Yellow-billed Spoonbill	<i>Platalea flavipes</i>
1980	3		EN	L	Little Egret	<i>Egretta garzetta</i>
1980	7		CR	L	Intermediate Egret	<i>Ardea intermedia</i>
2005	44		VU	L	Great Egret	<i>Ardea alba</i>
2005	70				White-faced Heron	<i>Egretta novaehollandiae</i>
2005	41				White-necked Heron	<i>Ardea pacifica</i>
1981	6		NT		Nankeen Night Heron	<i>Nycticorax caledonicus</i>
1990	1		EN	L	Australasian Bittern	<i>Botaurus poiciloptilus</i>
1978	2				Cotton Pygmy-goose	<i>Nettapus coromandelianus</i>
2005	90				Australian Wood Duck	<i>Chenonetta jubata</i>
2003	67				Black Swan	<i>Cygnus atratus</i>
1978	2				Plumed Whistling-Duck	<i>Dendrocygna eytoni</i>
2005	56				Australian Shelduck	<i>Tadorna tadornoides</i>

Last	Recs	EPBC	DSE	FFG	Common Name	Scientific Name
2005	84				Pacific Black Duck	<i>Anas superciliosa</i>
2003	17				Chestnut Teal	<i>Anas castanea</i>
2005	66				Grey Teal	<i>Anas gracilis</i>
2005	29		VU		Australasian Shoveler	<i>Anas rhynchos</i>
1991	15				Pink-eared Duck	<i>Malacorhynchus membranaceus</i>
1981	15		EN	L	Freckled Duck	<i>Stictonetta naevosa</i>
2005	26		VU		Hardhead	<i>Aythya australis</i>
1987	5		EN	L	Blue-billed Duck	<i>Oxyura australis</i>
1989	37		VU		Musk Duck	<i>Biziura lobata</i>
1977	2		NT		Spotted Harrier	<i>Circus assimilis</i>
2000	6				Swamp Harrier	<i>Circus approximans</i>
2000	8				Brown Goshawk	<i>Accipiter fasciatus</i>
2005	21				Wedge-tailed Eagle	<i>Aquila audax</i>
2000	16				Little Eagle	<i>Hieraaetus morphnoides</i>
2001	26		VU	L	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>
2005	41				Whistling Kite	<i>Haliastur sphenurus</i>
2005	15				Black-shouldered Kite	<i>Elanus axillaris</i>
2000	6				Australian Hobby	<i>Falco longipennis</i>
2005	11				Peregrine Falcon	<i>Falco peregrinus</i>
2005	39				Brown Falcon	<i>Falco berigora</i>
2005	31				Nankeen Kestrel	<i>Falco cenchroides</i>
2000	5				Southern Boobook	<i>Ninox novaeseelandiae</i>
1999	2				Rainbow Lorikeet	<i>Trichoglossus haematodus</i>
1999	4				Musk Lorikeet	<i>Glossopsitta concinna</i>
2000	4				Little Lorikeet	<i>Glossopsitta pusilla</i>
2001	1				Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>
2005	96				Sulphur-crested Cockatoo	<i>Cacatua galerita</i>
2005	21				Little Corella	<i>Cacatua sanguinea</i>
2005	104				Galah	<i>Cacatua roseicapilla</i>
1998	20				Cockatiel	<i>Nymphicus hollandicus</i>
1992	1				Australian King-Parrot	<i>Alisterus scapularis</i>
2001	6				Crimson Rosella	<i>Platycercus elegans</i>
2005	97				Eastern Rosella	<i>Platycercus eximius</i>
2005	103				Red-rumped Parrot	<i>Psephotus haematotus</i>
2001	8		NT	L	Turquoise Parrot	<i>Neophema pulchella</i>
1999	2	EN	EN	L	Swift Parrot	<i>Lathamus discolor</i>
1995	2				Budgerigar	<i>Melopsittacus undulatus</i>
2000	10				Tawny Frogmouth	<i>Podargus strigoides</i>
2000	4				Australian Owllet-nightjar	<i>Aegotheles cristatus</i>
1980	7				Dollarbird	<i>Eurystomus orientalis</i>
2005	76				Laughing Kookaburra	<i>Dacelo novaeguineae</i>
2000	18				Sacred Kingfisher	<i>Todiramphus sanctus</i>
2001	30				Rainbow Bee-eater	<i>Merops ornatus</i>
2000	3				White-throated Needletail	<i>Hirundapus caudacutus</i>
2001	1				Fork-tailed Swift	<i>Apus pacificus</i>
2000	6				Pallid Cuckoo	<i>Cuculus pallidus</i>
2000	6				Fan-tailed Cuckoo	<i>Cacomantis flabelliformis</i>
2000	3		NT		Black-eared Cuckoo	<i>Chrysococcyx osculans</i>
1999	10				Horsfield's Bronze-Cuckoo	<i>Chrysococcyx basalis</i>
1987	2				Shining Bronze-Cuckoo	<i>Chrysococcyx lucidus</i>
2005	95				Welcome Swallow	<i>Hirundo neoxena</i>
2005	42				Tree Martin	<i>Hirundo nigricans</i>
2000	23				Fairy Martin	<i>Hirundo ariel</i>
2001	46				Grey Fantail	<i>Rhipidura fuliginosa</i>
1980	1				Rufous Fantail	<i>Rhipidura rufifrons</i>
2005	111				Willie Wagtail	<i>Rhipidura leucophrys</i>
1979	1				Leaden Flycatcher	<i>Myiagra rubecula</i>
1979	2				Satin Flycatcher	<i>Myiagra cyanoleuca</i>
2005	52				Restless Flycatcher	<i>Myiagra inquieta</i>
2001	35				Jacky Winter	<i>Microeca fascians</i>
2001	18				Scarlet Robin	<i>Petroica multicolor</i>
2001	17				Red-capped Robin	<i>Petroica goodenovii</i>
2005	29				Flame Robin	<i>Petroica phoenicea</i>
2001	26		NT	L	Hooded Robin	<i>Melanodryas cucullata</i>
2002	14				Eastern Yellow Robin	<i>Eopsaltria australis</i>
2001	12				Golden Whistler	<i>Pachycephala pectoralis</i>
2002	26				Rufous Whistler	<i>Pachycephala rufiventris</i>
2005	60				Grey Shrike-thrush	<i>Colluricincla harmonica</i>
2005	95				Magpie-lark	<i>Grallina cyanoleuca</i>
2001	18				Crested Shrike-tit	<i>Falcunculus frontatus</i>
1978	1		VU	L	Ground Cuckoo-shrike	<i>Coracina maxima</i>
2005	59				Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>

Last	Recs	EPBC	DSE	FFG	Common Name	Scientific Name
1987	2				White-bellied Cuckoo-shrike	<i>Coracina papuensis</i>
1998	10				White-winged Triller	<i>Lalage sueurii</i>
2002	31		EN	L	Grey-crowned Babbler	<i>Pomatostomus temporalis</i>
2001	27				White-browed Babbler	<i>Pomatostomus superciliosus</i>
2005	16				White-fronted Chat	<i>Ephianura albifrons</i>
1981	3				White-throated Gerygone	<i>Gerygone olivacea</i>
2002	10				Western Gerygone	<i>Gerygone fusca</i>
2002	14				Weebill	<i>Smicromis brevirostris</i>
2000	4				Southern Whiteface	<i>Aphelocephala leucopsis</i>
2001	12				Striated Thornbill	<i>Acanthiza lineata</i>
2000	9				Yellow Thornbill	<i>Acanthiza nana</i>
2002	10				Brown Thornbill	<i>Acanthiza pusilla</i>
2000	4				Chestnut-rumped Thornbill	<i>Acanthiza uropygialis</i>
2001	18				Buff-rumped Thornbill	<i>Acanthiza reguloides</i>
2002	41				Yellow-rumped Thornbill	<i>Acanthiza chrysorrhoa</i>
1976	1				White-browed Scrubwren	<i>Sericornis frontalis</i>
2001	18		VU	L	Speckled Warbler	<i>Chthonicola sagittata</i>
1995	12				Brown Songlark	<i>Cincloramphus cruralis</i>
2000	23				Rufous Songlark	<i>Cincloramphus mathewsi</i>
2005	3				Little Grassbird	<i>Megalurus gramineus</i>
1999	16				Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>
2005	8				Golden-headed Cisticola	<i>Cisticola exilis</i>
2005	64				Superb Fairy-wren	<i>Malurus cyaneus</i>
2001	14				White-breasted Woodswallow	<i>Artamus leucorhynchus</i>
1980	3				Masked Woodswallow	<i>Artamus personatus</i>
1999	8				White-browed Woodswallow	<i>Artamus superciliosus</i>
2001	41				Dusky Woodswallow	<i>Artamus cyanopterus</i>
2002	16				Varied Sittella	<i>Daphoenositta chrysoptera</i>
2005	51		NT		Brown Treecreeper	<i>Climacteris picumnus</i>
2002	32				White-throated Treecreeper	<i>Cormobates leucophaeus</i>
2000	15				Mistletoebird	<i>Dicaeum hirundinaceum</i>
2000	25				Spotted Pardalote	<i>Pardalotus punctatus</i>
2000	14				Silvereye	<i>Zosterops lateralis</i>
2001	5				White-naped Honeyeater	<i>Melithreptus lunatus</i>
2001	5		NT		Black-chinned Honeyeater	<i>Melithreptus gularis</i>
1999	11				Brown-headed Honeyeater	<i>Melithreptus brevirostris</i>
1999	2				Black Honeyeater	<i>Certhionyx niger</i>
2001	1				Eastern Spinebill	<i>Acanthorhynchus tenuirostris</i>
1995	1		VU	L	Painted Honeyeater	<i>Grantiella picta</i>
1990	1	EN	CR	L	Regent Honeyeater	<i>Xanthomyza phrygia</i>
2001	1				Singing Honeyeater	<i>Lichenostomus virescens</i>
2001	11				Fuscous Honeyeater	<i>Lichenostomus fuscus</i>
1999	1				Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>
2001	23				Yellow-tufted Honeyeater	<i>Lichenostomus melanops</i>
2005	103				White-plumed Honeyeater	<i>Lichenostomus penicillatus</i>
2005	114				Noisy Miner	<i>Manorina melanocephala</i>
2005	34				Red Wattlebird	<i>Anthochaera carunculata</i>
2001	11				Noisy Friarbird	<i>Philemon corniculatus</i>
2001	17				Little Friarbird	<i>Philemon citreogularis</i>
2001	29				Richard's Pipit	<i>Anthus novaeseelandiae</i>
2005	27		VU	L	Diamond Firetail	<i>Stagonopleura guttata</i>
2001	2				Zebra Finch	<i>Taeniopygia guttata</i>
1998	1				Double-barred Finch	<i>Taeniopygia bichenovii</i>
1981	2				Red-browed Finch	<i>Neochmia temporalis</i>
2001	3				Olive-backed Oriole	<i>Oriolus sagittatus</i>
2001	43				White-winged Chough	<i>Corcorax melanorhamphos</i>
2001	12				Pied Currawong	<i>Strepera graculina</i>
2005	5				Pied Butcherbird	<i>Cracticus nigrogularis</i>
2000	4				Grey Butcherbird	<i>Cracticus torquatus</i>
2005	128				Australian Magpie	<i>Gymnorhina tibicen</i>
2005	71				Australian Raven	<i>Corvus coronoides</i>
2005	21				Little Raven	<i>Corvus mellori</i>
2005	78				Striated Pardalote	<i>Pardalotus striatus</i>
1988	3				Cattle Egret	<i>Ardea ibis</i>
2005	7		*		Common Blackbird	<i>Turdus merula</i>
1977	2		*		Skylark	<i>Alauda arvensis</i>
2001	34		*		House Sparrow	<i>Passer domesticus</i>
2005	10		*		European Goldfinch	<i>Carduelis carduelis</i>
1999	2		*		Common Myna	<i>Acridotheres tristis</i>
2005	77		*		Common Starling	<i>Sturnus vulgaris</i>
2002	4				Short-beaked Echidna	<i>Tachyglossus aculeatus</i>
1996	3				Yellow-footed Antechinus	<i>Antechinus flavipes</i>

Last	Recs	EPBC	DSE	FFG	Common Name	Scientific Name
1991	5				Common Brushtail Possum	<i>Trichosurus vulpecula</i>
1992	7				Common Ringtail Possum	<i>Pseudocheirus peregrinus</i>
1995	4				Koala	<i>Phascolarctos cinereus</i>
1995	1				Common Wombat	<i>Vombatus ursinus</i>
1997	2				Black Wallaby	<i>Wallabia bicolor</i>
2005	9				Eastern Grey Kangaroo	<i>Macropus giganteus</i>
1992	3		*		House Mouse	<i>Mus musculus</i>
1980	2				Water Rat	<i>Hydromys chrysogaster</i>
2005	5		*		European Rabbit	<i>Oryctolagus cuniculus</i>
2005	2		*		Brown Hare	<i>Lepus capensis</i>
2005	5		*		Red Fox	<i>Canis vulpes</i>
1993	2				Common Long-necked Tortoise	<i>Chelodina longicollis</i>
1994	6				Marbled Gecko	<i>Phyllodactylus marmoratus</i>
1995	1				Burton's Snake-Lizard	<i>Lialis burtonis</i>
1982	1		DD		Eastern Bearded Dragon	<i>Pogona barbata</i>
2003	13		VU		Tree Goanna	<i>Varanus varius</i>
1995	1				Southern Rainbow Skink	<i>Carlia tetradactyla</i>
1995	1				Carnaby's Wall Skink	<i>Cryptoblepharus carnabyi</i>
1970	1				Bougainville's Skink	<i>Lerista bougainvillii</i>
1995	1				Boulenger's Skink	<i>Morethia boulengeri</i>
1982	2				Common Blue-tongued Lizard	<i>Tiliqua scincoides</i>
1995	4				Red-bellied Black Snake	<i>Pseudechis porphyriacus</i>
1991	1				Eastern Brown Snake	<i>Pseudonaja textilis</i>
1970	1				Dwyer's Snake	<i>Suta dwyeri</i>
1995	1				Black Rock Skink	<i>Egernia saxatilis intermedia</i>
2004	12		EN	L	Carpet Python	<i>Morelia spilota metcalfei</i>
1987	1				Southern Bullfrog	<i>Limnodynastes dumerillii</i>
2005	6				Spotted Marsh Frog	<i>Limnodynastes tasmaniensis</i>
1970	2		EN	L	Brown Toadlet	<i>Pseudophryne bibronii</i>
2005	4				Plains Froglet	<i>Crinia parinsignifera</i>
2005	5				Common Froglet	<i>Crinia signifera</i>
1970	2	VU	EN	L	Growling Grass Frog	<i>Litoria raniformis</i>
1994	50		*		Brown Trout	<i>Salmo trutta</i>
1994	52				Australian Smelt	<i>Retropinna semoni</i>
1994	183		*		Goldfish	<i>Carassius auratus</i>
1994	423		*		Carp	<i>Cyprinus carpio</i>
1990	16		*		Mosquitofish	<i>Gambusia holbrooki</i>
1993	132	VU	EN	L	Murray Cod	<i>Maccullochella peelii peelii</i>
1994	489		VU		Golden Perch	<i>Macquaria ambigua</i>
1994	411		*		Redfin	<i>Perca fluviatilis</i>

Appendix 4. Faunal significance criteria

Criteria for assessing **zoological significance of taxa:**

Local	All indigenous fauna is considered significant at a Local level, because of the overall decline in the fauna since European settlement, and the continued incremental loss of habitat and reduction in abundance due to development.
Regional	A taxon is considered significant at a Regional level if: <ul style="list-style-type: none"> ▪ it has a disjunct distribution in the bioregion; or ▪ it is represented in high concentrations in terms of colonial nesting, roosting or feeding sites; or ▪ it is substantially depleted or restricted in the bioregion; or ▪ it has an unusual ecological or biogeographical occurrence, ▪ if the study area is within the Melbourne metropolitan area, the above four points pertain to the region of 'Greater Melbourne' as described by Beardsell (1997).
State	A taxon is considered significant at a State level if it is: <ul style="list-style-type: none"> ▪ listed under Schedule 2 of the Victorian <i>Flora and Fauna Guarantee Act 1988</i>; or ▪ listed under the <i>Advisory List of Threatened Vertebrate Fauna in Victoria – 2003</i> (DSE 2003); or ▪ Listed as Data Deficient or Insufficiently Known under the following Australian Action Plans: Bannister <i>et al.</i> (1996), Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Pogonoski <i>et al.</i> (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003).
National	A taxon is considered significant at a National level if it is: <ul style="list-style-type: none"> ▪ listed as Critically Endangered, Endangered, Vulnerable, Conservation Dependant or Presumed Extinct on the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>; or ▪ listed as Extinct, Extinct in the Wild, Critically Endangered, Endangered, Vulnerable Rare or Lower Risk (near threatened or conservation dependent) under the following Australian Action Plans: Bannister <i>et al.</i> (1996), Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Pogonoski <i>et al.</i> (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003).

Guidelines for determining **significant sites for fauna:**

Local	All sites are generally considered at least Locally significant if they contain indigenous and/or exotic vegetation which supports indigenous fauna. A site is also designated as being of Local significance if: <ul style="list-style-type: none"> ▪ <i>it has moderate to high potential for serving as a habitat link between two sites of Regional significance or as a link to suburban areas to enable native taxa to disperse into such areas; or</i> ▪ <i>it has moderate to high potential for rehabilitation and management for the public appreciation of fauna values.</i>
Regional	A site is designated as being of Regional significance if: <ul style="list-style-type: none"> ▪ it regularly supports taxa that are classified as Regionally significant; or ▪ it regularly supports individuals of a disjunct population, unusual ecological or biogeographical occurrence or extraordinary concentration in a regional context of a naturally restricted (eg. colonial nesting, roosting or feeding) or substantially depleted or restricted taxon in the region; or ▪ it supports a high level of species richness for the bioregion¹; or

	<ul style="list-style-type: none"> it contains a partial habitat link between two sites of state fauna significance, or a Regional and State site, or a primary habitat link between two sites of regional significance, or between a site of State significance and large urban areas.
<i>State</i>	<p>A site is designated as being of State significance if:</p> <ul style="list-style-type: none"> it, at least occasionally, supports individuals of a taxon listed under the Flora and Fauna Guarantee Act 1988 or listed as Critically Endangered or Endangered in Victoria (DSE 2003); or it regularly supports taxa listed as Vulnerable in Victoria (DSE 2003). For birds this only includes records of breeding, a single sighting of a large population or repeated sightings of individuals; or it regularly supports individuals of a taxon listed as Low Risk – near threatened or Data Deficient in Victoria (DSE 2003), or listed as Data Deficient or Insufficiently Known under the following Australian Action Plans: Bannister <i>et al.</i> (1996), Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Pogonoski <i>et al.</i> (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003), or supports a roosting colony of cave-dwelling bats; or it supports very high species richness in the bioregion²; or it regularly supports 5% or more of the Victorian population, or an extraordinary concentration in a State context of any taxa; or it represents an intact primary habitat link containing comparable habitat attributes to two connecting sites or series of sites of State or higher zoological significance; or it has high scientific significance, eg. it forms a long-term study or monitoring site.
<i>National</i>	<p>A site is designated as being of National significance if:</p> <ul style="list-style-type: none"> it supports individuals of a taxon listed as Critically Endangered or Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, or the following Australian Action Plans: Bannister <i>et al.</i> (1996), Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Pogonoski <i>et al.</i> (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003); or it regularly supports taxa listed as Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, or the following Australian Action Plans: Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003); or it regularly supports a large population (exceeding 5% of the total known population) of a taxon listed as Conservation Dependant under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999, or listed as Rare or Lower Risk (near threatened, conservation dependent or least concern) in the following Australian Action Plans: Bannister <i>et al.</i> (1996), Cogger <i>et al.</i> (1993), Duncan <i>et al.</i> (1999), Garnett and Crowley (2000), Lee (1995), Maxwell <i>et al.</i> (1996), Pogonoski <i>et al.</i> (2002), Tyler (1997), Wager and Jackson (1993), or Sands and New (2003) it contains areas declared as ‘Critical Habitat’ under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

¹The number of taxa required to fulfil this criterion will vary depending on the size, scope and season of the survey. For the Greater Melbourne region Schulz *et al.* (1991) used 2' latitude by 2' longitude blocks with a six year survey period. Their species richness criteria required 7 to 21 native mammal taxa, 50 to 100 native bird taxa, or 8 to 24 taxa of native frogs and reptiles.

² For the Greater Melbourne region, Schulz *et al.* (1991) specified 22 or more native mammal species, 110 to 150 native bird species, or 25 or more species of native frogs and reptiles for 2' latitude by 2' longitude blocks surveyed over six years. The number of species required to fulfil this criterion will vary depending on the size, scope and season of the survey, and a knowledge of the fauna of the region.

Watkins (1993) Criteria for determining National and International **significant sites for shorebirds**¹

National	<p>A site is designated as being of National significance for shorebirds if:</p> <ul style="list-style-type: none"> ▪ it supports 10,000 or more shorebirds; or ▪ it supports 1% or more of the individuals of the Australian population of a taxon or sub-taxon of shorebird.
International	<p>A site is designated as being of International significance for shorebirds if:</p> <ul style="list-style-type: none"> ▪ it supports 20,000 or more shorebirds; or ▪ it supports 1% or more of the individuals in a population² of a taxon or sub-taxon of shorebird.

¹These criteria are modelled on the RAMSAR Convention criteria for identifying sites of significance for waterbirds.

²For taxon and sub-taxon that also occur outside Australia, the population is defined as all of the birds of that taxa or sub-taxa occurring in the East Asian-Australasian Flyway