

# **6. Barmah Landscape Zone**

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## 6. Barmah Landscape Zone

### 6.1 Barmah Landscape Zone description

The Barmah Landscape Zone (154,057 ha; 37% of the plan area) incorporates a number of distinct land system components—Kanyapella Basin, the Goulburn River floodplain (below Coomboona), Broken Creek (west of Waaia) and Barmah Forest. The entire zone is included within Murray Fans bioregion. The Murray forms the northern boundary of Barmah Landscape Zone. The Kanyapella segment is bounded in the west by the North Central CMA boundary, extending south from Echuca Village to the Murray Valley Highway. The southern boundary of this segment approximates the Murray Valley Highway east to around O’Dea’s Road, then diverts north-east to Yambuna. The boundary then runs close to the southern edge of the Goulburn, crossing to the north of the river around Coomboona. The eastern boundary runs roughly north from Coomboona (downstream of Shepparton), through Waaia, to the Murray River at Bearii (Map 2). The zone takes in Nathalia and the smaller townships of Barmah, Bearii, Echuca Village, Kotupna and Picola. It is overlain by, Campaspe, Greater Shepparton and Moira Local Government Areas (Map 11).

The zone falls across two drainage basins—Goulburn and Broken River Basins—which are separated just south of Broken Creek (LCC 1989). It contains a far higher proportion of retained native vegetation than any other zone in the Shepparton Irrigation Region (SIR) (Map 17), with most of this remnant vegetation on public land within Barmah State Forest (F1), Barmah State Park (A2) and Top Island Reference Area (B2) (Map 12). Part of Barmah State Park (the Ulupna Island block) is included in the Yarrawonga Landscape Zone.

Broken Creek, a small but significant stream system in the region, flows east-west through the zone (in Broken River Basin), passing through Nathalia, to enter the Murray River north of Barmah township (Map 14). Many small weirs and diversions exist along the lower length of this creek, the natural water level being artificially supplemented to supply irrigation needs.

However, the most significant waterway in the zone (and, indeed, in the plan area) is the Goulburn River, which flows north-west through the zone. The Goulburn, with over 24 times the mean annual discharge of the Broken Creek (LCC 1983), enters the Murray River to the west of Kanyapella. Waters are drawn off the Goulburn at numerous diversion points within the zone to feed irrigation channels servicing many districts, mainly to the west. Relatively



Red Gum wetland in Kanyapella Wildlife Management Co-operative Area. Nature Scope Pty. Ltd.

few natural drainage lines feed run-off back to the river. For most of its length, this large river is buffered from surrounding farmland by a well-timbered strip of reserved public land which varies in width from a few hundred metres to several kilometres, but which is mostly wider than one kilometre. Much of this reserved buffer is State Forest. However, within the zone the Goulburn also includes two Streamside Reserves (K5 Yambuna Bridge, K6 McCoy’s Bridge) and a Wildlife Management Co-operative Area (C33 Loch Garry) (LCC 1985).

Between the Goulburn and Broken Creek lies an additional local unregulated drainage system—the Deep Creek system (incorporating Skeleton and Sheepwash Creeks)—which rises near Kaarimba to enter the Murray River at Lower Moira.

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### 6.1 Barmah Landscape Zone description (cont'd)

The only other substantial drainage system in the zone centres on Tullah (or Smiths) Creek, which is the main watercourse distributing floodwaters through Barmah Forest. Tullah Creek system is comprised of a complex of anabranches or 'runners', fed from and draining back into the Murray River. The extent and duration of flooding is influenced naturally by the Barmah Choke, a constriction in



Gulf Creek, a lesser anabranch lying between the Murray River and Tullah Creek, viewed from Four Mile Track bridge, Barmah State Forest. Nature Scope Pty. Ltd.

the Murray River near Barmah Lakes and artificially by a series of regulators established on strategic effluent anabranches. Since the regulation of Murray River flows due to major upstream impoundments, substantial flooding (70% coverage) of the forest only occurs about half as often and persists for only about half as long, as under former (pre-1750) conditions. Furthermore, the natural cycle of winter-spring flooding and summer-autumn drying has been replaced by a storage strategy based on sustained spring-summer-autumn releases designed to service irrigation and water supply requirements (DCE 1992). Consequently, both of these major drainage systems are typically to be seen carrying unnaturally high flows, even in the dry height of summer. Despite being primarily a flood-drainage basin receiving irrigation run-off, Kanyapella Basin Wildlife Management Co-operative Area (C32) has been extensively modified with a system of pondages designed to provide diverse habitats for waterfowl, while retaining the natural tree cover of River Red Gum and Black Box. The Basin contains two substantial floodways (Beattie Depression D50 and Warrigal Creek D51) which function to facilitate regional drainage and provide flood protection (LCC 1985). River regulation is regarded as the factor to have most affected natural ecological processes within Kanyapella Basin (Robertson 2002). The general landform of this zone has already been described under Murray Fans bioregion Strategic Overview (Ahern et al. 2002).

Pre-1750 vegetation on the floodplain land system within the zone consisted of River Red Gum-dominated *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d), within which patches of *plains grassy woodland* (e) (Grey and Yellow Box) and some treeless areas occurred on sandy ridges. This configuration persists today in Barmah Forest, although vegetation quality has been greatly compromised due to a range of degrading factors, including cattle grazing, feral horse grazing, timber and sleeper cutting, firewood harvesting, vehicular access, wild-pig foraging and insufficient and unseasonal flooding. Sand ridge vegetation is especially susceptible to trampling and overbrowsing by cattle, horses, pigs and Eastern Grey Kangaroo during periods of floodplain inundation, when these elevated sites may constitute the few unsubmerged refuges.

## 6. Barmah Landscape Zone

### 6.1 Barmah Landscape Zone description (cont'd)

Pre-1750 EVCs associated with the Goulburn River and Broken Creek drainage lines, despite their proximity, were quite distinct from each other, reflecting the differing land system characteristics of the floodplain and riverine plain, respectively. Only the Goulburn floodplain was able to sustain *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d). Similarly, only the less well-drained riverine plain areas sustained *riverine grassy woodland* (v) and *riverine grassy woodland / gilgai plain woodland /*



River Red Gum in Streamside Reserve (K8) on the unregulated Skeleton Creek at Kotupna. Nature Scope Pty. Ltd.

*wetland / riverina plains grassy woodland mosaic* (e). *Drainage line complex* (e) characterised the Deep Creek system on this same poorly-drained plain. These River Red Gum-dominated EVCs were not supported on the better-drained riverine plain of Broken Creek, where River Red Gum and Grey Box together featured in *creekline grassy woodland* (e) along the stream. On the adjacent plain, *pine box woodland / riverina plains grassy woodland mosaic* (e) predominated while, further away still from major drainage lines, *plains grassy woodland* (e) prevailed. Grey Box, Buloke and White Cypress-pine dominated these better-drained woodlands, while Black Box became more prevalent near the Murray River. Very little trace remains of the *pine box woodland / riverina plains grassy woodland mosaic* (e) or *plains grassy woodland* (e) which flanked the north

of Broken Creek. Wooded remnants along the creek are dominated by River Red Gum, with some Black Box pockets persisting near Barmah. Around Kanyapella Basin, the formerly extensive *black box chenopod woodland* (e) and *riverine grassy woodland / riverina plains grassy woodland / black box chenopod woodland complex* (e) have vanished. However, some limited vegetation patches within the Wildlife Management Co-operative Area retain *black box chenopod woodland / lignum wetland mosaic* (e) and *red gum wetland* (e).



Large old Yellow Box in *plains grassy woodland* occupying a sand ridge on Long Plain Track, Barmah State Forest. Nature Scope Pty. Ltd.

## 6. Barmah Landscape Zone

### 6.1 Barmah Landscape Zone description (cont'd)

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Today, Barmah Forest and State Park, the Goulburn River, Broken Creek and, to a lesser extent, Deep Creek constitute the main landscape elements along which native vegetation has been retained within the zone and few, if any, good-quality woodland patches of substantial size (> 20 ha) exist on the plains away from these systems. Some well-connected box-dominated roadside networks are to be found between the Kotupna district and the Shepparton–Barmah Road, complementing the riparian corridors. However, in much of the remainder of the zone, roadsides of the riverine plain retain only short woodland strips (usually of Grey Box), with understorey often severely degraded by invasive pasture grasses and woody weeds.

Primary production south of the Goulburn River is mainly focused on irrigated dairying and mixed farming, while mixed cropping and grazing occurs on the dryland areas north of the Goulburn, to about the Shepparton–Barmah Road. North of this road, low intensity irrigation mixed farming is practised. The floodplain corridor of the Goulburn River has high values for recreation and nature conservation (LCC 1983, 1985, Robinson 1998a). Most State Forest, together with all other public land bordering the Goulburn River within the zone, has overlying Heritage River status (NRE 1997b). It is also regionally important for apiculture and is managed for timber harvesting (under proposed Special Management conditions; NRE 2002e) and licenced cattle grazing (currently under review at some sites; NRE 2002e).

The floodplain forest resource on the Murray River today has significance for hardwood timber and honey production, as well as for recreation and, most importantly, nature conservation. The biodiversity value of Barmah Forest, in particular, stems largely from the variety of permanent and temporary wetlands, including lakes, swamps, lagoons and flooded forest. When inundated, these wetlands provide habitat for a large number of bird species, including White-bellied Sea-eagle (e), ducks, cormorants, herons, night herons, spoonbills, crakes, rails and ibis. Breeding populations of many of the species number in the thousands. An important suite of other fauna species are also supported, including Squirrel Glider (e), Brush-tailed Phascogale (Rv), Superb Parrot (Ve), Grey-crowned Babbler (e), Barking Owl (e), Bush Stone-curlew (e) and Carpet Python (e). Drier box woodland habitats, occurring on sand ridges in the forest and on other tenures neighbouring the forest boundary, are an important resource for these and many other fauna species, especially birds. Threatened fish in Barmah Forest include Trout Cod (Ecen), Murray Cod (v) and Golden Perch (v) (DCE 1992). The forest also contains many flora taxa of State, regional and local significance and a number of significant communities. Notable species include Mueller Daisy (Ve), Fat Spectacles (e), Small-leaf Blue-bush (e), Buloke Mistletoe (v) and Woolly Buttons (r) (DCE 1992).

Timber harvesting of River Red Gum continues to occur throughout Barmah State Forest (under a proposed zoning scheme; NRE 2002e) and in specified areas within Barmah State Park (DCE 1992). Grazing of sheep was practiced in Barmah Forest between 1840 and 1885, after which time cattle were introduced (DCE 1992). Cattle grazing under licence and agistment continues to occur today, both in Barmah Forest and other floodplain forests. Stocking levels are usually highest when these public land areas are not inundated. Areas currently grazed in Barmah Forest are

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### 6.1 Barmah Landscape Zone description (cont'd)

those for which the managing authority considers that the activity does not compromise forest values and is compatible with zoning objectives (areas of State Forest and River Murray Reserve) or where government policy has directed that the activity may continue (parts of Barmah State Park). Adverse environmental impacts of grazing pressure on plant diversity, including in floodplain forest, are now well established (NRE 2002e).



Good-quality roadside of Grey Box, Yellow Box, River Red Gum and Buloke adjacent to farmland on Lancaster Road, Picola North. Nature Scope Pty. Ltd.

Freehold land use on the riverine plain south of Barmah Forest includes mixed cropping and grazing on dryland areas (mainly abutting the floodplain), with dairying and mixed farming, as well as low intensity irrigation mixed farming, on irrigated land further south (such as around Nathalia) (LCC 1983). Despite this extensive development, box-dominated dryland remnants on roadsides and freehold retain important conservation values, especially as habitat for threatened fauna species, including Superb Parrot (V,e), Bush Stone-curlew (e) and Grey-crowned Babbler (e).

Detailed maps showing the locations of Pre-1750 EVCs (Map 16), Current EVCs (Map 17), EVC conservation status and public land (Map 18), threatened fauna (Map 19), threatened flora (Map 20), 1A threatened fauna and management actions (Map 21) and 1A threatened flora and management actions (Map 22), are at the end of this document.

For Threatened Biodiversity Assets, the codes used in brackets are:

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

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### 6.1 Barmah Landscape Zone description (cont'd)

**Table 14. Total area of pre-1750 and extant EVCs in the Barmah Landscape Zone, within the Murray Fans bioregion**

EVC Group	EVC Number	EVC Bioregional Conservation Status	EVC Name	Pre-1750 Area (ha)	Current Area (ha)
15	255	D	Riverine Grassy Woodland/Riverine Sedgy Forest/Wetland Mosaic	42007	31612
14	55	E	Plains Grassy Woodland	21009	837
14	867	E	Pine Box Woodland/Riverina Plains Grassy Woodland Mosaic	20217	145
15	103	E	Black Box Chenopod Woodland	11812	327
15	871	E	Riverine Grassy Woodland/Gilgai Plain Woodland/Wetland/Riverina Plains Grassy Woodland	11377	669
15	872	E	Riverine Grassy Woodland/Riverina Plains Grassy Woodland/Black Box Chenopod Woodland Complex	11298	843
14	868	E	Pine Box Woodland	8796	66
15	295	D	Riverine Grassy Woodland	5745	1935
15	870	E	Riverine Grassy Woodland/Riverina Plains Grassy Woodland Complex	3885	183
15	168	E	Drainage Line Complex	3175	298
19	289	LC	Moirra Plain Wetland	2295	2039
15	321	E	Black Box Chenopod Woodland/Lignum Wetland Mosaic	2265	421
15	873	V	Riverine Grassy Woodland/Black Box Chenopod Woodland/Wetland Mosaic	1743	16
14	264	E	Sand Ridge Woodland	1547	54
19	125	E	Plains Grassy Wetland	1338	25
14	294	E	Plains Grassy Woodland/Gilgai Plains Woodland/Wetland Mosaic	1088	28
19	292	E	Red Gum Wetland	950	251
19	333	E	Red Gum Wetland/Plains Grassy Wetland Mosaic	889	51
15	68	E	Creekline Grassy Woodland	751	63
19	300	V	Reed Swamp	461	395
19	334	E	Lagoon Wetland	332	16
19	104	E	Lignum Wetland	260	50
19	74	E	Wetland Formation	257	3
14	299	E	Unclassified Lunette Woodland	192	132
13	132	E	Plains Grassland	71	0
TOTAL				153761	40460
99	997	NA	Private Land No Tree Cover	0	113300
99	999	NA	Unknown/Unclassified	296	296

**Table 15. Total area and number of current EVCs in each conservation status in the Barmah Landscape Zone, within the Murray Fans bioregion**

EVC Bioregional Conservation Status	Area (ha)	Number of EVCs
Endangered	4468	19
Vulnerable	411	2
Depleted	33543	2
Rare	0	0
Least Concern	2039	1
Presumed Extinct	0	0

## 6. Barmah Landscape Zone

### 6.1 Barmah Landscape Zone description (cont'd)

**Table 16. List of current threatened flora and their conservation status in the Barmah Landscape Zone**

Latin Name	English Name	Australian Status	Victorian Status*	FFG Listed#	FFG Action Statement Number**	Recovery Plan*	BNA Unassessed	Species number
<i>Amyema linophylla ssp. orientale</i>	Buloke Mistletoe		v					217
<i>Lipocarpa microcephala</i>	Button Rush		v				Un	2020
<i>Cyperus bifax</i>	Downs Nutgrass		v				Un	913
<i>Menkea crassa</i>	Fat Spectacles		e	L				4734
<i>Hakea tephrosperma</i>	Hooked Needlewood		v				Un	1572
<i>Ranunculus papulentus</i>	Large River Buttercup		k				Un	2900
<i>Maireana aphylla</i>	Leafless Bluebush		v				Un	2096
<i>Eryngium paludosum</i>	Long Eryngium		v				Un	1238
<i>Acacia notabilis</i>	Mallee Golden Wattle		v					65
<i>Swainsona recta</i>	Mountain Swainson-pea	End	e	L			Un	3326
<i>Brachyscome muelleroides</i>	Mueller Daisy	Vul	e	L				465
<i>Acacia loderi</i>	Nealie		v				Un	52
<i>Myriophyllum porcatum</i>	Ridged Water-milfoil	Vul	v	L			Un	2257
<i>Swainsona sericea</i>	Silky Swainson-pea		v	N			Un	4946
<i>Digitaria ammophila</i>	Silky Umbrella-grass		v				Un	1041
<i>Isolepis congrua</i>	Slender Club-sedge		v	L			Un	1773
<i>Swainsona murrayana</i>	Slender Darling-pea	Vul	e	L				3321
<i>Rhodanthe stricta</i>	Slender Sunray		e	L			Un	1651
<i>Myriophyllum gracile var. lineare</i>	Slender Water-milfoil		e	N			Un	4517
<i>Cullen parvum</i>	Small Scurf-pea	End	e	L	31			2773
<i>Cullen tenax</i>	Tough Scurf-pea		e	L			Un	2776
<i>Sida intricata</i>	Twiggy Sida		v				Un	3143
<i>Acacia oswaldii</i>	Umbrella Wattle		v				Un	70
<i>Swainsona adenophylla</i>	Violet Swainson-pea		e	N			Un	3319
<i>Acacia pendula</i>	Weeping Myall		e	L	86		Un	73
<i>Callitriche cyclocarpa</i>	Western Water-starwort	Vul	v	N				569
<i>Acacia omalophylla</i>	Yarran Wattle		e	L				69
<i>Brachyscome chrysoglossa</i>	Yellow-tongue Daisy		v	L				3654

**Source:** (EA 2003\*; NRE 2002c\*; SAC 2002#)

## 6. Barmah Landscape Zone

### 6.1 Barmah Landscape Zone description (cont'd)

**Table 17. List of current threatened fauna and their conservation status in the Barmah Landscape Zone**

English Name	Latin Name	Australian Status	Victorian Status*	FFG Listed#	FFG Action Statement No.	Recovery Plan*	BNA Assessed	Species number
Australasian Bittern	<i>Botaurus poiciloptilus</i>		EN				Un	197
Australasian Shoveler	<i>Anas rhynchos</i>		VU				Un	212
Baillon's Crake	<i>Porzana pusilla</i>		VU				Un	50
Barking Owl	<i>Ninox connivens</i>		EN	L	116		Un	246
Black Falcon	<i>Falco subniger</i>		VU				Un	238
Blue-billed Duck	<i>Oxyura australis</i>		EN	L	174		Un	216
Bluenose(Trout) Cod	<i>Maccullochella macquariensis</i>	End	CR	L	38	Y		4093
Brolga	<i>Grus rubicunda</i>		VU	L	119			177
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>		VU	L	79		Un	1017
Bush Stone-curlew	<i>Burhinus grallarius</i>		EN	L	78			174
Carpet Python	<i>Morelia spilota metcalfei</i>		EN	L	175			2969
Diamond Firetail	<i>Stagonopleura guttata</i>		VU				Un	652
Freckled Duck	<i>Stictonetta naevosa</i>		EN	L	105			214
Freshwater Catfish	<i>Tandanus tandanus</i>		EN	L				4050
Giant Bullfrog	<i>Limnodynastes interioris</i>		CR	L				3060
Golden Perch	<i>Macquaria ambigua</i>		VU					4095
Great Egret	<i>Ardea alba</i>		VU	L	120			187
Grey Goshawk	<i>Accipiter novaehollandiae</i>		VU				Un	220
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>		EN	L	34			443
Ground Cuckoo-shrike	<i>Coracina maxima</i>		VU	L			Un	423
Hardhead	<i>Aythya australis</i>		VU				Un	215
Intermediate Egret	<i>Ardea intermedia</i>		CR	L	120			186
Lewin's Rail	<i>Rallus pectoralis</i>		VU	L			Un	45
Little Bittern	<i>Ixobrychus minutus</i>		EN					195
Little Egret	<i>Egretta garzetta</i>		EN		120			185
Macquarie Perch	<i>Macquaria australasica</i>	End	EN	L			Un	4096
Major Mitchell's Cockatoo	<i>Cacatua leadbeateri</i>		VU	L	87		Un	270
Masked Owl	<i>Tyto novaehollandiae</i>		EN	L	124		Un	250
Murray Cod	<i>Maccullochella peelii peelii</i>		EN	L				4094
Musk Duck	<i>Biziura lobata</i>		VU				Un	217
Painted Honeyeater	<i>Grantiella picta</i>		VU	L			Un	598
Painted Snipe	<i>Rostratula benghalensis</i>		CR				Un	170
Powerful Owl	<i>Ninox strenua</i>		VU	L	92		Un	248
Regent Honeyeater	<i>Xanthomyza phrygia</i>	End	CR	L	41	Y	Un	603
River Blackfish	<i>Gadopsis marmoratus</i>		CR				Un	4127
Royal Spoonbill	<i>Platalea regia</i>		VU					181
Silver Perch	<i>Bidyanus bidyanus</i>		CR	L				4099
Speckled Warbler	<i>Chthonicola sagittata</i>		VU				Un	504
Squirrel Glider	<i>Petaurus norfolcensis</i>		EN	L	166			1137
Superb Parrot	<i>Polytelis swainsonii</i>	Vul	EN	L	33			277
Swift Parrot	<i>Lathamus discolor</i>	End	EN	L	169	Y	Un	309
Tree Goanna	<i>Varanus varius</i>		VU				Un	2283
Warty Bell Frog	<i>Litoria raniformis</i>	Vul	EN				Un	3207
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		VU	L	60			226

Source: EA 2003\*, DSE 2003^, NRE 2002d\* & SAC 2002#

## 6. Barmah Landscape Zone

### 6.2 Barmah Landscape Zone priorities

#### 6.2.1 Summary of priority biodiversity actions for Barmah Landscape Zone

- Protect and enhance native vegetation communities within Barmah State Park, Top Island and Top End Reference Areas, Barmah Regional Park and Loch Garry and Kanyapella Basin Wildlife Management Co-operative Areas and conserve threatened flora and fauna taxa which these reserves support.
- Within State Forest, ensure that all Special Management Zone (SMZ)/Special Protection Zone (SPZ) sites identified by Todd (1999) and by Robinson (1998a) as 'priority' areas for conservation and/or reservation are managed so as to fully protect their existing biodiversity value and potential. Carefully review them as to the adequacy of their current tenure to provide long-term protection from the threat of timber harvesting and/or domestic grazing. These 'priority' areas or sites include numerous specified State Forest blocks within Barmah State Forest and along the Murray and Goulburn River floodplains.
- Prevent further decline in biodiversity values of native vegetation due to domestic grazing on public land by removal of stock and fencing of relevant reserves where needed. Give priority to: Barmah State Park; Goulburn River *Heritage River* zone; Barmah State Forest; at least specified parts of Loch Garry and Kanyapella Basin Water Management Catchment Areas; Bushland Reserves H19A & H20-25; box-woodland (Sites 19, 26, 57, 67, 18, 22, 59 & 68) identified by Clark (1996); and Numurkah–Picola Disused Rail Reserve between Broken Creek and Picola (and associated unused road reserve in Picola)
- Fully protect high-quality roadsides including Murray Valley Highway roadsides at Picola East; and municipal roadsides at Picola East, West Bearii, Lower Moira, Kotupna and along Nathalia–Barmah Road.
- Pursue appropriate mechanisms to adequately protect and secure Numurkah–Picola Disused Rail Reserve between Broken Creek and Picola as a conservation reserve.
- Give priority to protection and management of Streamside Reserves and Public Land Water Frontage on Deep Creek, Skeleton Creek and Broken Creek.
- Identify localised sites of high biodiversity value and provide appropriate protection and management. Select the most strategic sites around which to develop Local Landscape Plans. Aim to use vegetation restoration to expand and extend existing remnants across tenures. Priority sites include: Bushland Reserves H19A on Broken Creek & H20-25 on Deep Creek; Loch Garry and Kanyapella Basin Wildlife Management Co-operative Areas; Public Land Water Frontage and/or Streamside Reserves on Deep Creek, Skeleton Creek, Broken Creek and Goulburn River; Numurkah–Picola Disused Rail Reserve between Broken Creek and Picola (and associated unused road reserve in Picola); Murray Valley Highway roadside at Picola East; and municipal roadsides at Picola East, West Bearii, Lower Moira, Kotupna and along Nathalia–Barmah Road; and freehold remnants at Picola South (Greens Swamp), West Bearii, Picola East, Deep Creek catchment (above Griffiths Lane) and near Kotupna.

## 6. Barmah Landscape Zone

### 6.3 Private Land

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#### ***Land Tenure Details:***

This land tenure type includes all private land in the zone, with associated creeklines. This zone has the lowest proportion of freehold to public land of any in the plan area. Todd (1999) identified Greens Swamp (> 100 ha; Picola South) as a 'priority area for protection and establishment of protected areas', in the context of 'Riverina' bioregion (now in the Murray Fans bioregion), noting its high biodiversity values and its contiguity with numerous other freehold swamps further east along the Muckatah Depression. He also identified substantial freehold remnants (and associated roadside vegetation) on Bearii Road and Lancaster Road, West Bearii, which he considered to be 'priority areas for protection and establishment of protected areas', in the context of 'Riverina' bioregion. He identified further freehold (and associated roadsides) on nearby Yielima North Road and its extension south onto Murray Valley Highway (Picola East), as having high biodiversity values and constituting an important north-south habitat corridor between the plains and the Murray River.

The good-quality roadsides associated with these freehold sites have also been noted by both Todd (1999) and Cook (1997). Perhaps surprisingly, considering its many-branched stream system and abundance of small swamps and billabongs, the riverine plain of Deep Creek system has been largely alienated. Todd (1999) identified private land in the upper catchment of Deep Creek (above Griffiths Lane) as 'priority areas for protection and establishment of protected areas' in the context of 'Riverina' bioregion. The strategic importance of these large private land remnants was in their combination with Deep Creek vegetation corridor, to link the plains with the Murray River.

Throughout the tenure, River Red Gum or (less commonly) Black Box dominated the more flood-prone parts of the tenure, while Grey Box, Yellow Box, White Cypress-pine and Buloke featured on the better-drained plains and rises. Large, wooded freehold blocks, incorporating vegetation types dominated by both River Red Gum and box species, occur near Kotupna. One large remnant in particular (300 ha, Kotupna North) supports high priority vegetation types and threatened flora and adjoins Public Land Water Frontage on Sheepwash Creek (Todd 1999).

#### ***Land Manager:***

Private landholders

#### ***Stakeholders:***

Key Lc, LGA, DSE, DPI, PV, CMA

Other TFN, LFW, BG, GAV, CVA, FNC, VAA, VFF, GNP

## 6. Barmah Landscape Zone

### 6.3 Private Land (cont'd)

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

**EVCs:** In relation to existing freehold, the pre-1750 vegetation cover on the riverine plain south of Barmah Forest was predominantly *pine box woodland* (e), *black box chenopod woodland* (e), *plains grassy woodland* (e) and *riverine grassy woodland* (v), often represented as mosaics or complexes. Vegetation at Greens Swamp formerly carried *lignum wetland* (e) and *black box chenopod woodland* (e). Although wetland elements are the main feature of current remnants, the site retains high vegetation and flora and fauna values. Todd's (1999) West Bearii freehold remnants (and adjacent road reserve) formerly carried a range of EVCs (see above). Today they still support high priority vegetation units and threatened flora and fauna and constitute substantial habitat isolates (predominantly Grey Box, as well as Yellow Box, River Red Gum, White Cypress-pine and Buloke), close to other vegetated road corridors.

Further south, along Broken Creek, former vegetation included mainly *plains grassy woodland* (e) and *pine box woodland / riverina plains grassy woodland mosaic* (e), as well as a number of more localised wetland and creekline EVCs. Freehold along the riverine plain of Deep Creek system and on areas surrounding the Goulburn floodplain supported *riverine grassy woodland* (d), *riverine grassy woodland / gilgai plain woodland / wetland / riverina plains grassy woodland mosaic* (e), *riverine grassy woodland / riverina plains grassy woodland / black box chenopod woodland complex* (e), *riverine grassy woodland / riverina plains grassy woodland complex* (e) and *plains grassy woodland / gilgai plains woodland / wetland mosaic* (e).

**Threatened flora:** Buloke Mistletoe (v, un), Mallee Golden Wattle (v, 3B), Muller Daisy (Ve, un), Ridged Water-milfoil (Vv, 3B), Small Scurf-pea (Ee, 3A), Western Water-starwort (Vv, 2B), Yarran Wattle (e, un), Yellow-tongue Daisy (v, un).



*Acacia notabilis* (Photo: David Parkes)

**Threatened fauna:** Brolga (v, 3B), Bush Stone-curlew (e, 1A), Freshwater Catfish (e, 2B), Giant Bullfrog (cen, 1A), Glossy Ibis (v, 1B), Golden Perch (v, un), Great Egret (e, un), Grey-crowned Babbler (e, 1A), Intermediate Egret (cen, un), Little Egret (e, 3A), Murray Cod (v, un), Royal Spoonbill (v, 1B), Silver Perch (c, 3A), Squirrel Glider (e, 4A), Superb Parrot (Ve, 1A), White-bellied Sea-eagle (e, un), Woodland Blind Snake (v, un),



Bush Stone-curlew (Photo: DSE/McCann)

## 6. Barmah Landscape Zone

### 6.3 Private Land (cont'd)

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#### **Recommended actions:**

#### **Protection of existing remnants:**

- Identify and protect significant freehold remnants, giving priority to those high-quality sites described above (see under **Land tenure attributes**). Apply voluntary programs, incentives and/or planning controls as appropriate, to protect biodiversity values.
- Give priority also to significant remnants in close proximity to sites identified as significant or *high-value* on other tenures in the zone.
- Promote exclusion of stock from habitat remnants, to maximise recovery and regeneration of remaining native vegetation.
- Protect and enhance status of unreserved stream frontages that connect with or extend existing Public Land Water Frontage reserves, particularly on Deep, Sheepwash and Skeleton Creeks.
- Adhere strictly to native vegetation retention controls, focusing particular effort on retaining large trees and woodlots near sites used by threatened woodland taxa.
- Encourage and assist Local Government Authorities to develop or upgrade local conservation strategies, including procedures for minimising clearing of remnants for subdivision.
- Assist Local Government Authorities to include any priority freehold remnants having strategic connective value or potential with roadside conservation plans.
- Ensure that Shire staff have knowledge of locations and importance of freehold remnants with existing or potential biodiversity value.
- Assist landholders to identify incentives for fencing remnants and for other strategically important management actions.

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

- Supplement woodland habitats and enhance flow regimes on the Murray River floodplain, to benefit Giant Bullfrog (4).
- Improve diversity and cover of native understorey, exclude grazing and improve woodland connectivity and over time, aim to increase the abundance of mature woodland trees to benefit Superb Parrot (4).
- Supplement woodland habitats, exclude domestic grazing and control introduced predators to benefit Grey-crowned Babbler (4).
- Supplement woodland habitats and control introduced predators to benefit Bush Stone-curlew (4).

## 6. Barmah Landscape Zone

### 6.3 Private Land (cont'd)

- Enhance flow regimes to benefit Royal Spoonbill (3), White-bellied Sea-eagle (2), Great Egret (2) and Glossy Ibis (1).
- Supplement riparian vegetation to benefit Royal Spoonbill (3) and Nankeen Night Heron (3).
- Supplement woodland habitats and exclude domestic grazing to benefit Woodland Blind Snake (3).
- Exclude domestic grazing from ephemeral wetlands during breeding season and control introduced predators to benefit Brolga (1).
- Supplement woodland habitats and enhance flow regimes, to benefit Barking Marsh Frog (1).
- Enhance flow regimes to benefit Golden Perch (2) Crimson-spotted Rainbowfish (2) and Murray Cod (2).
- Enhance flow regimes, modify stocking levels in relevant areas and control weeds to benefit Western Water-starwort (2).
- Exclude domestic grazing, reduce use of chemicals and other water contaminants, monitor water quality and enhance flow regimes to benefit Ridged Water-milfoil (1).
- Exclude domestic grazing to benefit Small Scurf-pea (3).
- Implement ecological burning regimes, modify grazing levels in relevant areas, control weed invasion and control competition from introduced herbivores and macropods to benefit Mallee Golden Wattle (1).
- Determine management needs of Silky Umbrella Grass (2) and River Swamp Wallaby-grass (2) on freehold in the zone.



Crimson-spotted Rainbowfish  
(Photo: DSE)

#### Restoration of strategic vegetation blocks or linkages:

- Encourage and assist regeneration and consolidation of freehold remnants, giving priority to *high value* sites identified above (**Land tenure attributes**).
- Also encourage and assist landholders to restore and expand habitats and improve connectivity to any nearby remnants on freehold, road reserves or other tenure, giving priority to properties which are close to sites identified as significant or *high-value* on other tenures in the zone.
- Encourage landholder participation (through Local Landscape Plans) to establish habitat linkages within and between the *high-value* freehold remnants described above.
- Arrange (in consultation with licensees) to fence out key unused roads and creeklines.
- Encourage and assist Landcare groups and Land for Wildlife extension officers to inform landholders of their potential role in conserving biodiversity and to coordinate their involvement for the best possible outcome.
- Co-ordinate restoration and revegetation initiatives to assist landholders and the Shire in consolidating local remnants.

## 6. Barmah Landscape Zone

### 6.3 Private Land (cont'd)

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- On freehold land abutting roadside habitats of Grey-crowned Babbler, promote and assist creation of buffer strips (at least 15 m wide and 500 m long) which have preferably been undisturbed by previous agricultural use.
- In consultation with Goulburn-Broken CMA, develop habitat management plans for streamsides on freehold, with particular emphasis upon protecting and expanding habitat nodes (e.g. creekline-roadside intersects).

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

- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – Grey-crowned Babbler (34).
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – White-bellied Sea-eagle (60).
- FFG Action Statement – Bush Stone-curlew (78).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Brolga (119).
- FFG Action Statement – Great Egret (120).
- FFG Action Statement – Intermediate Egret (120).
- FFG Action Statement – Little Egret (120).
- JAMBA – Great Egret.
- CAMBA – Great Egret, White-bellied Sea-eagle, Glossy Ibis.
- Management Plan – Brolga (Arnol et al. 1984).
- Management Plan – Superb Parrot (Webster & Ahern 1992).



White-bellied Sea-eagle (Photo:  
Mike Carter)

## 6. Barmah Landscape Zone

### 6.4 Public Land Water Frontage

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#### ***Land Tenure Details:***

No Public Land Water Frontage (K1) occurs along the Goulburn River within this zone. However, several small isolated K1 blocks occur on drainage lines at Undera North and along the Deep Creek riverine plain. About 10 kms of lower Deep Creek, adjoining the River Murray Reserve (E1), is continuous (K1). The entirety of Broken Creek within the zone, apart from a section through Barmah State Forest to the Murray River, is also K1, supplemented by one small Streamside Reserve K9 (22 ha). Streamside Reserve segments also occur on Deep Creek (K7; 6 ha) and Skeleton Creek (K8; 24 ha) and on the Goulburn River (K5, 150 ha; K6, 175 ha).

Broken Creek, within the tenure, is included as part of the extensive 'Broken–Boosey–Nine Mile Creeks system' reserve recommended by Robinson (1998a) as a priority for 'nature conservation reservation and management in the eastern northern plains'. Similarly, Robinson recommended that Deep, Skeleton and Sheepwash Creek Public Land Water Frontages and Streamside Reserves K7 and K8, be incorporated into 'Deep Creek and branches' conservation reserve, noting that this is a creek system with natural (unregulated) flows. Todd (1999) also identified Broken Creek Public Land Water Frontage (together with Streamside Reserve K9) between Nathalia and Barmah and Deep Creek Public Land Water Frontage below Griffiths Lane, as 'priority areas for protection and establishment of protected areas' in the context of his 'Riverina' bioregion. This determination was based on the presence of high priority vegetation units, threatened flora and fauna and the corridor role of the creek frontages in linking the plains with the Murray River.

Streamside Reserves K5 and K6 are included in the Heritage River corridor overlaying the Goulburn River (NRE 1997b). Because of the excellent continuity of the Public Land Water Frontage along Broken Creek, the corridor, despite being a relatively narrow strip, contributes a wide range of biodiversity assets to the plan area. Historic protection from timber-cutting and cultivation (since 1874) has greatly enhanced its natural values (Robinson 1998a). A number of weirs situated within Public Land Water Frontage along Broken Creek (D15-18, 20-22) are used for diversion purposes. Broken Creek within this zone is part of a much longer drainage system listed (VIC036) in *A Directory of Important Wetlands in Australia* (EA 2001). Similarly, the Goulburn River within this zone is part of a more extensive listed drainage system (Lower Goulburn River Floodplain—VIC052).

#### ***Land Manager:***

Land Victoria

#### ***Stakeholders:***

Key CMA, RWA, DSE, DPI, Private

Other LGA, Lc, WAG, RAG, LFW, GAV, CVA, VFF, VAA, GNP

## 6. Barmah Landscape Zone

### 6.4 Public Land Water Frontage (cont'd)

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

**EVCs:** Around Barmah East, Public Land Water Frontage along Broken Creek formerly supported *riverine grassy woodland* / *riverine sedgy forest* / *wetland mosaic* (d) (River Red Gum) running through *black box chenopod woodland* (e). Although River Red Gum still lines the creek, the integrity of the flanking Black Box woodland has largely been lost. Further up Broken Creek, Public Land Water Frontage and Streamside Reserve K9 within this zone supported *creepline grassy woodland* (e), surrounded by *pine box woodland* / *riverina plains grassy woodland mosaic* (e) or *plains grassy woodland* (e). River Red Gum and Grey Box occurred along the stream, while Grey Box, Yellow Box, White Cypress-pine and Buloke featured in the adjoining woodlands.

Other Streamside Reserves in the zone (including K1, K5-7 and part of K8) were mainly associated with *riverine grassy woodland* (v) in various complexes and mosaics (e, v, d). The extended K1 on Deep Creek and part of K8, supported *drainage line complex* (e). Most of these frontages today support degraded representations of the pre-1750 vegetation, with understorey invaded by weeds (pasture grasses being a major threat). However, the continuity of tree-cover along the major drainage lines of Broken Creek, Deep Creek and Goulburn River constitute a highly significant biodiversity asset.

**Threatened flora:** Mallee Golden Wattle (v, un), Small Scurf-pea (Ee, un), Yellow-tongue Daisy (v, un).



*Brachyscome chryso glossa*  
(Photo: John Eichler)

**Threatened fauna:** Barking Marsh Frog (dd, un), Freckled Duck (e, 3A), Freshwater Catfish (v, un), Great Egret (e, un), Intermediate Egret (cen, un), Nankeen Night Heron (v, un), Squirrel Glider (e, 4A), Superb Parrot (Ve, un), Woodland Blind Snake (e, un).



Intermediate Egret (Photo: Mike Carter)

#### **Recommended actions:**

##### **Protection of existing remnants:**

- Monitor the status and condition of stream frontages in the zone, especially with respect to fencing and grazing, giving priority to sites identified above (**Land tenure attributes**) as of *high value* or warranting 'priority protection'. Implement measures to provide maximum protection for existing values.
- Exclude domestic stock grazing throughout the tenure, to protect fauna habitats and permit regeneration of remaining native vegetation.
- Enhance awareness of landholders and key stakeholders of the potential biodiversity linkage value of these frontages, once restored.
- Ensure firewood harvesting is excluded from the tenure, in order to conserve habitat resources for woodland fauna.
- Exclude desnagging or flow improvement works in streams within the tenure.

## 6. Barmah Landscape Zone

### 6.4 Public Land Water Frontage (cont'd)

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

- Restore more natural flow regimes to benefit Freckled Duck (3), notably at K5.
- Control introduced predators, exclude domestic grazing and over time, aim to increase abundance of mature hollow-bearing trees within existing or likely Squirrel Glider (3) habitat throughout the zone (notably K1 on Broken Creek and K5 on the Goulburn).
- Maintain and improve natural understorey and woodland structure to benefit Superb Parrot (2).
- Enhance flow regimes and supplement riparian vegetation (including tree cover), notably along K1 on Broken Creek and at K5, to benefit Intermediate Egret (2), Great Egret (2), Freshwater Catfish (2), Nankeen Night Heron (2) and Barking Marsh Frog (2).
- Supplement woodland habitat and connectivity of vegetation cover to benefit Woodland Blind Snake (2), notably along K1 on Broken Creek.
- Ascertain management needs to benefit Yellow-tongue Daisy (2) at K6 and Small Scurf-pea (2) and Mallee Golden Wattle (2) on Broken Creek.



Freshwater Catfish (Photo: DSE)

#### **Restoration of strategic vegetation blocks or linkages:**

- Initiate restoration and revegetation to consolidate riparian habitat, working where possible from existing habitat nodes and linking to adjacent remnants on freehold, roadsides or sections of unreserved creekline. Give priority to water frontage on Skeleton and Sheepwash Creek, on Deep Creek below Griffiths Lane, on Broken Creek throughout the zone and Streamside Reserves K5–9.
- Encourage (through incentives and voluntary programs) similar restoration and revegetation works on intervening stream sections which are currently unreserved.

## 6. Barmah Landscape Zone

### 6.4 Public Land Water Frontage (cont'd)

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

- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Freckled Duck (105).
- FFG Action Statement – Great Egret (120).
- FFG Action Statement – Intermediate Egret (120).
- FFG Action Statement – Squirrel Glider (166).
- JAMBA – Great Egret.
- CAMBA – Great Egret.
- Management Plan – Superb Parrot (Webster & Ahern 1992).
- Draft management plans for Heritage Rivers (NRE 1997b).
- Threat Abatement Plan – Feral Cats (EA 1999)
- ECC (2001) recommendation to redesignate all K1 in the zone, as well as K6, as Nature Features Reserve. In addition, it was recommended that sections of Broken Creek Public Land Water Frontage (and Streamside Reserve K9) upstream and downstream of Nathalia be upgraded to Nature Conservation Reserve (D58, 59). However, this recommendation has more recently been commuted by the Government to Nature Features Reserve throughout (Victorian Government 2002).

## 6. Barmah Landscape Zone

### 6.5 Water Production

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#### ***Land Tenure Details:***

The tenure is represented in the zone only by two drainage and floodway-protection reserves: Beattie Depression Floodway (D50) and Kanyapella Flood Protection Area—Warrigal Creek (D51). These are located to the west and north (respectively) of Kanyapella Basin Water Management Catchment Area (C32). D50 is recognised by Diez et al. (2000) as containing a *high value* remnant (DSE Flora Information System - S37735, 65 ha).

#### ***Land Manager:***

Rural Water Authority

#### ***Stakeholders:***

Key DPI, DSE, CMA

Other LGA, FNC, BG, TSN, PV, VAA

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

***EVCs:*** The pre-1750 vegetation of these floodways would have been a mix of *riverine grassy woodland / riverina plains grassy woodland / black box chenopod woodland complex* (e) and *black box chenopod woodland* (e). These EVCs have been mostly lost from the reserves, the present vegetation cover being mainly due to River Red Gum regeneration programs. However, the remnant at DSE Flora Information System site S37735 retains lignum community, with Black Box and River Red Gum woodland present (Diez et al. 2000).

**Threatened flora:** None recorded.

**Threatened fauna:** None recorded.

#### ***Recommended actions:***

##### **Protection of existing remnants:**

- Protect existing biodiversity values on D50 and assess the extent of revegetation success, or need for further tree-planting programs, as recommended by LCC (1985).

## **6. Barmah Landscape Zone**

### **6.5 Water Production (cont'd)**

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

- No recommendations.

#### **Restoration of strategic vegetation blocks or linkages:**

- Investigate opportunities to consolidate or restore natural vegetation and to increase connectivity with any suitable neighbouring remnants.

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

- Draft Kanyapella Basin Environmental Management Plan (Robertson 2002).

## 6. Barmah Landscape Zone

### 6.6 State Forest

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#### ***Land Tenure Details:***

The tenure includes all of Barmah State Forest (F1, 21,320 ha), all State Forests (hardwood production forests—F1) along the Goulburn River between Coomboona and the Murray River (including isolated forest patches to the west of Undera North [Munroe State Forest, 163 ha] and at Kanyapella, as well as Special Protection Zone (SPZ) 103/01, Special Management Zone (SMZ) 103/02, SPZ 103/03, SPZ 103/04 and SPZ 103/05) and a small parcel of F1 [General Management Zone (GMZ)] at Echuca Village. The zone also includes two additional forest patches adjacent to the River Murray Reserve, downstream of Lower Moira—on Barmah Tip Road [SPZ 105/01, 215 ha].

Todd (1999) identified a number of F1 sites within Barmah State Forest as 'priority areas for protection and establishment of protected areas' in the context of his 'Riverina' bioregion (which incorporates the area now designated as Murray Fans bioregion). These sites included SPZ land at Goose Swamp (Trickey's Lane), Sharp's Plain and Long Plain, as well as SMZ land at Sand Ridge Track (on Broken Creek). He also identified SPZ105/01 on Barmah Tip Road, Lower Moira, as a 'priority area for protection and establishment of protected areas', noting that the site, which contains high quality examples of several vegetation units, is under threat from potential grazing practices. In addition, Todd (1999) also identified (based on biodiversity values and current threats) all Goulburn River State Forest SMZ (103/02) and SPZ (103/01, 103/04-06) parcels between Murchison and the Murray River as 'priority areas for protection and establishment of protected areas' in the context of his 'Riverina' bioregion. Of the overall area identified by Todd, Barmah Landscape Zone takes in part (that is, all sites downstream of Coomboona). These sites contain high priority vegetation types, threatened flora and fauna and, in the case of SMZ 103/02 and SPZ 103/01 parcels, serve as important corridors linking the Goulburn River to its surroundings and to the Murray River. All are considered under threat from future grazing, while forest zoned SMZ 103/02 is also considered under threat from future timber harvesting (Todd 1999).

All public land bordering the Goulburn River within the zone has overlying Heritage River status (\*\*A5; LCC 1991). No State Forest within this zone, other than in Barmah Forest and near Echuca Village, is designated as having timber or other hardwood forest production as its major use (General Management Zone). Rather, all sites are designated either as SPZ or SMZ. The Heritage River corridor within this zone and additional public land extending to the Murray River, is part of a single reserve proposal recommended as a priority for 'nature conservation reservation and management in the eastern northern plains of Victoria' (Robinson 1998a). Munroe State Forest is also recommended as a complementary proposal by Robinson. Barmah State Forest within this zone was included by Robinson (1998a) in his 'Barmah and Tocumwal forests' site proposed as a 'priority for nature conservation reservation and management in the eastern northern plains'. Robinson also included most State Forest along the Goulburn River and State Forest along the Murray between Echuca Village and Kanyapella, in his 'Lower Goulburn River forests' site—proposed in the same context.

Clark (1996) identified seven high or medium-value box woodland sites larger than 20 ha in this tenure: Sites 26, 57, 67, 18, 22, 59 & 68. In addition, she identified one small high-value site (Site 19; 6 ha). All of Clark's sites are along the Goulburn River, except for Site 59 (AMG 185093) on Barmah Tip Road.

## 6. Barmah Landscape Zone

### 6.6 State Forest (cont'd)

'Barmah Forest', represented by Barmah State Forest (F1) land (as well as A2, B2, B3 and A5), is listed on the Register of the National Estate (Robinson 1998a) and on the RAMSAR List of Wetlands of International Importance (EA 2002). Barmah–Millewa Forest is also listed in *A Directory of Important Wetlands in Australia* (EA 2001)—as Site VIC043. Lower Goulburn River Floodplain, which is listed as site VIC052 in *A Directory of Important Wetlands in Australia* (EA 2001), includes most public land along the Goulburn River within the zone.

#### **Land Manager:**

Forests Service

#### **Stakeholders:**

Key PV, DSE, CMA

Others VEAC, VNPA, VAA, TSN, BG, GNP, FNC, VCM, LGA

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

**EVCs:** *Riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d) was the predominant pre-1750 vegetation type in Barmah State Forest and in most of Goulburn State Forest within the zone. Though now more restricted and degraded, this River Red Gum-dominated EVC still persists on these public lands.

Within Barmah State Forest (especially in the east), more elevated source-bordering dunes, adjacent to old anabranches, support *plains grassy woodland* (e) (Yellow Box, Grey Box, Buloke, White Cypress-pine). The characteristic vegetation of most of these dunes or sand ridges has survived, though extensively degraded by timber-cutting and grazing. *Moiria plain wetland* (lc) also occurred (and still persists) within Barmah State Forest. Around Goose Swamp, *riverine grassy woodland* (v) persists, but is more patchy than formerly. Other marginal woodlands, particularly *black box chenopod woodland* (e) or mosaics incorporating this EVC, have been heavily cleared and any remaining fragments (such as along Echuca–Nathalia Road, north of Kanyapella) now constitute important biodiversity assets locally. At Barmah Tip Road, *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d) was flanked by *black box chenopod woodland* (e). Today, basically only the *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d) EVC remains, however most is altered both structurally and floristically, due to grazing and harvesting.

Pre-1750 vegetation on State Forest along the Goulburn River was largely *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d), dominated by River Red Gum, with scattered small patches of *sand ridge woodland* (e), dominated by White Cypress-pine, Yellow Box and other characteristic ridge or dune species (Earl *et al* 2001). Near Kotupna, a section of *riverine grassy woodland / riverina plains grassy woodland complex* (e) would have been dominated by River Red Gum.

## 6. Barmah Landscape Zone

### 6.6 State Forest (cont'd)

**Threatened flora:** Buloke Mistletoe (v, un), Small Scurf-pea (Ee, 1A), River Swamp Wallaby-grass (Vk, 1B).



Buloke Mistletoe (Photo: John Eichler)

**Threatened fauna:** Barking Marsh Frog (dd, 1B), Brush-tailed Phascogale (v, un), Bush Stone-curlew (e, un), Carpet Python (e, 2A), Crimson-spotted Rainbowfish (dd, 4B), Flat-headed Galaxias (dd, 2B), Freckled Duck (e, un), Glossy Ibis (v, 1B), Golden Perch (v, 1B), Great Egret (e, 1A), Grey-crowned Babbler (e, un), Intermediate Egret (cen, 2A), Nankeen Night Heron (v, 2B), Royal Spoonbill (v, 2B), Silver Perch (cen, un), Squirrel Glider (e, 1A), Superb Parrot (Ve, 1A), White-bellied Sea-eagle (e, 3A), Woodland Blind Snake (v, un).



Carpet Python (Photo: Peter Robertson)

#### **Recommended actions:**

#### **Protection of existing remnants:**

- Review status and protect habitat condition and connectivity, of State Forest blocks in the zone, giving priority to the high value remnants and listed sites identified above (**Land tenure attributes**).
- For Barmah State Forest, ensure full implementation of Barmah State Park and Barmah State Forest Management Plan.
- Identify and ensure protection of old growth stands and individual large old trees in production forests and on forest margins and roadsides and exclude grazing.
- Protect old-growth stands and individual large old trees from damage during fire protection works, as well as from harvesting.
- Protect biodiversity values from effects of excessive firewood harvesting throughout the tenure.
- Reintroduce ecological flooding regimes throughout the tenure (and associated habitats) so as to equate as far as possible, with pre-European frequencies (Leslie 2001).
- Implement Clark's (1996) box woodland management recommendations for protection of sites identified above.

## 6. Barmah Landscape Zone

### 6.6 State Forest (cont'd)

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

- Maintain and improve natural understorey, exclude disturbance during breeding and over time, aim to increase abundance of mature hollow-bearing trees to benefit Superb Parrot (4) in Barmah State Forest.
- Control introduced predators, exclude domestic grazing and over time, aim to increase abundance of mature hollow-bearing trees within existing or likely Squirrel Glider (4) or Carpet Python (3) habitat throughout the zone.
- Restore more natural flow regimes in forest wetlands to benefit Great Egret (4), Golden Perch (3), Glossy Ibis (3), White-bellied Sea-eagle (2), Freckled Duck (2), Royal Spoonbill (2), Flat-headed Galaxias (2) and Crimson-spotted Rainbowfish (1) (Leslie and Ward 2002).
- Enhance flow regimes in forest wetlands and exclude grazing to benefit Intermediate Egret (3).
- Supplement habitat, exclude grazing and control predators to benefit Grey-crowned Babbler (2) and Bush Stone-curlew (2).
- Supplement riparian vegetation and tree cover (for roosts / nests) to benefit Nankeen Night Heron (2).
- Supplement woodland and floodplain habitat to benefit Barking Marsh Frog (3).
- Exclude domestic grazing in Barmah State Forest to benefit Small Scurf-pea (4), River Swamp Wallaby-grass (3) and Buloke Mistletoe (2).
- Enhance flow regimes and control introduced herbivore and macropod levels to benefit River Swamp Wallaby-grass (3) in Barmah State Forest.



Squirrel Glider (Photo: P.Menkhorst)

#### **Restoration of strategic vegetation blocks or linkages:**

- Initiate restoration programs in response to the assessed condition of priority areas and significant sites described above (see Land tenure attributes).
- Encourage neighbouring landholders to retain and enhance freehold remnants adjoining or close to State Forest, giving priority to locations where this effort would be most likely to benefit designated 'priority areas' described above and sites listed for their national and / or international significance.
- Implement restoration programs for remnant pine / box woodland vegetation on sand dunes supporting plains grassy woodland (e) throughout Barmah State Forest, to restore alternative habitat resources which may benefit taxa including Grey-crowned Babbler, Superb Parrot, Bush Stone-curlew, Carpet Python, Woodland Blind Snake and Apostlebird.

## 6. Barmah Landscape Zone

### 6.6 State Forest (cont'd)

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

- FFG Action Statement – Small Scurf-pea (31).
- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – Grey-crowned Babbler (34).
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – White-bellied Sea-eagle (60).
- FFG Action Statement – Bush Stone-curlew (78).
- FFG Action Statement – Brush Tailed Phascogale (79).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Freckled Duck (105).
- FFG Action Statement – Great Egret (120).
- FFG Action Statement – Intermediate Egret (120).
- FFG Action Statement – Little Egret (120).
- FFG Action Statement – Squirrel Glider (166).
- FFG Action Statement – Carpet Python (175).
- JAMBA – Great Egret.
- CAMBA – Great Egret, Glossy Ibis, White-bellied Sea-eagle.
- Management Plan – Heritage Rivers (Draft) (NRE 1997b).
- Forest Management Plan – Mid-Murray FMA (NRE 2002e).
- Management Plan – Barmah State Park and Barmah State Forest (DCE 1992).
- Management Plan – Superb Parrot (Webster & Ahern 1992).



Glossy Ibis (Photo:  
Viridians Biological  
Databases)

## 6. Barmah Landscape Zone

### 6.7 Other State Government

#### ***Land Tenure Details:***

The tenure includes: all unused roads in the zone; a section of River Murray Reserve (E1) between Kanyapella and Barmah; Uncommitted land ('racecourse reserve' U32 south-east of Nathalia, 40 ha); Murray Valley Highway easement; Numurkah–Picola Disused Rail Reserve; three small Utility sites (S12); and two Recreation Reserves (O4), one of which contains the racecourse south of Nathalia. There are no Stone or Gravel Reserves present (LCC 1985). Management of O4 and S12 reserves may be delegated to LGA. U32 is recommended for revegetation and use as a Bushland Reserve (LCC 1985).

That part of the Numurkah–Picola Disused Rail Reserve between Broken Creek and Picola is recommended by Robinson (1998a) as a priority for 'nature conservation reservation and management in the eastern northern plains', due to its high biodiversity values. Remnant habitat on the adjoining unused road reserve of Murray Road Picola, is also recommended by Robinson for protection. Todd (1999) also identified this disused (Numurkah–Picola) Rail Reserve (35 ha) as a 'priority area for protection and establishment of protected areas', in the context of 'Riverina' bioregion. He considered that it not only retains high priority vegetation units and numerous threatened flora taxa, but is also 'an important corridor linking plains, riverine and swamp vegetation, in association with a number of remnants on private and public land'.

Roadside on Murray Valley Highway at Picola East—between Yalca Church and Waaia–Bearii Roads—is identified by Cook (1997) as a native grassland roadside site of high significance (Site 10) (see also comments on Yielima North Road under Local Government). Verges along this section of highway have a combined width of 50m. Todd (1999) identified vegetated road reserve on Murray Valley Highway (Picola East; see also comments on Yielima North Road under Local Government) as a 'priority area for protection and establishment of protected areas' in the context of 'Riverina' bioregion.

#### ***Land Manager:***

Land Victoria, Public Transport Corporation, VicRoads

#### ***Stakeholders:***

Key DSE, CMA

Other VAA, BG, TSN, FNC, LGA, GNP, Private

## 6. Barmah Landscape Zone

### 6.7 Other State Government (cont'd)

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

**EVCs:** Former vegetation along the Numurkah–Picola Disused Rail Reserve, in the vicinity of Picola, was mainly *pine box woodland* (e). Further south-east, the easement passed through *plains grassy woodland* (e), *pine box woodland* (e) and *pine box woodland / riverina plains grassy woodland mosaic* (d). *Riverine grassy woodland / black box chenopod woodland / wetland mosaic* (dominated by Black Box) was traversed near Nathalia. Valuable remnants persist on and near this rail reserve. Grey and Yellow Box, Buloke and White Cypress-pine stands are still present, along with numerous other high-priority flora values (Robinson 1998a).

The Murray Valley Highway, between Yalca Church and Waiia–Bearii Roads, would formerly have supported pine box woodland (e), black box chenopod woodland (e), riverina grassy woodland / black box chenopod woodland / wetland mosaic (e) and plains grassy woodland (e). Fortunately, the persisting remnants are deemed of high to medium quality and include Buloke, White Cypress-pine, Grey Box, Yellow Box and Black Box (Cook 1997). Nearer to Nathalia, the Murray Valley Highway traversed similar EVCs, then entered riverine grassy woodland (v) in various complexes and mosaics (e, v, d) across the Goulburn River floodplain. The breadth of this road reserve ('3 chains' or 60m) has assisted the survival of good stretches of roadside vegetation. U32 and the O4 block south of Nathalia supported plains grassy woodland (e). However, both now carry volunteer grasses as understorey.

**Threatened flora:** Ridged Water-milfoil (Vv, un), Slender Darling-pea (Ve, 3A), Western Water-starwort (Vv, un).

**Threatened fauna:** Brolga (v, un), Golden Perch (v, 3B), Great Egret (e, un), Nankeen Night Heron (v, un), Royal Spoonbill (v, un), Silver Perch (cen, 3A), Superb Parrot (Ve, un), White-bellied Sea-eagle (e, 4A).



Swainsona murrayana (Photo: John Eichler)

## 6. Barmah Landscape Zone

### 6.7 Other State Government (cont'd)

#### **Recommended actions:**

#### **Protection of existing remnants:**

- Protect significant flora along Numurkah–Picola Disused Rail Reserve and permit only minimal movement of stock through the reserve ensuring that this does not damage flora values (ECC 2001).
- Ensure that roadsides of high significance on Murray Valley Highway are fully protected and appropriately managed to conserve these values.
- Ensure that DPI/DSE field staff are aware of the site location and significance of remnant vegetation on Numurkah–Picola Disused Rail Reserve and that appropriate management and protection of the reserve is undertaken (Todd 1999; ECC 2001).
- In consultation with licensees, review status of unused roads and, where habitat values (or potential values) exist, assess fencing, grazing exclusion and regeneration to ensure habitat protection.
- Protect any fenced, ungrazed or intact areas of native vegetation on unused roads from future stock disturbance, timber removal and weed invasion.

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

- Supplement habitat and enhance flow regimes, to benefit Silver Perch (3), Nankeen Night Heron (2), Royal Spoonbill (2) and Golden Perch (1), notably on wetlands associated with Numurkah–Picola Disused Rail Reserve.
- Supplement woodland and wetland habitats, notably along Murray Valley Highway around Bearii, to benefit Superb Parrot (2), White-bellied Sea-eagle (2) and Great Egret (2).
- Control introduced predators and exclude grazing to benefit Brolga (2) on Numurkah–Picola Disused Rail Reserve.
- Exclude grazing to benefit Slender Darling-pea (3) on Numurkah–Picola Disused Rail Reserve.
- Enhance flow regimes and control stocking pressure to benefit Ridged Water-milfoil (2) and Western Water-starwort (2) on Numurkah–Picola Disused Rail Reserve.



Golden Perch (Photo: DSE)

## **6. Barmah Landscape Zone**

### **6.7 Other State Government (cont'd)**

#### **Restoration of strategic vegetation blocks or linkages:**

- Initiate regeneration or revegetation works as necessary to expand and restore former native vegetation communities on Numurkah–Picola Disused Rail Reserve and Murray Valley Highway roadsides of high significance at Picola East and encourage and assist adjacent land managers to retain or restore connecting remnants.
- In consultation with licensees, improve habitat quality and connectivity of unused roads.

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

- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – White-bellied Sea-eagle (60).
- FFG Action Statement – Brolga (119).
- FFG Action Statement – Great Egret (120).
- JAMBA – Great Egret.
- CAMBA – Great Egret, White-bellied Sea-eagle.
- Management Plan – Brolga (Arnol et al. 1984).
- Management Plan – Superb Parrot (Webster & Ahern 1992).
- ECC (2001) recommendations to redesignate U32 and Numurkah–Picola Disused Rail Reserve as Nature Features Reserve (Bushland Areas).

## 6. Barmah Landscape Zone

### 6.8 Local Government

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#### **Land Tenure Details:**

The tenure includes municipal roadsides and township land throughout the zone. Todd (1999) identified vegetated road reserve (and associated freehold) on Bearii Road and Lancaster Road, West Bearii and road reserve along Nathalia–Barmah Road, as qualifying for 'priority areas for protection and establishment of protected areas', in the context of 'Riverina' bioregion. In addition, he identified nearby Yielima North Road roadside (and associated freehold) and its extension south onto Murray Valley Highway (Picola East; see also Other State Government), as having high biodiversity values and constituting an important north-south habitat corridor between the plains and the Murray River. These same sites had previously been selected by Cook (1997) as native grassland roadside sites of high significance (Sites 11, 13 and 18). Other sites identified by Cook (1997) as native grassland roadside sites of high significance include Site 2 (between McDonald and Thompson Roads, on Nathalia–Barmah Road, Lower Moira), Site 6 (between Griffith Road and Murray Valley Highway, on Skeleton Creek Track, Kotupna) and Site 44 (unmade road off Murray Road, Picola). Site 2 extends along some 22 km of road reserve, while Site 6 extends for 6 km and Site 44 is more localised still. Cook also identified a section of roadside on Morris Road, Picola East (Site 43), between Mathers and Hawkers Roads, as supporting remnant woodland of high to medium quality.

#### **Land Manager:**

Local Government Authority

#### **Stakeholders:**

Key DSE, CMA, PV, CFA

Other Private, LFW, FNC, CVA, GAV, LFB

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

**EVCs:** The pre-1750 vegetation cover of the riverine plain, in relation to existing road networks, was predominantly *pine box woodland* (e), *black box chenopod woodland* (e), *plains grassy woodland* (e) and *riverine grassy woodland* (v), often represented as mosaics or complexes. Todd's (1999) notable West Bearii road reserves (and associated freehold remnants) would have supported a number of these EVCs. Today these sites retain high priority vegetation units and a range of threatened flora and fauna. Moreover they constitute significant habitat isolates (predominantly Grey Box), close to other vegetated road corridors. Buloke and White Cypress-pine are noted as still present on the Yielima North Road / Murray Valley Highway site. Roadside woodland at Cook's (1997) Site 43 on nearby Morris Road contains Yellow Box and Grey Box, as well as an abundance of White Cypress-pine. Generally, drier woodland elements remaining on roadsides (typically Grey Box, White Cypress-pine) are often associated with *plains grassy woodland* (e) and *pine box woodland / riverina plains grassy woodland mosaic* (e). These sites commonly have a degraded understorey, however Site 2 of Cook (1997) is ranked of high to medium quality, containing communities dominated by Grey Box and River Red Gum and including at least six threatened flora taxa. Site 6 (also high to medium quality) contains Grey Box, Black Box and River Red Gum, while Site 44 (high quality) is a wetland lacking dominant eucalypts and with four threatened taxa.

## 6. Barmah Landscape Zone

### 6.8 Local Government (cont'd)

In detailing the rich biodiversity attributes of the roadsides along Nathalia–Barmah Road, Todd (1999) notes that the site serves as an important east-west link between plains and riverine environments. Nevertheless, roadside cover persists most strongly where riverine corridors are crossed. The main EVC here is the River Red Gum-dominated *riverine grassy woodland* (v), included in various complexes and mosaics (e, v, d), most notably across the Goulburn River floodplain.

**Threatened flora:** Mallee Golden Wattle (v, 4B), Ridged Water-milfoil (Vv, un), River Swamp Wallaby-grass (Vk, un), Silky Umbrella Grass (v, 3B), Small Scurf-pea (Ee, 3A), Western Water-starwort (Vv, un).



Cullen parvum (Photo: John Eichler)

**Threatened fauna:** Barking Marsh Frog (dd, un), Brolga (v, un), Bush Stone-curlew (e, un), Crimson-spotted Rainbowfish (dd, un), Giant Bullfrog (cen, un), Glossy Ibis (v, un), Golden Perch (v, un), Great Egret (e, un), Grey-crowned Babbler (e, 2A), Intermediate Egret (cen, un), Murray Cod (v, un), Nankeen Night Heron (v, un), Royal Spoonbill (v, un), Superb Parrot (Ve, un), White-bellied Sea-eagle (e, un), Woodland Blind Snake (v, un).



Giant Bullfrog (Photo: Peter Robertson)

#### **Recommended actions:**

##### **Protection of existing remnants:**

- Protect existing roadside remnants, giving priority to the *high-quality* sites identified by Todd (1999) and Cook (1997) above (**Land tenure attributes**) and to any others having mature or hollow-bearing trees and/or relatively intact understorey and ground layers.
- Provide fencing and sign-posting of all *high-quality* remnants.
- Encourage removal or control of grazing on all road reserves retaining native vegetation communities or significant components.
- Ensure that Shire staff (especially road maintenance workers) are aware of the location of significant roadsides.
- Assist Shires to develop or upgrade roadside conservation plans and encourage integration with voluntary efforts on adjacent tenures. Promote voluntary programs (e.g. Land for Wildlife) and/or planning overlays, as tools to assist Shires.
- Avoid removal from roadside habitats of ground litter, fallen timber, logs or dead-standing trees, which provide valuable shelter and forage resources for Grey-crowned Babbler, Bush Stone-curlew, Woodland Blind Snake and Barking Marsh Frog.
- Monitor known sites of Giant Bullfrog on Murray floodplain and ensure full protection of habitat.



Woodland Blind Snake (Photo: Peter Robertson)

## 6. Barmah Landscape Zone

### 6.8 Local Government (cont'd)

- Identify in Shire roadside conservation plans known and likely sites of threatened taxa and advise CFA to avoid or limit control burning of these sites.
- Inform managers of adjacent freehold land of the presence of significant remnants and/or threatened species on roadsides and the likely impacts of pasture improvement on these assets.

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

- Improve diversity and cover of native understorey, improve connectivity and retain fallen tree debris to supplement roadside habitat and over time, aim to increase the abundance of mature woodland trees for Grey-crowned Babbler (3), Superb Parrot and Woodland Blind Snake.
- Control foxes and cats to minimise predation on Grey-crowned Babbler (3), Bush Stone-curlew and Brolga.
- Enhance flow regimes and supplement riparian vegetation (including tree cover) on roadside wetlands to benefit Great Egret, White-bellied Sea-eagle, Royal Spoonbill, Giant Bullfrog, Nankeen Night Heron, Brolga, Glossy Ibis, Intermediate Egret, Murray Cod, Golden Perch, Crimson-spotted Rainbowfish and Barking Marsh Frog.
- Exclude domestic stock from roadsides supporting, or potentially suitable for, Grey-crowned Babbler (3), Superb Parrot, Woodland Blind Snake, Barking Marsh Frog or Brolga.
- Install signage and control stocking levels to best benefit Small Scurf-pea (3) and Silky Umbrella Grass (1).
- Implement weed control to benefit Silky Umbrella Grass (1).
- Install signage, exclude domestic stock, control weeds and implement appropriate burning regimes to best benefit Mallee Golden Wattle (1).
- Determine management needs for Western Water-starwort (2), Ridged Water-milfoil (2) and River Swamp Wallaby-grass (2) on roadsides in the Waaia–Bearii area.

#### **Restoration of strategic vegetation blocks or linkages:**

- Encourage and assist regeneration and consolidation of significant roadside remnants, giving priority to *high value* sites identified above.
- Extend and expand good-quality roadside / creekline habitat linkages, giving priority to sites known or likely to support colonies of Grey-crowned Babbler and targeting suitable sites in proximity to a known colony.
- In expanding linear habitat networks, utilise nodes on creek-crossings, intersections with other road reserves or patches on adjacent freehold.
- Liaise with landholders on adjacent properties to establish habitat strips by which to broaden roadside habitat for fauna and to expand significant flora.
- Liaise with landholders to fence across paddock corners at key intersections of roadside treelines, to maximise habitat availability for fauna (Robinson & Davidson, in prep.).

## **6. Barmah Landscape Zone**

### **6.8 Local Government (cont'd)**

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

- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – Grey-crowned Babbler (34).
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – White-bellied Sea-eagle (60).
- FFG Action Statement – Bush Stone-curlew (78).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Brolga (119).
- FFG Action Statement – Great Egret (120).
- FFG Action Statement – Intermediate Egret (120).
- JAMBA – Great Egret.
- CAMBA – Great Egret, White-bellied Sea-eagle, Glossy Ibis.
- Management Plan – Brolga (Arnol et al. 1984).
- Management Plan – Superb Parrot (Webster & Ahern 1992).

## 6. Barmah Landscape Zone

### 6.9 Parks and Reserves

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#### ***Land Tenure Details:***

The tenure includes Barmah State Park (A2; part only of 7900 ha), Top Island (B2; 160 ha) and Top End (B3; 120 ha) Reference Areas, Echuca (A4; 520 ha) and Barmah (A5; 580 ha) Regional Parks and Kanyapella Basin Wildlife Management Co-operative Area (C32; 2581 ha—managed by Parks Victoria in collaboration with Goulburn–Murray Water). The zone also contains Loch Garry Wildlife Management Co-operative Area (C33; 687 ha), a billabong on the Goulburn River floodplain supporting reed-bed swamps dominated by River Red Gum and with Grey and Yellow Box also present (LCC 1985). In addition, a suite of smaller Bushland Reserves (H13-15, 17-19, 19A & 20-25; totalling 98 ha) are scattered across the riverine plain between the Goulburn River and Barmah Forest.

H19A (4 ha), beside Broken Creek, is included as part of the extensive Broken–Boosey–Nine Mile Creeks reserve system recommended by Robinson (1998a) as a priority for 'nature conservation reservation and management in the eastern northern plains'. Similarly, Robinson recommended that H20, 23 & 24 be incorporated into a proposed 'Deep Creek and branches' conservation reserve. 'Barmah Forest' (which is represented by A2, B2, B3 and A5, together with Barmah State Forest [F1] land) is listed on the Register of the National Estate (Robinson 1998a) and on the RAMSAR List of Wetlands of International Importance (EA 2002).

Loch Garry Water Management Catchment Area is included within the *Heritage River* overlay along Goulburn River floodplain (LCC 1991, NRE 1997a). Lower Goulburn River Floodplain Forest, which is listed as site VIC052 in *A Directory of Important Wetlands in Australia* (EA 2001), includes Loch Garry Water Management Catchment Area. Barmah–Millewa Forest (the latter being the NSW component) and Kanyapella Basin are also listed in *A Directory of Important Wetlands in Australia* (EA 2001)—as sites VIC034 and VIC043, respectively. Conservation reserves A2, B2, B3 and A5 within this zone were all included by Robinson (1998a) in his 'Barmah and Tocumwal forests' site proposed as a 'priority for nature conservation reservation and management in the eastern northern plains'. Robinson noted that the nominated site comprised 'the largest and most diverse remnant of native vegetation in the eastern northern plains'.

#### ***Land Manager:***

Parks Victoria, RWA

#### ***Stakeholders:***

Key DSE, CMA

Other VEAC, VNPA, VAA, TSN, BG, FNC, Priv, LGA, GNP

## 6. Barmah Landscape Zone

### 6.9 Parks and Reserves (cont'd)

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

**EVCs:** *Riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d) was the predominant pre-1750 vegetation type on A4, A2 and A5 and (although degraded) remains so today. Barmah Lakes (east end of A2) supported *lagoon wetland* (e), now lost, in association with *moira plain wetland* (lc), the latter EVC still being secure. Parts of Top Island, including B2, supported *reed swamp* (v) and continue to retain this EVC. In the Top End compartment of A2 (and B3), scattered patches of *plains grassy woodland* (e) were associated with sand ridges, which still retain valuable remnants of this EVC.

The Bushland Reserves, many of which are former Water Reserves, included *plains grassy woodland / gilgai plains woodland / wetland mosaic* (e) (H25; 14 ha), *drainage line complex* (e) (H14, 15, 20 & 22; total 20 ha) and *riverine grassy woodland / gilgai plains woodland / wetland / riverina plains grassy woodland mosaic* (e) (H23-24; 27 ha). River Red Gum and Grey Box remain the dominant tree species over most of these Bushland Reserves (LCC 1983). H17-19 formerly supported *pine box woodland* (e) or *pine box woodland / riverina plains grassy woodland mosaic* (e), degraded remnants of which still persist.

Interestingly, Kanyapella Basin (C32) supported *black box chenopod woodland / lignum wetland mosaic* (e) and *redgum wetland* (e), flanked in the east by a long lunette bearing *sand ridge woodland* (e). While the wetland EVCs are still represented, though reduced in area and condition, the lunette vegetation of Kanyapella Basin has effectively disappeared, probably due to grazing. The wetland is dominated by River Red Gum open forest and Black Box woodland. Apart from forested areas, there are extensive areas of pasture grasslands dominated by introduced grasses (e.g. *Phalaris* spp.) and native grasslands dominated by native grass species (e.g. *Austrodanthonia* spp.). Depressions are dominated by Cumbungi (*Typha* spp.), rushes (*Juncus* spp.), sedges (*Carex* spp.) and areas of open water (Robertson 2002).

Pre-1750 vegetation at Loch Garry Water Management Catchment Area was *riverine grassy woodland / riverine sedgy forest / wetland mosaic* (d), dominated by River Red Gum. This EVC persists today, though in a greatly degraded state.

**Threatened flora:** Fat Spectacles (e, un), Mueller Daisy (Ve, 1A), Small Scurf-pea (Ee, 2A), River Swamp Wallaby-grass (Vk, 2B), Western Water-starwort (Vv, un).

**Threatened fauna:** Bluenose Cod (Ecen, 3A), Crimson-spotted Rainbowfish (dd, 2B), Golden Perch (v, 1B), Great Egret (e, 1A), Grey-crowned Babbler (e, un), Little Bittern (e, 1A), Murray Cod (v, 1B), Nankeen Night Heron (v, 2B), Silver Perch (cen, 1A), Squirrel Glider (e, un), Superb Parrot (Ve, 2A), Royal Spoonbill (v, 3B).



*Amphibromus fluitans*  
(Photo: Geoffrey Carr)



Silver Perch (Photo: DSE)

## 6. Barmah Landscape Zone

### 6.9 Parks and Reserves (cont'd)

#### **Recommended actions:**

#### **Protection of existing remnants:**

- Assess habitat values and monitor condition on all reserves within the tenure and ensure that protection of biodiversity values is adequate and effective. For A2, B2, B3 and A5, in particular, ensure full implementation of Barmah State Park and Barmah State Forest Management Plan. For the Bushland Reserves cited above for their strategic biodiversity values, ensure that these values are protected and maintained.
- Pursue complete removal of domestic grazing and timber harvesting from all Parks and Reserves in the zone.
- Pursue implementation of management recommendations of Clark (1996) for box woodland Site 23 within C33—restrict and fence out grazing, monitor and control weeds and propose as Flora Reserve. Also note revegetation recommended by LCC (1985) for H13 on Broken Creek.
- Reintroduce ecological flooding regimes throughout the tenure (and associated habitats) so as to equate as far as possible, with pre-European frequencies.
- Monitor biodiversity (waterbird populations, rare plants, vegetation recovery) and biophysical attributes (groundwater quality, water levels, duration of inundation and other indicators) in Kanyapella Basin and implement fire protection works, in line with recommendations of the existing draft Environmental Management Plan (Robertson 2002).
- Maintain exclosures in Barmah State Park to protect Small Scurf-pea.

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

- Consider options for reintroduction of Silver Perch (4) in Barmah State Park.
- Supplement habitat (providing structurally diverse substrates) and enhance flow regimes (providing fast-flowing streams of variable depth) to benefit Bluenose Cod (3) in Barmah State Park.
- Supplement habitat (providing dense emergent and floating vegetation) and enhance flow regimes (shallow waters) at Top Island to benefit Little Bittern (4).
- Supplement riparian habitat, exclude human disturbance and enhance wetland regimes to benefit Great Egret (4).
- Over time, aim to increase abundance of mature hollow-bearing trees in A2 and A5 to benefit Superb Parrot (3).
- Monitor habitat of Grey-crowned Babbler (2) and Squirrel Glider (2) colonies and take any opportunities to enhance existing or potential habitat, including by controlling introduced predators.



Little Bittern (Photo: unknown)

## 6. Barmah Landscape Zone

### 6.9 Parks and Reserves (cont'd)

- Enhance flow regimes (quiet or sluggish waters of variable depth and with diverse substrates) to benefit Golden Perch (3), Murray Cod (3) and Crimson-spotted Rainbowfish (2).
- Enhance flow regimes (shallow wetlands) and supplement riparian vegetation or trees (for roosts / nests) to benefit Nankeen Night Heron (2) and Royal Spoonbill (1).
- Control weeds and competition from introduced herbivores or macropods, to benefit Mueller Daisy (4) in A2 and River Swamp Wallaby-grass (2) in A5, C32 and C33.



*Brachyscome muelleroides*  
(Photo: John Eichler)

- Monitor management needs at sites of occurrence of Small Scurf-pea (3) in A2 and C33, Fat Spectacles (2) in A2 and Western Water-starwort (2) in A4.
- Enhance flow regimes to benefit River Swamp Wallaby-grass (2) in A5, C32 and C33.
- Control and manage licensed domestic grazing in Kanyapella Basin strictly in accord with the existing draft Environmental Management Plan (Robertson 2002).
- Implement pest and weed control programs and modify flow regimes, in Kanyapella Basin in accord with the existing draft Environmental Management Plan (Robertson 2002).

#### Restoration of strategic vegetation blocks or linkages:

- Implement management actions in Kanyapella Basin in accord with draft Management Plan (Robertson 2002) to improve biodiversity value of communities dominated by River Red Gum and Black Box, enhance wetland revegetation and liaise with adjoining landholders over water delivery and storage issues.
- Investigate with adjoining landholders or other land managers any options to bolster connectivity adjacent to Bushland Reserves H19A, 20, 23 & 24 cited above as warranting inclusion in broader reserve systems.
- Implement any revegetation still required on H13 (LCC 1985).

## 6. Barmah Landscape Zone

### 6.9 Parks and Reserves (cont'd)

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

- FFG Action Statement – Small Scurf-pea (31).
- FFG Action Statement – Superb Parrot (33).
- FFG Action Statement – Grey-crowned Babbler (34).
- FFG Action Statement – Bluenose Cod (38).
- FFG Action Statement – Regent Honeyeater (41).
- FFG Action Statement – Predation by Red Fox (44).
- FFG Action Statement – Brush-tailed Phascogale (79).
- FFG Action Statement – Predation by Cat (80).
- FFG Action Statement – Great Egret (120).
- FFG Action Statement – Squirrel Glider (166).
- JAMBA – Great Egret.
- CAMBA – Great Egret.
- Recovery Plan – Regent Honeyeater (Menkhorst et al. 1999)
- Recovery Plan – Trout Cod (Brown et al. 1998)
- Management Plan – Superb Parrot (Webster & Ahern 1992).
- Management Plan – Barmah State Park and Barmah State Forest (DCE 1992).
- Management Plan – Draft Heritage Rivers (NRE 1997b).
- Management Plan – Draft Kanyapella Basin Environmental (Robertson 2002).
- ECC (2001) recommendation to recategorise those Bushland Reserves within Box-Ironbark study area as Natural Features Reserves.



Bluenose Cod (Photo: DSE)