Submission to VEAC on Yorta Yorta Connections with River Red Gum forests on public land in Study Region

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1. Introduction to VEAC submission:

As an introduction to this submission it will first be necessary to set some contextual framework on which the foundations of Yorta Yorta-Bangerang occupation use and enjoyment of the Barmah Millewa forest and connected water systems can be better appreciated. In doing so I am conscious of the need to ground the knowledge of my people's connections with the ancestral lands, in their world view of Indigenous land relations. Occupying this position and at all times being careful not to compromise the excellent track record of Yorta Yorta land-water management and care, will be the guiding framework for my analysis of the:

- the impact of introduced activities on Yorta Yorta land and water systems and

- the urgent need for the heartland of the Yorta Yorta country (Barmah-Millewa Forests) to be declared a National Park under a Joint Management Agreement.

A National Park, like those operating successfully in other parts of Australia are models that can be used to entrench Yorta Yorta connections, and rights under a Joint Management Agreement (JMA) (see credentials to speak on this matter as a Yorta Yorta person in profile at): **http://webraft.its.unimelb.edu.au/166038/pub/Profile.pdf**

This document addresses the substantial issues of grazing, logging, water, cultural heritage matters and provides the necessary policies and structural arrangements for the future management of lands and waters within the study region under a Joint Management Agreement.

1.1. Prior Submissions to Victorian Land Authorities-LCC, 1983

In reassessing previous submissions on Yorta Yorta connections with the current VEAC study, it is important to note that the Yorta Yorta were one of the first Indigenous groups to present submissions to the LCC Study of the Murray Valley Study Region, 1993. This was done by the Yorta Yorta Murray Goulburn Rivers Clans Inc (predecessor of Yorta Yorta Nations Inc), who requested that their prior occupation and connections with study area be fully recognised. The submission was prepared by Wayne Atkinson and Annette Berryman, Archaeology Department, LaTrobe University, 28 February, 1983 titled: Aboriginal Associations with the Murray Valley Study Area, a summary of which was included in the Land Conservation Council Study Report, Murray Valley Study Area, LCC, Melbourne, 1983 and in its Final Recommendations Report, 1985.

The Yorta Yorta also presented submissions on the LCC recommendations which included calls for a 'joint management arrangement' with the Yorta Yorta along the lines of Uluru and Kakadu. These were presented to the LCC on: 29 November 1983 and 19 December, 1983: 4; and to Steve Crabb, Minister for Conservation and Environment, at a Parliament House, 14 March, 1991:4).

These submissions were supported by conservation and environmental groups; the Conservation Council of Victoria and the Victorian Association of Environmental Education (see Yorta Yorta Submission on LCC Recommendations, 19 December, 1983).

The Barmah Management Plan, 1990 recognised the Yorta Yorta's *'long and continuing association with the Barmah and adjacent NSW Forests. They consider these areas living examples of Aboriginal cultural heritage and an important part of their ancestral homelands'* (Barmah Management Plan: Barmah State Park, Barmah State Forest, Benalla Region, National Parks & Wildlife Division, Land & Forests Division, Department of Conservation, Forests & Lands-Victoria, February, 1990: 7, 49).

Following the submissions to the LCC, the Yorta Yorta lodged a claim for inalienable freehold title of the Barmah Forest with the Cain Government in June, 1984-see Chronology of Yorta Yorta Attempts to Gain Land Justice in Atkinson, W. Not One Iota, PhD Thesis, LaTrobe University, Appendix 1:277-78; Note: The 1984 Claim which preceded the YYNTC, (1994-2002) was the seventeenth attempt to settle the long standing issue of Yorta Yorta land justice).

These calls for land justice and joint management saw no positive outcomes for the Yorta Yorta. The only exception was the construction of the Dharnya Centre which was built on Indigenous funding through a Commonwealth Employment Grants Scheme. A grant of $409,425 was sponsored by the Forest Commission, Victoria, October, 1983 (Background to CEP Grant for Dharnya Centre in Yorta Yorta Native Title Correspondence, 27 August, 1997).

These are important considerations that need to put up front as background material for this submission. Indeed it gives one a sense of dejavu to be preparing a submission for the same areas of land that were the focus of the LCC study over two decades ago. As a Yorta Yorta person who has been involved in the struggle for land justice and the recognition of our ancestral connections with the study area over that period, I trust that due and fair processes will be applied in the recognition of my people's entitlements as the original owners and occupants. I will now examine the Yorta Yorta-Bangerang as a basis for restating our continued concerns for due recognition and empowerment in the current VEAC study.

1.2 The Yorta Yorta- Bangerang

The people who identify as Yorta Yorta-Bangerang are the descendants of the original ancestors who occupied the Barmah Millewa Forests. The events of the last one hundred and sixty years have shaped the nature and structure of groups within the region. The existence of narrower sub-groupings has evolved into broader interests within the area with greater emphasis being placed on collective identity and inter-relationships between family groups. Indeed it is correct to say that Yorta Yorta-Bangerang are one and of the same peoples who trace their ancestral lineages (bloodlines) and cultural connections back to the ancestors who were on country at the imposition of British colonial rule. This

is reflected in the name of the organisation set up to represent Yorta Yort-Bangerang people in land, compensation and heritage matters – the Yorta Yorta Nations Inc. The YYNI is the principle structure for dealing with land water, compensation and cultural matters. Its structure comes from a process whereby the inherent rights of the Yorta Yorta-Bangerang nation are represented through democratically elected representatives who make up the Elders Council and the Governing Committee. These representatives are drawn from the family groups who inherent their rights and interests form the ancestors who were in occupation when British authority was imported, and through them to the ancestors who have been in occupation since creation. A rather amazing and unique inherence of hereditary bestowal particularly when one considers the timeline of prior occupation, which has been put at 2,500-3,000 generations. The timeline, of inheritance that give rise to rights and interests in land, culture, identity and autonomy are the rock solid foundations of Australia's Indigenous history. Nothing as it is often asserted by the Yorta Yorta will ever change that reality.

Having discussed the collective nature of the relationship between the Yorta Yorta-Bangerang, and for the purpose of this discussion, where reference is made to their shared ancestral connections, I will use the term Yorta Yorta.

This will be an important framework for assessing:

- the extent to which the foundations, and its accompanying track record in land care are given due recognition in current land management policies and practices

The Yorta Yorta declare that they have never relinquished their sovereign rights to territories occupied by their ancestors. Given the interference of those events described by *Mabo* as 'unjust and discriminatory', the Yorta Yorta have continued to live on the ancestral lands and to exercise their inherent rights to use resources, and to continue cultural practices (*Mabo* (No. 2) 1992 Brennan J. at 29, 40–3; Aboriginal and Torres Strait Islander Social Justice Commissioner, 1995:94–6; Yorta Yorta Statement of Claim and Contentions 1994–95).

The current Yorta Yorta population is estimated to be 5,000–6,000 (Hagen, 1997-97; Alford, 2001; Rumbalara Aboriginal Community, 2001). Figures from the 1996 ABS survey indicate that the majority of Yorta Yorta people, still physically occupy the ancestral lands and that the Yorta Yorta population continue to regard the area as their traditional homelands. Other reports that correlate the legacy of land loss with current health concerns support continued Yorta Yorta connections (Alford, 1999:39–42; McKendrick, 1999; Australian Bureau of Statistics: National Aboriginal and Torres Strait Islander Survey, 1996; Department of Conservation, Forests & Lands (Vic), 1992).

The majority of Yorta Yorta live in the townships of Echuca, Moama, Shepparton, Mooroopna, Cummeragunja, Barmah, Nathalia, Finley, Cobram, Kyabram, Wangaratta and Mathoura, and other smaller centres within the lands. Some live nearby at Albury, Wodonga, Deniliquin, Kerang, Barham and Swan Hill. Others have moved to the cities to pursue educational and economic interests, most of whom still visit the area regularly to

maintain social and cultural links (ABS, 1996; Hagen, 1996:6–8; *Yorta Yorta Land Management Report*, 1999:10; and see Chapters 8–9).

The Yorta Yorta have set up organisations to service the needs of their people in housing, health, education, employment, land, sport and heritage matters. These organisations have provided mechanisms through which the Yorta Yorta have been able to deal with governments on both sides of the Murray and to maintain the social and cultural fabric of their society.

Many of the Yorta Yorta were instrumental in the fight for civil and political rights leading up to the 1967 Referendum. They established the first Aboriginal organisations in Melbourne and Sydney in the early 1930s. Some of the early leaders were active in highlighting similar injustices in other parts of Australia in the 1950s and in assisting those Victorian communities that gained some land justice in the 1970s and 1980s (*Aboriginal Land Act 1970* (Vic); Aborigines Advancement League, 1985: 55–84; Horner, 1974:68–80; Barwick, 1972:16; Broome, 1994:80–4; Goodall, 1996:230–58).

Yorta Yorta people reject the notion that their connections have been washed away by euphemistic phrases like the 'tide of history' and reassert their position as the traditional occupants and owners of the lands inherited from their ancestors. The history of race relations and conflict over land ownership, expose the 'tide of history' as no more than fanciful language, dressed up in disguise, which was used to cover over the underlying and causative effects of the struggle for land justice. The application of the tide idea in the YYNTC as a barrier to land justice perverted the course of justice in the Yorta Yorta case. It is often likened with the analogy of rubbing salt into the deep wounds of Yorta Yorta society. Reconciling the unfinished business of land justice and reaching a position of real effective and genuine reconciliation are the challenges that confront all parties in the study region.

Overlay the antiquity of Indigenous occupation use and enjoyment of the ancestral lands with the more recent events and any normal rationale thinking person would agree that they are indeed relatively recent events. Overlay the impact of the last two centuries or more however in terms of their dominance and control over Indigenous existence and land management practices, and one can construct a solid framework to:

- critically assess the extent to which the imported ideologies continue to dominate the current debate on land care and land management outcomes in the VEAC study area.

This framework will be used as a guideline for supporting the current struggle of the Yorta Yorta and their supporters, for the Barmah-Millewa Forests to be declared a National Park, recognising the Yorta Yorta as the original owners under a Joint Management Arrangement JMA.

I will now anlayse those issues that have overlaid the timeline of Yorta Yorta connections and still play a dominant role in forest management policies and practices. The Yorta Yorta has identified a variety of issues that pose threats to their lands and waters and to places of natural and cultural significance. These range from:

- impacts associated with the destruction and degradation of natural and cultural values by domestic stock grazing, logging and other hard use activities.

- impact of changes in traditional water regimes

In general terms these have all had a detrimental effect on the preservation and enjoyment of the land, water and its natural and cultural resources. Analysis of these particular issues will provide a context for reviewing past and present management strategies and a firm basis for recognising and entrenching the framework of inherent rights, and interests and views of the Yorta Yorta.

1.3 Evidentiary Materials consulted for this submission

The substantive evidence for this submission will be drawn from a range of sources primarily focusing on the extensive research into Yorta Yorta connections with the ancestral lands. These are:

- Evidence presented in the Yorta Yorta Mediation Process, 1994-95 & the Native Title Claim hearing, 1996-98.

- Yorta Yorta Policy on Claimed Lands and Waters 1995-96 used in Management Plan for Yorta Yorta Cultural Environmental Heritage Project, 2003.

- The Management Plan for Yorta Yorta Cultural Environmental Heritage Project, 2003 researched by Craib, J. & Atkinson, and W.R. **http://webraft.its.unimelb.edu.au/166230/pub/NatEstate1999.pdf**

- Barmah-Millewa National Park: Proposal and Briefing Document, Friends of the Earth Melbourne, Barmah-Millewa Collective 2002. **www.melbourne.foe.org.au/barmah/barmah_introduction.htm**.

- Chapter on Yorta Yorta Occupation from: Atkinson, W.R. *Not One Iota:* The Yorta Yorta Struggle for Land Justice, PhD Thesis, LaTrobe University, 2000, pp.14-35. **http://webraft.its.unimelb.edu.au/166230/pub/YYoccfinal.pdf**

- The summary of Evidence from the scientific literature supporting the environmental component of the Yorta Yorta Management Plan for the Barmah-Millewa forest ecosystem by Lindy Orthia, 2001. **http://webraft.its.unimelb.edu.au/166230/pub/YYscientific.pdf**

- The Murray Lower Darling Rivers Indigenous Nations (MLDRIN) agreement with the Murray Darling Basin Commission MDBC on Indigenous water issues will be consulted. The agreement provides a framework for the involvement of

Indigenous peoples in natural resource management in the Murray and Lower Darling River valleys in NSW. The agreement was signed off by traditional elders from the Murray and Lower Darling Rivers Indigenous Nations and the Director-General of the NSW Department of Land and Water Conservation, Bob Smith in 2002. **http://www.dlwc.nsw.gov.au/mediarel/ma20011014_1065.html**

- Other knowledge and materials from research on Yorta Yorta & Barmah-Millewa issues as Research Officer for the Yorta Yorta, 1980-2004, including previous submission to the VAECG predecessor the LCC. As senior researcher for the Yorta Yorta, I researched and prepared submissions on the Murray Valley Study by the LCC in 1983-see Aboriginal Associations with the Murray Valley Study Area, 1981 by Atkinson, W.R & Berryman, A. and submissions to the Land Conservation Council On the future use of public land in the Murray Valley Study Area, 29 November, 1983 and 9 December, 1983. This data can be accessed in PDF format at:
  http://webraft.its.unimelb.edu.au/166038/pub/Barmill.dwt

These sources of evidence can be read concurrently with this submission through the web linkages indicated. Much of the materials overlap and compliment the views in this submission.

1.4 Methodology

Indigenous wisdom throughout the world shares a common belief system that "all things are related". What happens in one area sooner or later directly or indirectly impacts on other areas. History has tended to vindicate this view. In line with this philosophy, Yorta Yorta views about their natural and cultural heritage will engage a holistic approach. This will be used as the methodology for our submission.

2. Grazing impacts

2.1 Grazing by Domestic Stock

When Europeans first arrived in the Yorta Yorta lands, both sheep and cattle grazed in Barmah Forest and the surrounding area. Since 1885, however, only cattle have been allowed to graze in Barmah Forest, under various types of agitate and lease arrangements. Cattle grazing in Barmah State Forest is now carried out in accordance with grazing licenses issued under the *Forest Act 1958* or water frontage license issued under the *Land Act 1958*.

Predictions and outcomes on the impact of hoofed animals in the Barmah Forest can be gleaned from Edward Curr who was one of the first non Indigenous people to enter Yorta Yorta- Bangerang ancestral lands, 1841-1851. Indigenous cultural interpretations aside,

Curr was in a prime and somewhat privileged position to observe the natural state of the forest, to witness the effects of imported hoofed animals on the land and water courses, and to examine the use of fire as an important Indigenous land management strategy. From a journey to the Barmah Forest to view the conditions of the lands which Curr had a vested interest in securing for pastoral purposes, he is quick to point out the initial effects of the 'trampling of stock'

> *' the ground had been hardened and drainage increased; the beds of rivers creeks and lagoons by the same means have also been rendered more impervious to soakage, and their banks a little less precipitous, so that the water courses are more easily filled that they used to be,…As the state of the this continent is gradually undergoing some changes consequent of our introduction of the domestic animals of Europe,…it seems to me that its condition when we took possession of it, was largely attributable to the customs of its Aboriginal inhabitants. I refer to fire-stick for the blackfellow was constantly and systematically setting fire to the grass and trees, both accidentally for hunting purposes. Living principally on wild roots & animals' he [Aborigines] 'tilled his land & cultivated his pastures with fire,* the frequency of which Curr estimated was '*once in every five years' (Curr, E.* 'Changes in Connection with Flora & Fauna of the Moira country' (original name for Barmah-Millewa), *Recollections of Squatting in Victoria,* 1841-1851, Melbourne University Press, 1965: 87-88).

One hundred and sixty years down the track many of Curr's observations revisit us, in terms of the magnitude of the problems that we are confronted with today. Trying to find more balanced and effective land management strategies and the recognition of Yorta Yorta connections are issues that require more comprehensive and lateral approaches to those of the past.

2.2 Cattle Grazing in the State Park

Cattle grazing in Barmah State Park is carried out under a license issued under the *National Parks Act 1975*. When the Land Conservation Council proposed (LCC: predecessor of VAECG) the creation of Barmah State Park in 1985, it recommended that cattle *be removed from the Park within three years* of the acceptance of the proposal (LCC 1985). The Barmah State park was a quarter of the lands set aside for the preservation of wetlands and bird habitat of national and international significance under the Ramsar and Migratory Bird Agreements. Providing a buffer zone to ensure the protection of the lakes, and birdlife including Yorta Yorta cultural sites was seen as an essential measure. Indeed the LCC tried to strike a balance with graziers by allowing continued use of the remaining State Forest which was three quarters or 75 % of the total Barmah Forest area.

By the time the Barmah Management Plan was written however, the LCC recommendation for cattle removal was watered down (DCE 1992). The Plan recognised the Victorian government's Wetlands Conservation Program intention that 'Grazing on

publicly owned wetlands of high value will be phased out within five years of a wetland being recognised as being of high value'. Since the *Barmah Management Plan* and, the *Ramsar Convention*, 1972 describe Barmah as a high value wetland, grazing should have been phased out at least in the State Park if not in the whole forest by, at the very latest, 1997. Due to the politics of the day largely motivates by the greed and the self interest of surrounding grazers, the LCC plan was compromised. Its original position of phasing out cattle in the Park was replaced by the announcement that "management must ensure grazing does not have a *significant detrimental effect on wetland values"* (55). This was a major concession to a minority of privileged graziers who were able to maintain their interests, and the benefits of subsidized public land access, to all of the forest, rather than a compromise on their part to forego what was a quarter of the lands for preservation purposes. The need to exclude cattle from the State Park and the rest of the Barmah Millewa is one of the key objectives of the Barmah-Millewa campaign for the total area to be declared a National Park.

In contrast to Barmah State Park and Barmah State Forest, Ulupna Island, 1972 had suffered little from grazing (Muir 1974) and supported a very rich flora of 178 species (Muir 1974; LCC 1985); although low flows in Ulupna Creek allow cattle to cross regularly onto Ulupna Island to graze (Peter Barker, pers.comm.; DCE 1992). The Ulupna Island section of the park has been closed from grazing since 1980 because of its floristic values.

Note: This analysis does not include the impact of other hoofed animals such as horses (brumbies) and pigs in terms of their numbers, grazing arrangements and control measures (A pig eradication program was being conducted in the Barmah State Park on the weekend 25 June 2005: pers comm. with ranger in charge Bruce Wherner).

The main effects of this long history of grazing by sheep, cattle, horses and other hard use activities can be listed. Note however that the list is not complete and as other impacts are being identified, and with the benefit of more advanced scientific and technological analysis they will be added to the list. The generic impacts of domestic stock grazing can be listed as follows:

1. Detrimental effects on the species composition and structure of several plant communities in the forests and wetlands.

2. Decline or extinctions of some local species of shrubs (e.g. Sandalwood)

3. Damage to and destruction of Indigenous food and medicinal plants e,g. common nadoo, marsh club rush, grass sedges, buckabun, bulbine lily, common purslane and old man weed, mat-rush plants were used for there fibre. The Quandong previously grew in the forest (Wally Cooper, 1997). Only one very small population of the Sweet Leek orchid has survived see- Wilson, 1994, Zola & Gott, 1994 who identify plant species in the study area and recommend

strategies for their protection. Many of these plants have been discussed in evidence presented to the Yorta Yorta Native Title Claim Hearing, 1996-97.

4. Changes in vegetation: for instance, some areas that once supported palatable reeds and cumbungi have been taken over by giant rush. This has disrupted the seasonal migration patterns of the Brolga, a significant bird in Aboriginal culture, and the decline of some other bird life such as the Little Bittern and Spotless Crake. It also may have reduced the extent of potential nesting habitat for some species of waterbird (Chesterfield et al. 1984).

5. Trampling of vegetation on the periphery of wetland areas which may deprive waterbirds of food and shelter. Some of the areas and birdlife are protected under the Ramsar Wetlands Convention, 1972 and the JAMBA and CAMBA, Migratory Birds Agreements, eg the Latham's Snipe.

6. Loss of understorey vegetation and effects on species which feed, nest, or shelter close to the forest floor.

7. Compaction and disturbance of the soil and litter layer, adversely affecting burrowing snakes and lizards that were once more common in these forests.

8. Exacerbated impacts on the vegetation of the box ridges because of the restriction of cattle and horses to these areas of higher ground in times of flood (Wilson, K. 1989 Traditional Used Plants In The Barmah Forest Area: 44).

9. Soil disturbance, especially on wet or muddy ground, churning up wetland areas and damaging roads and tracks (see reports by Wilson and Bonhomme- 1989-90: pers comm Leon Atkinson Ranger, 2 Jan 1997).

10. Degradation of sites of natural or cultural significance. Cattle and horses often discharge their waste on sites of cultural significance which is viewed as a form of sacrilege on the cultural values that are of reverence to the Yorta Yorta.

11. Burial sites and other cultural features particularly along the box ridges are continually at risk from cattle desecration - see Yorta Yorta Fencing Program under the National Estate Grants Program-1990-94).

12. Cattle have been implicated in the spread of noxious, woody and environmental weeds, severely restricting re-establishment of threatened species and increasing nutrient loads to rivers that are already struggling with increased pressures from agricultural development.

13. Many river frontages and associated wetland areas are grazed by domestic stock resulting in loss of bank stability and increased pollution of water by animal waste and sediments-see impacts identified in Alpine region and their relevance to the mid Murray region.

14. Cattle also compete for limited feed with native animals in the forest areas.

15. Cattle have been recorded grazing in riparian zone vegetation at the backs of the lakes and lagoon systems eg Barmah Lakes & Nelsons Lagoon (pers observation & photographic evidence).

16. Feral horses (brumbies) and pigs also intensify the impact of hoofed animals on the preservation of natural and cultural values in the Barmah State Park and State forest.

17. Since Barmah State Park is a high valued wetland, grazing has a potential significant detrimental effect on wetland values. Grazing licenses and part of a water frontage license cover areas now within the State Park. (Management Plan for Yorta Yorta Cultural Environmental Heritage Project Final Report Yorta Yorta Clans Group Inc. 11 January, 2003).

18. Grazing by cattle and other hoofed animals may have had a detrimental effect on the species composition and structure of several plant communities in the forests and wetlands including changes to vegetation in areas that once supported palatable reeds and cumbungi which have taken over by giant rush. This is affected to the natural migratory patterns of the brolga, which is a significant bird in Aboriginal culture, and other bird life such as the little bittern and the spotless crake.

19. Breakdown of the soil caused by the trampling hoofs of cattle may have adversely affected burrowing snakes and lizards that were once more common in these forests. Other small birds and reptiles could also be disadvantaged because of the affect of hoofed animals.

20. When the forest is flooded cattle and horses inevitably gravitate to higher ground which supports box woodlands. Overgrazing of box ridges exposes mineral earth and permits dense colonies of introduced species to become established. Box ridges are very sensitive areas and when cattle are left in the forest over winter they cause soil disturbance on the dry box ridges (Wilson, Traditional used plants in the Barmah Forest, 1989:44). Experiments in similar environments have shown that grazing reduces both number of species and the biomass of ground plants.

21. Stock-grazing next to creeks is also implicated in the decline of native fish (Koehn 1993).

22. Cattle cause considerable localised soil disturbance, especially on wet or muddy ground, churning up wetland areas and damaging roads and tracks particularly those on higher ridges which are used more in the floods- see reports by Wilson and Bonhommie- 1989-90).

23. Cattle numbers are supposed to be reduced over winter to lessen the impact on the land (DCE 1992). In fact numbers are only reduced during prolonged droughts or floods, and usually supplemental feeding occurs instead of removal when all other available forage has been consumed (Leslie 2000).

24. Drought conditions and the depletion of food resources, cause cattle to move into riparian zones and feed on vegetation in these areas and along the river banks, thus normal sources of food are being supplemented by riparian zone vegetation.

25. Germination of red gum is also determined by factors such as insects, domestic and feral stock, which impact on and influence seed survival through grazing or trampling.

26. Grazing of cattle in Barmah State Park and on vegetation that provides a buffer zone for wetlands and bird habitats including the dropping of cow pats in the park which was designated for recreational purposes (pers obs).

27. Cowpats covered the grass plains and their pats and pugs had created a mud slick of the shoreline of Hut Lake, which was seriously devegetated (pers.obs.).

28. The moira grass plains in the western portion of Barmah State Park were found to be full of cattle in July 2001 (Orthia, L. Scientific evidence supporting the Yorta Yorta Management Plan for Barmah-Millewa: 19).

29. Diminishment of vigor of grasses by grazing and reduced competition for seedling (Leon Bren, Barmah-Millewa Forest, Conference, University of Melbourne, 18 June, 2005).

Other studies within Yorta Yorta lands have clearly shown the impacts of grazing by domestic stock on the natural environment. Grazing by stock was found to have significant impacts on:

- Groundcover Biomass
- Tree Regeneration
- Shrub cover
- Lignum cover
- Native grass type
- % Bare ground (reduction of grazing pressure at sites, creates more plant cover, & less potential for soil erosion and water runoff).
- Weed patches (e.g. annuals)

- Noxious weeds (Robinson & Mann 1998; The Management Plan for Yorta Yorta Cultural Environmental Heritage Project, 2003: 47-49).

2.3 Effects of Grazing on Yorta Yorta Heritage

2.3.1 Site Protection

Reports by Bonhommie, Wilson, 1995; local Site Officers, Cultural Officers, and Rangers on the impact of cattle on cultural sites and Indigenous vegetation reveals uncontrolled destruction and desecration.

In order to protect their cultural heritage from damage and desecration, the Yorta Yorta have been forced into a position where they have had to construct fences around sites, which inadvertently has accommodated the interests of graziers. Fences are an alien concept to Indigenous heritage management but one that is being used in many parts of Australia to protect sites from the impact of hoofed animals and vandalism. Some communities in Victoria have chose to construct cages around sites to protect them from wanton vandalism-see Site Protection Measures in Gariwerd (Grampians) and Mt Pilot in eastern Victoria (Yorta Yorta Fencing Program Under The National Estate Grants Program-1990-94).

Other anomalies arising from fences are that once a site is enclosed within a fence it creates an artificial perception of the original context of the site. Yorta Yorta people view the relationship between the site, and its surrounding environment including its structure and contents as one (see-Transcript of Evidence on Sites given by Yorta Yorta witnesses, Federal Court Hearing, Barmah Forest, 1996).

Some fences have been deliberately cut to allow cattle to graze. This is an ongoing occurrence at Bucks Sandhill in the Barmah Forest which was declared a permanent site by the Minister for Aboriginal Affairs, Victoria in 2002. It is one of the very few sites that has gained permanent heritage protection in Australia under the Aboriginal and Torres Strait Islander Heritage Protection Act, 1994 which operates concurrently with the Victorian Heritage Act, Part 11A, 1997 (pers comm with Yorta Yorta Site Officers, 1991-92; Transcript to Evidence, Yorta Yorta Native Title Claim, Federal Court, Barmah Forest, November, 1996; Permanent Declaration of Yorta Yorta Site: Barmah Forest-3 April, 2002, reported in Riverine Herald Echuca, 5 April 2002).

2.4 Graziers Justification for Grazing Cattle in Barmah Forest & Park

1. Generate income for graziers

2. Fire prevention,

3. For ‘cultural’ reasons, or to be more specific, because stock grazing has been allowed in the forest since the 1840s (DCE 1992).

The issue of socioeconomic inequality between the number of rather privileged grazers whose grazing interests are subsidised by having access to public land, by contrast to those who have no other option but to graze on their own land warrants critical assessment. The agistment fee graziers pay per head of cattle in Barmah probably doesn’t offset that inequality of access, and the use of public forests for the private gain of graziers. Access to public land allows those graziers, most of who are on the edge of the forests to increase their carrying capacity by 20% over and above other less privileged farmers.

As for the cultural importance of grazing, it is a false proposition that the import of what are relatively recent events that overlay 60,000 years of cultural continuity and sustainable land management practices, should take precedence over Indigenous occupation use and enjoyment of their ancestral lands and waters. It is an argument that is underpinned by the continuation of a colonial mindset that serves to maintain its position of domination and control.

2.5 Fire as traditional method of land management

Stock grazing (hereafter called simply ‘grazing’) is advocated as a fire prevention method based on the idea that cattle reduce the fine fuel load in the forest (DCE 1992).

From an Indigenous perspective this proposition is one that runs parallel with other imported notions of land management that are often used to overlay the integrity and the efficiency of Indigenous land management practices. Arguments like these are used to justify the vested interests of a small group of privileged graziers as discussed above. who benefit from having continued access to public lands for agistment purposes? These views are underpinned with what appears to be an obscure form of logical reasoning in that for the most part of the forests existence it has been managed by ‘fire stick farming’. Indeed the use of fire as a land management practice and a food production strategy has been an essential part of Australia’s history for at least 120,000 years (Singh ref here). Indeed it is asserted that the very nature of the vegetation in dispute is the product of fire. Take fire or controlled burning out the equation as a natural phenomena and the forest suffers from natural replenishment. Take cattle and other hoofed animals out of the equation and the forest can only enjoy greater relief from the impacts listed. Moreover the substantive evidence suggests that domestic stock grazing is no greater fire preventer than the natural grazing of Indigenous fauna. Silvers study dispels the myth of fire prevention by suggesting that stock grazing is not a useful fire prevention tool (Silvers 1993).

The Yorta Yorta are continually confronted with trying to dispel the tired old one liners that are promoted and often propped up by the regional media as the dominant discourse.

(Note: The McPherson Media have editorial control over the ten media outlets within the region See- Our Sites Link at: http://news.mcmedia.com.au/: see- also role of newsprint media in constructing non-Indigenous understandings of Indigeneity in the Goulburn Valley September 1994-December 2002 by Derryn Shoenborn, Are They Making This Up Or What, First Class Honors Thesis, Department of Political Science, University of Melbourne, 2003).

2.6 Other Destructive Impacts on Yorta Yorta Cultural Heritage.

In addition to the impacts listed there are a number of other activities that have a detrimental effect on the preservation and protection of Yorta Yorta heritage and cultural sites. These are:

• river erosion

• construction of tracks, levees and earth walls

• logging

• recreation (camping, construction of fireplaces and picnic tables)

• bardi grub digging

• casual earth removal

• fires,

• horses and rabbits

Linked to this issue of destruction of cultural sites has been the failure of government departments to ensure the adequate protection of Aboriginal sites.

2.7 Impact of Cattle in Alpine National Park & relevance to Barmah Millewa

Like the Barmah Forest, in the mid Murray region, Victoria's Alpine National Park has suffered grazing and trampling by cows for 150 years. Similar to the Barmah Forest the effect of cattle in the Alpine and catchments region, has caused damage to streams and wetlands at watering points, causing, increased situation and nutrient loads in streams. This affects rivers and dams downstream, and cause many changes in underwater life. The introduction of pathogens to waterways can cause health problems for park visitors, and for other water users downstream. Cattle grazing in the Alpine region affect a variety of vegetation species. At least 15 plants and animals, and several vegetation

communities, are listed under Victoria's Flora and Fauna Guarantee Act as being at risk from cattle grazing, and a further 30 plants in grazing license areas are listed as vulnerable. One plant only found in Victoria on the Dargo High Plains, the Carpet Willow Herb, for example, has not been sighted since 1933. As with the Barmah Millewa region there is sufficient substantive evidence in support of the view, that the removal of cattle will significantly improve the quality of water and will prevent the further impact on the unique biodiversity of the proposed Alpine National Park (Australian Alps National Park Website at: **http://www.onebigpark.com/**

Given that the Barmah Millewa Forest is in the mid region of the impacts identified in the Alpine country, the Alpine statistics have direct relevance. Indeed it strengthens the case for the setting aside of the Barmah Millewa area as a National Park and supports the call for the phasing out of cattle in the study area (Yorta Yorta Management Plan, 2003).

2.8 Yorta Yorta Policy on Cattle

While these are the generic impacts of cattle on natural and cultural heritage values it is clear, nonetheless, that the removal of cattle would greatly benefit Indigenous plants, animals, and sites, by reducing grazing pressure and physical disturbance. The overwhelming substantive evidence from the introduction of cattle in the early 19th century to the present vindicates the view that hoofed animals are incompatible with the preservation and the continuity of natural and cultural values (Barmah Management Plan, 1992:52-53).

The impact of grazing in the upper reaches of the Murray and the Victorian Governments decision to ban cattle in the National Park supports the evidence of the negative effects of grazing in the mid section of the Barmah Forest.

Goals

• To maintain the land and waters in a natural and healthy state

• To help conserve places and sites identified as having heritage values to us and to the Register of the National Estate.

Policy
The Yorta Yorta favors a gradual phasing out of grazing within the claimed land with a complete removal of cattle in the longer term. In the interim, we aim to minimise the impacts of stock on water, soil, flora, fauna, archaeological and other Aboriginal sites by limiting grazing to designated areas at designated times.

Proposed Actions

• Phase out stock-grazing from the claimed lands in the longer term.

• Stop winter grazing of our claimed lands.

• Remove stock-grazing from the riparian zone, around the Moira and Barmah Lakes, and from all areas listed as Ramsar wetlands, National Estate Registered places of natural value.

• Review the impacts of stock-grazing at other sites and amend management as required.

3. Logging impacts

3.1 Timber Harvesting

Timber harvesting by Europeans has occurred throughout the Yorta Yorta lands since the 1840s. It is now concentrated on the large red gum forests along the Murray, Edward, Ovens and Goulburn Rivers but also includes the box-ironbark forests at Killawarra and Rushworth.

Historically, timber-harvesting also happened in the Warby Range and in cypress-pine woodlands close to the Murray (LCC 1983). By far the main effect of this persistent logging on our cultural and natural heritage has been the selective removal of larger trees (see Bennett *et al*. 1998). This has resulted in:

• Loss of habitat for the 64% of mammal species in the region that require hollows (Bennett *et al. 1*998)

• Loss of habitat for the 37% of landbirds that nest in hollows

• Loss of breeding sites for the endangered Superb Parrot, a key species of the Yorta Yorta lands.

• Loss of habitat for animals and birds that need larger trees for food resources (Robinson & Traill 1996)

• Loss of habitat for wildlife dependent on fallen timber (e.g. Laven & McNally 1998) and

• Loss of cultural sites through the destruction of scarred trees. In addition, recent studies have suggested that logging of the red gum forests has resulted in the removal of as much as 85% of the fallen timber debris which occurred on the floodplains before European contact (McNally & Parkinson 1999).

One of the main components of structural complexity in red gum forests is thereby missing over extensive areas of our lands, again leading to major changes in the ecology and sustainability of the environment (McNally & Parkinson 1999).

Red gum is an important source of timber for sawlogs, sleepers, piles, landscape chipwood, firewood and charcoal (MDBC 1992). The long-lasting timber from grey and black box is harvested for fence posts (MDBC 1992). Commercial harvesting of live trees takes place in the forest under licence, as does commercial harvesting of firewood timber (DCE 1992), but unlicensed collection of fallen timber is also permitted (*Riverine Herald* 13th July 2001).

Timber from the Barmah-Millewa forests has been harvested extensively since the 1860s (DCE 1992). The demand for red gum timber was so high in the 1870s that the section of the Barmah Forest from the river to two miles inland was wholly or partly worked, and the then Victorian Secretary for Agriculture estimated that the forest would be entirely used up within 4-6 years (Fahey 1987). This overworking of the forest has resulted in the existence at present of extensive areas of even aged stands which all regenerated in the 1870s and 1880s (Dexter 1979). This obviously does not reflect a natural distribution of age classes, and this has implications for the Barmah-Millewa biota, which requires a diversity of age classes (Dexter 1979). Logging of live trees still takes place in the forest, and is often associated with practices such as ring barking and poisoning of non-merchantable mature trees to maximise young tree growth (Lacey 2001). Ring barking in the past has altered understorey vegetation (Chestefield 1986) and destroyed habitat trees (Webster & Ahern 1992). In box-ironbark woodlands, live timber harvesting has altered vegetation structure and composition (Robinson & Traill 1996).

Current forest management authorities recognise the need for the conservation of habitat trees, but with one qualification. Only the bare minimum number of habitat trees need be conserved (Lacey 2001). This policy does not recognise the possibility that for tree-dwelling organisms to thrive, they need to have their choice of a range of habitat trees, and they also need room to colonise more habitat trees if they increase their numbers. McIlroy (1978) found a relationship between the number of different types of hollows and the numbers of hole-nesting mammals and birds, and also found that many animals were highly selective in the type of cavities they used. A shortage of suitable home sites and the resultant competition is the main limiting factor for scientific evidence supporting the Yorta Yorta Management Plan for Barmah-Millewa.

some populations of hollow nesting mammals (McIlroy 1978). The superb parrot is a good example of an animal that is choosy about nesting cavities: parrots prefer to live-in broken hollow limbs (spouts) or in holes in limbs of large, mature, healthy eucalypts adjacent to watercourses (Webster & Ahern 1992). Hollows do not form in red gums until they are at least 140 years old (Parson 1991), so it must take a longtime for a range of hollows to form in a forest. Considering that red gum forest has the highest proportion of whole nesting birds of any vegetation type in Victoria, harbouring parrots, ducks, falcons, cockatoos, tree creepers, pardalotes, kingfishers and owls (Loyn 1985 cited in Parson 1991), a lot of trees with hollows are required to cater to the needs of all the animals present. Micro chiropteran bats, possums and gliders also nest in tree hollows (Parson 1991). In Barmah-Millewa, squirrel gliders and brush tailed phascogales are the most significant tree nesting mammals (LCC 1985).

The carpet python (*Morelia spilota variegata*), which is endangered in Victoria, also relies on large hollow trees in the Barmah Forest (DCE 1992). It stands to reason then that the longer the forest is left alone, the more diverse the hollow tree population is, and the more diverse the community will be. Logging in the vicinity of habitat trees can also have an adverse effect on animals. Superb parrots have been observed to become agitated and to refuse to enter their hollows when humans are around (Webster & Ahern 1992). They would almost certainly be disturbed by logging activity taking place below them, even if the trees being logged were not important for habitat. Large, mature trees are not only important for providing homes, they are also important suppliers of food. Old trees can supply an abundance of nectar and insects, as well as catering to the more specialised palate with food sources such as peeling bark, rotten wood, and the grassy gaps between big trees, some of which regent honeyeaters rely on (Robinson & Traill 1996). Destroying such trees simply because they are of no economic value clearly conflicts with conservation imperatives.

Logging even some distance away from habitat trees can impact on species. Superb parrots rely on box ridge communities for foraging (Webster & Ahern 1992), which means they need the trees to be intact. Logging has been identified as a threat to box ridge integrity, and the cessation of logging (as well as grazing, mentioned above) on all box ridges within 10 kilometers of known superb parrot nest sites was recommended by Webster & Ahern (1992), which should mean timber harvesting should cease on almost all box ridges within the Barmah-Millewa forest.

It has been estimated that to maintain viable populations of large mammals that cannot move out of a habitat patch, reserves should be at least 6,000 hectares in size, possibly 20,000 hectares (Tyndale-Biscoe & Calaby 1975). If that were the case for a hypothetical hollow-nesting species, then it is arguable that 20,000 hectares of forest should be reserved from logging to give the population the best chance of surviving into the future.
The collection of ground wood is just as much of a concern as the logging of live trees, if not more so. MacNally & Parkinson (1999) have estimated that 85% of pre- European amounts of coarse woody debris on the Murray floodplains is regularly removed for firewood and timber harvesting – in other words only 15% remains. It is well established that fallen wood provides significant habitat for terrestrial organisms (Parson 1991), including the carpet python (DCE 1992). Laven & MacNally (1998) Scientific evidence supporting the Yorta Yorta Management Plan for Barmah-Millewa – Lindy Orthia – Page 26, found that woodland birds occurred significantly more frequently and in greater diversity in areas containing fallen timber than in areas without, possibly because fallen wood offered more food, more foraging opportunities and/or more shelter from predators.

Fallen wood is also an important part of aquatic environments on the floodplain. Because red gum logs don't rot under water, they can last there for thousands of years (NRE no date c). Red gum snags in waterways have been compared to ocean reefs because they are relatively permanent habitats (NRE no date c), providing a substrate for fish eggs and shelter for fish (Wharton 1970; Cadwaller 1978). The removal of snags for flood mitigation since the early 20th century (Wharton 1970; Hibbins 1991) has been disastrous for native fish populations (McKinnon 1997), and authorities have started returning snags

to waterways (NRE no date c). But coarse woody debris on the floodplain itself (ie, not just in permanent waterways) is also important habitat, for example for aquatic invertebrates (Walker 1985). It enhances the detention and concentration of organic matter on the floodplain, facilitating its use locally (Kauffman & Krueger 1984), and it reduces flow rates, causing longer flood durations and more widespread flooding and natural ponding of floodwaters (Ward 1991). It also assists in the formation of "pools, scour holes, gutters and general undulations in the substrate", which is the key to fish diversity: streams with simplified habitat are often dominated by generalised exotic fish, whereas high quality, complex habitat waterways are more likely to harbour native species (Koehn & O'Connor 1990). General debris on the substrate increases the number of potential nesting sites for freshwater blackfish (Cadwaller 1978). Floodplain debris also washes into rivers under natural flooding regimes (MacNally & Parkinson 1999), diversifying in stream habitat.

3.2 Yorta Yorta Policy on Timber and Proposed actions

Goals

- To maintain the claimed lands in a natural and healthy state

- To preserve the remaining native forest habitats in order to conserve native wildlife species and help control erosion

Policy

The Yorta Yorta favors the gradual phasing-out of timber production in the claimed lands. In the interim, timber production should be limited to designated areas where it has minimal on environmental, recreational and cultural values.

Proposed Actions

- Phase out timber-harvesting and silvicultural operations in the claimed lands.

- Prepare a re-forestation plan for those areas that have been degraded by past activities for the purpose of controlling soil erosion, improving wildlife habitat diversity and improving water quality.

4. Water Issues

4.1 Changes in Water Regimes

As already emphasised in this document, Yorta Yorta people are predominantly water-based people. The provision of natural water flows is therefore fundamental to the

continuation of our culture and traditional rights because of its fundamental role in replenishing our natural environment and ensuring the survival of our ancestral lands. In this context, we have never made a distinction between the terrestrial and aquatic environments within our lands but have always seen them as part of one, holistic system.

As has also been emphasised within this document, the Yorta Yorta lands include some very large wetland systems whose natural functions, survival and productivity depend entirely on regular flooding from the bigger rivers such as the Ovens, Goulburn, Murray and Edward.

Unfortunately, as has been well documented (e.g. Bren 1 990; Cadwallader & Lawrence 1990; Close 1 990; Jacobs 1 990), the aquatic environments within the Yorta Yorta lands have been just as modified as the terrestrial environments. The major changes to the natural water regime have been as follows:

- Significant reductions in the frequency, extent and length of floods, resulting in far fewer wetlands being flooded than formerly

- Fundamental shifts in the timing of flooding from late winter and spring (as a consequence of winter rainfall and snow melt) to summer and autumn (as a consequence of controlled releases from dams for irrigation)

- The artificial creation of permanent wetlands from what were once intermittent wetlands, because of summer releases of excess water

- Changes in the temperature regime of regulated rivers, because of releases of cold water from storage dams

- Massive increases in nutrient and sediment runoff as a consequence of agriculture and vegetation clearance throughout the catchments

- The creation of barriers across most of the major waterways, so preventing the movement of in stream wildlife

- The removal of thousands of logs from the streams to ‘facilitate’ stream flow in time of flood

- The introduction of exotic species of fish, and

- Major earthworks along some of the rivers and creeks for channelisation works.

In the Warby Range and Chesney Hills, just as severe a change in water regimes has occurred as a result of the selective grazing and degradation of land with springs, and the exploitation of groundwater aquifers for irrigation.

Some of the effects of these changes on the aquatic environment have already been noted

(e.g. 4.1 .4). In summary, though, all of these changes have caused massive environmental
degradation of the waterways within Yorta Yorta lands as indicated by:

- Large declines in the abundance of native fish, leeches and snakes (see 4.1.4)

- The classification of three-quarters of the native fish species within Yorta Yorta lands as threatened wildlife (e.g. Robinson & Mann 1996)

- The lack of breeding by many species of waterbirds in Barmah Forest since 1970

- The failure of some species of fish to breed or to migrate to their breeding grounds
- The removal of breeding habitat for fish and other wildlife

- Changes to the natural drying and wetting regimes of nearly all wetlands

- Changes in vegetation (for instance, the replacement of Moira Grass Plains in Barmah Forest by Giant Rush and River Red Gum, Chesterfield 1 986, and the transition from Grey Box to River Red Gum along some of the creeks, Robinson & Mann 1996)

- Declining tree health as a consequence of altered flooding regimes

- Increases in outbreaks of blue-green algae (Bren 1990; Robinson & Mann 1996).

4.2 Restoring a natural water regime

The regulation of the Murray River by construction of a series of dams, weirs, levees, block banks and regulators, as well as by snag removal and channelisation, has dramatically altered the way water flows through the Barmah-Millewa floodplains (Dexter 1978; Leitch 1989; MDBC 1992; McKinnon 1997; Kingsford 2000).

Before European colonisation, the Barmah-Millewa forests would flood almost every year between August and December as rain and snow melt increased, with a peak in October, followed by a dry period through summer until the following winter (Dexter 1978; 1979; Walker 1985; Leitch 1989; MDBC 1992). When the river was in flood, water was forced into the forest as it pooled behind the Barmah Choke, the narrow river channel that runs through the forest (Kingsford 2000), and spread through the forest via a network of runners or effluent streams, which overflowed in sheets as they filled (Parson 1991). Floodwaters were necessary to sustain the ecosystem, because mean annual rainfall to the area (460mm) is far exceeded by mean annual evaporation (1530mm) (Glazebrook & Robertson 1999), and underground aquifers, which trees rely on for water after flood recession (Bren 1987), require floodwaters to replenish them (Bren 1989). The floodwaters were so plentiful that they allowed the growth of red gum to heights of 45 metres, where elsewhere the species grows only to around 12 metres (Parson 1991).

The flood regime was responsible for maintaining ecosystem diversity in Barmah-Millewa. The slight topographic variation in the forest system meant that the exact timing, duration and depth of natural inundations varied slightly across the landscape, and this temporal and spatial heterogeneity accounts for the variation in vegetation types (Chesterfield 1986; Ward 1999). Grey box woodlands grew where the floods never reached, yellow box woodlands could stand the occasional slight inundation and black box woodlands grew where floods were rare (Chesterfield 1986).

The understorey species in these woodlands varied with flooding conditions, for example, tangled lignum (*Muehlenbeckia florulenta*), which likes to be flooded every 3-10 years (Craig *et al* 1991), was common under black box (Ward 1999), while grey and yellow box woodlands supported a rich array of shrubs, annuals and tussock grasses (Chesterfield 1986). Red gum, which has evolved a number of anatomical and physiological adaptations to inundation and drought (Bren 1989), grew where flooding occurred most years for a prolonged period, but where there was a complete drying out of the soil at least every 18 months (MDBC 1992). Six months wet/six months dry flood cycles drive out all other woody species but red gum (Bren 1987).

The red gum understorey varied with flood duration (Leitch 1989), but mostly it consisted of species of vegetatively producing monocots that could stand prolonged inundation followed by drought stress (Chesterfield 1986). The warm summer temperatures and soil moisture following a flood promoted luxuriant growth in understorey grasses, while winter rains had no effect on their growth because the plants are dormant in winter (Chesterfield 1989). Where the land was flooded every year for at least two months, and where floods were too deep and/or too long for red gum seedlings to survive, grass plains formed, dominated by moira grass (*Pseudoraphis spinescens*) (Ward 1991; MDBC 1992; Bren 1999). Moira grasslands were the first to flood each year and the last to recede (Ward 1991). Rushlands grew in the areas that endured inundation for extended periods of time (Kingsford 2000), from 8 to 33 months (Leitch 1989).

The wet-dry cycles also maintained diversity within more wholly aquatic communities. Before regulation, there were few permanent wetlands in the Murray- Darling Basin (Briggs *et al* 1997), but there were many semi-permanent wetland habitats such as backwaters, billabongs, cowals, lagoons, marshes and swamps (MDBC 1998) which filled and dried with the river level (Briggs *et al* 1997). These wetlands, particularly the billabongs, often contained communities of organisms which were taxonomically distinct from those in the mainstream and which were highly diverse (Hillman 1986; Parson 1991). This was partly because the low turbidity of the billabong environments allowed the extensive growth of macrophytes, which provided an array of microhabitats for animals including zooplankton, microcrustaceans, rotifers and insect larvae (Hillman 1986; Parson 1991). These organisms were important food items for higher order animals, including juvenile fish (McKinnon 1997), waterbirds, particularly when breeding (Llewellyn 1983; Maher & Carpenter 1984; Briggs *et al* 1997), bats (Law & Anderson 1999), water rats (Woollard *et al* 1978) and turtles (Chessman 1988). The natural wetting and drying cycles maintained the diversity of these semi-permanent wetlands because there was insufficient wet time for any species of plant, invertebrate or

fish to become dominant (Pressey 1986; Briggs *et al* 1997). Periodic floods were also important because they 'liberated' billabong fauna into the mainstream, replenishing the diversity there and providing preferred food items to mainstream-dwelling native fish (McKinnon 1997).

Wetting and drying cycles maintained nutrient cycling and primary production on the floodplain. Periodic inundation facilitates the fast breakdown of terrestrial litter by bacteria and aquatic invertebrates, for whom it is an important food source, releasing the nutrients held in litter into the aquatic food chain (Pressey 1986; Leitch 1989; Glazebrook and Robertson 1999). It also allows nutrients and sediments from the river to accumulate in floodplain soils, increasing soil fertility (Leitch 1989; Glazebrook & Robertson 1999). Macrophytes and biofilm organisms, the main primary producers for the riverine system, relied on periodic inundation to grow (Glazebrook & Robertson 1999). On the other hand, periodic drying stimulates the breakdown of accumulated soil organic matter for use by terrestrial organisms and prevents the accumulation of harmful reduced ions in the soil (Pressey 1986). It allows the growth of terrestrial and marginal vegetation that also contributes nutrients to the system (Pressey 1986).

The natural flooding regime is believed by scientists to have played an important role in maintaining populations of native fish in Barmah-Millewa. In his five year study of fish communities in the Barmah forest, McKinnon (1997) found that the diversity and density of native fish was greatest during larger, more 'natural' flood events (compared to smaller, more regulated events). He attributed this to a number of factors: increased food production on the floodplain, greater habitat availability, the triggering of cues to spawn by rising water level, and increased migration to the forest from elsewhere in the river system because barriers that were normally in place (such as weirs) were drowned out by the flood. Earlier authors also found that rising water levels can trigger spawning in species such as the silver perch (*Bidyanus bidyanus*)(Koehn & O'Connor 1990), which is critically endangered in Victoria (NRE 1999),and the vulnerable golden perch (*Macquaria ambigua*) (Morison 1989; NRE 1999).

Those species lay pelagic eggs which are carried into the floodplain by floodwaters (Morison 1989), or which are carried downstream in the river (Cadwaller 1978), thus necessitating upstream migration of adult fish at spawning time from up to 900 kilometers away (Cadwaller 1978; McKinnon 1997). Floods that endure for a reliable length of time are vital for fish species such as the western carp gudgeon (*Hypseliotris klunzingeri*) and the freshwater blackfish (*Gadopsis marmoratus*), which lay their eggs on aquatic vegetation, hollow logs or debris, where they are vulnerable to desiccation if there is a sudden drop in water level (Cadwaller 1978; Koehn & O'Connor 1990). In addition, native species such as the murray cod (*Maccullochella peelii*), freshwater catfish (*Tandanus tandanus*) and trout cod depend on floodwaters to trigger the growth of abundant food stocks for their young (Morison 1989).

Other species, such as the crimson-spotted rainbow fish (*Melanotaenia fluviatilis*), take advantage of the additional habitat and food provided by the floodplain to boost their numbers by spawning (Morison 1989). Frogs also relied on the natural flooding regime to

provide a plentiful food supply and dense cover in rush land vegetation (Leitch 1989). Permanent billabongs disadvantage frogs because they allow the growth of fish, which eat frog eggs and larvae (Healey *et al* 1997). The reliability of floodwaters was important to frogs, because sudden changes in water level can expose their eggs to desiccation or can sweep them away (Leitch 1989). Healey *et al* (1997) noted an increase in frog abundance when the water level of the wetlands they were studying rose after rain. Some tortoises too need semi-permanent water bodies for food and breeding. *Chelodina longicollis*, a resident of Barmah-Millewa, has a preference for water bodies that are shallow, ephemeral and/or distant from the main Murray channel because they are less likely to contain fish competitors (Chessman 1988). Tortoises lay their eggs above the high water mark in autumn, when the forest was usually dry under natural conditions (Leitch 1989).

Many waterbirds were also dependent on the flood regime to breed successfully. The floods brought an increase in food for waterbirds (Llewellyn 1983; Pressey 1986; Briggs *et al* 1997; Briggs & Thornton 1999): not only were billabong fauna, fish and fish larvae abundant as noted above, but terrestrial organisms were flushed into the water and yabbies may have become more active (Llewellyn 1983). An important food source for waterbirds in the Murray-Darling system is chironomid larvae, in particular *Chironomus tepperi* (Maher & Carpenter 1984). Success ional changes in chironomid species have been observed to occur in wetlands post-flooding, with *Chironomus tepperi* being most abundant early on and chironomid production dropping off rapidly after two years of continuous inundation (Maher & Carpenter 1984). This indicates the importance of wetting and drying cycles to successional processes supporting the floodplain food chain. Nests surrounded by water also offered water birds some protection from disturbance (Loyn 1989) including by predators (Carrick 1962). Mature river red gums in and around the wetland environment were important to many waterbirds for nesting (Briggs & Thornton 1999), cover and perching (Llewellyn 1983), and as noted above, wetting and drying cycles promote red gum growth. The duration of floods was clearly important to water birds too, as several species have been noted to abandon their nests before completing their breeding activities if there is a drop in the water level (Carrick 1962; Briggs & Lawler 1991; Briggs & Thornton 1999; Leslie 2001).

River regulation has resulted in changes to the natural wetting and drying cycles of Barmah-Millewa. There has been an overall reduction in the frequency and duration of flooding. According to some estimates, the forest is now flooded in less than half as many years as it was under natural conditions (Leitch 1989), and the flood duration has been cut by an average of one month per year (Leitch 1989). The average area of the forest reached by a flood event has decreased significantly (Leitch 1989). The timing of floods has also changed. Winter floods have decreased in frequency and duration (Walker 1985; Dexter *et al* 1986; Leitch 1989) while summer floods have increased in frequency (Dexter 1979; Walker 1985; Dexter *et al* 1986; Leitch 1989; Ladson 2001). Spring floods have become more variable (Leitch 1989), having once been very reliable (Dexter 1979). The water level in the Murray is kept artificially high in summer for irrigation purposes, but if irrigators cancel their water orders (for example, if it rains), the excess water enters the forest (Dexter 1979; Ladson 2001).

Regulators have been built along the Murray channel throughout the forest to prevent this from happening (Forests Commission 1977), but they are inefficient at keeping out summer floods (Chesterfield 1986; Ladson 2001). Some places that were once semi-permanent wetlands have now become permanent wetlands because of regulators and/or summer floods (Briggs *et al* 1997). Barmah Lake, for example, would normally dry out from February through to winter, but now remains wet until May or throughout the year (Leitch 1989), making it good habitat for exotic fish species and bad for native fish (Wharton 1970).

The general reduction in flows through the forest has meant that some rushlands that were once flooded for up to 33 months at a time are now rarely flooded for more than 9 months continuously (Leitch 1989). This has had a profound effect on the forest. The reduction in frequency, duration and depth of floods on the moira grass plains has allowed red gum stands to encroach upon them (Bren 1989; Ward 1991), reducing their area by 55% from 4500 hectares to about 1500 hectares in just 50 years (Ward 1991; MDBC 1998). Summer floods have allowed communities dominated by giant rush (*Juncus ingens*) or upright milfoil (*Myriophyllum crispatum*) to encroach on the moira grasslands too (Chesterfield 1986; Ward 1991). The superior ability of upright milfoil to capture flood sediments means there is a risk that soil will build up in the moira grass plain drainage basins, which will allow red gum to encroach more rapidly (Ward 1991); indeed it has been suggested that the moira grasslands will be extinct by 2050 if natural water regimes are not restored (Bren 1999). The work of Ward (1991) showed that the reproductive potential of moira grass is related to stem length, which is influenced by flood timing, depth and duration. Moira grass needs at least five months of inundation to attain a substantial length, and only large specimens flower.

Floods that start too early in winter or that recede too early have been shown to decrease sexual reproduction (Ward 1991), which is usually vital for maintaining genetic diversity and adaptive ability in populations (Breckwoldt 1986). Floods that recede too slowly in summer scald the ground (Ward 1991). Ward (1991) recommended that floods at least 0.5 metres deep that endure for at least five months and recede quickly in summer are required to sustain and increase the extent of moira grasslands. Less frequent flooding has been implicated in the decline in abundance of common reed (*Phragmites australis*) and cumbungi (*Typha angustifolia*) (Kingsford 2000), which were once prolific in the forest and dominant in reedbeds (Chesterfield 1986). It has caused a decline in the condition of red gum stands (Kingsford 2000), since the best quality stands of red gum are those that are inundated most regularly (Forests Commission 1977; Dexter 1979). Regular floods are important for keeping down the numbers of gum leaf skeletoniser moth (*Uraba lugens*) by promoting naturally occurring pathogens and by removing good conditions for pupation (Chesterfield 1986; Parson 1991). While this moth has as much right as the next organism to exist in the forest, it has the potential to outbreak in plague proportions if natural ecological checks (such as the flood regime) are not in place, and in plague proportions it can defoliate up to 60,000 hectares of forest at one time (Parson 1991). Regular flooding is also crucial for keeping down weed numbers: inundation has been

shown to reduce or eliminate exotic weed species that threaten community integrity (Ward 1991).

The impact of river regulation on water bird breeding has been well documented. Breeding colonies of avocets, stilts, grebes, coots, terns and swans in Barmah-Millewa had been virtually eliminated by 1980, because of the decline in nonemergent macrophytes due to water regulation (Leslie 2001). Breeding numbers of several other water bird species have also declined because of the reduction in nest security and food with shorter floods (Leslie 2001). In particular, the critically endangered little egret (*Egretta garzetta*) and intermediate egret (*Ardea intermedia*) and the endangered great egret (*Ardea alba*), which is protected under international migratory bird agreements (JAMBA 1981; CAMBA 1986), have declined in numbers by at least one order of magnitude, despite their former huge colonies (Leslie 2001).

Egrets and some other birds need five to eight months inundation with winter/spring floods to successfully complete breeding (Briggs & Thornton 1999) and they do not like heavily controlled breeding environments, which tend to contain fewer aquatic plants and invertebrates (Briggs *et al* 1997). As noted above, erratic changes in water level such as sudden rises and early recession can cause nest abandonment, and such changes are much more common under regulation than under natural conditions (Leitch 1989). Breeding straw-necked ibis (*Threskiornis spinicollis*) and Australian white ibis (*Threskiornis molucca*) are still relatively abundant in Barmah-Millewa, but their numbers have also declined by around one order of magnitude because of a reduction in flood duration (Leslie 2001). This is bad news for farmers, because ibis have always played an important role in controlling plague locusts in the region (Hibbins 1991), as their nesting time (August) coincides with locust emergence (Carrick 1962). Leslie (2001) argues that the impacts of river regulation on water birds were not fully recognised until the 1970s because it took that long for habitat structure and ecosystem function to collapse and for relic bird populations to expire. He contends: "the provision of an effective environmental flow strategy for the River Murray during the next decade will govern whether or not egret breeding persists in the forest" (34). Colonial water birds develop traditional attachments to nesting sites; if sites are left to deteriorate further then even a later reinstatement of a natural flooding regime may not entice them back (Leslie 2001). Briggs & Thornton (1999) recommended deep spring floods of 5-8 months duration with ample drying time between floods to encourage water bird abundance and diversity. Their earlier work found that there was some variation in nesting site preferences among water bird species, with birds such as cormorants, darters, herons and spoonbills (all of which also nest at Barmah-Millewa) preferring sites that were inundated for long periods or permanently (Briggs *et al* 1997). For this reason they recommended management for a mosaic of wetland environments with some areas of prolonged flooding (Briggs & Thornton 1999).

Regulation has had multiple deleterious effects on aquatic fauna. Small, regulated flood events have only benefited local fish populations because large, natural-style flood events are required to allow long distance native fish migrations to occur (McKinnon 1997). Tag-recapture studies have shown that most of the native fish breeding in Barmah-

Millewa during occasional large flood events have migrated from up to hundreds of kilometers away (McKinnon 1997), so small floods will not lead to large-scale recruitment. Most native fish require a specific water temperature range in order to breed successfully (Cadwaller 1978), so out of season floods may not be appropriate for them. Nor will water released from the bottom of weirs, which is generally colder and less oxygenated than inflowing water (Wharton 1970; Koehn & O'Connor 1990). Levee banks effectively reduce the floodplain area along the Murray (Cadwaller 1978) and restrict the movement of fish across the floodplain and between the floodplain and the mainstream (McKinnon 1997). Such movement may be necessary for juvenile growth (Morison 1989), so levee banks have a deleterious impact on native fish development.

The practice of 'locking in' floodwaters with regulators to reduce the total amount of water required to flood the forest has dramatic impacts on fish and other aquatic organisms. McKinnon (1997) recounts a 1992 flood event, where flooding along the Murray and Goulburn rivers was so extensive that waters were held on the floodplain for a prolonged period and went stagnant. Dissolved oxygen dropped dramatically and potentially toxic polyphenolic compounds accumulated in the water (McKinnon 1997). Oxygen levels were low because there was a reduction in the mixing of waters and because of a high oxygen demand by decomposers, factors which would disperse if flows were increased (McKinnon 1997). As a consequence of this 'blackwater' phenomenon, there was a major fish kill, including a kill of some natives such as murray cod and catfish, and murray crayfish (*Euastacus armatus*) emerged from the river *en masse* (McKinnon 1995; 1997). McKinnon (1997) recommended that flooding should be protracted, deep (to 1 metre) and continuous to flush out lentic water bodies and the whole of the floodplain adequately, and should be followed by a fast early recession, in order to create an ideal environment for fish.

The majority of fish now living in the forest are exotics, primarily European carp (*Cyprinus carpio*) which comprised 44% of the catch during McKinnon's five year study, but also substantial numbers of goldfish (*Carassius auratus*), redfin (*Perca fluviatilis*) and mosquito fish (*Gambusia holbrooki*) (McKinnon 1997). The impacts of these fish on the forest environment are discussed in detail in another section of this paper, but there is a great deal of evidence to show that they keep native fish numbers down by competition and predation. The regulated flood regime suits the breeding requirements of these exotic species. They are able to breed without flood events, but can also take advantage of the abundance of food and habitats available during floods (Morison 1989). In McKinnon's study, carp recruited in both October and December, so summer floods add to carp numbers while contributing nothing to native species (McKinnon 1997). Barmah-Millewa is an ideal spawning ground for carp, as are irrigation channels (NRE no date a), so it may be difficult to control their numbers by simply changing the watering regime. On the other hand, introduction of a flooding cycle that mirrors the natural cycle as closely as possible would boost the number of natives, who might then have more of a fighting chance of eventually excluding exotic species by competition.

Robertson *et al* (1999) argue that alterations to environmental flow regimes have been the most important agents of change to the riverine carbon cycle since European

colonisation. The transfer of carbon between floodplains and rivers has been dramatically altered by the changes in the way the two environments are connected (Robertson *et al* 1999). Glazebrook & Robertson (1999) have commented that summer/autumn floods decrease litter standing stocks in low-lying areas, increasing the C: N: P ratios and reducing the amount of nutrients available to support spring biological production. This affects primary producers (macrophytes and biofilm) and through them the whole food chain (Glazebrook & Robertson 1999). Restoration of natural wetting and drying cycles in Barmah-Millewa is essential in order to prevent the further loss of moira grasslands, rushlands, aquatic vegetation, breeding water bird colonies, native fish stocks, frog and turtle populations, invertebrate diversity, nutrient cycling, successional processes and primary production systems. They are necessary to maintain ecosystem, species and genetic diversity in the forest. Some steps have already been taken by management authorities to improve the environmental flows through the wetlands. Barmah-Millewa currently receives an environmental water allocation of 100GL, which has been used twice, in spring 1998 and spring 2000 (Ladson 2001). This amount of water is insufficient to flood the forest alone, but it is useful as a 'top up' to natural floods (Ladson 2001).

Summer floods still occur in the forest, although an agreement between the Victorian and New South Wales governments means that they are diverted to the Barmah forest and the Millewa group of forests in alternate years to reduce permanent inundations on either side (Ladson 2001). Levees, block banks and regulators are still in place and still prevent floodplain waters from wholly mixing with the mainstream. In all, the current flooding regime is still insufficient to fully maintain the biodiversity and ecological processes of Barmah-Millewa. Floodplain areas are part of large, integrated systems (McKinnon 1997), so their proper management necessitates a holistic rather than piecemeal approach. Since most of the water entering the forest during a flood comes out again downstream (Dexter 1978; Johnson 1984), allocating more water to Barmah-Millewa would not mean 'losing' all that water to the environment. Lack of water is not a solid argument against restoring environmental flows. The main problems are

- the levees, block banks and regulators which increase flow efficiency past the wetlands (Kingsford 2000), and impede flood recession and thus risk water stagnation (McKinnon 1997), and

- the seasonal changes in flow regime to suit irrigators.

The issue of irrigation uses is a big one that must be solved on a regional or even national basis and is beyond the scope of this paper. But it is a problem that affects more than just Barmah-Millewa because of the impacts that irrigation can have on the water table and salinity. Australians certainly need to consider adopting more sustainable farming practices if we are to continue farming at all in this country. As a part of that discussion that needs to happen, we should be considering the physical deregulation of waterways for the sake of the environment. The Yorta Yorta are standing firm on the issue of water regulation on their lands and will have a leading role to play in those discussions. As for the more localised issue of levees, block banks and regulators: their eventual removal will

no doubt be a very positive move for the biota of Barmah-Millewa. At the moment, they are all that stands between the forest and summer flooding, which is clearly very damaging to the ecosystem. Creative solutions to this problem are required urgently. The management of Barmah-Millewa for conservation, as a national park, instead of for resource use, may spark a renewed interest in the issue within the Australian public and appropriate solutions may be found.

4.3 Yorta Yorta Policy on Water

Goals

- To provide adequate care, protection and maintenance of water.

- To maintain the land and waters in a natural and healthy state

We favor a water regime system that emulates natural wetting and drying regimes, including the reinstatement of regular and seasonally favorable flood events of sufficient extent and duration by way of an environmental water allocation. We also wish to improve water quality within our lands.

Proposed Actions:

- Restore a water regime that emulates the natural wetting and drying fluctuations, through the use of environmental water allocations.

- Ensure that the Ramsar agreement is upheld for the nine Ramsar-listed wetlands, especially in terms of management of those sites.

- Nominate the Barmah-Millewa Forests for World Heritage listing.

- Reduce inputs of nutrients, sediments and herbicides into our waterways in order to improve water quality and the health of our waterways.

- Establish substantial buffer zones around all Ramsar-listed wetlands to give them adequate protection from degrading processes.

- Leave existing wetlands undisturbed from degrading processes, because of their importance in absorbing surface runoff from adjacent areas and in providing seasonal habitat for migratory waterfowl.

- maintain existing vegetative cover in the Yort Yorta lands to help ensure natural water cycling processes and the maintenance of long-term water quality water quality.

- protect groundwater aquifers and recharge zones from potential sources of contamination.

5. Other destructive impacts

5.1 Threats to Ramsar Convention

The Barmah Forest was listed under the *Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat* in 1982 because of the huge numbers of water birds nesting there, for the significant numbers of threatened species it harbors, and for its "ecological, recreational, tourist, scientific, educational, cultural, scenic and aesthetic features" (Wetlands International Website; Yorta Yorta Clans Group 2001, 113).

Not all conditions of the *Ramsar Convention* have been upheld under the current management of Barmah-Millewa. Article 3.1 of the convention states that the contracting parties shall formulate and implement their planning so as to promote the conservation and wise use of wetlands (Ramsar 1971). The reservation of most of Barmah-Millewa for forestry does not promote its conservation, as will be discussed in detail in a later section of this paper. Nor is forestry listed as a 'wise use' of wetlands under Ramsar criteria (Ramsar 1971; annex to Recommendation 4.10 of the 4th meeting of the contracting parties 1990). Grazing is included as a potential wise use of wetlands (Ramsar 1971), but it is also listed under the Directory of Important Wetlands in Australia as a potential threat or disturbance to Barmah-Millewa (2001; also Robertson 1998), so the stock-grazing regime as it currently stands may not qualify as a wise use. As has been described in the section above, the regulation of water through the forest also has adverse implications for conservation.

Article 3.2 states that each contracting party plus the IUCN should be informed if the ecological character of a wetland is changing (Ramsar 1971). However, a review of wetland inventories written under contract to the Bureau of the Ramsar Convention in 1999 found that the wetland inventory processes, methods and information in Australia were inadequate, and no inventories provided quantitative information on changes in the extent of wetlands (Finlayson & Davidson 1999). Clearly there have been substantial changes in ecological processes and the extent of some vegetation types, as outlined above, and the detailed investigation and documentation of this coupled with relevant action would seem to be an appropriate response if the Ramsar Convention is to be upheld by Australia. Article 4.4 states that the contracting parties should endeavor through management to increase waterfowl populations on appropriate wetlands (Ramsar 1971). The huge colonies of breeding water birds in the past and the present must qualify Barmah- Millewa as an appropriate wetland. Management activities have led to a reduction in waterfowl populations as has already been shown. This includes a reduction in populations of bird species protected under international migratory bird agreements,

such as the great egret, cattle egret (*Ardea ibis*), glossy ibis (*Plegadis falcinellus*) and red-necked stint (*Calidris ruficollis*) (JAMBA 1981; CAMBA 1986; Leslie 2001).

The Montreux Record of the Ramsar Convention (Resolution VI.1 passed at the 6th meeting of the contracting parties, 1996) is the principal tool for highlighting those sites where an adverse change in ecological character has occurred, is occurring, or is likely to occur (Ramsar 1971). The reductions to water bird and native fish populations plus the reduction in area of the moira grassplains in Barmah-Millewa certainly constitute adverse changes in ecological character. This has been recognised by some scientists within Australia: there is currently a proposal to list the aquatic ecological community in the natural drainage system of the lower Murray River catchment as an endangered ecological community (Fisheries Scientific Committee 2001; NRE no date b). It may also be appropriate to list Barmah-Millewa on the Montreux Record so that its situation receives international attention.

5.2 World Heritage Listing

Sites can be nominated for World Heritage listing for either their cultural or natural values, or for both (World Heritage Convention 1972). The large number of archaeological sites at Barmah-Millewa alone (Yorta Yorta Clans Group 2001) may warrant the forest's nomination for its cultural values, but an examination of that possibility is beyond the scope of this paper. In terms of natural values, Barmah-Millewa may meet three of the four criteria for nomination. Those criteria are:

(i). be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals; or

(ii). contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance; or

(iii). contain the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation. (World Heritage Convention 1972)

Criterion (i): The Barmah-Millewa floodplain formed around 30,000 years ago when land west of the Cadell fault, which reaches from Deniliquin to Echuca, rose 15 metres above the surrounding lands, cutting across the course of the ancestral main Murray channel (AHC 1992). The raised fault forced the ancestral Murray River to divert to the south (the present Murray course) and the north (the present Edwards River) (AHC 1992). Before these diversions were able to carve out new river channels, the Murray waters backed up towards the east, creating a broad shallow lake system (MDBC 1992)

that eventually became a floodplain. It is this floodplain and the unique fluvial geomorphology of the area that has enabled the Barmah-Millewa forest to develop, because normally red gum forms open woodland or a narrow strip of riparian vegetation, not a dense forest (Parson 1991).

The strong association between red gum and floods at Barmah-Millewa gives the place unique flora and ecology that is not representative of red gum forests generally (Chesterfield 1989). Thirty thousand years is not a long time in geological history, indeed it is recent enough that the story of the Cadell fault uplift and subsequent huge flood remains a part of Yorta Yorta culture (Wayne Atkinson, pers.comm.).

The great changes that have taken place on the Barmah-Millewa floodplain since the uplift suggest that the system may still be in the process of change – may still be undergoing 'ecosystem evolution'. We residents of the year 2001 are privileged to be alive at this time to witness such a dynamic system. Viewed from this perspective, Barmah-Millewa has great scientific importance, and can be considered to present a significant example of on-going ecological and biological processes in the evolution and development of terrestrial and fresh water ecosystems and communities. It also has unique global status as the largest river red gum forest in the world (Robinson 1998).

Criterion (ii): As this paper's aim is to write about Barmah-Millewa from a scientific perspective, it is probably inappropriate to comment on the forest's aesthetic values.

There are stories that the Yorta Yorta tell about the Murray that are magic. In certain seasons, the river water used to be so clear you could see right to the bottom almost all the way across (Wayne Atkinson, pers.comm.). Fish were so plentiful in the river that a person could dive down to below a red gum snag and tickle a fat murray cod's belly, making it rise to the surface (Wayne Atkinson, pers.comm.).

The land is vibrant and lush and, to the non-Indigenous visitor, gives an impression of a pre-land theft Yorta Yorta lifestyle that was incredibly rich and bountiful. Even now, the Murray in the forest is exquisite as mist rises above the water at dawn on winter mornings, and flocks of thousands of deafening corellas paint the red gum white. Those twisted, grand old trees are spectacular, growing, as they do, straight up out of the floodwater. The author defies anyone to go camping in the forest for just one night and not call it beautiful.

Criterion (iii): As has already been mentioned, Barmah-Millewa is a very important piece of remnant bush for the conservation of threatened species. Some of the threatened species it harbors, for example the regent honeyeater and the trout cod, are endangered nationally (Environment Australia 2001), and being Australian endemics, are therefore endangered globally, so they do have international value to science and conservation. The thirteen migratory birds protected under international agreements (JAMBA 1981; CAMBA 1986) that breed or reside in the forest also have global conservation significance. However, whether or not these species qualify as having 'outstanding universal value to science or conservation' is another matter.

Exactly what qualities species need to possess to fit this description is unclear from the convention itself (World Heritage Convention 1972). The species mentioned by name under 'official' brief descriptions of World Heritage sites, which presumably fit the description, are almost all vertebrates and are mostly large mammals (World Heritage Convention 2001). This may indicate that organisms need to be appealing to the general public of the world to be of world heritage significance (ie to have outstanding universal value). Species which are 'valuable' from a strictly scientific perspective may have little universal appeal, for example the mite *Brevipalpus phoenicis* has recently captured scientific interest because it is asexual and haploid (Weeks *et al* 2001), a condition that has not been observed in any other animal (Paul Sunnucks, pers.comm.). Despite its outstanding scientific value, the universal appeal of *Brevipalpus phoenicis* is questionable, and if it were threatened with extinction it seems unlikely that its habitat would receive a World Heritage listing to protect it.

This aside, Barmah-Millewa has a good chance of capturing the interest of the public and UNESCO anyway, because many of its threatened species do have charismatic 'cuddly-furry' appeal. The great egret, for example, was over-hunted in the nineteenth and twentieth centuries for its magnificent lacy breeding plumes, which are still coveted internationally (Tan 2001).

5.3. Reduce inputs of nutrients, sediments and herbicides

The range and amount of chemical compounds and sediments present in waterways has significant implications for carbon fluxes (Robertson *et al* 1999). Increased input of sediments and nutrients into the Murray River wetlands can shift primary production from macrophytes and biofilm to phytoplankton (Robertson *et al* 1999), with resultant impacts on organisms such as some water birds and fish that rely on macrophytes for food (Koehn & O'Connor 1990; Glazebrook & Robertson 1999; Leslie 2001). Some authors refer to the low turbidity of billabongs as an important characteristic for maintaining local biodiversity (Hillman 1986; Parson 1991), so increased sediments may adversely affect billabongs. Channel siltation and pesticides in water have been implicated in the decline of some River Murray crustaceans, such as the murray crayfish, *Euastacus armatus*, which is possibly extinct below Mildura (Horwitz 1990). Abundant sediment can smother the eggs of the Macquarie Perch (*Macquaria australasica*), a species that is endangered in Victoria (NRE 1999), whose eggs are deposited directly onto the substrate (Koehn & O'Connor 1990).

The current management plan for the Barmah Forest (DCE 1992) outlines concerns that a number of wetlands are silting up rapidly and that the Murray is becoming broader and shallower. It implicates erosion by boat wash as a major cause, compounded by the fact that the river water is continually high in the summer months (DCE 1992), but stock-grazing and the siltation activities of carp may also be important causal factors, as will be discussed in more detail below.

5.4 Buffer zones around wetlands

The role of buffer zones in protecting habitat that is surrounded by significantly altered landscape is well documented in conservation biology. The IUCN has suggested that buffer zones managed in an ecologically sustainable manner should surround reserves in order to adequately conserve biodiversity (SAG 1995 cited in Burgman & Lindenmayer 1998). In the case of Barmah-Millewa, degrading processes that should be buffered against include grazing, land-clearing, timber harvesting, erosion and salinity. Irrigated land south of Barmah-Millewa was found to have a water table sitting approximately 2 metres below the surface in 1988, compared with the Barmah Forest, which had a water table approximately 11-14 metres below the surface (Ife 1988). The irrigation mound was expanding towards the river including the forest area, which has clear implications for forest health (Ife 1988). The creation of a non-irrigated buffer zone around the forest would hopefully prevent or diminish the impacts of irrigation and other threats to the system.

5.5 Maintain existing vegetative cover for the sake of water cycling and quality

Riparian, riverine and aquatic vegetation plays an important role in bank and shoreline stabilisation (Parson 1991) and buffers soil against erosion (Kauffman & Krueger 1984). It also intercepts materials from overland flows (Robertson 1998), filters out nutrients (Parson 1991) and buffers waterways from other surrounding activities (Koehn & O'Connor 1990). Emergent or overhanging vegetation reduces evaporation by shielding water surfaces from solar radiation and drying winds (Anon. 1962). The integrity of vegetation in wetlands is therefore crucial for maintaining water cycling processes and quality.

5.6 Protect aquifers from contamination

The geology of Barmah-Millewa is relatively simple: most soils are cracking clays and loams that are lacustrine in origin (Bren 1999), but aquifers occur as sandy soils amongst the clays (Bren & Gibbs 1986). Aquifers are an important source of water for forest vegetation, particularly red gum, after floods recede (Bren 1987), and the best quality stands of red gum occur either where there is regular flooding or on top of aquifers (Dexter 1979). Yellow box trees may also rely on aquifers, as they tend to grow on sandier soils in the forest (Ward 1999). The protection of aquifers is therefore important in protecting the health of the forest.

5.7 Murray Lower Darling Rivers Indigenous Nations: 'Our Rivers our Life'

Indigenous nations along the length and bredth of the Murray are members of the Murray Lower Darling Rivers Indigenous Nations MLDRIN. Inclusive in this submission is their core principles in the present and future direction of water within the study area and broader Murray and Darling Basin and the need for the reinstatement of traditional replenishment regimes including the need for cultural flows. These and other matters are articulated in their information sheet which can be accessed at: http://www.mdbc.gov.au/news_room/media_release/Indigenous_gathering_170504.pdf

- MLDRIN is a confederacy of Indigenous Nations or traditional owners in the Lower Murray Darling Basin who come together to make collective decisions on our rivers in a respectful and holistic manner.

- Our core principle is that only traditional owners are best placed to talk for Country.

- MLDRIN does not interfere with individual Nation business. We are a combined Indigenous voice on the history, present state and future directions for the rivers and tributaries within the lower Murray and Darling Basin.

- MLDRIN has been working with various government agencies in NSW, Victoria, South Australia and Queensland, as well as the Australian Government.

Our achievements

MLDRIN has worked hard to achieve many things for our Peoples and Rivers:

- Signing of a Memorandum of Understanding with NSW Government in 2001: Employment of Coordinator:

- Ongoing inclusion and participation in *The Living Murray* decision making process through the Indigenous Partnerships Project:

- Ongoing negotiations with the Murray Darling Basin Commission and State and Territory Governments to assert our rights to land and water.

MLRDIN Membership

Nations that want to become members of MLDRIN should:

- Be within the Murray and Lower Darling Rivers Valleys:
- Elect 2 delegates from a Nation meeting and using your own internal Nation process.

Current MLDRIN Member Nations include:

- Wiradjuri
- Yorta Yorta
- Taungurung
- Barapa Barapa
- Wamba Wamba
- Wadi Wadi
- Mutti Mutti
- Latji Latji
- Werigaia
- Ngarrandjeri

Spokesperson for the agreement Ms Monica Morgan, believes that "The agreement establishes a process that ensures that Indigenous peoples can be involved in the management of the Murray and Lower Darling Rivers." See web link at:
http://www.dlwc.nsw.gov.au/mediarel/ma20011014_1065.html

There is a great deal of evidence in the scientific literature to support the Yorta Yorta's and MLDRIN's list of priorities regarding water issues. Most of the available literature on environmental issues in Barmah-Millewa examines the effects of water regulation which many authors (eg Robertson 1998) consider to be the biggest threat to the ecosystem. In this regard, the Yorta Yorta and conservation biologists are in agreement about what needs to be done by managers.

6. Cultural Heritage Matters

6.1 Program Agreement

It is recommended that a Program Agreement be developed in consultation between the Yorta Yorta and the Cultural Heritage Managers of the Aboriginal Affairs Victoria and the National Parks and Wildlife Service of New South Wales. The Program Agreement should include the following elements:

- Documentation of the consultation between the Yorta Yorta and the Cultural Heritage Managers;
- Implementation of the Yorta Yorta Cultural Resources Management Plan;
- Procedures for compliance with specific State and Federal legislation;
- Provision for monitoring and review of activities;
- Provision for revision of the Program Agreement

6.2 Comprehensive Burial Treatment Plan

It is recommended that a burial treatment plan should be developed which provides guidance for the discovery, disinterment, and curation of human remains and associated artifacts. The elements of the treatment plan should include procedures to handle inadvertent discovery or exposure of human remains in the absence of a qualified archaeologist, as well as procedures to handle discovery of human remains during archaeological monitoring. The treatment plan should include:

- Provision to divert or stop construction work, or stabilize exposed remains
- Notification procedures
- Provision for consultation
- Identification and evaluation procedures
- Criteria that will provide guidance on whether the remains should be disinterred or left in place
- Location of temporary curation
- Location of re-interment
- Provision for appropriate ceremonies

6.3 Inadvertent Discovery of Aboriginal Human Remains and Objects

- If the human remains or objects were discovered during earth-moving activities, the activity shall be suspended and reasonable efforts to protect the remains or objects shall be made. The appropriate State Cultural Heritage Organisation shall be immediately notified of the discovery. The Heritage Officer will then notify the Yorta Yorta. All activity in the area of the discovery shall be suspended until appropriate mitigative procedures have been agreed upon and performed;
- Disposition and control of the remains or objects shall follow the requirements of appropriate legislation.

6.4 Intentional Excavation and Removal of Human Remains and Objects

- Consultation with the Yorta Yorta is required prior to excavation or removal;
- An excavation permit from the appropriate State cultural heritage agency is required;
- Right of control of the disposition of human remains or objects shall be negotiated between the Yorta Yorta and the appropriate State agency;
- Proof of all consultation shall be provided by the applicant.

6.5 Discovery of Buried Cultural Deposits

It is recommended that if cultural resources are encountered inadvertently during an undertaking, work in the immediate vicinity shall be halted, the immediate vicinity of the site shall be secured, and the Yorta Yorta and appropriate State Cultural Heritage organisation should be notified. The following procedure should be followed:

. An *in situ* evaluation of the resources shall be made by a qualified archaeologist and a representative of the Yorta Yorta. Based on recommendations from these two people, decisions regarding treatment of the resources shall be made in consultation with the appropriate State Cultural Heritage Manager.

6.6 Priorities for Future Work

Monitoring and Research

Monitoring of the environmental and heritage areas should be an integral part of the implementation of this management plan. Monitoring should occur not only for specific projects but general monitoring should also be implemented.

Research into the environment and heritage within the Yorta Yorta lands should be a continuing part of the management plan in order to provide data which will support the implementation and further development of the plan.

The Australian Heritage Commission is actively involved in compiling or advising on a number of inventories. Priorities for implementation and completion of these projects and programs are suggested, but these priorities are subject to revision based on our needs,

the availability of funding, and conditions affecting the resources. The priorities are seen as follows:

Inventory

- Complete inventory surveys of the unsurveyed portions of Yorta Yorta lands, particularly the areas listed in Table 14;
- Identify, map, and describe all resources encountered
- Evaluate historic and prehistoric sites and places for significance
- Make photo documentation of all resources encountered
- Complete inventory surveys and documentation of Aboriginal Places

6.6.1 Proposed Areas for Archaeological Work

Area Recommended	Work
Eroding Shell Middens:	Column Sampling
Warby Range:	Inventory Survey
Green Gully:	Inventory Survey
Bullatale Creek:	Inventory Survey Sections of the Murray
Tocumwal – Cobram:	Inventory Survey
Cobram - Yarrawonga	Inventory Survey
Ovens Rivers:	Inventory Survey
Barham ‘Stadium”	
Massacre Site:	Documentation
Murray River/Campaspe R.	
Victoria Park:	Inventory Survey
Warby Ranges:	Inventory Survey

Assessment:

- Identify historic and prehistoric resources that are subject to destruction or deterioration from natural causes

- Identify historic and prehistoric resources that are subject to destruction or deterioration from human activities or neglect

- Identify the specific causes of destruction or deterioration

- Assess methods of stopping the destruction or deterioration

- Identify a suitable curation facility for artifacts, human remains, and documents

Treatment:

- Develop a program to stabilize resources that are subject to destruction or deterioration from natural causes, human activities, or neglect;

- Develop a program to rehabilitate resources;

- Develop a program to monitor the condition of fragile resources

Management and Interpretation:

- Maintain the condition of the sites through an active program of monitoring, repair, and stabilisation;

- Continue and expand the interpretative and public education program. Continue the program to collect oral histories from individuals that would have information about the Yorta Yorta lands;

- Develop and maintain a new sensitivity map that distinguishes between areas of known or potential sensitivity and areas known to be clear of cultural resources.

6.7 Yorta Yorta Policy on Cultural Heritage

Goal

To protect and maintain the cultural rights as Yorta Yorta people. This includes (but is not limited to) archaeological sites, traditional places, language and continuing practices.

Policy

We believe that the day to day management and care of our Heritage should come under the control of a management committee that will be directed by a Council of Yorta Yorta elders. Under this structure, Yorta Yorta people will scrutinise all policy decisions relating to cultural heritage matters within our lands and waters.

Proposed Actions

- The establishment of mechanisms which will enable Yorta Yorta control and protection of, and access to Yorta Yorta cultural property, including a definition of Yorta Yorta cultural property.

- A system of appropriate Yorta Yorta representation in employment and training as administrators, rangers and cultural officer positions within the claimed areas.

- Transfer of the Dharnya Centre to the Yorta Clans Group to develop as a cultural centre of national and international significance.

- Board of management involvement in public education in relation to Yorta Yorta Cultural Heritage.

- Mechanisms by which we will have rights to access and control all historical and present information and materials, including intellectual property rights, pertaining to our people, land and water.

- The compiling of, and control of, access to a detailed register of all information and materials pertaining to our heritage.

- The return of all skeletal remains and artefacts wherever located to the Yorta Yorta.

- The establishment of mechanisms to enable us to control and protect our traditional food and medicinal plants.

7. Management issues

There are four important management issues that need to be addressed. These are:

7.1 Joint Management Plan & Board of Management

A Joint Management Plan should be developed between the New South Wales Government, the Victorian Government and the Yorta Yorta. The Plan will establish a Board of Management in relation to the claimed land and waters. The Plan will reflect the acknowledgment by the New South Wales and Victorian Governments of our right to a key decision-making role in the management of the claimed lands and waters within the Yorta Yorta territorial boundary. Our participation in management in terms of day to day activities will be as an equal partner, not as subordinates providing advice when asked.

The Joint Management Plan will be part of a joint management arrangement in which we have management decision-making powers and a power of veto over all decision making in respect of the claimed land and waters. The Plan of Management will set out:

• The purposes for which the claimed land and waters are to be managed;

• The manner in which the management is carried out;

• Management guidelines for the claimed land and waters; and

Through the Board of Management we will be involved in management at all levels, including policy formulation.

If agreement is reached on the terms of a Joint Management Plan it will be subject to a constant review by the Yorta Yorta Nations Inc.

7.2 Board of Management

The powers of the Board will concern, amongst other things, management and control of water rights and utilisation regimes; timber production; grazing; general use of the claimed lands; and cultural heritage matters.

The Board of Management will be structured such that we have a majority representation. The Board of Management will include representation from the Victorian and New South Wales Governments. The Board of Management will make general policy decisions and the Yorta Yorta people are to have a power to veto over decisions made by the Board in administering the Plan of Management. Management decisions by the Board are to be implemented according to the Plan. For land and waters falling in New South Wales or Victoria the present Government departments involved will implement the Plan and Board decisions and will act on behalf of and subject to the decisions and direction of the Board and the Plan.

The Board of Management may receive advice as required from the advisory and decision-making structures, committees and other bodies that currently exist and operate in relation to our claimed areas.

Note: The Yorta Yorta are currently exploring existing JMA's operating in other parts of Australia with the view of adapting appropriate structures to meet the conditions and circumstances of their requirements.

7.3 The Dharnya Cultural Centre

A central part of long-term management of our lands must be one of public education. A major process in this approach is one of interpretation and explanation for both natural and cultural features and areas.

We believe that interpretation of Aboriginal places is a process of cross-cultural communication. This process has begun in Yorta Yorta lands with the creation of the Dharnya Interpretive Centre in the Barmah Forest. Currently the centre is controlled by

the Victorian Department of Natural Resources and Environment We recommend that the Dharnya Centre be restored to its former glory and transferred to the Yorta Yorta Nations Inc and that this centre be developed as a cultural centre of national and international significance. It urgently requires a capital injection from State Government resources so that it can enjoy the benefits of the cultural economy that other cultural tourism icon projects enjoy in Echuca and the Murray Goulburn region-see background to Dharnya Centre at p.5.

In addition to the Dharnya Centre, an interpretive plan should be considered for areas across the Yorta Yorta lands. The interpretive plan should serve a variety of audiences. These would include local residents, adults and children, visitors from other parts of Australia as well as overseas tourists.

The plan should establish and define the modes of interpretation. These would include, but not be restricted to directional signs, roadside interpretive signs, interpretive trails and brochures. Each of these elements should be integrated into a cohesive plan which follows consistent themes. The overall strategy would be to provide accurate information about the natural and cultural landscape within the Yorta Yorta lands and offer a variety of interpretive experiences ranging from the Dharnya Centre to specific sites.

7.4 Implementation Plan

A three-year implementation program will be prepared by us to ensure efficient implementation of this management plan. It must be emphasised again that the plan is just an initial presentation of our concerns and goals regarding the conservation of our natural and cultural heritage. The plan therefore will be updated and further developed as we learn more about our ancestral lands and waters.

The Appendixes on: Traditional Yorta Yorta Vegetation Uses, details of cultural and historic sites listed on the National Estate Register, and those Ramsar sites that are located within Yorta Yorta country and the study region are the final materials of this submission.

Yours Sincerely

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Wednesday, June 29, 2005

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Appendixes:

APPENDIX 1. TRADITIONAL VEGETATION USAGE BY YORTA YORTA

Bark:

Canoes, shields, mia mias and coolamons were all made from bark removed from living trees. The size and shape of the scar made by removing the bark indicates the use the bark slab was put to (see Figure 3.1).

The red gum and the three types of box were all utilised for their bark. There are a few box ridges that were extensively harvested for their bark, in particular Tongalong ridge (3 1), Ulupna Island ridge (46) and the two ridges north of Hammys plain (15, 26). All are in close proximity to the Murray river. No areas of red gum were found in the Barmah forest with an equivalent intensity of scarred trees as that of the mentioned box ridges.

Canoes:

Canoe trees are a feature of the Barmah forest as with other forests along the Murray River flood plain. The three types of trees used to make canoes in the Barmah forest were

red gum, yellow box, and grey box. Black box bark was also used to make canoes in the Barmah area, but no black box canoe trees are found in the Barmah forest itself. A contributing factor to this may be that there are very few black box trees included in the present day Barmah forest.

The original size of the canoe can be measured from the scar, if the re-growth is determined. As a general rule each metre of canoe carries one person ie a three metre canoe carries around three people. The canoe scars in the Barmah forest vary from about 1 .5 metres (a childs canoe) to a scar in excess of 8 metres on Barmah island. Often these scars are slightly pointed at one end and are rounded at the other. The pointy end becomes the bow and the rounded one becomes the stern (Gary Nelson pers. comm.).

Canoes were only made by men (Wally Cooper pers. comm., Gary Nelson pers. comm., Matthews 1893*).* They chose potential canoe trees carefully; free of knots and preferably with a slight bend in the trunk where the slab of bark was to be removed. By choosing a tree with a bend in it, the canoe bow and stern had natural clearance from the water and required little shaping when being cured.

The trees often had toe holes cut into the bark or branches propped up against the trunk to help the Aboriginal balance while chopping out the canoe with his stone axe. Removing the bark of the red gum and box trees can be difficult, besides tapping the canoe gently all over the surface to aid its removal, Aborigines also timed the removal of the bark. The bark is said to be easier to pry off "when the sap is running "or around late spring-early summer time (Sandy Atkinson pers. comm., Gary Nelson & Wayne Atkinson pers. comm.). The time of the day is also very important, R early in the morning when the bark is cold is easiest, as the day warms up so does the sap which becomes tacky and the bark becomes harder to remove "(Wally Cooper and Les Cooper pers. comm.).

After the canoe had been hammered over its surface, it was pried off the tree and lowered to the ground by means of twine. The bark slab is still easily broken at this stage and a leaf litter fire was used to dry out the sap, toughen and cure the canoe.

Canoes were used to transport both people and food from hunting and, gathering, grounds. They required skilful handling due to their frail and unstable nature and were posed through the wetlands to gather foods such as cormorant eggs, ducks and fish. Curr recorded that he was given fresh couch grass to sit on in the canoe (Curr 1883).

Fires were lit on hearths of wet clay in the bows for grilling a fresh duck or fish and 1 or keeping warm (Wayne Atkinson and Gary Nelson pers. comm; Curr 1965).

Mia mias:

The mia mias or shelters were made from either bark or leafy boughs or a combination of both depending on the season. In cooler weather the mia mias were made of bark and as the weather began to improve mia mias of leafy boughs were built.

Mia mias were constructed in a sort of big, half round lean to and could be made fairly quickly. Daniel Matthews was camping away from Maloga and the aborigines who accompanied him built a bough gunyah* for the evenings shelter (Matthews 1 879, 1882).

The bark for mia mias was removed from the trees in rectangular slabs, the upper and lower edges of the scar being marked by parallel stone axe marks.

The mark of the white mans steel axe is unmistakable on a number of the shelter scars particularly around Ulupna Island. Shelter scars are marked with parallel cuts using either steel or stone axe, or 'scissor' steel axe marks. It is possible that, either White man copied the technique of making the shelters out of bark from the Aborigines or that the steel axes were bought 1 traded by the Aborigines.

gunyah - Matthews frequently used this word as an alternative term to mia mia in his reports of the Maloga Aboriginal Mission School.

Shields:

The shape of shield scars in the Barmah forest are variable, of the more common shapes are drawn by Nelson (see Figure 3.1). The majority of shield scars in the Barmah forest are found on box trees and are approximately one metre in length.

Coolamons:

Oval shaped dishes or coolamons up to 0.5 metre, were cut from both red gum and box and used
for carrying food or water (Des, Morgan Snr. pers. comm., Sandy Atkinson -pers. comm , Gary
Nelson pers. comm., Curr 1965).

Use of Fibre:

Nets

Many types of nets were made by the people of the Barmah forest. Duck nets were strung low across the mouths of lagoons, and were frightened by the hunters into the nets (Des Morgan Snr., pers. comm., Gary Nelson pers. comm., Atkinson and Berryman 1983, Beveridge 1889). Other objects made out of net included women's net bags, nets worn on the forehead and fishing nets (Curr 1886).'

Fishing nets were also used for skipping ropes.

They made a rope by lightly rolling up fishing net. Then vie with each other by jumping

in and assuming the most grotesque appearances, lying on the ground rolling on the ground rolling over, and imitating the movement of various animals to the amusement of the spectators. This game is only practiced by the men (Matthews 1878)

Twine

Grass twine or cord was used to tie bodies into a sitting position for burial (Cato 1976).

Tools & Weapons & Implements:

Spears

Different types of spears were made by the people of this area for different purposes; Emu spears, war spears and fishing spears (Curr 1886).

The reed spears were used by the Aborigines to fish with. They were a major trade item for Mt. William greenstone. Reed spears or cama's were made by straightening and curing the reed stems over the coals (Curr 1 965, Matthews 1 896, Smyth 1878).

Wich-wich

The wich-wich was thrown to improve aim over long distances (Des Morgan Snr.). It consisted of a long lignum shaft, hafted to an oval wooden missile (Edwards 1936).

Yam sticks

Yam sticks were carried by the women on their daily food collecting trips and also used for tasks such as preparing the earthen oven (Curr 196S).

Undema

Tree grubs were a favorite food of the people of the Barmah forest and they were extracted from the trees using a hooked twig or undema (Curr 1886).

Yiletta

Yiiettas were notched message sticks carried by 'postmen' between tribes.

Hunting Aids:

Fish traps

Fish traps were' made at the mouths of natural flood channels by driving stakes close

together.
The stakes prevented the fish escaping with the receding flood waters (Atkinson and Berryman
1983). These traps were owned by individual family groups and descended to their heirs (Curr 1965).

Plant debris as cover

Besides netting the ducks, the people of the Barmah forest would swim beneath the water using a reed to breathe through and floating clumps of plant debris as cover. When they reached the ducks, they would pull them below the surface by their legs (Gary Nelson, pers. Comm.).

Adhesives

The resin or gum of Waw-luila was used to fasten the greenstone to the shaft of the tomahawks
(Sandy Atkinson pers. comm., Gott 1 985). The gum of silver wattle was also used for fastening
tomahawks (Gott 198S).

Resin was also used to repair the canoes (Gary Nelson pers. Comm.).

Fire

Aboriginal people of the Barmah forest used fire to manage the plants of the forest and also used it to cook the food plants. Fire was made by rubbing up and down one vertical stick in a crack (Clark 1 988). Rather than having to make a fire when they shifted to a new camp the women carried fire sticks (Curr 196S).

Cooking

There is no stone naturally occurring in the Barmah forest, nor any containers in which to cook. One method of cooking food was steaming in an earthen oven.

‘The way in which these ovens were used was as follows:-

When there was food to be baked the women, with their hands and yam sticks scooped a hole in the mound, if in doing so they came upon any lumps of clay (for there was no stone in these parts), they roughly lined the bottom of the hole with them, if none were met with they quickly doing up a quantity for the purpose with their yam-sticks from somewhere near at hand. These lumps were about twice the size of a mans fist The bottom of the hole then being lined with them, a fire was made on top of them and on the fire were thrown more of these lumps of clay. When the fire had burnt down these lumps

were removed to one side and the hot embers to the other. The hole being thus cleared of everything except its flooring of hot lumps of clay, there after were strewn thinly with grass or with the leaves of a herb called pennyroyal, green if possible, if well damped with water. On this were laid neatly packed, the animals or roots to be cooked then came another coating of wet grass next the remaining lumps of heated clay, the heated burning embers. These were often covered with a sheet of bark and on top of all this was a quantity of earth. In an hour or two the food was taken out all cooked and clean." (Curr 196S)

Over many years-the plant and animal debris from these cooking sites built up, these sites are commonly known as mounds.

Food Plants
Food plants were gathered by the women and children.

Roots and Shoots

Roots are stored in the ground for long periods of time and available all year round, they provided a staple food source. Quantities of roots and shoots would have been dug and taken back to camp to be cooked.

Greens and Fruits

Probably these were eaten as they were encountered, rather than gathered and taken back to camp.

Seeds and Nuts

The seed of Waw-luila was eaten as encountered (Wally Cooper pers. comm.), other seed may have been gathered and taken back to camp for processing.

Drinks

The people of this area basically drank water, though sometimes it was sweetened by dissolving manna or from soaking gum blossom in it (Curr 1 965, Clark 1 988). The water was held in a kokoma, made from hollowed out tree knots or lumps.

Medicine

There are 13 known medicine plants recorded for the Barmah forest (see table xx). The strong belief in the powers of Old Man Weed remains in the community today. It is used for curing both internal and external ailments.

Poison

Fish poisoning was occasionally practiced using the fresh gum tree boughs placed into small lagoons. After a few hours had past the fish died and came to the surface (Curr 1 965). Two other traditionally used fish poison plants that grow in the Barmah forest are the Willow Wattle (using the bark) and the Water pepper (using the leaves) (Gott 198S).

Ornamentation

Necklaces of short lengths of Common reed threaded on twine were used in this area (Curr 1 883, Beveridge 1889).

Plant species known to be used by the Yorta Yorta people

Bartja (Cherry Ballart)

USE: Fruit for food, sap used for medicine (Gott 1985)
HABITAT & NOTES: Found in both Red gum and Box communities. Only a few trees left in the Barmah forest. Use to be fairly common around Cherry tree yards as the name suggests (Des Morgan Snr.), possibly removed through fear of stock poisoning.

Berrigan

USE: Leaves crushed and boiled, used for skin medicine (lsaacs 1987). HABITAT & NOTES: Found growing in both grey and black box communities of the Barmah forest.

Black Box

USE: Bark used to make coolamons, mia mias, canoes, shelters (Gary Nelson, pers. comm.)

Box mistletoe

USE: Fruit used as food (Elizabeth Hoffman, pers. comm.).

Buckabun

USE: Stems and leaves eaten as fresh greens, "best eaten before flowering"- (Elizabeth Hoffman, Des' Morgan Snr., Wayne Atkinson, Gary Nelson, Cohn Walker, Lula Grant, Ella Anselmi, Wally Cooper, pers. comms).

Common Reed

USE: Stems used to make the reed spears. These spear were traded for Mt William greenstone. “Best time to harvest the stems for spears is when the water recedes” - Wally Cooper, pers. comm. (Des Morgan Snr., Gary Nelson, Wayne Atkinson, Wally Cooper, Smyth 1 878, Curr 1883, Gott 1985).

USE: Shoots for food (Barmah forest), Wally Cooper, pers. comm. Pieces of stem used to make ornamental necklace. (Gott 1985, Curr 196S).

Cumbungi or bulrush

USE: Underground stem or rhizome used for food. Roots are pounded for the starch. “I remember the Aboriginal women pounding the stems of the cumbungi” (Mrs Corry, Tongala, pers. comm; Beveridge 1878; Gott 1985). Young shoots used as food (Wally Cooper, pers. comm.). Underground stem fibres used for making nets and string (Beveridge 1889).

Native Pennyroyal and River mint

USE: Used as a herb when steaming meat in the ovens (Curr 196S).

Old man weed

USE: Whole plant used for medicinal purposes. Makes the best medicine when it has flower buds. Used as a skin lotion for sores and cuts. Also drunk for upset stomachs and as a health tonic. This plant is still sought today for medicine. A skin lotion made from this plant is now available commercially (Yorta Yorta community, pers. comm.).

River Red gum or Dharnya

USE: Fresh leaves burnt to smoke out the spirit of the dead (Elizabeth Hoffman, pers. Comm.).

USE: Bark used to make coolamons, mia mias, and canoes (Gary Nelson, Des Morgan Snr, Cohn Walker, Wayne Atkinson, pers. comms).

USE: Knots and lumps on the trees hollowed out to make ko-koma’s (wooden water containers)

.

USE: Fresh boughs thrown into lagoons as a fish poison

Ruby Saltbush

USE: Fruit as food (Ella Anselmi, pers. comm.).
HABITAT & NOTES: Not found in the Barmah forest but found growing in remnant

road-side
vegetation along Barmah-Picola road.

Silver Wattle

USE: Gum soaked in water and used as a medicine for upset stomachs (Elizabeth Hoffman, pers. comm.).

Sweet Quandong or Malinyodo

USE: Fruit for food in Barmah Forest (Wally Cooper, pers. comm.).
HABITAT & NOTES: Now extinct from the Barmah forest. Seedlings known to be palatable to sheep (Doug Frood pers., comm.).

Tangled Lignum

USE: long stems used to make the shaft of the wich-wich (Edwards 1936).

Variable Sida

USE: Fruit as food (Ella Anselmi, pers. comm.).

Water-ribbons

USE: Raw tubers used for food, "tubers sweetest when the plant is fruiting" (Wally Cooper, pers. comm.).

APPENDIX 2. DETAILS OF PLACES LISTED ON THE REGISTER OF THE NATIONAL ESTATE AS CONTAINING ABORIGINAL SITES

Kow Swamp

Burials in sand around the lake shore. Investigations at this site have unearthed approximately 60 skeletons dating between 6,000 and 13,000 years before present (with new dating techniques the date has been revised to 15000 years) The skeletal population is characterised by a number of archaic morphological traits which have given rise to speculation that it is a relict of an earlier population.

AHC Official Statement of Significance: The Kow Swamp burials have aroused worldwide interest because they are the largest single localised population group of late Pleistocene antiquity yet found anywhere in the world. Some forty burials have been excavated, and date from 9,500 to 13,500 years ago. The whole group shows remarkably

archaic features. One of the major, palaeontological discoveries of the past thirty years.

Gunbower Forest Scarred Trees

The Place Report describes that a dozen or more scarred tree have been located and photographed in this particular area of the Gunbower Island reserved forest. Subsequent archeaological survey with the forests have shown that this region contains a high density and wide variety of archaeological sites.

AHC Official Statement of Significance: The scarred trees in this region are well preserved surviving material remains indicative of past economic activities. These sites show adaptation to and utilisation of the immediate riverine environment(s) and support local traditional information. Their proximity to Kow Swamp makes them important and significant components of the historic sequence.

Mt. Pilot Art Site Area

The shelters are formed in fallen granite boulders on the slopes of Mt. Pilot. The region has a variety of environments which were probably exploited by the Aborigines, but to date little survey work to locate occupation sites has been performed. Both shelters contain red art work and deposits of potential significance.

AHC Official Statement of Significance: Art sites are rare in Victoria and the Mount Pilot sites are isolated from other north-east Victorian art sites. The size and style of motif is unlike that of any other Victorian painting site. Both sites are well preserved and contain potential deposit.

Mount Pilot Art Site, Beechworth Shelter

The pictographs are in a granite boulder overhang. Red ochre figures are visible on the south wall; these include a possible snake, a possible kangaroo and two other indistinguishable figures, one oriented along a vertical plane, the other along a horizontal plane.

AHC Official Statement of Significance: none is provided on the Place Report form although the same statement listed above for Mt. Pilot Art Sites is applicable here.

Garden Range Rock Shelter No. 2 (Euroa)

An art site located within a granite overhang. The figures were painted on an almost vertical, two-tier, slab of rock. They have been executed in various shades of red and orange ochre; their colour and stage of fading suggests two phases of painting occurred. Two major motifs are represented - stick figures and parallel strokes.

AHC Official Statement of Significance: Such paintings are rare in Victoria. These motifs bear a similarity to those occurring in the Grampians, the only other portion of the state where paintings are known to occur.

Mount Camel Area

Two stone quarry sites adjacent to Mt. Camel; one is on the southeast slopes (Mt. Camel north), the other is about 1 .5 km further south (Mt. Camel south). Mt Camel north comprises about thirty quarrying pits and troughs on a low knoll. Mt Camel south has pits on a hilltop and quarry waste below greenstone boulders on a hill slope. Flaking floors also occur.

AHC Official Statement of Significance: The Mount Camel area includes extensive prehistoric quarries from which Aborigines obtained greenstone for manufacturing ground-edge axes.

Scientific analysis has established that axes from this quarry were traded throughout Victoria, in excess of 1 00 km from the source. This evidence establishes the considerable economic significance this source of stone had in the past.

Faithfull Massacre Site Memorial

The site comprises a granite boulder and plaque memorial to the site of the Faithfull massacre. The massacre occurred on 11 April 1 83 8 when a party of Europeans (stockmen, shepards as well as convicts and ex-convicts in the service of William and George Faithfull) were attacked by a group of Aboriginal men, believed to be Waveroo and Taungerong. This event occurred near what is now Benalla.

Eight Europeans and one Aboriginal were killed during the attack. Although the incident bore the hallmarks of a specific, traditionally sanctioned act of revenge, the guerilla tactics employed by the Aboriginal group led the government and its military advisers to perceive the Aboriginal people as conducting a formal campaign of resistance to pastoral settlement. This interpretation led to the establishment of the border police, a paramilitary force which was, in effect, a force of occupation.

AHC Official Statement of Significance: The Faithfull massacre is important for two reasons. Firstly, it symbolises the type of conflict and misunderstanding which arose between Aboriginal people and European settlers as the pastoral frontier moved across Australia. Secondly, it resulted in a series of retaliatory raids by both groups, which led to the establishment of the border police (Criterion A.4).

Murchison Cemetery Aboriginal Graves

The graves of King Tattambo and Captain John are sited in the Murchison cemetery. The grave of King Tattambo is protected by a wrought iron fence; the grave of Captain John is open.

AHC Official Statement of Significance: An historic Aboriginal grave site is rare, especially one with an associated king plate.

Barmah-Millewa Forests

Although nominated as a natural place, archaeological survey in the Barmah-Millewa forests have shown that this region is contains hundreds, perhaps thousands of archaeological sites.

AHC Official Statement of Significance (pertaining to Aboriginal sites): mention is given in passing to the "diversity of Aboriginal site types present in the area" which "gives the place importance in exhibiting an unusual richness of cultural features. Although accurate in this general description, this statement should be expanded to provide a greater appreciation of the scientific significance to the sites in this region. Here is a recommended addition:

The organisation of the cultural landscape within the Barmah-Millewa forests, as exemplified by the spatial arrangements of sites, particularly the large mounds and cemeteries, strongly suggest
that well-defined territories were present. These sites, together as a whole, have the potential to provide information regarding numerous aspects of past Aboriginal lifeways.

Ulupna Island Flora Reserve

This place consists of Crown Land included as part of the Barmah State Park (Gazetted 1 7/12/87) and is specifically included as part of the Barmah and Millewa Forests nomination. No mention of the Aboriginal sites is provided in this statement. Subsequent to the listing of Ulupna Island, two archaeolgoical surveys have been conducted on

portions of the island (Russell 1992, Schell 1995).

A small portion of Ulupna Island was surveyed in 1992. Russell (1992) performed an intensive survey along two lagoons (Dead River, Dead End) located in the northwest corners of the island. Dead River is a former channel of the Murray; Dead End lagoon is a section of an older portion of the river channel. Nine sites were found and recorded. These include seven scarred trees and two isolated hearths. The hearths, both found along Dead End Lagoon, consisted of clusters of clay balls and shell fragments; no stone artefacts were found.

Schell (1995) surveyed an area of roughly 2.5 km^2 in the western portion of Ulupna Island, focusing on the margins of rivers and creeks. Fifty-five (55) sites were recorded, almost all (49) were scarred trees although one lithic scatter and five isolated lithic artefacts were also recorded. No mounds, hearths or shell middens were located.

About half of the sites were located along two lagoons (Dead River Lagoon, Dead End Lagoon) and a creek; only one site was found adjacent to the Murray River. The other sites, all consisting of stone artefacts, were found on the dirt tracks. The majorities (42) of the scarred trees are River Red Gum; the remaining seven were on Grey Box.

It is unclear whether any of the sites recorded by Schell had previously been recorded by Russell. Nevertheless, these two, relatively small

AHC Official Statement of Significance: No statement regarding archaeological sites is provided in the Ulupna Island Flora Reserve Place Report.

The following is recommended as an addendum to the Place Report:

A variety of Aboriginal sites have been recorded from the island and the potential for an even greater density of sites is high. Taken together, these sites have the potential to provide information regarding the organisation of a cultural landscape in a unique setting.

APPENDIX 3. RAMSAR SITES IN THE YORTA YORTA LANDS

Barmah-Millewa Forest - RIVOO1VI

Location: On the Murray River floodplain between Ulupna Island 35o 49’ 5, 145o 30’ E and Barmah 36o 01’ 5, 144o 58’ E. Bioregion: Riverina. Shire: Moira.

Area: 29 500 ha.

Elevation: c. 94 m ASL.

Other listed wetlands in same aggregation: RIVOOSVI (Broken Creek), RIVO1 1VI

(Gunbower Island), RIVO16VI (Kow Swamp).

Wetland type(s): Bl, B2, B4.

Criteria for inclusion: 1, 2, 3, 5.

Site description: The area is a large River Red Gum Eucalyptus camaldulensis open forest and woodland. The forest features a variety of permanent and temporary wetlands, including lakes, swamps, billabongs, grassland plains and flooded forest. Smaller areas support Black Box E. largiflorens, Yellow Box E. melliodora and Grey Box E. microcarpa woodland on higher ground.

Physical features: Geological setting: Quaternary fluvial and aeolian sediments. Climate: Mean and median annual rainfall at Ulupna are 448 and 437 mm respectively (BM 1995a). Mean and median annual rainfall at Barmah East are 388 and 368 mm respectively (BM 1995a).

Hydrological features: One major stream, Tullah Creek, flows almost the length of the Victorian side of the forest but is not an anabranch of the Murray River (unlike most major creeks in forests along this river). Mean annual discharge in the Murray
River at Tocumwal is S 860 000 megalitres; mean pH and mean conductivity are 7.4 and 66 EC respectively (RWC 1 990d). Mean annual discharge in the Murray River at Barmah is 3 620 000 megalitres; mean pH and mean conductivity are 7. 1 and 72 EC respectively (RWC 1 990d).

Ecological features: The Barmah-Millewa Forest consists of a large area of floodplain forest with a variety of wetland and dryland habitats for flora and fauna. It is very valuable for breeding waterbirds and the threatened Superb Parrot Polytelis swainsoni.

Significance: Barmah Forest is a high value wetland for its ecological, recreational, tourist, scientific, educational, cultural, scenic and aesthetic features. It is of special value for its genetic and ecological diversity because of its size, variety of communities and its high productivity (given maintenance of flooding). Barmah Forest has the most extensive areas of Moira grasslands in Victoria (CFL 1 990a; Ward 1 991, 1 995a). Given an appropriate flooding regime Barmah Forest has supported significant colonies of Ibis and nesting waterfowl, and provides significant breeding habitat for fish and amphibians. The Barmah-Millewa forest is the largest River Red Gum forest in Australia (CFL 1 990a). River Red Gum and Black Box forests have a high priority for conservation measures in the state (Frood & Calder 1987).

Notable flora: Threatened species: The Variable Spike-sedge Eleocharis minuta (Se), Mueller Daisy Brachyscome muelleroides (Se), Upright Sunray Helipterum strictum (Se), Fairy Spectacles Menkea crassa (Se), Small Psoralea Psoralea parva (Se and listed under the Flora and Fauna Guarantee- DCNR 1 995r), Silky Umbrella Grass Digitaria ammophila (Sv), Yellow-tongue Daisy Brachyscome chrysoglossa (Sv), Flaccid Flat-sedge Cyperus flaccidus (Sv), Hypsela Hypsela tridens (Sv), Small-leaf Blue-bush

Maireana microphylla (Sv), Violet Swainson-pea Swainsona microcalyx (Sv), Veiled Fringe-sedge Fimbristylis velata (Sr), Delicate Love-grass Eragrostis tenellula (Sr), Reader's Daisy Brachyscome readeri (Sr), Bear's-ears Cymbonotus lawsonianus (Sr), Woolly Buttons Leptorhychos (Sr), Smooth Minuria Minuria integerrima (Sr), Waterbush Myoporum acuminatum (Sr), Red Bird's-foot Trefoil Lotus cruentus (Sd), Leafy Templetonia Templetonia stenophylla (Sd), Buloke Allocasuarina luehmannii (Sd), Buloke Mistletoe Amyema linophyllum (Sv) and Umbrella Wattle Acacia oswaldii (Sd) have been recorded (DCE 1 990). The latter three species are found in drier areas. Moira Grass Pseudoraphis spinescens community is inadequately represented or protected in Victoria and continues to be in decline (Ward 1991, 1995a). Since altered flooding regimes threaten Moira Grass in the forest, recent advances in a Water Management Strategy aim to arrest this decline (Ward 1995b).

Fauna: Threatened species: The Superb Parrot (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 995q), Regent Honeyeater Xanthomyza phrygia (Se), Bush Thick-knee Burhinus magnirostris (Sv), Square-tailed Kite Lophoictinia isura (Sv), Grey-crowned Babbler Pomatostomus temporalis (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 99Sf), Swift Parrot Lathamus discolor (Sv), Great Egret Egretta alba (listed under the Flora and Fauna Guarantee- DCNR 1 995e), Little Bittern Ixobrychus minutus (Sr), Freckled Duck Stictonetta naevosa (Nr and listed under the Flora and Fauna Guarantee- DCE 1 992f), Blue-billed Duck australis (Sr and listed under the Flora and Fauna Guarantee- DCNR 1 995v), Grey Goshawk Accipiter novaehollandiae (Sr), White-bellied Sea-eagle Haliaeetus leucogaster (Sr and listed under the Flora and Fauna Guarantee- DCNR 1 995u), King Quail Coturnix chinensis (Sr), Barking Owl Ninox connivens (Sr and listed under the Flora and Fauna Guarantee- DCNR 1 995b), Ground Cuckoo-shrike Coracina maxima (Sr), Painted Snipe Rostratula benghalensis (Si), Painted Honeyeater Grantiella picta (Si), Australasian Bittern Botaurus poiciloptilus (Si) and Baillon's Crake Porzana pusilla (Si) have been recorded in Barmah Forest. Many of these species are forest/wetland birds rather than true water birds. Threatened fish that have been recorded are the Trout Cod Maccullochella macquariensis (Se and listed under the Flora and Fauna Guarantee- DCNR 1 995t), Macquarie Perch Macquaria australasica (Sv), Murray Cod Maccullochella peeli (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 995k), Silver Perch Bidyanus (Sv), Golden Perch Macquaria ambigua (Sr), Bony Bream Nematalosa erebi (Sr), Crimson-spotted Rainbow Fish Melanotaenia fluviatilis (Sr), Freshwater Hardyhead Craterocephalus stercusmuscarum (Si), Flat-headed Galaxias Galaxias rostratus (Si) and Freshwater Blackfish Gadopsis marmoratus (Si). Threatened reptiles that have been recorded are Hooded Scaly-foot Pygopus nigriceps (Se), Bandy Bandy (unconfirmed) Vermicella annulata (Sv), Curl Snake (unconfirmed) Suta suta (Sr) and Southern Water Skink Sphenomorphus tympanum (WTF) (Si). Only one threatened amphibian, the Barking Marsh Frog Limnodynastes fletcheri (Si), has been recorded. Threatened mammals that have been recorded are the Tiger Quoll (unconfirmed) Dasyurus maculatus (Sv and listed under the Flora and Fauna Guarantee-DCNR 1 995w), Brush-tailed Phascogale Phascogale tapoatafa (Sr and listed under the Flora and Fauna Guarantee- DCNR 1995y), Squirrel Glider Petaurus norfolkensis (Sr and listed under the Flora and Fauna Guarantee- DCNR 1 995x) and Large-footed Myotis Myotis adversus (Si).

Numbers: The forest has supported 5% of the Victorian population of Superb Parrot (Webster 1988). Breeding: More than 5% of the breeding sites of Superb Parrot occur in Barmah Forest (Webster 1988). In the past, Barmah Forest has supported enormous colonies of breeding
waterbirds.

Effects of Water Changes on Wildlife:

Changes in the water regime have reduced the numbers but it is still an area of significance, supporting colonies of Straw-necked Ibis Threskiornis spinicollis, Australian White Ibis Threskiornis molucca, Great Cormorants Phalacrocorax carbo, Little Black Cormorants P. sulcirostris, Little Pied Cormorant P. melanoleucos, Pacific Heron Ardea pacifica, White-faced Heron A. novaehollandiae, Darter Anhinga melanogaster, Rufous Night Heron Nycticorax caledonicus, Yellow-billed Spoonbill Platalea flavipes, Maned Duck Chenonettajubata, Pacific Black Duck Anas superciliosa as well as crakes and rails (CFL 1990a; I. Davidson pers. comm.; CNR 1995). Large breeding numbers include 300 Australian White Ibis nests at Top Island, 5000 Australian White Ibis and 6000 Straw-necked Ibis nests at Boals Deadwoods and 200 Australian White Ibis nests at Doctors Point. There are many smaller colonies throughout the forest such as Four Mile Crossing (120 nests consisting of Black, Little Black and Little Pied Cormorants, Darter and Yellow-billed Spoonbill) and Bunyip Hole (80 nests consisting of Black, Little Black and Little Pied Cormorants, and Yellow-billed Spoonbill) (Ward 1 995a). Numbers of birds nest in the adjacent Millewa Forest in NSW.

Social & Cultural Values:

Tourism: An estimated 100000 visitor days were spent in Barmah Forest in 1988. Many of the recreational activities, and the high visitor numbers, have detrimental side-effects for nature conservation. Research: A number of research studies have been or are being undertaken at Barmah Forest, particularly in the fields of forest ecology, floodplain ecology and hydrology eg. Bren (1984-94), Chesterfield (1984-86), Dexter (1967-78) and Ward (1991-currently). The Integrated Watering Strategy project is investigating the ecology and hydrology of Barmah Forest. In particular, it is assessing the responses of floodplain vegetation communities to different flooding parameters (Ward 1991, 1995a). The results are being applied to a water management strategy for the forest designed to conserve the ecological diversity and functioning (Ward 1995b). Education: Barmah has a very high educational value. It receives a large number of visitors and is well suited to school camps. The Dharnya Centre, within Barmah Forest, includes a visitor centre with an information display on fauna, flora, hydrology etc. A number of interpretive leaflets are available. A part-time teacher is available to assist with education and interpretation and Aboriginal rangers are available to assist with interpretation of natural history and Aboriginal culture. Barmah is close to regional centres such as Nathalia, Numurkah, Tocumwal, Echuca and Shepparton. It is within reach of Melbourne for overnight or

extended visits. Aboriginal culture: Sites include burial grounds, middens, mounds and scarred trees-see also Tourism Victoria website for marketing statistics re: economic benefits of tourism in Murray Region at:
www.tourismvictoria.com.au/pdf/aboriginalfactsheet2003.pdf

Aboriginal Heritage:

A large number (1528: Yorta Yorta Management Plan, 1999: 38-40) of Aboriginal sites within the Barmah-Millewa forests have been partially surveyed and registered. These sites include burial grounds, mounds, middens, and scarred trees. Barmah Forest was one of the more densely populated areas of Australia prior to European settlement. The descendants of the local tribes maintained close links with the Barmah Forest through the nearby Cummeragunja reserve in N.S.W. and through intermittent settlement in the Forest. The present day descendants refer to themselves as the Yorta Yorta, and have a close involvement with planning, management and interpretation at Barmah- see section on Cultural Heritage which gives an overview of site types and distribution in the area Site surveys conducted in the Barmah-Millewa, by Craib & Bonhommie in consultation with the Yorta Yorta Nations Inc, provide important predictive models on the extent of site distribution and location in the VEAC study region.

Land tenure:

On site: State Forest, Reference Areas, State Park, Recreation Reserve, and Regional Parks. Surrounding area: Millewa State Forest- NSW, Moira Lake Flora Reserve- NSW, private land.

Current land use:

On site: A wide range of activities, eg. pleasure driving, 4WD driving, trail bike riding, cycling, horse riding and bushwalking are popular. Orienteering, picnicking, camping, canoeing, boating, fishing, bait collection, duck shooting, hunting of feral animals and nature study are also undertaken (CFL 1990a). Nature conservation and grazing are overall uses of the forest.

Surrounding area: Forestry, grazing, water supply.

Disturbances or threats

Current: Grazing, logging, water regulation, recreational impacts, pest plants, grazing.

Conservation measures taken

The Barmah Forest is listed under the Ramsar Convention and is registered under the

National Estate. 7900 ha of Barmah Forest is in the Barmah State Park and 280 hectares is in the Top Island and Top End Reference Areas. Other areas are within the Barmah and Tocumwal Regional Parks. Recommendations in WSC (1993) are that old River Red Gums (as identified in Table 3, p. 34 of CFL 1990a) be protected as fauna habitat, at least some sites be protected from grazing, flooding regimes be restored as close as possible to natural levels, the balance between recreational impact and ecological conservation be carefully monitored and managed, and that more information should be collected on the non-ecological values of wetlands to allow a more complete evaluation. Some grazing exclusion plots have been established in the forest for the purpose of studying the impacts of grazing on the vegetation and fire fuel loads. Some cultural sites have been fenced off. One species listed by JAMBA and CAMBA, the Great Egret, and one species listed only by CAMBA, the White-bellied Sea-eagle, has been recorded in the Barmah Forest (Department of Conservation and Natural Resources, September 1995).

Management authority and jurisdiction: Department of Conservation and Natural Resources, Barmah.

2. Broken Creek - RIVOO5VI

Location: Between 36o 29’ 5 145o 56’ E, 8 km north north-west of Banally and 35o 57’ 5 144o 57’ E, Barmah Forest; includes Moodie Swamp 36o 13’ 5, 145o 47’ E, approximately 3 km north-west of Waggarandall. Bioregion: Riverina. Shire: Moira and Delatite.

Area: 2500 ha.

Elevation: c. 130 m ASL.

Other listed wetlands in same aggregation: RIVO26VI (Lower Broken River), RIVOO1VI (Barmah- Millewa Forest).

Wetland type(s): B4.

Criteria for inclusion: 1, 2, 3.

Site description: This wetland includes all of the floodplain associated with the Broken Creek. The floodplain is characterised by a mixture of cleared agricultural land and River Red Gum Eucalyptus camaldulensis-dominated open woodland. Moodie Swamp is the largest individual wetland within the Broken Creek floodplain.

Physical features: Geological setting: Tertiary-Quaternary alluvium. Climate: Mean and median annual rainfall at Numurkah are 453 and 455 mm respectively (BM 1995a). Average annual evaporation at Numurkah is c. 1617 mm (BM 1995b).

Hydrological features: Broken Creek is a distributary of the Broken River. Mean annual

discharge in the Broken Creek at Katamatite is 9380 megalitres; mean pH and mean conductivity are 7.2 and 197 EC respectively (RWC 1 990c). Mean annual discharge in the Broken Creek at Rices Weir is 74 300 megalitres; mean pH and mean conductivity are 7.0 and 174 EC respectively (RWC 1990c).

Ecological features: The Broken Creek floodplain contains flora and fauna that is threatened at the state and national levels. Several waterbird species breed on the floodplain.

Significance:

Notable flora: Threatened species: The flood plain contains the small Psoralea Psoraleaparva (New and listed under the Flora and Fauna Guarantee-DCNR1995r), Yarran Wattle Acacia omalophylla (Se), Variable Spikes edge Eleocharisminuta (Se), Mallee Golden Wattle Acacia notabilis (Sv), Reader's Daisy Brachy scomereaderi (Sr),Leafless Blue bush Maireanaaphylla (Sr), Woolly Button Leptorhynchos panaetioides (Sr) and Leafy Templetonia Templetonia stenophylla (Sd). Notable fauna: Composition: Moodie Swamp has supported waterbird species (CNR 1995).Threatened species: The Murray Cod Maccullo chellapeeli (Svandlisted) under the Flora and Fauna Guarantee DCNR 1995k), Tiger Quoll Dasyurus maculatus (Svand) listed under the Flora and Fauna Guarantee- DCNR 1 995w), Squirrel Glider Petaurus norfolkensis (Sr and listed under the Flora and Fauna Guarantee DCNR1995x), Freckled Duck Stictonetta naevosa (Nr and listed under the Flora and Fauna Guarantee DCE1992f), White bellied Sea-eagle Haliaeetus leucogaster (Sr and listed under the Flora and Fauna Guarantee-DCNR 1995u), Brolga Grus rubicundus (Sr and listed under the Flora and Fauna Guarantee-DCE 1992g), Crimson-spotted Rainbow fish Melanotaenia fluviatilis (Sr), Australasian Bittern Botaurus poiciloptilus (Si), Painted Snipe Rostratula benghalensis (Si), Barking Marsh Frog Limnodynastes fletcheri (Si) and Great Egret Egretta alba (listed under the Flora and Fauna Guarantee- DCNR 1995e) have been recorded. Numbers: Up to 100 Australasian Grebe Tachybaptus novaehollandiae, 400 White-faced Herons Ardea novaehollandiae, 500 Dusky Moorhens Gallinula tenebrosa and 500 Purple Swamphens Porphyrio porphyrio have been counted at Moodie Swamp (CNR 1995). Breeding: The Little Black Cormorant Phalacrocorax sulcirostris, Little Pied Cormorant P. melanoleucos, Royal Spoonbill Platalea regia (Src), Black Swan Cygnus atratus and Purple Swamphen have bred at Moodie Swamp (CNR 1995).

Land tenure:

On site: Public Land Water Frontage Reserves, State Wildlife Reserve- State Game Reserve, State Forest, private land.

Surrounding area: Township and private land.

Current land use:

On site: Nature conservation, duck hunting, water supply.

Surrounding area: Grazing.

Disturbances or threats

Current: Adjacent irrigated dryland farms dispose of nutrients, chemicals, saline drainage and summer irrigation water into the creek. Such activities are also a source of pest plant seed.

Potential: Outfall of community surface drainage scheme - currently under construction - will flow into the creek and is likely to raise nutrient and salinity levels.

Conservation measures taken: Public Land Water Frontage Reserves and Moodie Swamp State Wildlife Reserve have been declared. One species listed by CAMBA (the White-bellied Sea-eagle) and one species listed by JAMBA and CAMBA (the Great Egret) has been recorded on the Broken Creek.

Management authority and jurisdiction: Private and Department of Conservation and Natural Resources (Department of Conservation and Natural Resources, September 1995).

3. Gunbower Island - RIVO11VI

Location : Between 4 km north of Torrumbarry, 36o 00’ 5, 144o 31’ E and Koondrook, 35o 39’ 5, 144o 08’ E. Bioregion: Riverina. Shire: Gannawarra and Campaspe.

Area: 19500 ha.

Elevation: 75-83 m ASL.

Other listed wetlands in same aggregation: RIVO1 6V1 (Kow Swamp), RIVO1 3V1 (Johnson’s Swamp), RIVO12VI (Hird’s Swamp), RIVOO9VI (Fosters Swamp), RIVOO6VI (Cemetery Swamp) and other sites in the Ramsar listing of the Kerang Wetlands.

Wetland type(s): B4, B14.

Criteria for inclusion: 1, 2, 3.

Site description: Gunbower Island is bounded by the Murray River and one of its anabranches, Gunbower Creek. The island contains the second largest River Red Gum Eucalyptus camaldulensis forest in Victoria, much of which is subject to regular inundation from the Murray River.

Physical features: It is a depositional basin which contains a number of channels and miscellaneous floodplain depressions. Geological setting: Quaternary fluvial and aeolian sediments. Climate: Mean and median annual rainfall at Gunbower are 380 and 388 mm respectively (BM 1995a). Mean and median annual rainfall at Koondrook are 365 and 326 mm respectively (BM 1995 a).

Hydrological features: Gunbower Forest is part of the Murray River floodplain with Pericoota and Koondrook Forests in NSW and is itself a significant wetland complex. It contains more than 1 50 wetland basins (Pressey 1986) occurring in a floodplain matrix with some areas never receiving inundation (Atkins et al. 1 992). Mean annual discharge in the Murray River at Barmah is 3 620 000 megalitres; mean pH and mean conductivity are 7. 1 and 72 EC respectively (RWC 1 990d). Mean annual discharge in the Gunbower Creek at Koondrook is 1 00 000 megalitres; mean pH and mean conductivity are 6.9 and 1 99 EC respectively (RWC 1 990d). Mean annual discharge in the Murray River at Torrumbarry is S 460 000 megalitres; mean pH and mean conductivity are 7.0 and 115 EC respectively (RWC 1990d).

Ecological features: Gunbower Island is a high value wetland system for its ecological features. It is of special value for maintaining the ecological diversity of the region because of the extent to which the Murray River floodplain has been cleared for agriculture. During inundation, Gunbower Forest is a special breeding and nursery area for flood-dependent organisms such as many waterfowl, native fish species, major tree species, aquatic plants, amphibians and aquatic invertebrates.

Significance: The wetlands and the floodplain matrix are subject to different hydrological characteristics which at a gross scale produces major differences in vegetation cover. Similarly, distinct aquatic invertebrate communities are found in wetlands subject to different flooding parameters (Boulton & Lloyd 1991; Boulton & Lloyd in press), and these communities are expected to be diverse (Atkins & Lloyd in prep.). Gunbower Forest is the second largest River Red Gum forest in Victoria and contains some of the tallest River Red Gum in Victoria.

Flora: Threatened species: Western Water Starwart Callitriche cyclocarpa (Nv), Spreading Summer-grass Digitaria divaricatissima (Sv), Brown Beetle-grass Diplachne fusca (Sr), Winged Pepper-cress Lepidium morophocoides (Ne and listed under the Flora and Fauna Guarantee- DCE 1 992aa), Smooth Minuria Minuria integerrima (Sr) and Squat Picris Picris squarrosa (Sr) have been recorded (DCE file-wetlands unit).

Notable fauna: Composition: 21 waterbird species have been recorded in Gunbower Forest (CNR 1995). Breeding: The forest has supported the only breeding colony of the Intermediate Egret Egretta intermedia (Src) in Victoria (Horricks et al. 1 989). Australian White Ibis Threskiornis molucca, Grey Teal Anas gibberifrons, Black Swan Cygnus atratus and other water birds also breed here (J. Bowen pers. comm.). Gunbower Forest has supported significant breeding populations of Nankeen Night Heron Nycticorax caledonicus (Src). Threatened species: White-bellied Sea-eagle Haliaeetus leucogaster (Sr and listed under the Flora and Fauna Guarantee-DCNR 1 995u), Barking Marsh Frog

Limnodynastes fletcheri (Si), Broad- shelled Tortoise Chelodina expansa (Si), Tree Goanna Varanus varius (Si) and Carpet Python Morelia spilota variegata (Sv) have been recorded. Threatened fish species include: Crimson-spotted Rainbowfish Melanotaenia fluviatilis (Sr), Golden Perch Macquaria ambigua (Sr) and Murray Cod Maccullochella peeli (Sv and listed under the Flora and Fauna Guarantee- DCNR 1995k) (Koehn & Morison 1990).

Social and cultural values: Recreation: The Gunbower Forest provides excellent recreational opportunities, and is popular for fishing, camping and hunting (where permitted). The most popular areas are adjacent to the Murray River and at Torrumbarry Weir, where a caravan park is located. The Department of Conservation and Natural Resources maintains an extensive system of fireplaces and picnic tables. Cohuna Scout Group has a camp within the Forest. Access within the Forest is good along the River Track, which provides a scenic drive from Koondrook Torrumbarry Weir. Research: The ecology and hydrology of Gunbower Forest has been investigated. In particular, the responses of floodplain communities to different flooding parameters have been assessed. The data was used to develop a strategy. Education: Spence Bridge, an area of 230 ha, has been set aside as an Education Area (DCE files-wetlands unit).

Land tenure:

On site: State Forest, River Murray, Education Area.
Surrounding area: State Forest- NSW, private land.

Current land use:

On site: Fishing, camping, hunting- where permitted.

Surrounding area: Grazing, cropping.

Disturbances or threats

Current: Altered flooding regime from river regulation, grazing, inappropriate recreational activities, illegal deposition of
irrigation drainage.

Potential: Not known.

Conservation measures taken: Gun bower Forest is listed under the Ramsar Convention and on the Register of the National Estate. One species listed only under CAMBA, the White-bellied Sea-eagle, has been recorded at Gunbower Island.

Management authority and jurisdiction: Department of Conservation and Natural Resources (Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 1995).

Australian Ramsar Sites - Site 15 Gunbower Forest

DESIGNATED: 15 December 1982

GEOGRAPHICAL COORDINATES:

Latitude (approx) 35o 39’ to 36o 00’S

Longitude (approx) 144o 08’ to 144o 30’E

GENERAL LOCATION: North-central Victoria, Australia, approximately 30 kilometres north-west of Echuca.

AREA:

19,450 hectares

WETLAND TYPE:

Inland Wetlands - 11, 9, 2

ELEVATION:

Approx 80 metres

OVERVIEW:

Gunbower Forest is the second largest Red Gum forest in Victoria, and is subject to periodic inundation from the Murray River when it supports large numbers of breeding waterfowl.

PHYSICAL FEATURES:

Physiography and Geology

Gunbower Forest is a long shallow depression lying between the banks of the Murray River and Gunbower Creek. Soils in the area are predominantly grey/brown clays.

Flood Regime

Gunbower Island is a depositional basin which contains a number of lentic channels and miscellaneous floodplain depressions. The lowest and therefore major entry point for water into the forest is Spur Creek which runs when the Murray River height at Echuca reaches four metres. All the channels and depressions from Spur Creek are more or less

connected to the Little Gunbower Creek which, at its junction with Gunbower Creek, is the main exit point for floodwaters. As the Murray River rises other effluents begin to flow, until the forest is entirely inundated. This usually occurs when the Echuca river height is approximately eight metres. Water depth on the island can vary from a few centimetres on high ground to six metres in creeks and billabongs in the centre of the forest during flood. River regulation has caused a change in the natural flood regime. Prior to the completion of the Torrumbarry Lock in 1 923 there was little control exerted on water flow except for small scale damming by locals to prevent flooding. Since then Gunbower Creek has been maintained at flood level during the irrigation season **(** August to May) by three weirs at Gunbower, Cohuna and Koondrook resulting in a protracted flood period for the island, regulators between Gunbower Creek and the forest prevent water entering the forest during these times.

ECOLOGICAL FEATURES:

The distribution of plant species and communities on Gunbower Island is largely a result of minor differences in elevation which determine the frequency and duration of flooding and grazing practices.

River Red Gum (Eucalyptus camaldulensis) forest is widely distributed across the north-western part of Gunbower Forest, in areas that are inundated the most frequently. In general, this part of the island is at a slightly lower elevation. Gunbower Forest is approximately 53km in length, with a fall in elevation of on average 0.2m per km.

Black Box (E. largiflorens) woodland occurs on low rises and sand ridges where flooding occurs infrequently. In the forest, this community is most abundant at the south-east end of the island, but it also occurs along the length of Gunbower Creek.

The other eucalypt present in numbers on the island, Grey Box (E. microcarpa) occurs on sandy ridges which are rarely flooded. This species often grows in association with Black Box and occasionally with River Red Gum. In addition, some small grassy plains and swamp vegetation occur within the forest.

During flood periods, the forest becomes a large waterbird breeding area. The only record of Intermediate Egret breeding in Victoria is in the Gunbower Forest (in 1974 there were an estimated 500 nests, and in 1982 there were over 100 nests). Sections of the forest also support
breeding colonies of the Rufous Night Heron (Nycticorax caledonicus), the Little Egret (Egretta garzetta), and the Great Egret (Egretta alba).

LAND TENURE:

Gunbower is managed by Department of Conservation and Environment as State Forest. The eastern half (9,712 ha) is also a proclaimed Wildlife Sanctuary and all land between the River and the “River Track” is part of the River Murray Reserve.

CONSERVATION MEASURES TAKEN:

Study of water requirements as part of Integrated Watering Strategy (Benalla Region,

Department of Conservation and Environment); Proclamation of Wildlife Sanctuary.

CURRENT LAND USE:

Timber production, grazing, nature conservation, recreation, apiculture, flood mitigation, sand and gravel supply

POSSIBLE THREATS:

The introduction of river regulation in 1 934 has reduced the frequency, intensity and duration of flooding in Gunbower Forest, which has important implications for River Red Gum and other species whose survival is flood dependant. Timber harvesting and silvicultureal practices alter the age structure of Red Gum stands and may reduce the number of nest hollows available to wildlife.

Grazing by introduced and domestic animals poses a significant threat to understorey communities.

Threatened Species: White-bellied Sea-Eagle (Haliaeetus leucogaster) - rare in Victoria Barking Marsh Frog (Limnodynastes fletcheri) - Insufficiently known in Victoria Broad-shelled Tortoise (Chelodina expanse) - Insufficiently known in Victoria Tree Goanna (Variants varies) - Insufficiently known in Victoria Carpet Python (Morella spilt variegate) - vulnerable in Victoria

FLORA: Threatened Species

Acacia osswaldii (Umbrella Wattle) - depleted in Victoria
Allocasuarina leuhmannii (Buloke) - depleted in Victoria
Amyema linophyllum (Buloke Mistletoe) - vulnerable in Victoria
Callitriche cyclopcarpa (Western Water Starwort) - Poorly known in Australia, rare in Victoria
Digitaria divaricatissima (Spreading Summer-grass) - vulnerable in Victoria
Diplachne fusca (Brown Beetle-grass) - rare in Victoria
Hakea tephrosperma (Hooked Needlewood) - depleted in Victoria
Lepidium monoplocoides (Winged Pepper-cress) - endangered in Australia, endangered in Victoria
Minuria integerrima (Smooth Minuria) - rare in Victoria
Myoporum deserti (Turkey Bush) - depleted in Victoria
Picris squarrosa (Squat Picris) - rare in Victoria
Santalum acuminatum (Sweet Quandong) - depleted in Victoria

Current Conservation Education

Integrated Watering Strategy is being developed. Spence Bridge, an area of 230 ha, has been set aside as an Education Area. The area is to be used to provide opportunities for students of all ages to:

(a) study the nature and functioning of reasonably natural ecosystems in a manner such that the integrity of these ecosystems is maintained as far as practicable;

(b) compare the ecosystems within education areas with other nearby natural and modified systems;

(c) observe and practise of methods of environmental analysis, and the field techniques of the natural sciences; and

(d) conduct simple long-term experiments aimed at giving an understanding of the changes occurring in an area with time.

CURRENT RECREATION AND TOURISM:

The Forest with its many wetlands, creeks and effluence provides excellent recreation opportunities, and is popular for fishing, camping, and hunting. The convoluted course of the Murray River provides many fishing spots. Wildlife, particularly waterfowl are plentiful.

The most popular spots for recreation are along the Murray and at Torrumbarry Weir, where a formal caravan park is located. The Department of Conservation and Environment maintains an extensive system of fireplaces and picnic tables.

Cohuna Scout Group has a camp within the Forest. Access within the forest is good and includes the River Track, which provides a scenic drive from Koondrook to Torrumbarry Weir.

MANAGEMENT AUTHORITY:

Department of Conservation and Environment, P0 Box 41, East Melbourne Victoria 3002.

JURISDICTION:

Government of Victoria.

4. Kanyapella Basin - RIVO14VI

Location: 36o 09’ 5, 144o 54’ E; 13 km east south-east of Echuca. Bioregion: Riverina.

Shire:
Campaspe.

Area : 2581 ha.

Elevation : c. 95 m ASL.

Other listed wetlands in same aggregation: RIVOO1VI (Barmah-Millewa Forest).

Wetland type(s): BlO, B14.

Criteria for inclusion: 1, 2, 3.

Site description: The lower portion of Kanyapella Basin is River Red Gum Eucalyptus camaldulensis open forest. The outer edges of the Basin has a sparser cover of River Red Gum, Black Box E. largiflorens and Grey Box E. microcarpa open woodland with a grassy understorey.

Physical features: The basin is a large ancestral playa. Much of the basin has been divided into shallow ponds separated by bunds. Geological setting: Quaternary alluvium.

Hydrological features: The hydrology of the basin is based on times of high flood in the Goulburn River, when the Cobram, Tongala and Wyuna Drains flow into the basin. This water is held in the basin until the river is low enough to allow drainage of the basin.

Ecological features: Kanyapella Basin is a high value wetland for its flora and fauna. The eucalyptus forests of the basin support breeding waterfowl and several threatened fauna species.

Significance: The basin contains areas of open water, areas of water supporting dense vegetation and patches of trees with hollows which all provide suitable habitat for waterfowl species. The extent of the River Red Gum/Black Box association at Kanyapella Basin is the most significant example in the region (B. Wehner pers. comm.).

Notable flora: Threatened species: Barren Cane Grass Eragrostis infecunda (Sd) and Woolly Buttons Leptorhynchos panaetioides (Sr) have been recorded in the Kanyapella Basin (Disken & Meyer 1991).

Notable fauna: Composition: 12 waterbird species have been recorded at the Kanyapella Basin (CNR 1 995). Threatened species: The Bush Thick-knee Burhinus magnirostris (Sv), Barking Owl Ninox connivens (Sr and listed under the Flora and Fauna Guarantee- DCNR 1 995b), Brolga Grus rubicundus (Sr and listed under the Flora and Fauna Guarantee- DCE 1992g), Painted Snipe Rostratula benghalensis (Si), Pied Cormorant Phalacrocorax varies (Src), Great Egret Egretta alba (Src and listed under the Flora and Fauna Guarantee- DCNR 1 992e), Rufous Night Heron Nycticorax caledonicus (Src) and Royal Spoonbill Platalea regia (Src) have been recorded in the Basin (Disken & Meyer

1991; R. Weber and D. Wyatt pers. comm.). The former two species are woodland/forest birds. Breeding: The basin forms an important breeding area for waterfowl, in particular the Maned Duck Chenonetta jubata, Musk Duck Biziura lobata, Pacific Black Duck Anas superciliosa and Grey Teal A. gibberifrons.

Social and cultural values: Recreation: Use of Kanyapella Basin is not as high as that experienced by the nearby Goulburn River and Barmah-Millewa Forest due to restricted vehicular access (into the Wildlife Co-operative Area) and few visitor facilities. Camping, horse riding, duck hunting, bait collection, motor bike riding, hunting (feral animals), bushwalking and nature study are undertaken. Access is limited to the drier times of the year, as tracks can be impassable after periods of heavy rain and flooding. Aboriginal culture: Kanyapella Basin has high cultural value for its Aboriginal heritage. Sites include a midden and scarred canoe trees.

Land tenure:

On site: 2581 ha is within a recommended Wildlife Management Co-operative Area.

Surrounding area: Private land.

Current land use:

On site: Recreation, grazing.

Surrounding area: Grazing, cropping.

Disturbances or threats

Current: Artificial hydrological regime.

Potential: Not known.

Conservation measures taken: Managed as the Kanyapella Basin Wildlife Management Cooperative Area. One species listed under JAMBA and CAMBA, the Great Egret, has been recorded in the Kanyapella Basin.

Management authority and jurisdiction: The Kanyapella Basin public land is managed cooperatively by the Rural Water Corporation and Department of Conservation and Natural Resources primarily to provide habitat for waterfowl (LCC 1989).

Compiler & date : Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 1995.

5. **Kow Swamp - RIVO16VI**

Location: 35o *57'* 5, 144o 17' E; 20 km south-east of Cohuna. Bioregion: Riverina. Shire: Campaspe.

Area : 2724 ha.

Elevation: > 80 m ASL.

Other listed wetlands in same aggregation: RIVO1 1VI (Gunbower Island) (listed under the
Ramsar Convention), RIVO12VI (Hird's Swamp), RIVO13VI (Johnson's Swamp), RIVOO9VI
(Fosters Swamp), RIVOO6VI (Cemetery Swamp) and other sites in the Ramsar listing of the
Kerang Wetlands.

Wetland type(s): Cl, BS.

Criteria for inclusion: 1, 2, 3, 6.

Site description: Kow Swamp is a permanent open freshwater wetland. This area is used as water storage for the irrigation system.

Physical features: Geological setting: Quaternary fluvial and aeolian sediments of the Woorinen and Shepparton Formations. Climate: Mean and median annual rainfall at Kow Swamp are 329 and 3 1 0 mm respectively (BM 1995 a).

Hydrological features: The swamp used to be a deep freshwater marsh and is very fresh (100-400 EC). It is fed by a branch of the Gunbower Creek (an anabranch of the Murray River) and the Mount Hope Creek, and is connected to Hird's Swamp (downstream) by Box Creek and Pyramid Creek. Mean annual discharge in Mount Hope Creek at Mitiamo is 35 200 megalitres; mean pH and mean conductivity are 7.5 and 1460 EC respectively (RWC 1 990d).

Ecological features: Kow Swamp is a high value wetland for its large size, habitat diversity and for the breeding opportunities it provides for waterbirds. The swamp has five distinctive habitat subcategories: shallow open water, River Red Gum, dead timber, rushes and reed habitat. Its native vegetation, waterbird species diversity, waterbird breeding, fish, mammals, reptiles and amphibians are of high value.

Significance: Kow Swamp is a significant archaeological site. It is the largest permanent wetland in the Victorian part of the Riverina. It is classified as semi-remote which is unusual in the Kerang Lakes area (Heron & Nieuwland 1989).

Notable flora: Threatened species: The Swamp Buttercup Ranunculus undosus (Sv)

occurs in this area (O'Donnell 1990). Composition: Kow Swamp supports 57 plant species (DCNR undated a). Beauglehole (1986) has identified several species in this area that are considered to be of very limited distribution in the Murray Valley: Southern Swamp Wallaby Grass Amphibromus neesii, Tall Sedge Carex appressa, Rush Sedge C. tereteticaulis, Common Rush Juncus usitatus, Bonefruit Osteocarpum salsuginosum and Water Ribbons Triglochin procera. Cumbungi Typha sp. is a critical plant in the wetland.

Notable fauna: Breeding: The habitat diversity and size of Kow Swamp provides breeding opportunities for significant numbers of Australian White Ibis Threskiornis aethiopica and Straw-necked Ibis T. spinicollis (Pressey 1 986b). Other breeding species are: Darter Anhinga melanogaster (Src), Little Pied Cormorant Phalacrocorax melanoleucos, White-faced Heron Ardea novaehollandiae, Yellow-billed Spoonbill Platalea flavipes and Australian Shelduck Tadorna tadornoides (CNR 1995). Composition: 27 waterbird species have been recorded at Kow Swamp. It is an important area for the conservation of native fish as it supports large numbers of native fish including threatened species such as Silver Perch Bidyanus bidyanus (Sv), Golden Perch Macquaria ambigua (Sr) and Freshwater Blackfish Godopsis marmoratus (Si) (Lugg et al. 1989) Kow Swamp is a major drought refuge for waterbirds due to its large size.

Social and cultural values: Aboriginal culture: Kow Swamp has been the subject of several archaeological studies and has been found to be very significant (Thorne & Raymond 1 989; VAS 1 992). Human skeletal remains dating between 10000-15000 years have been found (VAS 1 992). Examination of these remains has revealed that the skeleton was of a different origin to the now famous 'Lake Mungo Woman' found in South Australia, suggesting cohabitation of a more modern race originating in China. Research: The hydrology of the swamp has also been studied (Macumber 1991). Recreation: The area has a well maintained and compact picnic area but otherwise there is limited access to the wetland. There are opportunities for recreational fishing.

Land tenure:

On site: Irrigation storage; sanctuary.

Surrounding area: Private land, Public Land Water Frontage Reserve- on Box Creek and Mount Hope Creek.

Current land use:

On site: Grazing on southern shoreline, recreational fishing. Used to be worked by professional fisherman.

Surrounding area: Grazing.

Disturbances or threats

Current: Predation from feral foxes poses a threat to native wildlife. Grazing on the south

shoreline has degraded vegetation and reduced the natural values of the area. Similarly, beds of native waterplants have deteriorated in the past 40 years. Use of the swamp's water in the irrigation water supply system limits the potential for improvements in wetland values (Lugg et al. 1 989). Bank erosion is a problem.

Potential: Not known.

Conservation measures taken: Listed as a Sanctuary. Recommendations in Lugg et al. (1989) are: water levels to be allowed to fluctuate as much as possible- high in winter-spring and low in summer-autumn, the water level be allowed to decline by evaporation, the wetland be allowed to dry periodically, public land areas be fenced, all grazing be discontinued (if the wetland remains part of the irrigation system), an assured water supply be provided to all areas of the wetland, and salinity be maintained at less than 1 500 EC. One species listed by JAMBA and CAMBA, the Latham's Snipe Gallinago hardwickii, has been recorded (CNR 1995).

Management authority and jurisdiction: Managed by the Rural Water Corporation.

Compiler & date : Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 199~.

6. Lower Broken River - RIVO26VI

Location: Between 36o 29' 5 145o 56' E, 8 km north north-west of Benalla and 36o 24' 5 145o
23' E, Shepparton. Bioregion: Riverina. Shire: Greater Shepparton (City), Delatite and Strathbogie.

Area : 1268 ha.

Elevation : 110-115 mASL.

Other listed wetlands in same aggregation: RIVO27VI (Lower Goulburn River Floodplain).

Wetland type (s): Bl, B4.

Criteria for inclusion: 3, 6.

Site description: The Lower Broken River downstream of Casey's Weir meanders for over 63 km through plains country before reaching the Goulburn River at Shepparton. The floodplain is narrow (often no greater than 40 m wide).

Physical features: Geological setting: Quaternary alluvium on Tertiary-Quaternary alluvium. Climate: Mean and median annual rainfall at Goorambat are 552 and 543 mm

respectively (BM1995a). Average annual evaporation at Dookie is 1245 mm (BM 1995b). Mean and median annual rainfall at Kialla East are 497 and SOS mm respectively (BM 1995 a).

Hydrological features: The billabongs within the floodplain are remnants of the prior river courses and are generally less than one hectare in area. The billabongs vary in shape from saucer-like to cut-off loops. Mean annual discharge in the Broken River at Goorambat is 234 000 megalitres; mean pH and mean conductivity are 7.4 and 1 62 EC respectively (RWC 1990c). Mean annual discharge in the Broken River at Benalla is 287 000 megalitres (RWC 1990c).

Ecological features: The floodplain is of high value for its fauna and contains a large area of habitat for fauna such as waterbirds and fish. The dominant vegetation type is continuous River Red Gum Eucalyptus camaldulensis open forest. It has a wide variety of wetland types and is a good example of a major floodplain system.

Significance: Both Squirrel Gliders Petaurus norfolcensis and Brush-tailed Phascogales Phascogale tapoatafa have been observed along the Broken River near Shepparton and in the forested hills around Warrenbayne on Five Mile Creek. The Lower Broken River with its continuous River Red Gum fringe is the only corridor of remnant vegetation which connects the two populations. Protection of this corridor thus assists in their survival.

Notable flora: No detailed flora assessment has been undertaken along the Lower Broken River.

Notable fauna: Composition: Woodland that fringes the Lower Broken River has supported at least 1 0% of the regional populations of Squirrel Glider and Brush-tailed Phascogale (I. Davidson, pers. comm.). Threatened species: The Regent Honeyeater Xanthomyza phrygia (Se), Bush Thick Knee Burhinus magnirostris (Sv), Freckled Duck Stictonetta naevosa and listed under the Flora and Fauna Guarantee- DCE 1 992f), Baillon's Crake Porzana pusilla (Si), Royal Spoonbill Platalea regia (Src), Brush- tailed Phascogale (Sr), Squirrel Glider (Sr), Macquarie Perch Macquaria australasica (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 995j), Murray Cod Maccullochella peeli (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 995k) and Crimson-spotted Rainbowfish Melanotaenia fluviatilis **(** Sr) have been recorded for the Lower Broken River (Hawdon 1 992). Breeding: The Lower Broken River has supported at least 1 0% of the regional breeding populations of Squirrel Glider and Brush-tailed Phascogale (I. Davidson, pers. comm.).

Social and cultural values: Recreation: The area of public land along the Lower Broken River receives many visitors, in particular along the frontage adjoining Shepparton which is readily accessible along its entire northern bank. Elsewhere, access to both sides of the river is generally limited to roads which end at the river. Recreational activities are listed below.

Land tenure:

On site: Public Land Streamside Reserves, private land.

Surrounding area: Private land, Dookie Campus- Victorian College of Agriculture and

Horticulture, Bushland Reserve.

Current land use:

On site: Swimming, cycling and nature study, fishing; boating, walking, duck hunting, camping, water supply, education.

Surrounding area: Grazing, education, urban area- Shepparton.

Disturbances or threats:

Current: The floodplain has been partially modified by clearing, cultivation and irrigation.

Potential: Not known.

Conservation measures taken: Large sections of the Lower Broken River are reserved as Public Land Streamside Reserves.

Management authority and jurisdiction: Private, Department of Conservation and Natural Resources.

Compiler & date : Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 199~.

7. **Lower Goulburn River Floodplain- RIVO27VI**

Location: The Lower Goulburn River Floodplain extends for approximately 1 50 km downstream of Goulburn Weir (36o 43’ 5, 145o 10’ E, 8 km north of Nagambie) to its junction with the Murray River (36o 06’ 5, 145o 47’ E, 7 km east north-east of Echuca). Bioregion: Riverina. Shire: Strathbogie, Greater Shepparton (City), Campaspe and Moira.

Area : 13 000 ha.

Elevation : 96 m ASL.

Other listed wetlands in same aggregation: RIVO26VI (Lower Broken River).

Wetland type(s): B4, B14.

Criteria for inclusion: 1, 2.

Site description: This floodplain forms a system separate from the floodplain upstream as its flow regime is directly controlled by the Goulburn Weir, which diverts water to the Shepparton Irrigation Region. The floodplain consists of a River Red Gum Eucalyptus camaldulensis open forest/woodland with smaller areas of Grey Box E. microcarpa open forest/woodland associated with Yellow Box E. melliodora, White Box E. albens and Black Box E. largiflorens occurring on higher ground within the forest.

Physical features: Geological setting: Recent alluvium fringed by Devonian-Silurian sediments and Devonian Broadford Formation sediments. Climate: Mean and median annual rainfall at Goulburn Weir are 548 and 552 mm respectively (BM 1995a). Average annual evaporation at Tatura is c. 1375 mm (BM 1995b). Mean and median annual rainfall at Kialla East are 497 and SOS mm respectively (BM 1 995 a).

Hydrological features: There are a large number and variety of permanent and temporary wetlands within the floodplain, including billabongs, sloughs, marginal swamps, potholes, scroll swales, anabranches and cut-off loops. Mean annual discharge in the Goulburn River at

Goulburn Weir, Nagambie, is 1 340 000 (RWC 1 990c). Mean annual discharge in the Goulburn River at McCoy Bridge is 1 680 000 megalitres; mean pH and mean conductivity are 7.0 and 228 EC respectively (RWC1990c).

Ecological features: The Lower Goulburn River is a high value wetland system for its ecological features. The floodplain consists of a large area of habitat for fauna such as waterbirds and fish. It has a wide variety of wetland types and is an excellent example of a maj or floodplain system.

Significance: The system provides a major area of natural ecosystems within a large, intensively cleared irrigation and grazing region. It forms an important breeding area for waterbirds (including many colonial nesting species). The Lower Goulburn River contains excellent examples of River Red Gum open forests and woodland communities (LCC 1991).

Notable flora: Threatened species: Western Water Starwort Callitriche cyclocarpa (Sr), Smooth Minuria Minuria integerrima (Sr), Waterbush Myoporum acuminatum (Sr), River Bitter- cress Rorippa eustylis (Sr), Kangaroo Grass Themeda triandra (Sr), White Cypress-pine Callitris glaucophylla (Sd) and Buloke Allocasuarina luehmannii (Sd) have been recorded (LCC 1991).

Notable fauna: Composition: 34 waterbird species have been recorded at Gemmills Swamp (CNR 1995). Numbers: The Lower Goulburn River Floodplain and woodlands fringing this system has supported at least 5% of the Victorian populations of Squirrel Glider Petaurus norfolcensis (Sr), White-bellied Sea-eagle Haliaeetus leucogaster (I. Davidson, pers. comm.), Great Egret Egretta alba (Src) and Murray River Crayfish

Euastacus armatus (R. Weber, pers. comm.). It also has supported 10% of the regional populations of Darter Anhinga melanogaster (Src and Royal Spoonbill Platalea regia (Src) (R. Weber, pers. comm.). Counts of over 1000 ibis have regularly been made at Reedy Swamp (R. Weber pers. comm.). Threatened species: The Murray Cod Maccullochella peeli (Sv and listed under the Flora and Fauna Guarantee- DCNR 1 995k) populations in the Lower Goulburn River and their habitat are highly valued because of the decline in their abundance elsewhere in Victoria (Anderson & Morison 1 988). Other threatened fauna (Baker-Gabb 1991) recorded within or fringing the Lower Goulburn River Floodplain include the Magpie Goose Anseranas semipalmata (Si), Bush Thick-knee Burhinus magnirostris (Sv), Superb Parrot Polytelis swainsonii (Sv and listed under the Flora and Fauna Guarantee- DCE 1992g), Swift Parrot Lathamus discolor (Sv), Grey-crown Babbler Pomatostomus temporalis (Sv), Lewin's Rail Rallus pectoralis (Sr), Little Bittern Ixobrychus minutus (Sr), White-bellied Sea-eagle (Sr and listed under the Flora and Fauna Guarantee-DCNR 1995u), Ground Cuckoo-shrike Coracina maxima (Sr), Painted Honeyeater Grantiella picta (Sr), Turquoise Parrot Neophema pulchella (Sr), Barking Owl Ninox connivens (Sr and listed under the Flora and Fauna Guarantee-DCNR 1995b), Australasian Bittern Botaurus poiciloptilus (Si), Baillon's Crake Porzana pusilla (Si), Great Egret (listed under the Flora and Fauna Guarantee- DCNR 1995e), Brush-tailed Phascogale Phascogale tapoatafa (Sr), Squirrel Glider Petaurus norfolcensis (Sr), Large-footed Myotis Myotis adversus (Sr), Trout Maccullochella macquariensis (Se and listed under the Flora and Fauna Guarantee- DCNR 1 995t), Macquarie Perch Macquaria australasica (Sv and listed under the Flora and Fauna Guarantee- DCNR 1995j), Silver Perch Bidyanus bidyanus (Sv), Murray Cod Maccullochella peeli (Sv and listed under the Flora and Fauna Guarantee- DCNR 1995k), Freshwater Catfish Tandanus tandanus (Sv), Crimson-spotted Rainbowfish Melanotaenia fluviatilis (Sr), Golden Perch Macquaria ambigua (Sr), Unspecked Hardyhead Craterocephalus stercusmuscaram fulvus (Sr), Dwarf Flat-headed Gudgeon Philypnodon sp. (Si), Carp Gudgeon species complex Hypseleotris spp. (Si), Murray River Crayfish Euastacus armatus (Si), Barking Marsh Frog Limnodynastes fletcheri (Si) and Mountain Galaxias Galaxias olidus (Si). The Great Egret, Little Bittern and Blue-billed Duck have occurred at Gemmills Swamp (CNR 1 995). Breeding: The Australian White Ibis Threskiornis aethiopica, Royal Spoonbill Platalea regia (Src), Yellow-billed Spoonbill P. flavipes, Black Swan Cygnus atratus, Pacific Black Duck Anas superciliosa, Grey Teal A. gibberifrons, Musk Duck Biziura lobata, Dusky Moorhen Gallinula tenebrosa, Purple Swamphen Porphyrio porphyrio, Eurasian Coot Fulica atra and Masked Lapwing Vanellus miles have bred at Gemmills Swamp (CNR 1995).

Social and cultural values: Recreation: The area of public land along the Lower Goulburn floodplain provides significant and varied outdoor recreation opportunities. Recreational usage and visitation levels vary from very high at recreation reserves between the urban areas of Shepparton and Mooroopna, to low along sections where access is difficult. Generally, due to the large number of access points to the floodplain and the extensive network of seasonal vehicle tracks within the floodplain forest, recreational use is dispersed over the length of the floodplain. Research: A number of studies have been undertaken along the Lower Goulburn River particularly in the fields of warm water ecology and environmental salinity impacts. The Murray Cod populations are important

as a source of brood stock for the Native Fish Breeding Program based at Snobs Creek Fish Hatchery. Education: The Lower Goulburn River Floodplain is easily accessible from the large regional centre of Shepparton. Moira Park Scout Camp is on the banks of the Goulburn River and can cater for large numbers of Scouts.

Aboriginal culture: The Lower Goulburn River Floodplain has high cultural value for its Aboriginal heritage. Sites include scarred trees, oven mounds and artefact scatters.

Land tenure:

On site: The Lower Goulburn River Floodplain is mostly State Forest but includes Public Land Water Frontage Reserves, Loch Garry Wildlife Management Co-operative Area, Reedy Swamp State Wildlife Reserve and township- Shepparton, State Wildlife Reserve.

Surrounding area: Recreation Reserve.

Current land use:

On site: Driving, motor bike riding, horse riding, nature study and picnicking, walking, camping, fishing, boating- including canoeing, duck hunting, water supply.

Surrounding area: Grazing, irrigated cropping.

Disturbances or threats:

Current: Sedimentation due to land clearance, fertiliser runoff, higher groundwater due to irrigation.

Potential: Not known.

Conservation measures taken: The Goulburn River has been listed as a Victorian Heritage River (LCC 1991). Two State Wildlife Reserves (Gemmill Swamp Wildlife Reserve: 1 73 ha and Reedy Swamp State Wildlife Reserve: 224 ha) and the Loch Garry Wildlife Management Cooperative Area (687 ha) are included within the floodplain: the wetlands of the floodplain have been grouped together because of their large number. 70 sites have been listed in CNR (1995). One species listed by JAMBA and CAMBA, Latham's Snipe Gallinago hardwickii, and one species listed only by CAMBA, White-bellied Sea-eagle, have been recorded on the Goulburn River.

Management authority and jurisdiction: Department of Conservation and Natural Resources and private.

Compiler & date: Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 1995.

8. Muckatah Depression - RIVO32VI

Location: The Muckatah Depression extends from 36o 04’ 5, 146o 07’ E, 11 km south-east of
Yarrawonga to 36o 06’ 5, 145o 28’ E, 2 km east of Numurkah and includes Dowdles Swamp, 36o 07’ 5, 146o 02’ E, 11 km south south-west of Yarrawonga. Bioregion: Riverina. Shire: Moira, Milawa and Indigo.

Area: Total area 2909 ha (2017 ha - depression, 892 ha - off-depression). Elevation: 1 15-135 m ASL.

Other listed wetlands in same aggregation: RIVOOSVI (Broken Creek), RIVOO1VI (Barmah-Millewa Forest).

Wetland type(s): B4, BlO.

Criteria for inclusion: 1, 2.

Site description: The Muckatah Depression flows through Dowdles Swamp and meanders for a further 60 km, with inflow from other off-depression wetlands before entering the Broken Creek, upstream of Numurkah.

Physical features: Geological setting: Recent alluvial sediments on Quaternary alluvial Coonambidgal Formation and Pliocene-Pleistocene alluvial Shepparton Formation.

Hydrological features: The Muckatah Depression consists of one long continuous narrow wetland (20-1 00 m wide) within the prior stream depression and off-depression saucer-shaped wetlands up to or exceeding 40 ha in area which drain into the depression. The catchment is relatively flat and the depression is only slightly incised into the surrounding alluvial plain, being rarely more than SO cm deep. The depression system is an important tributary of the Broken Creek RI VOOS VI.

Ecological features: The Muckatah Depression is a high value wetland for its ecological features. The wetlands in this system are mainly sedge-dominated freshwater meadows with some herb-dominated freshwater meadows and sedge or River Red Gum Eucalyptus camaldulensis dominated shallow freshwater marshes. Grey Box E. microcarpa occurs in the bed and along the margin of some reaches of the depression. River Red Gum dominates Dowdles Swamp and can also be found within areas of the depression which naturally flood more frequently and for longer durations.

Significance:

Notable flora: Threatened species: Barren Cane Grass Eragrostis infecunda (Sd) (this grass is particularly abundant at Saunders Swamp) and Yellow-tongue Daisy Brachyscome chrysoglossa (Sv) (R. Weber, pers. comm.) have been recorded in the Muckatah Depression (Briggs & Leigh 1988).

Notable fauna: Number: The Muckatah Depression system has supported at least 5% of the Victorian population of Brolga Grus rubicundus (Sr and listed under the Flora and Fauna Guarantee- DCE 1992f) (R. Weber, pers. comm.). Brolga have been recorded nesting at one wetland and there have been widespread observations on other wetlands and in the Depression itself. Breeding: The Muckatah Depression system has supported at least 5% of the Victorian breeding population of Brolga (R. Weber, pers. comm.). The larger off- depression wetlands (Saunders Swamp, Dowdles Swamp, Kels Swamp and Kinnairds Swamp) are important breeding areas for waterfowl, ibis species and other waterbirds. Threatened species: The Great Egret Egretta alba (listed under the Flora and Fauna Guarantee- DCNR 1995e) has been recorded (Camp Scott Furphy 1992 unpub.; Hawdon 1992 unpub.).

Social and cultural values: Recreation: Use of the freehold portion of the wetland system is limited to duck hunting with land-holder permission. Dowdles Swamp is used for camping, nature study and duck hunting. The only visitor facilities provided are rubbish bins. Research: As part of the feasibility study for surface drainage of the Muckatah Depression, an environmental study (including some fauna and flora surveys) of sites along the Muckatah Depression was undertaken in 1991 (Scott, Camp & Furphy 1992).

Land tenure:

On site: Dowdles Swamp is a State Wildlife Reserve, private land.

Surrounding area: Private land.

Current land use:

On site: Grazing, cropping, duck hunting.

Surrounding area: Grazing, cropping.

Disturbances or threats

Current: The agricultural land has been extensively modified by clearing, cultivation and irrigation.

Potential: Fertiliser, irrigation-induced salinity, clearing.

Conservation measures taken: Dowdle Swamp is gazetted as a State Wildlife Reserve. One species listed by JAMBA and CAMBA (the Great Egret) has been recorded at the Muckatah Depression.

Management authority and jurisdiction: Private and Department of Conservation and Natural Resources.

Compiler & date : Parks and Reserves Section, National Parks Service, Department of

Conservation and Natural Resources, September 199~.

9. Black Swamp - RIVOO3VI

Location: 36o 10’ 5, 146o 19’ E; 13 km west of Springhurst. Bioregion: Riverina. Shire: Milawa.

Area : 176 ha.

Elevation : c.145 mASL.

Other listed wetlands in same aggregation : None.

Wetland type(s) : B14.

Criteria for inclusion : 1 , 3.

Site description : Black Swamp is a River Red Gum Eucalyptus camaldulensis-dominated shallow freshwater marsh with a herb-dominated understorey. It is situated on a gently undulating extensively cleared plain between the floodplains of the Murray and Ovens Rivers.

Physical features: Black Swamp forms a large shallow depression at the confluence of two streams. Several other shallow depressions also occur at intervals along these streams both upstream and downstream of this swamp. Geological setting: Pliocene-Pleistocene alluvial sediment of the Shepparton Formation. Climate: Mean and median annual rainfall at Peechelba East are 548 and 535 mm respectively (BM 1995a). Average annual evaporation at Rutherglen is c. 1547 mm (BM 1995b).

Hydrological features: This swamp is mainly fed by a drainage line that is a tributary of the Black Dog Creek. This and other poorly-defined drainage lines link the various disjunct wetlands in the area during seasons of high rainfall.

Ecological features: Black Swamp supports a large variety of bats, woodland birds and waterbirds.

Significance: Black Swamp is a high value wetland for its ecological, educational, scientific, cultural and scenic features. Black Swamp supports a high diversity and number of birds. Such diversity and density reflects the value of the habitat and the lack of availability of suitable alternative habitat elsewhere in the locality. Extensive land clearing and drainage has resulted in the destruction of most of the private wetlands in this area. Black Swamp, being the only public wetland in the area, has escaped much of the devastation and is therefore a very significant remnant of what was once possibly a relatively common wetland type in the area. Black Swamp is a good example of a shallow freshwater marsh in this section of the Riverina.

Notable fauna: Composition: 35 waterbird species have been recorded at Black Swamp (CNR 1 995). Lumsden (1992) found ten of the twelve species of bats known to occur in north-east Victoria at this wetland during a bat survey conducted in the area in January 1 992. These include:- Mormopterus planiceps (species lMormopterus planiceps (species 2), Gould's Wattled Bat Chalinolobus gouldii, Chocolate Wattled Bat Chalinolobus mono, Southern Forest Bat Vespadelus regulus, Large Forest Bat Vespadelus darlingtoni, Little Forest Bat Vespadelus vulturnus, Lesser Long-eared Bat Nyctophilus geoffroyi, Western Broad-nosed Bat Scotorepens balstoni and White-striped Mastiff Bat Tadarida australis. Threatened species: This swamp has supported the Great Egret Egretta alba (listed under the Flora and Fauna Guarantee- DCNR 1995e). Breeding: Many species of birds utilise fringing woodland habitat at Black Swamp for breeding including: Sulphur-crested Cockatoo Cacatua galerita, Little Corella Cacatua pastinator, Galah Cacatua roseicapilla, Eastern Rosella Platycercus eximius, Yellow Rosella P. elegans, Sacred Kingfisher Halcyon sancta (all woodland/plains species), Maned Duck Chenonetta jubata, Pacific Black Duck Anas superciliosa and Grey Teal Anas gibberifrons (all waterbird species). Black Swamp has supported at least 10% of the regional populations of nine species of colonial nesting birds including the Australian White Ibis Threskiornis aethiopica, Straw-necked Ibis Threskiornis spinicollis, Yellow-billed Spoonbill Platalea flavipes, Royal Spoonbill Platalea regia (Src), Great Egret (Src), White-faced Heron Ardea novaehollandiae, Pied Cormorant Phalacrocorax varies (Src), Little Black Cormorant Phalacrocorax sulcirostris, and Rufous Night Heron Nycticorax calendonicus (Src). Other breeding species are Australasian Grebe Tachybaptus novaehollandiae, Little Pied Cormorant P. melanoleucos, Black Swan Cygnus atratus, Australian Shelduck Tadorna tadornoides, Musk Duck Biziura lobata, Dusky Moorhen Gallinula tenebrosa, Purple Swamphen Porphyrio porphyrio, Eurasian Coot Fulica atra and Masked Lapwing Vanellus miles (CNR 1995).

Social and cultural values: Recreation: There is limited recreation such as bird watching by local field naturalist groups, and duck hunting. Aboriginal culture: In a survey of the area in 1991, Victorian Archaeological Survey noted the occurrence of several scarred trees on Black Swamp
(VASDATA 1992).

Land tenure:

On site: State Wildlife Reserve- State Game Reserve.

Surrounding area: Private land.

Current land use:

On site: Bird watching, grazing, duck hunting, nature conservation. Surrounding area: Private land.

Disturbances or threats

Current: Establishment of weeds transported by stock, water and wind, altered hydrology due to drainage and road construction, grazing, causing species structure and composition changes and soil pugging and salinisation by the influx of salt laden water from the Diddah Diddah Creek system are the main threats. The vegetation community of Black Swamp is not at present threatened but may become so if the existing pressures of grazing and saline influx continues.

Potential: Influx of nutrient rich and/or pesticide-contaminated effluent water from nearby freehold land and nutrient enrichment and accumulation of salts may also be threats. Conservation measures taken : Black Swamp is gazetted as a State Wildlife Reserve (classified as a State Game Reserve) after LCC (1985). It is recommended that investigations into the threat of salinisation of Black Swamp should commence as soon as possible, that Black Swamp be given high priority for the preparation of an integrated management plan and follow-up actions ensuing from such a plan, and grazing should be removed from Black Swamp as soon as practicable. One species listed by JAMBA and CAMBA (Great Egret) occurs at this swamp.

Management authority and jurisdiction: Department of Conservation and Natural Resources, Wangaratta..

Compiler & date : Parks and Reserves Section, National Parks Service, Department of Conservation and Natural Resources, September 1995