

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

This Ramsar Information Sheet has been converted to meet the 2009 – 2012 format, but the RIS content has not been updated in this conversion. The new format seeks some additional information which could not yet be included. This information will be added when future updates of this Ramsar Information Sheet are completed. Until then, notes on any changes in the ecological character of the Ramsar site may be obtained from the Ecological Character Description (if completed) and other relevant sources.

1. Name and address of the compiler of this form:

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

15 August 2006

3. Country:

Australia

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

Gunbower Forest, Victoria

5. Designation of new Ramsar site or update of existing site:

Gunbower Forest, Victoria was designated on 15 December 1982.

The previous RIS documents were dated 1992 and 1998.

This RIS is for (tick one box only):

a) Designation of a new Ramsar site ☐; or

b) Updated information on an existing Ramsar site ☒

6. For RIS updates only, changes to the site since its designation or earlier update:**a) Site boundary and area**

The Ramsar site boundary and site area are unchanged: ☒

or

If the site boundary has changed:

i) the boundary has been delineated more accurately ☐; or

- ii) the boundary has been extended ☐; or
- iii) the boundary has been restricted** ☐

and/or

If the site area has changed:

- i) the area has been measured more accurately ☐; or
- ii) the area has been extended ☐; or
- iii) the area has been reduced** ☐

**** Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site:

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a hard copy (required for inclusion of site in the Ramsar List): ☒;
- ii) an electronic format (e.g. a JPEG or ArcView image) ☒;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables ☐.

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The Ramsar area is confined within the Gunbower State Forest and adjoining River Murray Reserve.

8. Geographical coordinates (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude: (approx) 35°39' to 36°00'S; Longitude: (approx) 144°08'E to 144°30'E

9. General location:

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

Gunbower Forest lies in the north of the State of Victoria, approximately 225 km north of the state capital Melbourne and adjacent to the towns of Cohuna, population 2,100 (Map 1). The nearest large town is Cohuna. The site is located in the management area of the North Central Catchment Management Authority (NCCMA).

10. Elevation: (in metres: average and/or maximum & minimum)

Approximately 80 metres above the Australian Height Datum

11. Area: (in hectares)

19,931 hectares

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Gunbower Forest is located on the floodplain of the River Murray in the Riverina Bioregion (Victorian Murray Fans subregion) (Map 1). The floodplain is predominantly vegetated with River Red Gum (*Eucalyptus camaldulensis*) Forest and, together with the adjacent floodplain on the opposite bank of the river, comprises the second largest River Red Gum forest in Australia. Small peaks in river flow introduce water to wetlands within the forest, some of which represent types that are depleted in Victoria. During large peaks in flow, overbank flooding occurs and almost the entire Ramsar area is inundated. When flooded, the wetlands support large and diverse waterbird populations and provide rookeries for colonial nesting waterbirds. The floodplain forest surrounding the wetlands is diverse, with 278 indigenous flora and 205 indigenous fauna species reported from the site, including species of national conservation significance.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	•	2	•	3	•	4	•	5	•	6	•	7		8	•	9	
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14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

The site maintains the ecological diversity of the bioregion by supporting a vegetation communities representative of the Victorian Murray Fans Bioregion, which is a component of the Riverina IBRA Bioregion (DSE 2006).

The Murray Fans bioregion is a floodplain of alluvial fan-shaped deposits along the Murray River typified by Barmah and Gunbower forests. The bioregion features ox-bows, meander scrolls and isolated wind-blown dunes (DNRE 1997). Gunbower forest predominantly comprises Red Gum Forest which occurs in low-lying, more frequently flooded areas. Less frequently flooded areas support more open Red Gum Forest and infrequently flooded areas support woodlands dominated by Black Box (*Eucalyptus largiflorens*). Dunes are not subject to flooding and support Pine / Buloke (*Callitris gracilis* / *Allocasurina leuhmannii*) and mallee vegetation.

The vegetation has been mapped by Arthur Rylah Institute (2003) using Ecological Vegetation Classes (EVCs). Of the 14 EVCs mapped in the Ramsar area, 11 are considered vulnerable or endangered in the Victorian Murray Fans bioregion.

The site supports a high diversity of species.

A total of 278 indigenous flora species and 205 indigenous fauna species have been recorded on the Victorian Wildlife Atlas (DSE 2005a) and the Victorian Flora Information System (2005b) (Appendix A). The high diversity of species results from the diverse habitats provided by different water regimes in the forest. The wetland areas support breeding by more than 22 waterbird species, and diverse fish, macroinvertebrate and frog species. Nationally threatened plant species are *Amphibromus fluitans* (vulnerable), *Callitriche cyclocarpa* (vulnerable) and *Lepidium monoplocoides* (endangered).

Nationally threatened fauna species are *Litoria raniformis* (vulnerable) and *Muccullochella peelii peelii* (vulnerable).

The wetlands also support a diverse flora including the nationally vulnerable species *Amphibromus fluitans* and *Callitriche cyclocarpa* and the nationally endangered *Lepidium monoplocoides*.

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

[Information to support the criterion will be provided in the next RIS update]

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Riverina Bioregion (National level – IBRA 6.1)

Murray Fans Sub-bioregion (Victorian)

b) biogeographic regionalisation scheme (include reference citation):

National - the Interim Biogeographic Regionalisation for Australia version 6.1 (<http://www.deh.gov.au/parks/nrs/ibra/version6-1/index.html>)

Victorian - Victoria's Biodiversity Strategy (NRE 1997)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Gunbower Forest and the neighbouring Koondrook-Perricoota State Forest on the opposite bank of the Murray River, and part of the NSW Central Murray State Forests Ramsar site (see **Map 1**), lie on an alluvial fan which formed after the uplift of the Cadell Fault block across the River Murray upstream. The fan has a number of distributary or anabranch channels, the main one being Gunbower Creek (Young and Hillman 2001). Together, the River Murray to the north and Gunbower Creek to the south form Gunbower Island. Most of Gunbower Island is occupied by the Gunbower Island State Forest, which also represents the Gunbower Forest Ramsar site. Other, smaller areas of the island are occupied by freehold and leasehold land, which is predominantly developed for irrigated agriculture. The forest is approximately 2 km wide at the upstream end and reaches a maximum width of 8 km before progressively narrowing as the Gunbower Creek and River Murray merge (DSE 2003).

The constriction on the river channel created by the Cadell Fault upstream limits the flow that reaches Gunbower Forest from the River Murray to approximately 36,000 ML/d. Flows in excess of this level originate from other, substantial Broken-Goulburn and Campaspe tributaries that enter the river downstream of the fault (Murray Darling Basin Commission 2005).

The greater part of the Gunbower Forest Ramsar site forms an elongate basin. High ground on the banks of the River Murray and Gunbower Creek confine flow somewhat within the forest where well-defined watercourses and wetlands occur. Water is introduced to the forest from the river via channels that cut through the natural levee when river levels exceed approximately 15,200 ML/d. Substantial overbank flows occur when river levels are sustained over 30,000 ML/d at Torrumbarry. Within the forest basin, deep, internally draining wetlands can retain water for approximately 2 years between inflow events (Cooling *et al.* 2002).

Torrumbarry Weir, a major structure on the River Murray, is located at the upstream end of Gunbower Forest. The weir distributes water to the Torrumbarry Irrigation Area, through a variety of constructed and natural channels including Gunbower Creek. Shallow, saline groundwater is associated with both the irrigation district and Gunbower Creek, and results in a significant groundwater gradient beneath the forest from the creek to the river (SKM 2002). Poor tree health and signs of salinisation are associated with shallow groundwater in the south-west of the island.

Torrumbarry Weir and Gunbower Creek are potentially useful in flooding the forest. Gunbower Creek is operated at a higher elevation than the bed level of much of the forest during the spring and summer irrigation season and can be used to fill wetlands and flood some forest areas (URS 2001).

Annual average rainfall at the nearby Koondrook State Forest is 395 mm and the mean daily maximum temperature is 22.2 degrees Celsius (data provided by Bureau of Meteorology, Australia).

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The River Murray drains over 420,000 km² of the south eastern highlands of Australia. The river originates in a upland region of 1,430 m AHD and flows in a north-west direction through a predominantly semi-arid region before turning due south in South Australia to meet the sea. The upland region represents only 2% of the catchment area, but generates over 40% of the water yield. The lowland region has a relatively low rainfall and a low gradient. From the commencement of the lowland region at Albury, the river falls approximately 150 m over more than 2,000 km to the sea.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

In the past, excess water in the Torrumbarry Irrigation System has been released to Gunbower Forest to prevent flooding in developed areas (URS 2001). This facility still exists but is considered undesirable if it creates unseasonal flooding.

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 1923 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.

Gunbower Forest mitigates the flooding effects of high flows in the River Murray.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • O • P • Q • R • Sp • Ss • Tp • Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

Wetland types have been calculated from Ecological Vegetation Class Mapping (Arthur Rylah Institute 2003) where EVCs have been assigned to Ramsar classes as follows:

Xf (Riparian Woodland, Grassy Riverine Forest, Riverine Grassy Woodland, Riverine Swamp Forest, Sedgy Riverine Forest, Sedgy Riverine Forest/Riverine Swamp Forest Complex)

P (Floodway Pond Herbland / Riverine Swamp Forest Complex, Spike Sedge Wetland, Tall Marsh)

9 (Water Body – Fresh)

P = 11% (2365 ha)

Xf = 63% (12,670 ha)

9 = 0.6% (118.6 ha)

Other non-wetland = 24% (4911 ha)

EVCs are presented in **Map 2**.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The following description of ecological features has been adapted from URS (2001). The six water regime classes identified at the site (Permanent Wetlands, Semi-permanent Wetlands, Red Gum Forest with Flood-dependent Understorey, Red Gum Forest with Flood-tolerant Understorey and Black Box Woodland) are described here and illustrated in **Map 3**.

The deepest internally draining areas of the forest have been classified as Permanent Wetlands, although permanent water no longer occurs due to the altered hydrology of the River Murray. Permanently flooded areas were vegetated with submerged and semi-emergent aquatic macrophytes and fringed by emergent macrophytes. River Red Gum (*Eucalyptus camaldulensis*) trees, which do not tolerate permanent flooding, are absent. Permanent wetlands would have provided a refuge for aquatic fauna during drought. Permanent wetlands provided a reliable breeding habitat for colonial nesting waterbirds.

Semi-permanent Wetlands occur in low lying parts of the forest surrounding the Permanent Wetlands. Prior to regulation they were inundated seasonally and supported a productive understorey of emergent and submerged aquatic macrophytes and a dense overstorey of Red Gum. Semi-permanent Wetlands are a major nesting site for colonial nesting waterbirds including Egrets and Nankeen Night Heron (genera include *Ardea*, *Ncticorax* and *Egretta*) and reed-dependent waterbirds, including grebes (e.g. *Podiceps* spp.), breed in the understorey. The understorey provide aquatic habitat for fish

and tortoise when flooded and grazing for terrestrial vertebrates, such as Red Kangaroo (*Macropus giganteus*).

River Red Gum forest covers approximately 60% of the Ramsar site and occurs in seasonally or intermittently flooded areas. The lower-lying, more frequently flooded areas support an understorey of aquatic macrophytes such as River Swamp Wallaby Grass (*Amphibromus fluitans*) and Warrego Summer Grass (*Setaria jubiflora*). Less frequently flooded areas have an understorey of terrestrial plants including Wallaby Grass (*Austrodanthonia* spp.), Kangaroo Grass (*Austrostipa* spp.) and species from the family Chenopodiaceae.

The least frequently flooded areas of the forest are inundated approximately 10 times every 100 years and support Black Box (*Eucalyptus largiflorens*) woodlands with an understorey of terrestrial grasses and shrubs.

Some high-elevation areas are not subject to inundation and support Grey Box (*Eucalyptus microcarpa*) woodland or mallee woodland vegetation.

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Red Gum growing at the perimeter of the wetlands are important to the habitat values and productivity of the site. The trees provide sheltering and nesting habitat for a range of vertebrate species, particularly as hollows, for bats, parrots, possums, snakes and waterbirds (URS 2001). The trees also contribute organic matter to the wetlands to support productivity and provide physical habitat as snags.

The Ramsar site supports several plant species that are recognised as endangered (e) or vulnerable (v) at a national level (Commonwealth Environment Protection and Biodiversity Conservation Act 1999) or in the state of Victoria (DSE 2005a): River Swamp Wallaby Grass (*Amphibromus fluitans* vulnerable nationally), Western Water-starwort (*Callitriche cyclocarpa* vulnerable nationally and in Victoria), Winged Peppergrass (*Lepidium monoplacoides* endangered nationally and in Victoria), Dwarf Swainson Pea (*Swainsona phacoides* endangered in Victoria), Twiggy Sida (*Sida intricata* vulnerable in Victoria), Umbrella Wattle (*Acacia oswaldii* vulnerable in Victoria).

When flooded the lakes support beds of aquatic macrophytes which support aquatic productivity and diversity. Notable species include Bulrush (*Typha* spp.), Milfoil (*Myriophyllum* sp.), Cane Grass (*Eragrostis australisica*), Spiny Mudgrass (*Pseudoraphis spinescens*) and Water Couch (*Paspalum distichum*).

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Gunbower Forest is reported to be an important waterbird breeding site however there are few records of the numbers of birds breeding during past flood events. The forest supports the only breeding colony of Intermediate Egret (*Ardea intermedia*) in Victoria (DSE 2003). In 1974 there were an estimated 500 nests and in 1982 there were over 100 nests (Horrocks et al. 1989). There are also records of significant numbers of Nankeen Night Heron (*Nycticorax caledonicus*), Little Egret (*Egretta garzetta*), Great Egret (*Ardea alba*) and Darter (*Anhinga melanogaster*).

Australian White Ibis (*Threskiornis molucca*), Grey Teal (*Anas gracilis*), Black Swan (*Cygnus atratus*) and other waterbirds use Gunbower Forest for breeding (DSE 2005b). A number of species subject to international migratory bird agreements have been reported from the site as set out in **Appendix 1**.

The site supports a high diversity of native fish including species of conservation significance in Victoria (DSE 2005b) and nationally (Commonwealth Environment Protection and Biodiversity Conservation Act 1999): Golden Perch (*Macquaria ambigua* vulnerable in Victoria), Murray Cod (*Muccollochella peelii peelii* endangered in Victoria, and vulnerable at the national level) and Silver Perch *Bidyanus bidyanus* (critically endangered in Victoria). The Southern Bell Frog (*Litoria raniformis*) is endangered in Victoria and vulnerable at the national level.

23. Social and cultural values:

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Gunbower Forest is a popular visitor destination (DSE 2003). Popular activities including fishing, camping, four-wheel driving, trail bike riding, cycling, horse riding and bushwalking. Other activities include orienteering, boating, bait collection, duck shooting and hunting of feral animals. These activities are regulated by Parks Victoria and the Forestry Service of the Department of Sustainability and Environment under the Mid Murray Forests Management Plan to prevent conflicts with the ecological character of the system.

Gunbower Forest is an important Aboriginal cultural heritage area (DSE 2003). The area features numerous significant archaeological features that have been recorded by Aboriginal Affairs Victoria (AAV) including shell deposits, mounds, scarred trees, burial sites, heaths and other features. The locations of many other features including burial or natural sacred sites may not be registered but may be known to members of local Aboriginal communities.

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ☐ and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

a) within the Ramsar site:

The greater part of the Ramsar area lies within Gunbower State Forest (17,106 ha) which is managed by the Forestry Service of the Department of Sustainability and Environment (the State Government of Victoria).

The river bank and a narrow frontage between the river and the forest (2,096 ha) lies within the Murray River Reserve. The Murray River Reserve is managed by Parks Victoria, an agency of the State Government of Victoria.

b) in the surrounding area:

Koondrook – Perricoota State Forest, on the opposite bank of the River Murray is managed by Forests NSW, an agency of the Government of the State of New South Wales under the NSW Department of Natural Resources.

25. Current land (including water) use:

a) within the Ramsar site:

The Ramsar site is subject to multiple land uses.

The forest is used for firewood collection and timber harvesting by the Forests Service of the Department of Sustainability and Environment under the Mid Murray Forests Management Plan (DNRE 2002). The plan specifies sustainable firewood collection and timber harvesting measures in the forest, including the exclusion of these activities from sensitive conservation sites.

Areas of the forest are set aside for recreational use, including campsites along the river bank. Cattle are agisted in leases within the Ramsar site. The forest is used for honey production by the European Honey Bee (*Apis mellifera*). There are leases to extract sand and gravel from the forest.

The Torrumbarry Weir is located near the upstream end of the Ramsar site. A caravan park is located near the weir.

Parts of Gunbower Creek lie within the Ramsar site. Gunbower Creek is an anabranch of the River Murray and is operated as a regulated water delivery channel in the Torrumbarry Irrigation District. The irrigation district covers 167,000 ha with 150,000 ha suitable for irrigation in northern Victoria. The system supplies approximately 2,650 irrigation customers and a further domestic and stock customers (G-M Water 2006). Irrigation system interacts with the Ramsar site in that irrigation drainage and seepage from Gunbower Creek contribute to high saline groundwater levels to the south-east of the forest (SKM 2002). The regulation of Gunbower Creek provides scope to release water to the forest for environmental purposes. However, any releases must accommodate the role of the channel in the Torrumbarry Irrigation District (URS 2001).

When available, water is released to the forest from Gunbower Creek to meet environmental water requirements. Water may also be released to the forest to prevent flooding of farmland (URS 2001).

b) in the surroundings/catchment:

Koondrook-Perricoota State Forest, located on the opposite bank of the River Murray is managed for timber harvesting, conservation and recreation.

The predominant land uses around Gunbower are irrigated agriculture, particularly dairying.

The River Murray is part of the Murray-Darling basin which drains 1,061,469 km². The basin has an estimated population of 1,956,765. It is extensively developed for agriculture with 1,472,241 ha under irrigated crop and pasture.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

The Ramsar site is subject to continuing impacts associated with the reduced frequency and duration of flooding (Ecological Associates 2004). Flooding has declined significantly since regulation of the River Murray began in 1936 with the completion of Hume Dam and the subsequent growth in diversions. The frequency with which River Murray flows reach the level required to inundate wetlands or *Eucalyptus camaldulensis* forest areas has declined significantly (**Table 1**).

Flow modelling predicts the times at which the river flow and associated water levels were stated to exceed the effluent sill levels in Gunbower Forest. **Table 1** below summarises modelled flow events for current regulated conditions and the unregulated conditions that occurred prior to settlement. This is reported as the average duration and frequency of flood events. Statistics are based on flows shown in bold. Comparable monthly and daily flows are approximate.

Table 1. The effects of regulation on flows in the River Murray at Torrumbarry Weir (analysis taken from Ecological Associates 2004).

River Murray Flow below Torrumbarry		Duration ¹ (Months/Event)		Frequency ² (Events/100 years)	
ML/day	GL/month	Natural	Current	Natural	Current
<15,200	<460	6.2	3.9	4	47
≥15,200	≥460	6.0	3.7	96	53
>36,000	>1,100	3.4	2.6	68	27

Notes:

Data is based on modelled monthly flows from the Murray-Darling Basin Commission – Monthly Simulation Model for flows between 1891 and 1990.

1. Duration is the average number of months per event that monthly flows exceeded the threshold values shown **bold** in columns 1 or 2.

2. Frequency is the number of years, in the 100 years modelled, in which one or more months had flows exceeding the threshold values shown **bold** in columns 1 or 2.

The flooding of wetlands is initiated at flows of 15,200 ML/day. As a result of the changes presented in **Table 1**, wetlands have become more temporary and are less likely to provide a reliable aquatic habitat between inflow events. Forested areas are inundated by sustained flow events of more than 30,000 ML/day. Declining flood frequencies and durations have resulted in poor health in mature *Eucalyptus camaldulensis* trees and a decline in the productivity of forested areas.

The Ramsar site is subject to rising saline groundwater, particularly in the vicinity of Gunbower Creek (SKM 2002). Groundwater monitoring indicates shallow groundwater exists near Gunbower Creek, where recharge has increased as a result of land clearance, irrigation and seepage from irrigation channels. The level of the water table is significantly deeper in the central part of the forest. Poor tree health near Gunbower Creek, particularly *Eucalyptus largiflorens*, is likely to be caused by shallow saline groundwater.

b) in the surrounding area:

The surrounding area is subject to shallow saline groundwater (SKM 2002). Groundwater recharge has increased as a result of land clearance, irrigation and seepage from irrigation channels and storages.

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

The Gunbower Forest Ramsar site is preserved in the Gunbower State Forest and Murray River Reserve. The Ramsar site is specifically protected from actions that are likely to have a significant impact on its ecological character by the Commonwealth EPBC Act. Threatened and migratory species are protected under the EPBC Act. Species threatened in Victoria are protected under various Victorian legislation (DSE 2003).

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ☐; Ib ☐; II ☐; III ☐; IV ☐; V ☐; VI ☐

c) Does an officially approved management plan exist; and is it being implemented?:

A management plan has been prepared for the Ramsar site (DSE 2003) and is being implemented. The management plan includes measures to address deficiencies in the water regime of the forest, to control pest plants and animals, to investigate possible groundwater risks, to protect cultural heritage assets and to improve knowledge regarding the ecology and hydrology of the site.

In Victoria, a steering committee of stakeholders including the Department of Sustainability and Environment, North Central Catchment Management Authority, Goulburn-Murray Water and Parks Victoria has been formed to identify options for improving management of environmental water in the Gunbower Forest. Improvements in the integration of cross-border water management arrangements would facilitate management of Gunbower and the neighbouring Koondrook and Perricoota Forests in NSW as a single ecological unit (DSE 2003).

The development of programs to monitor ecological character is specified as a strategic direction in the Gunbower Forest Ramsar Site Strategic Management Plan (DSE 2003). A program to monitor forest vegetation classes, based on Woodward's classification has been implemented by the North Central Catchment Management Authority (Brett Lane and Associates 2005). A waterbird monitoring program, recently established by the North Central Catchment Management Authority will collect data to verify this ecosystem service (Crome 2004).

d) Describe any other current management practices:

National recovery plans are in preparation for the Southern (Warty) Bell Frog (*Litoria raniformis*) and the Winged Peppergrass (*Lepidium monoplacoides*) (DEH 2006).

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

An environmental water management plan is currently being developed by the North Central Catchment Management Authority in cooperation with the Murray-Darling Basin Commission under the Living Murray Initiative (Murray-Darling Basin Commission 2005). The plan will include on-ground works to meet environmental water requirements.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

A detailed monitoring methodology has recently been developed for the forest (Crome 2004) and has been implemented in an inaugural survey by Brett Lane and Associates (2005). The method assesses

tree health and plant community composition within mapped water regime classes. A methodology to survey frogs and waterbirds has been developed and implemented in 2003 (Davies 2004).

30. Current communications, education, participation and awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The Department of Sustainability and Environment office in Cohuna provides information to visitors on the facilities, permissible uses and conservation values of the forest

The Ramsar Management Plan (DSE 2003) is publicly available and provides information on values, threats and management measures.

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 observe the forest ecosystem and to conduct simple long-term experiments (DSE 2003).

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The forest is popular for fishing, camping and hunting. Parks Victoria maintains an extensive system of fireplaces and picnic tables. The caravan park at Torrumbarry Weir provides accommodation in the Ramsar Area (DSE 2003). Cohuna Scout Group has a camp site within the forest (DSE 2003).

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Territorial jurisdiction: Government of the state of Victoria

Functional jurisdiction: The Gunbower State Forest is managed by the Department of Sustainability and Environment. The Murray River Reserve is managed by Parks Victoria (the main state nature conservation agency). Strategic natural resource management in the bioregion is managed by the North Central Catchment Management Authority (regional natural resource management planning agency).

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Murray Thorson, Forester in Charge
Department of Sustainability and Environment
King Edward St, Cohuna, Victoria, 3568
03 5456 5555

Mark Tscharke, Ranger in Charge
Parks Victoria
26 Wellington St Kerang Victoria 3579
Parks Victoria Information Centre 13 1963
www.parksweb.vic.gov.au

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

- Arthur Rylah Institute (2003). The Vegetation of North-West Victoria. A report to the Wimmera, North Central and Mallee Catchment Management Authorities. Department of Sustainability and Environment, Victoria.
- Brett Lane and Associates (2005). Gunbower Forest Flood Enhancement Monitoring Program. Implementation: Sentinel Wetland and Understorey Surveys. Report prepared for the North Central Catchment Management Authority, Huntly.
- Cooling, M., Lloyd, L., Rudd, D. and Hogan, R. (2002). Environmental water requirements and management options in Gunbower Forest, Victoria. *Australian Journal of Water Resources*, 5(1), 75-88.
- Crome, F. (2004). A Monitoring System for the Gunbower Forest. Report prepared for the North Central Catchment Management Authority, Huntly.
- DEH (2006). Recovery Plans. <http://www.deh.gov.au/biodiversity/threatened/recovery/index.html>
- DNRE (1997). Victoria's Biodiversity: Directions in Management. Department for Natural Resources and Environment, Melbourne.
- DNRE (2002). Forest Management Plan for the Mid-Murray Forest Management Area. Department of Natural Resources and Environment, Victoria.
- DSE (2003). *Gunbower Forest Ramsar Site Strategic Management Plan*. Department of Sustainability and Environment, Victoria.
- DSE (2005a). Atlas of Victorian Wildlife. Department of Sustainability and Environment, Victoria.
- DSE (2005b). Victorian Flora Information System. Department of Sustainability and Environment, Victoria.
- DSE (2006). A framework for responding to challenges in the management of biodiversity. <http://www.dse.vic.gov.au/dse/nrence.nsf/LinkView/67C8A2D6F5772C91CA256EE8002044A01C26CB3A9ABC1C2FCA256EE700148D0B>
- Davies, D. (2004). Gunbower Forest Pilot Project – Bird and Frog Monitoring Survey. Report prepared for the North Central Catchment Management Agency, Huntly.
- Ecological Associates (2004). Flooding Enhancement of Gunbower Forest: Investigation of Priority Options Part A. Report prepared for the North Central Catchment Management Authority, Huntly Victoria.
- Environment Australia (2000). Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 – Summary Report. Environment Australia, Canberra.
- Environment Protection and Biodiversity Conservation (EPBC) Act (1999). Australian Government Attorney Generals Department.
- G-M Water (2006). Torrumbarry. <http://www.g-mwater.com.au/browse.asp?ContainerID=torrumbarry>

Horrocks, G.F.B, Brown, G.W., Earl, C.E., Griffiths, R.C. and Williams, L.M. (1989). Flora and Fauna of Gunbower Island, Northern Victoria. Ecological Survey Report No. 28 (incomplete). Department of Conservation, Forests and Lands, Victoria.

Murray-Darling Basin Commission 2005. The Living Murray Foundation Report on the Significant Ecological Assets Targeted in the First Step Decision. MDBC Publication No. 09/05, Murray-Darling Basin Commission, Canberra.

URS (2001). Flooding Enhancement of Gunbower Forest – Scoping Study. Report prepared for the Department of Sustainability and Environment and the North Central Catchment Management Authority, Huntly, Victoria.

SKM (2002). Gunbower Forest Flooding Enhancement – Groundwater Review. Report prepared by Sinclair Knight Merz for the North Central Catchment Management Authority, Huntly.

Young, W. J. and Hillman, T. J. (2001). The Murray River – to the Darling River Junction. In Young, W. J. (Ed.), "Rivers as Ecological Systems – The Murray-Darling Basin". Murray-Darling Basin Commission, Canberra.

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Appendix 1.

Species observed at Gunbower Forest subject to international migratory bird agreements administered under the EPBC Act (JAMBA – Japan Australia Migratory Bird Agreement; CAMBA – China Australia Migratory Bird Agreement; Bonn Convention). Source: Atlas of Victorian Wildlife.

Common Name	Scientific Name	JAMBA	CAMBA	Bonn
Australian Hobby	<i>Falco longipennis</i>			x
Australian Shelduck	<i>Tadorna tadornoides</i>			x
Banded Lapwing	<i>Vanellus tricolor</i>			x
Black Swan	<i>Cygnus atratus</i>			x
Brown Falcon	<i>Falco berigora</i>			x
Brown Goshawk	<i>Accipiter fasciatus</i>			x
Cattle Egret	<i>Ardea ibis</i>	x	x	
Collared Sparrowhawk	<i>Accipiter cirrhocephalus</i>			x
Great Egret	<i>Ardea alba</i>	x	x	x
Hardhead	<i>Aythya australis</i>			x
Latham's Snipe	<i>Gallinago hardwickii</i>	x	x	
Little Eagle	<i>Hieraaetus morphnoides</i>			x
Masked Lapwing	<i>Vanellus miles</i>			x
Musk Duck	<i>Biziura lobata</i>			x
Pacific Black Duck	<i>Anas superciliosa</i>			x
Peregrine Falcon	<i>Falco peregrinus</i>			x
Swamp Harrier	<i>Circus approximans</i>			x
Wedge-tailed Eagle	<i>Aquila audax</i>			x
Whistling Kite	<i>Haliastur sphenurus</i>			x
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>		x	
White-throated Needletail	<i>Hirundapus caudacutus</i>		x	