



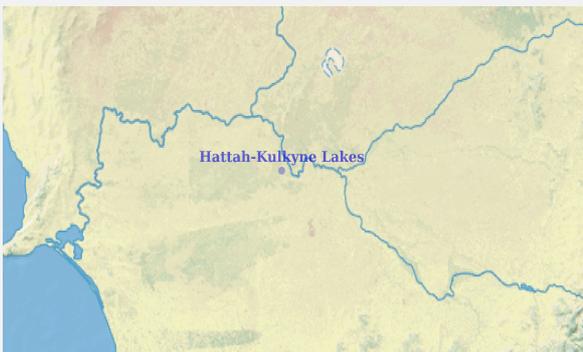
# Ramsar Information Sheet

Published on 5 July 2022

Update version, previously published on : 1 January 1998

## Australia

### Hattah-Kulkyne Lakes



Designation date	5 April 1983
Site number	264
Coordinates	34°43'24"S 142°22'40"E
Area	955,00 ha

## Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

## 1 - Summary

### Summary

The site is located in northern Victoria and consists of 12 floodplain lakes within the Hattah-Kulkyne National Park. The lakes lie on the floodplain approximately 15 km from the Murray River and are fed by Chalka Creek. The boundary of the site is the high water mark of Lake Arawak, Bitterang, Brockie, Bulla, Cantala, Hattah, Lockie, Konardin, Kramen, Mourmpall, Yerang, Yelwell and a small section of Chalka Creek between Lakes Lockie, Yerang and Mourmpall. Significant areas of the floodplain are not included in the site, however the broader area is also part of a UNESCO biosphere reserve.

The site is designated under Criterion 1, 2, 3, 4 and 8. The site supports:

- 70 species of waterbird, 34 which breed at the site. Functional feeding groups are dominated by ducks and herbivores, a reflection of the open water habitat with submergent herbland vegetation.
- A diversity of small-bodied native fish with breeding occurring across several species.
- A rich diversity of plant species, particularly within the dominant lake bed herbland vegetation community.
- At least four wetland dependent threatened species that are listed at the national and/or international level

The critical components and processes for the Hattah-Kulkyne Lakes Ramsar site are:

- hydrology;
- fish;
- lake bed vegetation; and
- waterbirds.

The following critical services (all supporting services) occur at the site:

- near natural wetland ecosystem;
- provides physical habitat for waterbird breeding and feeding;
- threatened species;
- biodiversity; and
- ecological connectivity.

The lakes are sequentially filled and can remain hydrologically and ecologically connected for different periods of time depending on the magnitude of the floods. On recession of floodwaters the presence of permanent water in the deeper lakes, especially Mourmpall and Hattah, provide critical drought refuges and maintains populations of obligate aquatic species. The lakes are predominantly fresh, turbid and support high productivity including ecologically important algal blooms a common occurrence. However, there are spatial differences in water quality between lakes. Fringing vegetation provides inputs of coarse woody debris and contributes to carbon cycling within the system. Woody debris and leaf litter from fringing river red gums provide important structural habitat for invertebrates and substrate for the development of biofilms.

## 2 - Data & location

### 2.1 - Formal data

#### 2.1.1 - Name and address of the compiler of this RIS

##### Responsible compiler

Institution/agency	Department of Environment, Land, Water and Planning
Postal address	PO Box 500 East Melbourne VIC 8002 Australia

##### National Ramsar Administrative Authority

Institution/agency	Department of Agriculture, Water and Environment
Postal address	GPO Box 858 Canberra ACT 2601 Australia

#### 2.1.2 - Period of collection of data and information used to compile the RIS

From year	<input type="text" value="2009"/>
To year	<input type="text" value="2020"/>

#### 2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish)	<input type="text" value="Hattah-Kulkyne Lakes"/>
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#### 2.1.4 - Changes to the boundaries and area of the Site since its designation or earlier update

(Update) A. Changes to Site boundary	Yes <input type="radio"/> No <input checked="" type="radio"/>
(Update) B. Changes to Site area	No change to area
(Update) For secretariat only: This update is an extension	<input type="checkbox"/>

#### 2.1.5 - Changes to the ecological character of the Site

(Update) 6b i. Has the ecological character of the Ramsar Site (including applicable Criteria) changed since the previous RIS?	No
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(Update) Optional text box to provide further information

While there has been no notifiable change to the ecological character, the site is subject to a changing climate. Australia has warmed by just over 1°C since 1910, with most warming since 1950. Further increases in temperature are projected, with more extremely hot days and fewer extremely cool days over the coming decades under all emissions scenarios. Warming over Australia is expected to be slightly higher than the global average. These conditions will affect the critical components, processes and services of the Ramsar site, and the resilience and adaptive capacity of the site will be tested.

The Living Murray Program has implemented a significant environmental works program at the Hattah-Kulkyne Lakes Ramsar site. This included the construction of a permanent pump station, regulators and environmental levees, which will be used to return a more natural and healthy pattern of flooding to the lakes. Water was delivered using the novel infrastructure to fill all lakes in 2014/15 (<http://www.mdba.gov.au/about-basin/river-murray-icon-sites/hattah-lakes>).

A number of monitoring programs are underway to investigate changes to ecological components in the Hattah-Kulkyne Lakes Ramsar site. These monitoring programs are delivered by the Murray-Darling Basin Authority and include tree health, aquatic vegetation, bird, fish and feral species monitoring. The results of these studies indicate positive signs of improved health of vegetation and populations of birds and fish responding to flows of environmental water.

## 2.2 - Site location

### 2.2.1 - Defining the Site boundaries

#### b) Digital map/image

<1 file(s) uploaded>

Former maps	<input type="text" value="0"/>
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#### Boundaries description

The Hattah-Kulkyne Lakes Ramsar Site consists of all area contained within the Mean High Water Mark (MHWM) of each of the twelve lakes that make up the site. These are Lake Brockie (30.2 ha), Lake Bulla (37.1 ha), Lake Arawak (38.1ha), Lake Yerang (51.1), Lake Hattah (57.5), Lake Yelwell (59/4 ha), Lake Konardin (52.7 ha), Lake Cantala (83.7 ha), Lake Bitterang (122.1 ha), Lake Lockie (131.3 ha), Lake Kramen (133.3 ha) and Lake Mourmpall (180.5 ha).

2.2.2 - General location

- a) In which large administrative region does the site lie?
- b) What is the nearest town or population centre?

2.2.3 - For wetlands on national boundaries only

- a) Does the wetland extend onto the territory of one or more other countries? Yes  No
- b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes  No

2.2.4 - Area of the Site

Official area, in hectares (ha):

Area, in hectares (ha) as calculated from GIS boundaries

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
Other scheme (provide name below)	Lower Mallee, Murray-Darling Basin

Other biogeographic regionalisation scheme

Australian Hydrological Geospatial Fabric (Geofabric): Topographic Drainage Divisions and River Regions (BOM 2012) – Lower Mallee River Region, Murray-Darling Basin Drainage Division.

### 3 - Why is the Site important?

#### 3.1 - Ramsar Criteria and their justification

- Criterion 1: Representative, rare or unique natural or near-natural wetland types

Hydrological services provided

The Hattah-Kulkyne Lakes are considered a representative good example of a series of large, hydrologically connected, permanent and intermittent floodplain lakes on the Murray River floodplain. The lakes are approximately 15 km from the Murray River with most being fed by Chalka Creek and lie within the Hattah-Kulkyne National Park. The wetlands of the Ramsar site are the key feature of the floodplain and National Park. The lakes, combined with a range of other wetland types in the National Park, are representative of a large relatively intact section of the Murray River floodplain.

Other ecosystem services provided

The site is important as it supports significant biodiversity representative of the bioregion, and provides important floodplain lake refuge for obligate aquatic species.

- Criterion 2 : Rare species and threatened ecological communities

- Criterion 3 : Biological diversity

Justification

The Ramsar site and the surrounding National Park, support considerable biodiversity at the local scale, with flora and fauna representative of Murray River floodplain and mallee country. Species richness is high across several groups of biota including plants and waterbirds, being comparable to several other Ramsar sites in the Murray-Darling Basin. The soil seed bank from within the lakes has high species richness and is comparable to that recorded from entire floodplain systems such as Narran Lakes, a Ramsar site in northern New South Wales. Native fauna diversity is higher than some nearby floodplain forest systems which is noteworthy as the Ramsar boundary at Hattah-Kulkyne does not include significant areas of floodplain.

- Criterion 4 : Support during critical life cycle stage or in adverse conditions

- Criterion 8 : Fish spawning grounds, etc.

Justification

Considered to be an important nursery area for native fish. The larvae and juveniles of large bodied native fish such as golden perch (*Macquaria ambigua*), silver perch (*Bidyanus bidyanus*) and Murray cod (*Maccullochella peelii peelii*), move into the floodplain lakes in floodwaters. Recruitment of juveniles back into the adult river population is dependent on the water levels of the lakes being maintained but more importantly there needs to be reconnection to the Murray River for species to return to the riverine habitat. Small bodied natives also breed in the site, with young of the year from fly-specked hardyhead (*Craterocephalus stercusmuscarum fulvusfluviatilis*), carp gudgeons (*Hypseleotris* spp.), flat-headed gudgeon (*Philpnodon grandiceps*), and Australian smelt (*Retropinna semoni*) recorded from the site. The site provides migratory routes between habitat in the Murray River and the floodplain for species such as golden perch, silver perch and Murray cod. Chalka Creek, and possibly Cantala Creek, are important passageways for native fish during natural flows. Native fish typically move into off-stream areas on rising flows, and make refuge movements into deeper waters during low flow periods.

#### 3.2 - Plant species whose presence relates to the international importance of the site

Phylum	Scientific name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List	CITES Appendix I	Other status	Justification
<b>Plantae</b>								
TRACHEOPHYTA / MAGNOLIOPSIDA	<i>Lepidium monolocoides</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	Endangered under EPBC Act.	

A small population of *Lepidium monolocoides*, Winged peppergrass, is present at the site. This species is nationally listed as endangered under the Environment Protection and Biodiversity Conservation (EPBC) Act.

### 3.3 - Animal species whose presence relates to the international importance of the site

Phylum	Scientific name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence <sup>1)</sup>	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
		2	4	6	9	3	5	7	8								
<b>Fish, Mollusc and Crustacea</b>																	
CHORDATA / ACTINOPTERYGII	<i>Bidyanus bidyanus</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				VU	<input type="checkbox"/>	<input type="checkbox"/>	National (EPBC) - critically endangered	Uses site on irregular basis linked to flooding
CHORDATA / ACTINOPTERYGII	<i>Craterocephalus fulvus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / ACTINOPTERYGII	<i>Maccullochella peelii</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>	National (EPBC) - vulnerable	Uses site on irregular basis linked to flooding
CHORDATA / ACTINOPTERYGII	<i>Macquaria ambigua</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / ACTINOPTERYGII	<i>Retropinna semoni</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
<b>Birds</b>																	
CHORDATA / AVES	<i>Anhinga novaehollandiae</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Ardea alba</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Cygnus atratus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Haliaeetus leucogaster</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Microcarbo melanoleucos</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Pelecanus conspicillatus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Phalacrocorax carbo</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Phalacrocorax varius</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Podiceps cristatus</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				LC	<input type="checkbox"/>	<input type="checkbox"/>		Breeding
CHORDATA / AVES	<i>Polytelis anthopeplus monarchoides</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					<input type="checkbox"/>	<input type="checkbox"/>	National (EPBC) - vulnerable	Uses the site for feeding, roosting and possibly breeding

1) Percentage of the total biogeographic population at the site

The site acts as a drought refuge. Water can remain in the lakes for several years after filling, providing habitat in adverse times for waterbirds and other aquatic species (MDBC 2006; DSE 2010). Hattah Lake has records indicating that between 1908 and 1982 the lake only dried on 9 occasions with a maximum dry period of 36 months (DSE 2010). Data specific to the role of the lakes as drought refuges is lacking for individual species.

In the most recent surveys of fish populations using the Hattah-Kulkyne site, all 5 significant fish identified above, were identified in the site in 2018 and 2019 (Bloink et al. 2019).

### 3.4 - Ecological communities whose presence relates to the international importance of the site

<no data available>

## 4 - What is the Site like? (Ecological character description)

### 4.1 - Ecological character

The critical components and processes of the Ramsar site include:

- hydrology,
- lake bed hermland vegetation,
- fish, and
- waterbirds.

**Hydrology:** The lakes are predominantly fed by inflows from the Murray River via Chalka Creek. The lakes start filling at flows of 23,000 megalitres per day in the Murray River downstream of Euston. This lower commence to fill level is due to new infrastructure which allows natural floods of smaller magnitude to enter the system. Prior to this, the lakes started filling at flows of 36,700 megalitres per day. The infrastructure is part of the Hattah Lakes North Floodplain Restoration Project and includes three regulating structures and approximately 1.8 km of raised access tracks (containment banks) to facilitate managed inundation of up to 1,130 ha of degraded floodplain habitats at Hattah Lakes North. The majority of the lakes dry within 12 months after inflows cease, the exceptions being Lakes Mournpall and Hattah which retain water for several years post flooding.

The site supports a suite of near natural permanent and intermittent freshwater floodplain lakes, which in turn provide a range of physical habitats especially for waterbird breeding and feeding. The lakes are sequentially filled and can remain hydrologically and ecologically connected for different periods of time depending on the magnitude of the floods. On recession of floodwaters the presence of permanent water in the deeper lakes, especially Mournpall and Hattah, provide critical drought refuges and maintains populations of obligate aquatic species. Some natural variability of the hydrological regime has been restored after the introduction of pumping infrastructure and this appears to have led to improvements in the ecological condition.

**Lake bed hermland vegetation:** The dominant vegetation across all lakes is lake bed hermland. It shifts from being dominated with aquatic and amphibious species with some terrestrial species on the edges in the wet phase, to being dominated by terrestrial species in the dry phase. The relative length of each inundation event and subsequent dry phase also influences the community structure. Aquatic macrophyte growth is variable across lakes, and data is limited. Seed bank species richness is high and suggests establishment of beds of aquatic macrophytes is possible with the right antecedent conditions. Data on aquatic vegetation at the time of listing are not available.

**Fish:** Hattah-Kulkyne Lakes represent an important, highly connected, floodplain habitat for fish. Twelve native species and five exotic species have been recorded from the Ramsar site. Fish present in the Ramsar site include species that spawn in response to floods, species that are main channel specialists and generalists and species that are wetland specialists and low-flow specialists. Data on large bodied fish such as Murray cod, silver perch and golden perch are limited.

**Waterbirds:** The site supports 70 species of waterbirds, 12 of which are covered by international migratory bird treaties while 34 species breed at the site. Functional guilds are dominated by ducks, which is unusual in the major wetland systems of the Murray River.

Reduced inflows due to river regulation and the impacts of drought led to declining condition of ecological values of the Hattah Lakes Icon site. A lack of overbank flooding between 2000 and 2010 gave rise to concern regarding the condition of floodplain vegetation, most notably river red gum. Delivery of environmental water commenced in April 2005 with water pumped into Chalka Creek and a number of the Ramsar wetlands as an emergency measure to maintain existing river red gum communities (EPA and MDFRC 2007).

### 4.2 - What wetland type(s) are in the site?

#### Inland wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
Fresh water > Flowing water >> N: Seasonal/intermittent/irregular rivers/streams/creeks	Chalka Creek	3	0.0795	Representative
Fresh water > Lakes and pools >> O: Permanent freshwater lakes	Hattah Lake, and Lake Mournpall	2	256	Representative
Fresh water > Lakes and pools >> P: Seasonal/intermittent freshwater lakes		1	814	Representative

#### (ECD) Habitat connectivity

There are 12 lakes, which are hydrologically connected by channels/creeks. The lakes fill sequentially with several flow paths evident within the site. Water quality and biota in each lake reflect that of the parent lake in the sequence.

### 4.3 - Biological components

#### 4.3.1 - Plant species

Other noteworthy plant species

Phylum	Scientific name	Position in range / endemism / other
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Austrobryonia micrantha</i>	This species is near threatened in Victoria.
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Calotis cuneifolia</i>	This species is near threatened in Victoria.
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Centipeda nidiformis</i>	This species is near threatened in Victoria.

Invasive alien plant species

Phylum	Scientific name	Impacts	Changes at RIS update
TRACHEOPHYTA/MAGNOLIOPSIDA	<i>Xanthium strumarium</i>	Actual (minor impacts)	No change

Optional text box to provide further information

Leafy elodea (*Egeria densa*), is a non-native submergent aquatic plant which prefers slow moving waters and nutrient rich conditions. It can become problematic by obstructing water flow and out-competing native vegetation. This species has not yet been recorded from the site, but is believed to be a threat to the site should it establish within the lakes. As it has been recorded from the Murray River there is a very high potential for it to enter the site and become established.

### 4.3.2 - Animal species

Invasive alien animal species

Phylum	Scientific name	Impacts	Changes at RIS update
CHORDATA/MAMMALIA	<i>Capra hircus</i>	Actual (minor impacts)	No change
CHORDATA/MAMMALIA	<i>Oryctolagus cuniculus</i>	Actual (minor impacts)	No change
CHORDATA/MAMMALIA	<i>Sus scrofa</i>	Potential	No change
CHORDATA/MAMMALIA	<i>Vulpes vulpes</i>	Actual (minor impacts)	No change
CHORDATA/ACTINOPTERYGII	<i>Carassius auratus</i>	Actual (minor impacts)	No change
CHORDATA/ACTINOPTERYGII	<i>Cyprinus carpio</i>	Actual (minor impacts)	No change
CHORDATA/ACTINOPTERYGII	<i>Gambusia holbrooki</i>	Actual (minor impacts)	increase
CHORDATA/ACTINOPTERYGII	<i>Misgurnus anguillicaudatus</i>	Actual (minor impacts)	increase

Optional text box to provide further information

The availability of water and food in an otherwise semi-arid region means that most common invasive animals are already present in the Hattah-Kulkyne. It is considered that the area is susceptible to further growth in the populations of these pest species. However, there is limited data available to adequately describe the current scope and scale of pest animal populations for the purposes of effective regional control. The priority of action to address invasive animals is strongly influenced by local scale data derived from local planning instruments and informal community consultation at the local level. The Mallee Invasive Plants and Animals Management Strategy (IPAMS) provides a planning and response framework where data is available.

## 4.4 - Physical components

### 4.4.1 - Climate

Climatic region	Subregion
B: Dry climate	BSk: Mid-latitude steppe (Mid-latitude dry)

Changes to climate and weather for the Mallee region over the last 30 years, include:

- Annual rainfall > by 7%, mainly in autumn and spring months
- Reliable Winter rainfall compared to other seasons, summer the most unreliable
- Dry years occurred twice as often as wet years
- Autumn break occurs around mid-May in the east through to mid-June in the west
- Spring frosts more common and occurring later
- More hot days, with more consecutive days above 38 °C

Impacts of climate change on the availability of environmental water may be significant for this site. By 2030 climate change is anticipated to increase temperatures in the Mallee region by 0.9°C with the greatest increase expected in summer. By 2030 reductions in total average annual rainfall of around 4%, with the greatest reductions in spring (7%). Evaporation is predicted to increase and combined with reduced humidity will create dryer conditions.

### 4.4.2 - Geomorphic setting

a) Minimum elevation above sea level (in metres)

a) Maximum elevation above sea level (in metres)

- Entire river basin
- Upper part of river basin
- Middle part of river basin
- Lower part of river basin
- More than one river basin
- Not in river basin
- Coastal

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean.

Murray Darling Basin

#### 4.4.3 - Soil

Mineral

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

No available information

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes  No

Please provide further information on the soil (optional)

Soils comprise alluvium deposits from the Cainozoic period, which have produced red brown earths, cracking clays and texture contrast soils (Dermosols, Vertosols, Chromosols and Sodosols).

#### 4.4.4 - Water regime

##### Water permanence

Presence?	Changes at RIS update
Usually permanent water present	No change
Usually seasonal, ephemeral or intermittent water present	No change

##### Source of water that maintains character of the site

Presence?	Predominant water source	Changes at RIS update
Water inputs from surface water	<input checked="" type="checkbox"/>	No change

##### Water destination

Presence?	Changes at RIS update
To downstream catchment	No change
Feeds groundwater	No change

##### Stability of water regime

Presence?	Changes at RIS update
Water levels largely stable	increase

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

Lake Mournpall is the only permanent wetland, the rest of the lakes are considered intermittent.

Water losses at the site are to evaporation as well as to the groundwater. The infrastructure at the site allows for return flows to the Murray River, which is regularly used for connectivity and allowing for native fish who have used the system as a nursery to return to the river.

The system is managed to mimic natural wetting and drying regimes which are variable across the lake systems from the episodic Lake Kramen to the near permanent Lake Mournpall.

(ECD) Connectivity of surface waters and of groundwater

The lakes are hydrologically connected through a series of channels and creeks.

(ECD) Stratification and mixing regime

No data, but may occur in Lake Mournpall and Hattah Lake when full.

#### 4.4.5 - Sediment regime

Significant accretion or deposition of sediments occurs on the site

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

Sediment regime is highly variable, either seasonally or inter-annually

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

Sediment regime unknown

Please provide further information on sediment (optional):

Sediment regime varies between lakes.

(ECD) Water turbidity and colour	11 NTU in temporary and high as 93 NTU in semi-permanent lakes
(ECD) Light - reaching wetland	n/a
(ECD) Water temperature	25°C in temporary and high as 20°C in semi-permanent lakes

#### 4.4.6 - Water pH

Circumneutral (pH: 5.5-7.4)

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

Alkaline (pH>7.4)

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

Unknown

Please provide further information on pH (optional):

Data for Lake Lockie suggest its pH is more circumneutral (7.2). Lakes Bitterang, Hattah, Boich, Cantala, Nip Nip, Marramook, Kramen and Mourmpall are more alkaline (8-9.5) (Lind and Cranston 2019).

#### 4.4.7 - Water salinity

Fresh (<0.5 g/l)

(Update) Changes at RIS update No change  Increase  Decrease  Unknown

Unknown

Please provide further information on salinity (optional):

All lakes are considered freshwater, noting that salinity varies as wetlands dry and salts concentrate in remaining pools of water.

(ECD) Dissolved gases in water	no information available
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#### 4.4.8 - Dissolved or suspended nutrients in water

Unknown

Please provide further information on dissolved or suspended nutrients (optional):

Dissolved oxygen is between 6.3 mg/L in Lake Cantala to 12.8 mg/L in Lake Nip Nip. Total Nitrate ranges from <0.01 mg/L in Lake Boich to 0.4 mg/L in Lake Mourmpall. Total Nitrogen is between 3.0 mg/L at Lake Bitterang to 8.3 mg/L at lake Nip. Total Phosphorus is 0.4 mg/L at Lake Boich mg/L (Lind and Cranston 2019)

(ECD) Dissolved organic carbon	No information available
(ECD) Redox potential of water and sediments	No information available
(ECD) Water conductivity	Electrical Conductivity (µS/cm) ranges from around 300 in Lake Lockie to 750 in Konardin.

#### 4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the i) broadly similar  ii) significantly different  site itself.

Surrounding area has greater urbanisation or development

Surrounding area has higher human population density

Surrounding area has more intensive agricultural use

Surrounding area has significantly different land cover or habitat types

Please describe other ways in which the surrounding area is different:

As the Ramsar boundary only goes to high water mark, the surrounding terrestrial vegetation of the National Park is different to that found in the lakes. Note that there are a number of other lakes similar to those of the Ramsar site also located within the National Park. There are also agricultural areas adjacent to the National Park, however these are not considered to affect the wetlands within the Ramsar site.

### 4.5 - Ecosystem services

#### 4.5.1 - Ecosystem services/benefits

##### Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Maintenance of hydrological regimes	Groundwater recharge and discharge	Low
Hazard reduction	Flood control, flood storage	Low

##### Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Recreation and tourism	Picnics, outings, touring	High
Recreation and tourism	Water sports and activities	Medium
Recreation and tourism	Nature observation and nature-based tourism	High
Spiritual and inspirational	Cultural heritage (historical and archaeological)	Medium
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	High
Scientific and educational	Educational activities and opportunities	Medium

##### Supporting Services

Ecosystem service	Examples	Importance/Extent/Significance
Biodiversity	Supports a variety of all life forms including plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part	High

##### Optional text box to provide further information

The following additional supporting services are identified in the Australian National Framework for describing ecological character (DEWHA 2008) and are provided by the site:

- supports near natural wetland ecosystems,
- provides physical habitat for waterbird breeding and feeding,
- supports threatened species and
- provides ecological connectivity.

##### Other ecosystem service(s) not included above:

The area has significant cultural ecosystem services both historically and contemporarily. The site has been used extensively by the Latji Latji for food and material resources and continues to be important for maintaining culture today. It is a significant recreational area for travellers, and is particularly popular for bird watchers.

Within the site:

Outside the site:

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes  No  Unknown

Where economic studies or assessments of economic valuation have been undertaken at the site, it would be helpful to provide information on where the results of such studies may be located (e.g. website links, citation of published literature):

A 2010 study by the Australian Conservation Foundation (2010) estimated the values provided by the Hattah Lakes at more than \$14 million annually. This included a direct use value of \$10.7 million for recreation and tourism, an indirect use value of \$3.8 million for water filtration, flood control, water storage and habitat and a non-use value of \$0.1 million for willingness to pay to protect the wetland.

#### 4.5.2 - Social and cultural values

- i) the site provides 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) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland
- iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples
- iv) 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

<no data available>

#### 4.6 - Ecological processes

(ECD) Primary production	Periodic inundation by floodwaters triggers a flush of zooplankton growth, which provides the basis of the food chain for fish and waterbirds.
(ECD) Nutrient cycling	Fringing vegetation provides inputs of coarse woody debris and litter contributions to carbon cycling within the system. Inundation of the floodplain also leads to mineralisation of organic carbon in litter and sediments.
(ECD) Animal reproductive productivity	The site is important for reproductive cycles of notable birds, including great egret and Australian pelican, and fish species including un-specked hardyhead and Australian smelt.
(ECD) Pressures and trends concerning any of the above, and/or concerning ecosystem integrity	Changes to the hydrological regime due to diversion of water had been considered a threat, however the recent infrastructure work to enable flood waters to more easily enter the site has reduced this pressure.

## 5 - How is the Site managed? (Conservation and management)

### 5.1 - Land tenure and responsibilities (Managers)

#### 5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
Provincial/region/state government	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Private ownership

Category	Within the Ramsar Site	In the surrounding area
Other types of private/individual owner(s)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Provide further information on the land tenure / ownership regime (optional):

The site is on crown land, which forms part of the Hattah Lakes National Park.

#### 5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site:

Mallee Catchment Management Authority; Parks Victoria; Victorian Department of Land Water and Planning

Provide the name and/or title of the person or people with responsibility for the wetland:

Nicole Wishart, Manager State Investment; Hattah-Kulkyne Lakes Ramsar site coordinator, Mallee CMA

Postal address:

PO Box 5017  
MILDURA VIC 3502

E-mail address:

reception@mallee.com.au

## 5.2 - Ecological character threats and responses (Management)

### 5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Water regulation

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Drainage	Low impact	Low impact	<input checked="" type="checkbox"/>	No change	<input checked="" type="checkbox"/>	No change
Canalisation and river regulation	Medium impact	High impact	<input checked="" type="checkbox"/>	decrease	<input checked="" type="checkbox"/>	No change

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Recreational and tourism activities	Low impact	Low impact	<input checked="" type="checkbox"/>	No change	<input checked="" type="checkbox"/>	No change

Natural system modifications

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Fire and fire suppression	Low impact	High impact	<input type="checkbox"/>	No change	<input checked="" type="checkbox"/>	No change

Invasive and other problematic species and genes

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Invasive non-native/ alien species	Medium impact	High impact	<input checked="" type="checkbox"/>	No change	<input checked="" type="checkbox"/>	No change
Problematic native species	Low impact	Medium impact	<input checked="" type="checkbox"/>	No change	<input checked="" type="checkbox"/>	No change

Climate change and severe weather

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Droughts	Low impact	Medium impact	<input checked="" type="checkbox"/>	No change	<input type="checkbox"/>	No change

Please describe any other threats (optional):

The ecological character description for Hattah-Kulkyne identifies the following threats to the site:

- water resource development
- climate change
- invasive species
- grazing

As the global climate continues to warm the broader region (Murray Basin) is projected to experience an increase in average temperatures in all seasons with more hot days and warm spells and fewer frosts. It is projected that rainfall will remain unchanged in the warm season throughout this century but by late in the century there will be less rainfall during the cool season. Even though mean annual rainfall is projected to decline, increased intensity of extreme rainfall events is predicted. Fire weather is projected to be harsher across region though the magnitude of the change is uncertain (CCIA, Southern Slopes (Victoria West) Projection Summaries).

### 5.2.2 - Legal conservation status

#### Global legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
UNESCO Biosphere Reserve	Hattah-Kulkyne and Murray-Kulkyne National Parks		whole

#### National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
national park	Hattah-Kulkyne National Park	<a href="http://parkweb.vic.gov.au/explorate/parks/hattah-kulkyne-national-park">http://parkweb.vic.gov.au/explorate/parks/hattah-kulkyne-national-park</a>	whole

### 5.2.3 - IUCN protected areas categories (2008)

- Ia Strict Nature Reserve
- Ib Wilderness Area: protected area managed mainly for wilderness protection
- II National Park: protected area managed mainly for ecosystem protection and recreation
- III Natural Monument: protected area managed mainly for conservation of specific natural features
- IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention
- V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation
- VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

### 5.2.4 - Key conservation measures

#### Legal protection

Measures	Status
Legal protection	Implemented

#### Habitat

Measures	Status
Catchment management initiatives/controls	Partially implemented
Hydrology management/restoration	Implemented

#### Species

Measures	Status
Control of invasive alien animals	Partially implemented
Threatened/rare species management programmes	Partially implemented

#### Human Activities

Measures	Status
Communication, education, and participation and awareness activities	Partially implemented
Regulation/management of recreational activities	Partially implemented
Research	Partially implemented

Other:

In Australia, the ecological character of a designated Ramsar site is protected as a Matter of National Environmental Significance (MNES) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Pest plant and animal management is undertaken by Parks Victoria and also Mallee Catchment Management Authority.

### 5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes  No

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party? Yes  No

### 5.2.6 - Planning for restoration

Is there a site-specific restoration plan? No, the site has already been restored

### 5.2.7 - Monitoring implemented or proposed

Monitoring	Status
Water regime monitoring	Implemented
Water quality	Implemented
Plant community	Implemented
Birds	Implemented
Animal species (please specify)	Implemented

Condition and intervention monitoring is undertaken at several of the lakes within the Ramsar site as part of The Living Murray Icon site monitoring program. Targeted monitoring assessing the status of ecological character is not undertaken.

Animal species monitoring includes native and exotic fish monitoring.

## 6 - Additional material

### 6.1 - Additional reports and documents

#### 6.1.1 - Bibliographical references

Included as an attachment in section 6.1.2 vi

#### 6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)  
<no file available>

ii. a detailed Ecological Character Description (ECD) (in a national format)  
<1 file(s) uploaded>

iii. a description of the site in a national or regional wetland inventory  
<no file available>

iv. relevant Article 3.2 reports  
<no file available>

v. site management plan  
<1 file(s) uploaded>

vi. other published literature  
<1 file(s) uploaded>

#### 6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:



Hattah Lakes ( *Andrea White, 22-11-2012* )

#### 6.1.4 - Designation letter and related data

Designation letter  
<2 file(s) uploaded>

Date of Designation 1983-04-05