

Information Sheet on Ramsar Wetlands (RIS) – 2009-2012 version

Available for download from http://www.ramsar.org/ris/key_ris_index.htm.

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).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 14, 3rd edition). A 4th edition of the Handbook is in preparation and will be available in 2009.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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:

30 March 2012

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.

Myall Lakes

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

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:

The Ramsar site was originally listed under four criteria, including *Criterion 3b: Regularly supports substantial numbers of waterbirds*. The updated criterion for waterbirds (Criterion 5 under the Ramsar Convention) requires a wetland "to regularly support 20,000 or more waterbirds". Under the annual eastern Australia waterbird surveys, annual counts of waterbirds in Myall Lakes over 1999-2009 have ranged between 464 and 4811, with a mean of 1384 over 1999-2009 (John Porter, pers. comm. 2010). Other observations indicate that large gatherings (more than 1000 individuals) of a species sometimes occur, however there is insufficient data to establish that the Myall Lakes regularly support a population of 20,000 or more waterbirds. Therefore the Ramsar site is not considered to meet Criterion 5 at this time.

Several species listed as threatened under the EPBC Act or in the IUCN Red List are now known from the site but were not recorded from the site at the time of listing: Freycinet's frog (*Litoria freycineti*) (IUCN Red List), Green-thighed frog (*Litoria brevipalmata*) (IUCN Red List) and Stuttering frog (*Mixophyes balbus*) (EPBC Act).

The Dark Point dune sheet, comprised of sand dunes up to 50 metres high and covering about 250 hectares of the Ramsar site, is estimated to have moved between 38 and 54 metres since 1999 (GBAC 2010). Whilst the dune sheet is moving towards Mungo Brush Road, the principal access road to the coastal parts of Myall Lakes National Park, its movement is a natural process and is being monitored.

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 site boundary is the Myall Lakes National Park boundary as gazetted on 28 April 1972, including additions gazetted up to and including 1 January 1999; the Little Broughton Island Nature Reserve boundary as gazetted on 19 May 1961; the Corrie Island Nature Reserve boundary as gazetted on 5 March 1999; and the Gir-um-bit National Park (Fame Cove section) boundary as gazetted on 1 July 2007 (originally gazetted as part of Myall Lakes National Park).

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.

Ramsar sub-site	Longitude	Latitude
Myall Lakes National Park	152° 20' E	32°27' S
Little Broughton Island Nature Reserve	152° 19' E	32° 37' S
Corrie Island Nature Reserve	152° 8' E	32° 40' S
Gir-um-bit National Park (Fame Cove section)]	152° 4' E	32° 41' S

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.

The Myall Lakes Ramsar site is situated approximately 75 kilometres north of Newcastle. It is located between Hawks Nest to the south and Forster to the north, on the central coast of New South Wales.

The Ramsar site includes Myall Lakes National Park, Corrie Island Nature Reserve, Little Broughton Island Nature Reserve and the Fame Cove section of Gir-um-bit National Park.

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

0–495 m above sea level

11. Area: (in hectares)

44,612 ha

12. General overview of the site:

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

The Myall Lakes Ramsar site constitutes one of the few coastal brackish lake systems in NSW which has not been greatly modified by human activities. The site provides habitat for a diverse number of native flora and fauna species, including large numbers of waterbirds such as the Black swan (*Cygnus atratus*), Eurasian coot (*Fulica atra*) and Chestnut teal (*Anas castanea*), and plays an important role in linking key fauna habitats to the north and west and in providing connectivity between estuarine wetland ecosystems to the north and the south. The lakes in the Ramsar site are part of the coastal lake system in New South Wales which provides drought refuge for waterbirds.

The site's wetlands include brackish waters, fringing swamps, freshwater swamps, mangroves, saltmarshes, riverine ecosystems and rocky marine shores and beaches, and are surrounded by a near natural terrestrial ecosystem. The site's estuarine and brackish waters provide a food source, spawning ground and nursery for many common fish species.

The lakes, which cover an area of 100–150 km² (depending on water levels) and drain a catchment of 780 km², hold a large volume of the catchment's runoff and groundwater, and slowly release this water into Port Stephens via the constricted entrance channel in the lower Myall River. The lakes maintain high water quality (oligotrophic clear waters) by effectively retaining, recycling and removing suspended solids, organic and inorganic nutrients, and other pollutants from water that flows through the lakes via several mechanisms.

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

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 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

The Myall Lakes are a relatively unmodified large coastal brackish lake system. The main streams flowing into the lakes (Myall River and Boolambayte Creek) are free of dams and mostly free of weirs. Consequently the water regime in the lakes are considered to be close to natural and represent a rare example of a brackish-freshwater barrier estuary in the South East Coast Drainage Division. The coastal wetland types in the Ramsar site are representative of near-natural wetlands in the Manning Shelf Bioregion, and include marine subtidal aquatic beds, intertidal marshes, and intertidal forested wetlands (mangroves). The range of wetlands, combined with the adjoining near natural terrestrial ecosystem, provide a complex variety of habitats and a rich biodiversity.

The Myall Lakes are significant because:

1. They represent a unique association of at least 18 Ramsar wetland types, ranging from fresh to marine waters, with the entire association covering an extensive area,

with minimal structural and hydrological disturbance and supporting ecosystems and processes in near-natural condition;

2. They are one of the two largest brackish-freshwater barrier estuaries in the South East Coast Drainage Division, and are an excellent representative example of this wetland type within the bioregion.
3. They contain a unique co-existence of deep and shallow water macrophytes and the organic lake-floor muds known as gyttja.

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

The Myall Lakes Ramsar site supports five wetland dependent species which are listed as nationally threatened under the EPBC Act, or listed as internationally threatened in the IUCN Red List. They are:

Common name	Scientific name	IUCN	National status
Birds			
Australasian bittern	<i>Botaurus poiciloptilus</i>	Endangered	Endangered (EPBC Act, 1999)
Amphibians			
Freycinet's frog	<i>Litoria freycineti</i>	Vulnerable	Not listed
Green and gold bell frog	<i>Litoria aurea</i>	Vulnerable	Vulnerable (EPBC Act, 1999)
Green thighed frog	<i>Litoria brevipalmata</i>	Endangered	Not listed
Stuttering frog	<i>Mixophyes balbus</i>	Vulnerable	Vulnerable (EPBC Act, 1999)

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 Ramsar site's large area of 44,612 ha supports a rich biodiversity, containing a range of undisturbed terrestrial vegetation communities and wetland types. As a consequence it supports a high diversity of terrestrial plants and animals in the South East Coast Drainage Division and aquatic plants and animals in the Manning Shelf Bioregion.

Many groups of wetland bird species are represented in the Ramsar site such as pelicans (*Pelicanidae*), cormorants (*Phalacrocoracidae*), grebes (*Podicipedidae*), swans and ducks (*Anatidae*), herons, egrets, bitterns, ibises and spoonbills (*Ciconiiformes*), and plovers and lapwings (*Charadriidae*), and wetlands-related raptors (*Accipitridae* and *Falconidae*).

The site provides a wide range of intertidal habitats for shorebirds such as the pied oystercatcher (*Haematopus longirostris*), crested tern (*Sterna bergii*), eastern curlew *Numenius madagascariensis*, red-necked stint (*Calidris ruficollis*) and bar-tailed godwit (*Limosa lapponica*). The intertidal habitats include coastal mudflats, sandy beaches, saltmarshes, brackish marshes, mangroves and swamp forests, and provide roosting, nesting, breeding, and feeding sites for the site's shorebirds (Lane 1987). The site is important for providing habitat for migratory birds, with 22 species listed in agreements between Australia and Japan (JAMBA), China (CAMBA) and the Republic of South Korea (ROKAMBA) recorded from the site. Migratory species listed under international agreements which breed in the Ramsar site include little tern (*Sterna albifrons*), sooty shearwater

(*Puffinus griseus*), short-tailed shearwater (*Puffinus tenuirostris*) and wedge-tailed shearwater (*Puffinus pacificus*).

The site's vegetation is particularly diverse, with 946 species of terrestrial flora, two mangrove species (*Avicennia marina* and *Aegiceras corniculatum*), 10 species of submerged aquatic flora recorded including *Vallisneria gigantea*, *Ruppia megacarpa*, *Myriophyllum salsaugineum* and *Najas marina*, and saltmarsh species such as *Sarcocornia quinqueflora*, *Suaeda australis*, *Baumea juncea* and *Juncus kraussii*. The terrestrial species occur in a wide range of vegetation communities, from rainforest and wet sclerophyll vegetation to heathland and sand dune vegetation.

There is also a high diversity of animal species, with 298 birds, 58 mammals, 44 fish species, 37 reptiles and 29 amphibians recorded from the Ramsar site (NSW Wildlife Atlas). Many of the site's animals are found in a wide range of wetland types, including estuarine waters; intertidal forested wetlands; coastal freshwater lagoons; permanent rivers, streams or creeks; freshwater tree dominated wetlands; and shrub dominated wetlands.

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:**

South East Coast Drainage Division (national/continental scheme)

Manning Shelf Bioregion (national/continental scheme)

b) **biogeographic regionalisation scheme** (include reference citation):

Australian Drainage Divisions
(Commonwealth of Australia (Bureau of Meteorology) 2011. Australian Hydrological Geospatial Fabric)

Integrated Marine and Coastal Regionalisation of Australia
(Commonwealth of Australia 2006. A Guide to the Integrated Marine and Coastal Regionalisation of Australia Version 4.0. Department of the Environment and Heritage, Canberra, Australia)

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.

Myall Lakes Ramsar site comprises four main lakes (Bombah Broadwater, Boolambayte Lake, Two Mile Lake and Myall Lake), together with the lesser areas of Nerong Creek, sections of the upper Myall River and lower Myall River, Boolambayte Creek, Fame Cove inlet and Broughton Island approximately 2 kilometres offshore from the mainland. The other main features of the site are the coastal dune system and the forested areas of the Coolongolook and Mayers ranges. The site incorporates a number of distinct wetlands associated with the waterways and dune systems. Little Broughton Island Nature Reserve and the Fame Cove section of Gir-um-bit National Park (in Port Stephens) are also included in the Ramsar site.

On the mainland, the dominant geological structure is the Myall Syncline within which the main rock types are Carboniferous sandstones, siltstones and mudstones, with some igneous intrusions varying in composition from rhyolite to basalt. A belt of limestone outcrops on the eastern side of Myall Lake. On the western side are a series of alluvial plains dissected by sandstone ridges comprising Crawford Formation Sandstone and Alum Mountain Volcanics. Further north the sandstone ridges grade into a series of low hills formed from the Wootton Beds and Nerong Volcanics. Broughton Island and Little Broughton Island have rock types associated with the Carboniferous Nerong Volcanics that are made up of toscanite, dacite, andesite, ignimbrite, agglomerate, conglomerate, sandstone and siltstone. Corrie Island constitutes a mixture of sand and mud flats and is an excellent example of a landform produced by coastal processes. Various erosional and depositional features have resulted from reworking of the island by waves and tides.

The waters of the Myall Lake system are shallow and of roughly uniform depth (2.4–3.7m), with the lower Myall River reaching 8 m in depth. Lake level fluctuations are associated with rainfall rather than tidal influences. The lakes are drowned river basins and the remnants of former hind-dune drainage systems. Their configuration is largely determined by the irregular bedrock topography of the western shoreline. The eastern shores are mainly formed by the two distinct beach ridge systems of an inner and outer barrier. The coastal dune systems were laid down between 60,000 and 2,000 years ago. The inner barrier system is composed of highly podzolised Pleistocene sands overlying a sandrock hardpan. The Holocene sands of the outer barrier are only moderately podzolised. An intervening swamp or lagoon usually separates these two larger systems. Acid peat soils occur in these areas. In general, soils are of moderate to low fertility and are subject to waterlogging or erosion depending on their location.

The main input of fresh water to the lake system is from the Myall River and Crawford River. Other inputs of fresh water are rainfall and groundwater drainage from the Eurunderee sand mass on the eastern shoreline. The water of the lakes has a pH of 7– 7.5. Unlike the estuarine systems, Myall Lake, Boolambayte Lake and the northern parts of Bombah Broadwater are not subject to normal tidal flushing (Atkinson et al. 1981; Great Lakes Council 2009).. Most of Bombah Broadwater and Boolambayte Lake is subject to marked and protracted fluctuations in salinity levels.

Myall Lakes Ramsar site has a temperate coastal climate, with an average annual rainfall of approximately 1,300 mm. The wettest months are in late summer and early autumn. Mean monthly maximum temperatures range from 27°C in summer to 17°C in winter with minimum temperatures of 15°C and 3°C respectively.

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 Myall Lakes catchment covers an area of approximately 780 km², with the combined lakes system covering 100–150 km², depending on water level. Over one-third of the Myall Lakes catchment is within Myall Lakes Ramsar site.

The catchment soils reflect their parent materials, and are generally of low fertility. On the ridge crests to the north and west the soils are shallow loamy yellow earths. These soils are easily erodible when disturbed but generally remain well covered by natural forests. On the hill slopes the soils are generally yellow podsols which are poorly aggregated and very detachable when wet. These soils are also subject to sheet erosion when cleared. Although most of these areas remain forested there are some areas of road construction and some small areas of residential development.

The Myall Lakes catchment comprises steep areas over most of the landward catchment that drains into the Myall River. The steep hills of the hinterland provide a large source of groundwater that contributes to the estuary on a fairly continuous basis.

18. Hydrological values:

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

The Myall Lakes Ramsar site comprises a series of fresh, saline and brackish water bodies of differing depths and associated vegetation types. The wetlands provide a permanent water source and thus serve as a drought refuge for flora and fauna. The waters within the site are in relatively natural condition because of the inherent stability of the small catchment, most of which has now been incorporated into the national park, and the level and type of land use that currently exists in the surrounding areas.

Since the Myall Lakes system has not been greatly modified by human activity, the area provides an important historical record of the changes in the coastline, lake deposits and seabed.

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:

Ramsar wetland type	Ramsar code	Area (ha)
Marine/coastal wetlands		
Coastal brackish/saline lagoons	J	9,150
Marine subtidal aquatic beds	B	280
Intertidal forested wetlands	I	212
Intertidal marshes	H	157
Rocky marine shores	D	4
Coastal freshwater lagoons	K	-
Intertidal mud or sand flats	G	-
Permanent shallow marine waters	A	-
Sand, shingle or pebble shores	E	-
Estuarine waters	F	-
Inland wetlands		
Permanent rivers/streams/creeks	M	190
Shrub dominated wetlands	W	-
Seasonal/intermittent/irregular rivers/streams/creeks	N	-
Permanent freshwater marshes/pools	Tp	-
Seasonal/intermittent freshwater marshes/pools	Ts	-
Freshwater, tree-dominated wetlands	Xf	-
Human-made wetlands		
Excavations	7	-
Canals and drainage channels, ditches	9	-

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.

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.

Myall Lakes Ramsar site is renowned for its floristic diversity, with over 968 species of terrestrial and aquatic plants recorded, and complex variety of habitats, which are largely due to differences in substrate. Seventeen plant communities have been identified ranging from rainforests to wet and dry sclerophyll forests, woodland, heaths, grassland and swamps. The vegetation of the sand dunes comprises a sequence of communities from dry heath forest through to dry heath, wet heath, swamp forest and swamp. In areas of sufficient shelter from the wind, there are open woodland communities dominated by *Angophora costata* and *Banksia* species. On deep stable sands, eucalypt forests dominated by *Eucalyptus pilularis* develop, often in conjunction with *E. gummifera*. An extensive heath called The Moors, six to eight kilometres long and as much as one kilometre wide, lies between the coastal dunes and the hills south-east of Myall Lakes. The Moors' heathland communities contain more than 60 species. In the wetter areas, the heath gives way to peat swamps which are dominated by *Leptospermum liversidgei*. The vegetation of the hills to the west of the lake differs markedly from the settled dunes and sand flats, comprising a mixed eucalypt forest and sub-tropical rainforest.

The open water of the lakes is fringed by a reed swamp, except where sand reaches the water's edge. Boolambayte Lake and Bombah Broadwater contain a number of submerged and emergent aquatic plant communities. The most abundant species is prickly water nymph (*Najas marina*), which has been found to a depth of three metres. This extends towards the

shore to depths of about 0.5 m. It is associated with floating pondweed (*Potamogeton tricarinatus*), *Vallisneria spiralis* and *Ruppia maritima*, a seagrass.

Reeds extend from the water's edge up to a depth of 1.5 metres along the lake shores and rivers and streams, the dominant species being *Scirpus locustris*. Nearer to the shore, in 0.3–0.6 m of water, there is usually a continuous densely growing zone. On the landward side of this zone *S. locustris* becomes mingled with *Phragmites communis*. A characteristic swamp forest with dense undergrowth of sedges extends from the edge of the reed swamp to the junction with the stable sand or silt flats. This can be divided into two zones in which *Melaleuca quinquenervia* (closer to the lake) and *Casuarina glauca* respectively dominate. Behind the swamp forest, on either side of Boolambayte Creek and the upper Myall River, are extensive silt flats resulting from flooding and wash from the neighbouring hills. These flats have been largely cleared of woody vegetation.

There are patches of mangroves (283 ha), saltmarshes (278 ha), and seagrass (211 ha) along the lower Myall River, the 25 km marine exchange channel between the Myall Lakes system and Port Stephens.

Little Broughton Island and Corrie Island have been included in conservation reserves in recognition of their particular importance for sea birds and, in the case of Corrie Island, its importance for shorebirds. Little Broughton Island also supports a population of the threatened green and golden bell frog (*Litoria aurea*), which is free of the chytrid fungus that infects the species' populations on the mainland part of the Ramsar site. Three species of shearwaters breed in large numbers on Little Broughton Island: short-tailed shearwater (*Puffinus tenuirostris*), wedge-tailed shearwater (*Puffinus pacificus*) and sooty shearwater (*Puffinus griseus*). The island is recognised as the most northern breeding site for the short-tailed shearwater. Other species of seabirds have been recorded nesting on Little Broughton Island, including Gould's petrel (*Pterodroma leucoptera leucoptera*), a nationally endangered species.

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.*

The site supports 968 species of plants, including three nationally threatened species: black-eyed Susan (*Tetratheca juncea*), Guthrie's grevillea (*Grevillea guthrieana*) and magenta lilly pilly (*Syzygium paniculatum*). The nationally threatened ecological community – littoral rainforest and coastal vine thickets of eastern Australia – also occurs in the site.

The site supports 10 threatened ecological communities (both terrestrial and wetland communities) listed under the NSW *Threatened Species Conservation Act 1995*. Four of those ecological communities occur in the freshwater and fringing wetlands of the Ramsar site:

- freshwater wetlands on coastal floodplains
- river-flat eucalypt forest on coastal floodplains
- swamp oak floodplain forest
- swamp sclerophyll forest on coastal floodplains.

The major introduced plants which are a threat to the Ramsar site's values include the aquatic weeds salvinia (*Salvinia molesta*) and parrot's feather (*Myriophyllum aquaticum*), and the terrestrial weeds bitou bush (*Chrysanthemoides monilifera*), slash pine (*Pinus*

elliottii), lantana (*Lantana camara*), climbing asparagus and prickly asparagus (*Protasparagus spp.*), blackberry (*Rubus fruticosus*) and Noogoora burr (*Xanthium spp.*).

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.*

The Ramsar site provides habitat for five threatened wetland dependent species: Australasian bittern (*Botaurus poiciloptilus*), green and golden bell frog (*Litoria aurea*), stuttering frog (*Mixophyes balbus*), Freycinet's frog (*Litoria freycineti*) and green-thighed frog (*Litoria brevipalmata*).

Australasian bittern (*Botaurus poiciloptilus*)

The Ramsar site provides suitable habitat for the Australasian bittern, as it prefers wetlands with dense vegetation, including sedges, rushes and reeds. This species generally prefers freshwater wetlands, although it also uses dense saltmarsh vegetation in estuaries and flooded grasslands (DECCW 2006). This species was originally recorded from the Ramsar site between 1977 and 1980 (NSW Wildlife Atlas). It is occasionally sighted in the Ramsar site.

Freycinet's frog (*Litoria freycineti*)

The Ramsar site provides suitable habitat for Freycinet's frog, which is found in heaths, paperbark swamps and forest habitats in coastal areas from central NSW to south-eastern Queensland (Cogger 2000). There are 23 records of Freycinet's frog from the Ramsar site between 1974 and 2008 (NSW Wildlife Atlas).

Green and golden bell frog (*Litoria aurea*)

The Ramsar site provides suitable habitat for the green and golden bell frog, which lives in large, permanent, open-water swamps or ponds that have a variable water level and dense vegetation, bulrushes (*Typha spp.*) or spikerushes (*Eleocharis spp.*) (DECC 2006). The species is known from Mungo Brush, The Moors and Neranie Bay in Myall Lake (on mainland part of Ramsar site), and on Broughton Island (Susanne Callaghan, NPWS Ranger, 2010, pers. comm.).

There are several populations of the green and golden bell frog within the Ramsar site: at Mungo Brush, on The Moors, on Broughton Island, and at Neranie Bay in Myall Lake (Susanne Callaghan, pers. comm., 2010). The population on Broughton Island is believed to be free of chytrid fungus affecting populations of the species on the mainland (Susanne Callaghan, pers. comm., 2010).

Green-thighed frog (*Litoria brevipalmata*)

The Ramsar site provides suitable habitat for the green-thighed frog, which occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain (DECC 2006). It is found in isolated localities along the coast and ranges from just north of Wollongong to south-east Queensland (DECC 2006; Cogger 2000). There are eight records of the green-thighed frog from the Ramsar site between 1995 and 1996 (NSW Wildlife Atlas).

Stuttering frog (*Mixophyes balbus*)

The Ramsar site provides suitable habitat for the stuttering frog, which is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range from southern Queensland to north-eastern Victoria. It breeds in streams during summer after heavy rain, and eggs are laid on rock shelves or shallow riffles in small, flowing streams (DECC 2006). Between 1993 and 2001 there were nine recorded sightings of the stuttering frog in the Ramsar site; however there is no data to estimate the population size and habitat extent (NSW Wildlife Atlas).

Other threatened species and ecological communities

The site also supports one threatened ecological community listed under the EPBC Act – littoral rainforest and coastal vine thickets of eastern Australia. The site supports seven other species which are listed as nationally threatened or internationally threatened – Gould's petrel (*Pterodroma leucoptera leucoptera*), grey-headed flying fox (*Pteropus poliocephalus*), spotted-tailed quoll (*Dasyurus maculatus*), swift parrot (*Lathamus discolor*), Guthrie's grevillea (*Grevillea guthrieana*), magenta lilly pilly (*Syzygium paniculatum*) and black-eyed Susan (*Tetratheca juncea*).

Myall Lakes Ramsar site also provides habitat for a diverse range of fauna species, including 298 birds, 54 mammals, 44 fish species, 37 reptiles and 29 amphibians. The wetlands regularly support large numbers of waterbirds and waders including ducks, swans, egrets and terns (see Appendix 1). Twenty two species listed under international migratory bird agreements (JAMBA, CAMBA and ROKAMBA) are also recorded from the site.

A large number of native fish species are found in the Myall Lakes and Myall River. At least nine of them are considered to be recreational or commercially important including yellow fin bream (*Acanthopagrus australis*), luderick (*Girella tricuspidata*) and flat-tail mullet (*Liza argentea*).

Introduced animals in the Ramsar site include foxes (*Vulpes vulpes*), pigs (*Sus scrofa*), cats (*Felis catus*) and rats (*Rattus rattus*) (e.g. on Broughton Island). Foxes, feral cats and introduced rats are threats to ground dwelling mammals, amphibians and shore birds, and rats on Broughton Island are a threat to nesting birds. Pigs are a threat to amphibians through their disturbance to swamps and other wetland areas which provide habitat for several threatened frogs.

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:

The Myall Lakes wetlands have a high social and cultural value, based on the Aboriginal heritage of the lakes and nearby lands, use by non-Aboriginal people, their conservation and scientific significance, and the lakes' popularity for recreation and tourism.

The Myall Lakes are within the traditional lands of the Worimi people. The Ramsar site contains numerous middens, which are evidence of Aboriginal occupation, and some of which contain Aboriginal skeletons. The Ramsar site also includes the Dark Point Aboriginal Place, which recognises the significance of the location to Aboriginal culture as a resource gathering and meeting place.

Evidence of European occupation of the lands around the lakes and use of the lakes themselves remains in the form of historic sites and items such as graves associated with villages and with subsistence farming; former timber mills; Tamboy fishing village; and the roads, camps and refuse associated with sandmining. The lakes are now popular for tourism and recreation.

The lakes are important for scientific research and education, and the University of New South Wales has established a research station in Myall Lakes National Park from which it conducts a range of ecological and other studies.

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 Ramsar site comprises national parks and nature reserves dedicated under the *National Parks and Wildlife Act 1974* (NSW).

b) in the surrounding area:

Surrounding land comprises a mixture of Crown land, State forests and freehold land.

25. Current land (including water) use:

a) within the Ramsar site:

The lands are permanently designated as national park or nature reserve and are managed primarily for nature conservation. The wetlands cater for a variety of recreational activities, principally sailing, power boating, canoeing, and bird watching. Bush walking and camping occur around the coastal and lake shores. One lease concession, the Myall Shores Resort at Bombah Point, operates permanently – the concessionaire has established facilities for campers and visitors seeking on-site accommodation. Commercial and recreational fishing occurs throughout much of the waterways. Commercial prawning occurs mostly at Tamboy and in the Myall River, and mesh fishing in the lakes. However, the establishment of the Port Stephens – Great Lakes Marine Park, which contains the waterways of the Myall Lakes Ramsar site, has classified the waterways within the site into three zones: sanctuary, habitat protection and general use. The zoning plan for the marine park commenced on 21 April 2007, and restricts recreational and commercial fishing activities in some areas, including fishing locations, methods, and catches.

b) in the surroundings/catchment:

In cleared areas along the floodplains of the upper Myall River, land is used primarily for grazing, with some small areas occupied by poultry farms and dairy farms. Other activities within the cleared areas, especially at Bulahdelah, include residential, commercial and industrial developments, roads and recreational facilities. Part of the village of Bungwahl, on the northern shores of Myall Lake, is also in the catchment. In some of the hillier areas Forests NSW continues to harvest timber.

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:

- i. The Myall Lakes are susceptible to pollution and damage from overuse due to their relatively small catchment, the shallowness of the water and the lack of tidal flushing. Human-induced disturbance has occurred at isolated sites and increased levels of recreation pose a moderate threat to the stability of aquatic ecosystems in some areas.
- ii. The Myall Lakes system is heavily utilised for recreation and fishing. While many current recreational activities appear to be compatible with the conservation of natural values, some activities such as power-boating on the lakes and vehicular access to a number of environmentally sensitive areas, pose a moderate threat.
- iii. Commercial prawning and fishing are traditional uses of the area and provide a livelihood for some of the local community. At present, these activities have low impact upon the wetland resources, especially since the implementation of Port Stephens – Great Lakes Marine Park zoning plan.
- iv. Noise pollution from Australian Air Force operations in the region has a moderate but widespread impact, disturbing site users and wildlife.
- v. Speed boats and water skiing also disturb other recreational users and wildlife in addition to increasing bank erosion.
- vi. Camping around the edges of the lakes is impacting on vegetation and causing shore erosion. Camping sites have been moved back from the lake's edge to reduce erosion and a waste disposal system has been installed to reduce pollution of the surrounding area.
- vii. Former uses, now discontinued, have had an impact upon the environment. These include timber harvesting, grazing, settlement and quarrying. Mineral sand mining during the 1970s and early 1980s has had the most significant impact and restoration of these areas has been undertaken.
- viii. The main anthropogenic impact on the terrestrial ecosystems is fire, as most fires are the result of arson and other human activities. Periods of particularly high fire incidence occurred in 1979, 1980 and 1991, 1998 and 2001.
- ix. The major introduced plants which are a threat to the Ramsar site's values include the aquatic weeds salvinia (*Salvinia molesta*) and parrot's feather (*Myriophyllum aquaticum*), and the terrestrial weeds bitou bush (*Chrysanthemoides monilifera*), slash pine (*Pinus elliotii*), lantana (*Lantana camara*), climbing asparagus and prickly asparagus (*Protasparagus spp.*), blackberry (*Rubus fruticosus*) and Noogoora burr (*Xanthium spp.*).

- x. The main vertebrate pests in the Ramsar site are foxes (*Vulpes vulpes*), pigs (*Sus scrofa*), cats (*Felis catus*) and rats (*Rattus rattus*) (e.g. on Broughton Island). Foxes, feral cats and introduced rats are threats to ground dwelling mammals, amphibians and shore birds, and rats on Broughton Island are a threat to nesting birds. Pigs are a threat to amphibians through their disturbance to swamps and other wetland areas which provide habitat for several threatened frogs.

b) in the surrounding area:

- i. Agricultural runoff from the upstream catchment poses a threat to the integrity of Myall Lakes. The upper Myall River and several creeks feed into the lakes. These watercourses receive runoff from adjacent farms which, on occasion, carry high loads of sediments and nutrients.
- ii. Residential development – there is potential for increased rural residential development and, to a lesser extent, expansion of urban areas in the catchment. Further developments can result in increased levels of sediments and nutrients in runoff.
- iii. Some pests in the lakes' catchment present a threat to the site. There is a risk of other aquatic weeds being introduced to the lakes, such as *Sagittaria graminea* which is known to occur in the upper Myall River catchment, especially as a result of heavy rainfall and floods. Animal pests from surrounding lands, such as foxes, pigs, dogs and cats, can also pose a threat, as there are few physical barriers preventing them from entering the site.

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.

Myall Lakes was first proclaimed a national park in 1972, when 15,000 ha, encompassing the entire bed of the lake system, was reserved as Myall Lakes National Park. The area of the national park has expanded considerably since then. The latest expansion was the addition of Seal Rocks in 2003; now the national park covers 44,493 hectares. Little Broughton Nature Reserve was proclaimed in 1961, Corrie Island Nature Reserve in 1999, and Gir-um-bit National Park in 2007.

The NSW Government established the Port Stephens – Great Lakes Marine Park in 2005. The lakes and estuarine waters of the Ramsar site form a large part of the 98,000 ha marine park (see Appendix 2). To conserve biodiversity while allowing sustainable recreational and commercial activities, the waterways within the Myall Lakes Ramsar site are classified into three zones: sanctuary, habitat protection and general use zones. The zoning plan for the marine park commenced on 21 April 2007, and restricts recreational and commercial fishing activities in some areas, including fishing locations, methods, and catches.

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 plan of management (PoM) for Myall Lakes National Park and Little Broughton Island Nature Reserve and Corrie Island Nature Reserve was adopted by the NSW National Parks and Wildlife Service (NPWS) in 2002 (NPWS 2002a). The PoM places primary emphasis on the conservation of the natural and cultural values of the national park and nature reserves. Within the PoM are a number of guidelines and actions to preserve and enhance the area for nature conservation. These include the control of introduced plants and animals, as well as fire, recreation and water quality management. Guidelines and actions are also prepared for the protection, maintenance and appropriate presentation of cultural heritage.

NPWS has developed a *Fire Management Strategy* in 2003 to reduce the occurrence of unplanned fires including from arson and to manage fire regimes to avoid the extinction of native species. The management of pests and weeds in the reserves in the Ramsar site is addressed by the *NPWS Hunter Region Pest Management Strategy 2008-2011*, prepared by NPWS in 2007 (DECC 2007).

d) Describe any other current management practices:

Port Stephens Council established a Myall Lakes Estuary Management Committee in 1994 to examine long-term management issues for the estuary and the surrounding hinterland. The committee has subsequently prepared an Estuary Management Plan for this area. In 2009 Great Lakes Council prepared a Water Quality Improvement Plan for its coastal lakes including Myall Lakes. The Plan describes land uses and pollution sources in the Myall Lakes' catchment and presents measures to mitigate the impacts of nutrients and sediments on the lakes' waters (Great Lakes Council, 2009).

Significant tracts of forest in the catchment of the Myall Lakes are managed by Forests NSW. Preparation of management plans for these areas, in consultation with NPWS, is currently in progress.

Myall Lakes National Park includes numerous wetlands identified under State Environmental Planning Policy (SEPP) 14 – Coastal Wetlands. SEPP 14 stipulates that a person may not conduct certain activities (clearing, filling, draining and constructing levees on lands) in or near these wetlands except with the consent of the relevant council and the concurrence of the Director of the Department of Planning.

NPWS has trialled biological methods to control bitou bush, an action in the *NPWS Hunter Region Pest Management Strategy 2008-2011* (DECC 2007). Three insects, the bitou tip moth (released in January 1993), the bitou tortoise beetle (released in January 1996) and the painted bone seed beetle, have been used to date. The area is being monitored to determine the success of these methods.

Boating on the lakes and associated rivers is regulated by Maritime NSW in accordance with the *Maritime Services Act 1935* (NSW) and associated legislation. In addition, NPWS has concurrent powers to regulate boating in waters within the national park. Maritime NSW has endeavoured to restrict boat speeds and exclude water skiing from some areas as a conservation measure. Moreover, it funds and manages two sewage collection facilities to receive waste discharged from boats on the lakes. A Myall Waterways Users Group was formed in 1995 to address issues such as speed limits, interpretative displays and ecotourism. It comprises representatives from NPWS, and recreation and community groups.

28. Conservation measures proposed but not yet implemented:

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

Continued monitoring and control of bitou bush (*Chrysanthemoides monilifera*), which has the potential to spread further into native vegetation communities growing on sands, will be required. Control of slash pine (*Pinus elliotii*), which is actively spreading into native vegetation communities in the southern part of the Ramsar site from a nearby plantation, will also be required.

Myrtle rust (*Uredo rangeii*), an introduced fungus known to infect plants in the Myrtaceae family, has recently been discovered in national parks and State forests on the NSW central coast (about 150 km south of the Myall Lakes Ramsar site). Myrtle rust's current host list includes several plants known to occur in the Ramsar site, including willow bottlebrush (*Callistemon salignus*), broad-leaved paperbark (*Melaleuca quinquenervia*), turpentine (*Syncarpia glomulifera*), and scrub turpentine (*Rhodamnia rubescens*) (Industry and Investment NSW 2010). Monitoring of Myrtle rust's spread will be required, and, in the event of it invading the Ramsar site, monitoring of its impacts on susceptible plants in the site will be required.

29. Current scientific research and facilities:

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

The University of New South Wales operates a research station in the Ramsar site. The research station provides a base for various ecological and other studies being carried out in the region.

Myall Lakes has been the subject of numerous academic and government studies, particularly in relation to the effects of sand mining operations. Other areas of investigation have included the benthos of the tidal portions of the Lower Myall River (Weate 1975); floristics (Buckney and Morrison 1992); geology (Thom et al. 1981); geomorphology (Shepherd 1970); zooplankton and aquatic invertebrates (Timms 1976); and more general studies (Atkinson et al. 1981). There have also been various studies on the lakes themselves (for example Carolin 1970).

Since the 1999 blue–green algal bloom in the Myall Lakes, substantial scientific investigation has been undertaken relating to nutrient levels. Significant studies include:

- In 2000, Australian Geological Survey Organisation (AGSO, now GeoScience Australia) conducted an 11-day survey in Bombah Broadwater, measuring fluxes of nutrients from the sediments using benthic chamber instrumentation.
- The then NSW Department of Land and Water Conservation initiated the Myall Lakes Catchment Investigation in 2000 to provide a basic assessment of catchment water quality and some of the nutrient cycling processes within the lake system. As part of this assessment, a long term monitoring program was also set up to monitor phytoplankton within the lakes so that the distribution of blue-green algal blooms within the system could be determined and the risk to public health could be assessed. The project continued in 2001 as 'Monitoring Blue Green Algal Blooms in Myall Lakes' under the Coasts and Clean Seas program funded by the Federal Government's Natural Heritage Trust.
- In 2005, the Great Lakes Council received \$1.8 million in funding from the Australian Government to prevent pollution entering the popular Myall and Wallis lakes, which resulted in the preparation of the *Great Lakes Water Quality Improvement Plan: Wallis, Smith and Myall Lakes* (Great Lakes Council 2009).

In addition, a number of university based research activities have been conducted within the Myall Lakes Ramsar site to investigate the ecology of the lakes system and assess its nutrient status.

In 2004, the NSW Government allocated \$60,000 to the plan for the Hawks Nest and Tea Gardens koalas, which focuses on sustaining habitat to ensure long-term survival of the species.

30. Current communications, education and public 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.

NPWS offers conservation education activities through a Discovery Ranger program. The program is run by rangers who operate interpretive tours and give talks about the national park's natural history. A number of information bays have been constructed to provide further information about its history and natural features. Several licensed commercial operators, who specialise in environmental education, also run tours.

31. Current recreation and tourism:

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

Myall Lakes Ramsar site is a popular tourist destination, with approximately 500,000 visitors per year. It caters for a variety of water-based activities such as sailing, canoeing, power boating and water skiing. Other popular activities are bird watching, bushwalking and camping. One of the most significant recreational events in the area is the Mungo Brush Regatta, an annual power boat and sailing event. Other popular recreational activities are canoeing in the lakes, four-wheel driving on the ocean beaches and fishing.

There are a range of visitor facilities including roads, walking tracks, picnic areas, toilets, camping areas, cabins, information bays, interpretive programs and commercial outdoor recreational activities.

Because Myall Lakes is a major tourist destination, a number of towns in the region, such as Tea Gardens, Hawks Nest and Bulahdelah, are heavily reliant on the Ramsar site for tourism-generated income.

32. Jurisdiction:

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

Territorial: Government of New South Wales
Functional: Office of Environment and Heritage (OEH), NSW Department of Premier and Cabinet
NSW Marine Parks Authority

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.

NSW National Parks and Wildlife Service (part of OEH)

Address: Area Manager
Booti Booti National Park
"The Ruins" Camp Ground
The Lakes Way
Pacific Palms NSW 2428

Phone: 02 6591 0300

Fax: 02 6554 0489

NSW Marine Parks Authority

Address: Manager, Port Stephens-Great Lakes Marine Park
Locked Bag 800
Nelson Bay NSW 2315

Phone: 02 4916 3970

Fax: 02 4984 8271

34. Bibliographical references:

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

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Appendix 1 Bird records

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)	
Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped thornbill	8		
	<i>Acanthiza lineata</i>	Striated thornbill	63		
	<i>Acanthiza nana</i>	Yellow thornbill	75		
	<i>Acanthiza pusilla</i>	Brown thornbill	109		
	<i>Acanthiza reguloides</i>	Buff-rumped thornbill	10		
	<i>Calamanthus pyrrhopygius</i>	Chestnut-rumped heathwren	1		
	<i>Gerygone levigaster</i>	Mangrove gerygone	6		
	<i>Gerygone mouki</i>	Brown gerygone	38		
	<i>Gerygone olivacea</i>	White-throated gerygone	42		
	<i>Sericornis citreogularis</i>	Yellow-throated scrubwren	10		
	<i>Sericornis frontalis</i>	White-browed scrubwren	90		
	<i>Sericornis magnirostris</i>	Large-billed scrubwren	10		
	<i>Smicromis brevirostris</i>	Weebill	2	Vag.	
	Accipitridae	<i>Accipiter cirrocephalus</i>	Collared sparrowhawk	11	
		<i>Accipiter fasciatus</i>	Brown goshawk	13	
		<i>Accipiter novaehollandiae</i>	Grey goshawk	3	
<i>Aquila audax</i>		Wedge-tailed eagle	20		
<i>Aviceda subcristata</i>		Pacific baza	6		
<i>Circus approximans</i>		Swamp harrier	20		
<i>Elanus axillaris</i>		Black-shouldered kite	27		
<i>Elanus scriptus</i>		Letter-winged kite	1	Vag.	
<i>Haliaeetus leucogaster</i>		White-bellied sea-eagle	116	C	
<i>Haliastur indus</i>		Brahminy kite	8		
<i>Haliastur sphenurus</i>		Whistling kite	120		
<i>Hieraaetus morphnoides</i>		Little eagle	7		
<i>Lophoictinia isura</i>		Square-tailed Kite	1		
<i>Pandion haliaetus</i>		Osprey	8		
Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar	35		
Alcedinidae	<i>Alcedo azurea</i>	Azure kingfisher	32		
Anatidae	<i>Anas castanea</i>	Chestnut teal	53		
	<i>Anas gracilis</i>	Grey teal	51		
	<i>Anas platyrhynchos</i> *	Mallard*	2		
	<i>Anas superciliosa</i>	Pacific black duck	83		
	<i>Aythya australis</i>	Hardhead	30		
	<i>Biziura lobata</i>	Musk duck	11		
	<i>Chenonetta jubata</i>	Australian wood duck	34		
	<i>Cygnus atratus</i>	Black swan	65		
	<i>Oxyura australis</i>	Blue-billed duck	1		
Anhingidae	<i>Anhinga melanogaster</i>	Darter	20		
Apodidae	<i>Apus pacificus</i>	Fork-tailed swift	7	J, C, R	
	<i>Hirundapus caudacutus</i>	White-throated needletail	68	C	
Ardeidae	<i>Ardea alba</i>	Great egret	72	J, C	
	<i>Ardea ibis</i>	Cattle egret	9	J, C	

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
	<i>Ardea intermedia</i>	Intermediate egret	10	
	<i>Ardea pacifica</i>	White-necked heron	42	
	<i>Botaurus poiciloptilus</i>	Australasian bittern	11	E, IUCN
	<i>Butorides striatus</i>	Striated heron	24	
	<i>Egretta garzetta</i>	Little egret	26	
	<i>Egretta novaehollandiae</i>	White-faced heron	127	
	<i>Egretta sacra</i>	Eastern reef egret	18	C
	<i>Ixobrychus flavicollis</i>	Black bittern	5	
	<i>Ixobrychus minutus</i>	Little bittern	3	
	<i>Nycticorax caledonicus</i>	Nankeen night heron	46	
Artamidae	<i>Artamus cyanopterus</i>	Dusky woodswallow	45	
	<i>Artamus leucorhynchus</i>	White-breasted woodswallow	50	
	<i>Artamus personatus</i>	Masked woodswallow	1	
	<i>Artamus superciliosus</i>	White-browed woodswallow	5	
	<i>Cracticus nigrogularis</i>	Pied butcherbird	30	
	<i>Cracticus torquatus</i>	Grey butcherbird	108	
	<i>Gymnorhina tibicen</i>	Australian magpie	150	
	<i>Strepera graculina</i>	Pied currawong	133	
Burhinidae	<i>Burhinus grallarius</i>	Bush stone-curlew	2	
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested cockatoo	5	
	<i>Callocephalon fimbriatum</i>	Gang-gang cockatoo	1	Vag.
	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-cockatoo	40	
	<i>Calyptorhynchus lathami</i>	Glossy black-cockatoo	5	
	<i>Eolophus roseicapillus</i>	Galah	29	
Campephagidae	<i>Coracina maxima</i>	Ground cuckoo-shrike	6	
	<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike	119	
	<i>Coracina papuensis</i>	White-bellied cuckoo-shrike	11	
	<i>Coracina tenuirostris</i>	Cicadabird	14	
	<i>Lalage tricolor</i>	White-winged triller	3	
Caprimulgidae	<i>Eurostopodus mystacalis</i>	White-throated nightjar	16	
Centropodidae	<i>Centropus phasianinus</i>	Pheasant coucal	58	
Charadriidae	<i>Charadrius bicinctus</i>	Double-banded plover	7	
	<i>Charadrius leschenaultii</i>	Greater sand-plover	4	J, C, R
	<i>Charadrius mongolus</i>	Lesser sand-plover	18	J, C, R
	<i>Charadrius ruficapillus</i>	Red-capped plover	51	
	<i>Charadrius veredus</i>	Oriental plover	1	
	<i>Pluvialis dominica</i>	Lesser golden plover	14	J, C
	<i>Vanellus miles</i>	Masked lapwing	105	
	<i>Vanellus tricolor</i>	Banded lapwing	1	
Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	Black-necked stork	18	
Climacteridae	<i>Climacteris erythrops</i>	Red-browed treecreeper	3	
	<i>Climacteris picumnus</i>	Brown treecreeper	7	
	<i>Cormobates leucophaeus</i>	White-throated treecreeper	101	
Columbidae	<i>Chalcophaps indica</i>	Emerald dove	4	

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
	<i>Columba leucomela</i>	White-headed pigeon	7	
	<i>Columba livia</i> *	Rock dove*	10	
	<i>Geopelia humeralis</i>	Bar-shouldered dove	50	
	<i>Geopelia placida</i>	Peaceful dove	16	
	<i>Leucosarcia melanoleuca</i>	Wonga pigeon	18	
	<i>Lopholaimus antarcticus</i>	Topknot pigeon	4	
	<i>Macropygia amboinensis</i>	Brown cuckoo-dove	17	
	<i>Ocyphaps lophotes</i>	Crested pigeon	22	
	<i>Phaps chalcoptera</i>	Common bronzewing	9	
	<i>Phaps elegans</i>	Brush bronzewing	6	
	<i>Ptilinopus magnificus</i>	Wompoo fruit-dove	2	
	<i>Streptopelia chinensis</i> *	Spotted turtle-dove*	20	
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	43	
Corcoracidae	<i>Corcorax melanorhamphos</i>	White-winged chough	38	
Corvidae	<i>Corvus coronoides</i>	Australian raven	115	
	<i>Corvus orru</i>	Torresian crow	14	
	<i>Corvus tasmanicus</i>	Forest raven	22	
Cuculidae	<i>Cacomantis flabelliformis</i>	Fan-tailed cuckoo	64	
	<i>Cacomantis variolosus</i>	Brush cuckoo	25	
	<i>Chalcites basalis</i>	Horsfield's bronze-cuckoo	4	
	<i>Chalcites lucidus</i>	Shining bronze-cuckoo	17	
	<i>Cuculus pallidus</i>	Pallid cuckoo	16	
	<i>Eudynamys orientalis</i>	Pacific koel	64	
	<i>Scythrops novaehollandiae</i>	Channel-billed cuckoo	22	
Dicaeidae	<i>Dicaeum hirundinaceum</i>	Mistletoe bird	43	
Dicruridae	<i>Dicrurus bracteatus</i>	Spangled drongo	14	
	<i>Grallina cyanoleuca</i>	Magpie-lark	115	
	<i>Monarcha melanopsis</i>	Black-faced monarch	25	
	<i>Monarcha trivirgatus</i>	Spectacled monarch	2	
	<i>Myiagra cyanoleuca</i>	Satin flycatcher	5	
	<i>Myiagra inquieta</i>	Restless flycatcher	12	
	<i>Myiagra rubecula</i>	Leaden flycatcher	37	
	<i>Rhipidura albiscapa</i>	Grey fantail	160	
	<i>Rhipidura leucophrys</i>	Willie wagtail	133	
	<i>Rhipidura rufifrons</i>	Rufous fantail	40	
Diomedidae	<i>Diomedea exulans</i>	Wandering albatross	3	V
	<i>Thalassarche melanophris</i>	Black-browed albatross	6	V; IUCN
Estrildidae	<i>Neochmia temporalis</i>	Red-browed finch	102	
	<i>Stagonopleura guttata</i>	Diamond firetail	1	Vag.
	<i>Taeniopygia bichenovii</i>	Double-barred finch	15	
Eupetidae	<i>Cinclosoma punctatum</i>	Spotted quail-thrush	2	
	<i>Psophodes olivaceus</i>	Eastern whipbird	94	
Falconidae	<i>Falco berigora</i>	Brown falcon	14	
	<i>Falco cenchroides</i>	Nankeen kestrel	52	
	<i>Falco longipennis</i>	Australian hobby	1	Vag.
	<i>Falco peregrinus</i>	Peregrine falcon	12	
Fregatidae	<i>Fregata ariel</i>	Lesser frigatebird	2	J, C, R

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
Fringillidae	<i>Carduelis carduelis</i> *	European goldfinch*	1	
Haematopodidae	<i>Haematopus fuliginosus</i>	Sooty oystercatcher	16	
	<i>Haematopus longirostris</i>	Pied oystercatcher	33	
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing kookaburra	164	
	<i>Todiramphus macleayii</i>	Forest kingfisher	1	
	<i>Todiramphus sanctus</i>	Sacred kingfisher	102	
Hirundinidae	<i>Cheramoeca leucosternus</i>	White-backed swallow	1	Vag.
	<i>Hirundo neoxena</i>	Welcome swallow	174	
	<i>Petrochelidon ariel</i>	Fairy martin	19	
	<i>Petrochelidon nigricans</i>	Tree martin	35	
Hydrobatidae	<i>Oceanites oceanicus</i>	Wilson's storm-petrel	1	J
	<i>Pelagodroma marina</i>	White-faced storm-petrel	25	
Laridae	<i>Catharacta skua</i>	Great skua	1	
	<i>Larus dominicanus</i>	Kelp gull	4	
	<i>Larus novaehollandiae</i>	Silver gull	322	
	<i>Procelsterna cerulea</i>	Grey ternlet	1	Vag.
	<i>Stercorarius parasiticus</i>	Arctic jaeger	7	
	<i>Stercorarius pomarinus</i>	Pomarine jaeger	4	
	<i>Sterna albifrons</i>	Little tern	28	J, C, R
	<i>Sterna bergii</i>	Crested tern	110	J
	<i>Sterna caspia</i>	Caspian tern	13	C
	<i>Sterna fuscata</i>	Sooty tern	2	
	<i>Sterna hirundo</i>	Common tern	#	J, C, R
	<i>Sterna striata</i>	White-fronted tern	1	
	Maluridae	<i>Malurus cyaneus</i>	Superb fairy-wren	131
<i>Malurus lamberti</i>		Variegated fairy-wren	100	
<i>Stipiturus malachurus</i>		Southern emu-wren	24	
Megapodiidae	<i>Alectura lathami</i>	Australian brush-turkey	9	
	<i>Acanthorhynchus tenuirostris</i>	Eastern spinebill	110	
	<i>Anthochaera carunculata</i>	Red wattlebird	60	
	<i>Anthochaera chrysoptera</i>	Little wattlebird	112	
	<i>Entomyzon cyanotis</i>	Blue-faced honeyeater	31	
	<i>Epthianura albifrons</i>	White-fronted Chat	17	
	<i>Gliciphila melanops</i>	Tawny-crowned honeyeater	3	
	<i>Grantiella picta</i>	Painted honeyeater	1	IUCN
	<i>Lichenostomus chrysops</i>	Yellow-faced honeyeater	162	
	<i>Lichenostomus fuscus</i>	Fuscous honeyeater	1	
	<i>Lichenostomus leucotis</i>	White-eared honeyeater	2	
	<i>Lichenostomus penicillatus</i>	White-plumed honeyeater	1	
	<i>Lichmera indistincta</i>	Brown honeyeater	13	
	<i>Manorina melanocephala</i>	Noisy miner	117	
<i>Manorina melanophrys</i>	Bell miner	2		
<i>Meliphaga lewinii</i>	Lewin's honeyeater	114		
<i>Melithreptus brevirostris</i>	Brown-headed honeyeater	9		
<i>Melithreptus lunatus</i>	White-naped honeyeater	30		
<i>Myzomela sanguinolenta</i>	Scarlet honeyeater	72		

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
	<i>Philemon citreogularis</i>	Little friarbird	2	
	<i>Philemon corniculatus</i>	Noisy friarbird	127	
	<i>Phylidonyris nigra</i>	White-cheeked honeyeater	130	
	<i>Phylidonyris novaehollandiae</i>	New Holland honeyeater	17	
	<i>Phylidonyris pyrrhoptera</i>	Crescent honeyeater	1	Vag.
	<i>Plectorhyncha lanceolata</i>	Striped honeyeater	5	
	<i>Xanthomyza phrygia</i>	Regent honeyeater	1	IUCN
Menuridae	<i>Menura novaehollandiae</i>	Superb lyrebird	23	
Meropidae	<i>Merops ornatus</i>	Rainbow bee-eater	4	
Motacillidae	<i>Anthus australis</i>	Australian pipit	66	
Muscicapidae	<i>Zoothera sp.</i>	Unidentified ground thrush	1	
Nectariniidae	<i>Nectarinia jugularis</i>	Olive-backed sunbird	4	
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied sittella	28	
Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed oriole	62	
	<i>Sphecotheres vieilloti</i>	Australasian figbird	23	
Orthonychidae	<i>Orthonyx temminckii</i>	Logrunner	3	
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey shrike-thrush	122	
	<i>Falcunculus frontatus</i>	Eastern shrike-tit	21	
	<i>Pachycephala pectoralis</i>	Golden whistler	99	
	<i>Pachycephala rufiventris</i>	Rufous whistler	85	
Paradisaeidae	<i>Ptiloris paradiseus</i>	Paradise riflebird	2	
Pardalotidae	<i>Pardalotus punctatus</i>	Spotted pardalote	54	
	<i>Pardalotus striatus</i>	Striated pardalote	15	
Passeridae	<i>Passer domesticus*</i>	House sparrow*	31	
Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican	112	
Petroicidae	<i>Eopsaltria australis</i>	Eastern yellow robin	99	
	<i>Melanodryas cucullata</i>	Hooded robin	3	
	<i>Microeca fascinans</i>	Jacky winter	50	
	<i>Petroica boodang</i>	Scarlet robin	2	
	<i>Petroica rosea</i>	Rose robin	12	
Phaethontidae	<i>Phaethon lepturus</i>	White-tailed tropicbird	1	J, C
	<i>Phaethon rubricauda</i>	Red-tailed tropicbird	2	Vag.
Phalacrocoracidae	<i>Phalacrocorax carbo</i>	Great cormorant	113	
	<i>Phalacrocorax melanoleucos</i>	Little pied cormorant	116	
	<i>Phalacrocorax sulcirostris</i>	Little black cormorant	86	
	<i>Phalacrocorax varius</i>	Pied cormorant	84	
Phasianidae	<i>Coturnix pectoralis</i>	Stubble quail	2	
	<i>Coturnix ypsilophora</i>	Brown quail	14	
Pittidae	<i>Pitta versicolor</i>	Noisy pitta	1	
Podargidae	<i>Podargus strigoides</i>	Tawny frogmouth	36	
Podicipedidae	<i>Podiceps cristatus</i>	Great crested grebe	5	
	<i>Poliiocephalus poliocephalus</i>	Hoary-headed grebe	11	
	<i>Tachybaptus novaehollandiae</i>	Australasian grebe	18	
Pomatostomidae	<i>Pomatostomus temporalis temporalis</i>	Grey-crowned babbler (eastern subspecies)	1	
Procellariidae	<i>Daption capense</i>	Cape petrel	2	

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
	<i>Macronectes giganteus</i>	Southern giant petrel	7	E
	<i>Pachyptila turtur</i>	Fairy prion	2	
	<i>Pterodroma inexpectata</i>	Mottled petrel	2	
	<i>Pterodroma leucoptera leucoptera</i>	Gould's petrel	60	E; IUCN
	<i>Puffinus bulleri</i>	Buller's shearwater	2	IUCN
	<i>Puffinus carneipes</i>	Flesh-footed shearwater	6	J, R
	<i>Puffinus gavia</i>	Fluttering shearwater	6	
	<i>Puffinus griseus</i>	Sooty shearwater	19	J, C
	<i>Puffinus huttoni</i>	Hutton's shearwater	1	IUCN
	<i>Puffinus pacificus</i>	Wedge-tailed shearwater	65	J
	<i>Puffinus tenuirostris</i>	Short-tailed shearwater	41	J, R
Psittacidae	<i>Alisterus scapularis</i>	Australian king-parrot	43	
	<i>Glossopsitta pusilla</i>	Little lorikeet	34	
	<i>Glossopsitta concinna</i>	Musk lorikeet	#	
	<i>Lathamus discolor</i>	Swift parrot	2	IUCN
	<i>Neophema pulchella</i>	Turquoise parrot	7	
	<i>Platycercus adscitus eximius</i>	Eastern rosella	120	
	<i>Platycercus elegans</i>	Crimson rosella	14	
	<i>Psephotus haematonotus</i>	Red-rumped parrot	17	
	<i>Trichoglossus chlorolepidotus</i>	Scaly-breasted lorikeet	48	
	<i>Trichoglossus haematodus</i>	Rainbow lorikeet	19	
Ptilonorhynchidae	<i>Ailuroedus crassirostris</i>	Green catbird	17	
	<i>Ptilonorhynchus violaceus</i>	Satin bowerbird	42	
	<i>Sericulus chrysocephalus</i>	Regent bowerbird	17	
Rallidae	<i>Aythya australis</i>	Hardhead	#	
	<i>Fulica atra</i>	Eurasian coot	31	
	<i>Gallinula tenebrosa</i>	Dusky moorhen	40	
	<i>Gallirallus philippensis</i>	Buff-banded rail	10	
	<i>Porphyrio porphyrio</i>	Purple swamphen	47	
	<i>Porzana fluminea</i>	Australian spotted crake	2	
	<i>Porzana pusilla</i>	Baillon's crake	1	Vag.
	<i>Rallus pectoralis</i>	Lewin's rail	2	
Recurvirostridae	<i>Himantopus himantopus</i>	Black-winged stilt	3	
	<i>Recurvirostra novaehollandiae</i>	Red-necked avocet	3	
Scolopacidae	<i>Arenaria interpres</i>	Ruddy turnstone	6	J, C, R
	<i>Calidris acuminata</i>	Sharp-tailed sandpiper	17	J, C
	<i>Calidris alba</i>	Sanderling	2	
	<i>Calidris canutus</i>	Red knot	2	J, C, R
	<i>Calidris ferruginea</i>	Curlew sandpiper	7	J, C, R
	<i>Calidris melanotos</i>	Pectoral sandpiper	3	J, R
	<i>Calidris ruficollis</i>	Red-necked stint	12	J, C, R
	<i>Gallinago hardwickii</i>	Latham's snipe	11	J, C, R
	<i>Heteroscelus brevipes</i>	Grey-tailed tattler	12	J
	<i>Limosa lapponica</i>	Bar-tailed godwit	40	J, C, R

Family Name	Scientific Name	Common Name	No. of sightings	Status (see key)
	<i>Numenius madagascariensis</i>	Eastern curlew	44	J, C, R
	<i>Numenius phaeopus</i>	Whimbrel	18	J, C, R
	<i>Tringa nebularia</i>	Common greenshank	6	J, C, R
	<i>Tringa stagnatilis</i>	Marsh sandpiper	1	J, C, R
	<i>Xenus cinereus</i>	Terek sandpiper	5	J, C, R
Spheniscidae	<i>Eudyptula minor</i>	Little penguin	35	
Strigidae	<i>Ninox boobook</i>	Southern boobook	27	
	<i>Ninox strenua</i>	Powerful owl	15	
Sturnidae	<i>Sturnus vulgaris</i> *	Common starling*	38	
Sulidae	<i>Morus serrator</i>	Australasian gannet	50	
	<i>Sula dactylatra</i>	Masked booby	1	J, R
	<i>Sula leucogaster</i>	Brown booby	1	J, C, R
Sylviidae	<i>Acrocephalus stentoreus</i>	Clamorous reed-warbler	7	
	<i>Cincloramphus mathewsi</i>	Rufous songlark	5	Vag.
	<i>Cisticola exilis</i>	Golden-headed cisticola	23	
	<i>Megalurus gramineus</i>	Little grassbird	1	Vag.
	<i>Megalurus timoriensis</i>	Tawny grassbird	2	
Threskiornithidae	<i>Platalea flavipes</i>	Yellow-billed spoonbill	11	
	<i>Platalea regia</i>	Royal spoonbill	41	
	<i>Plegadis falcinellus</i>	Glossy ibis	2	C
	<i>Threskiornis molucca</i>	Australian white ibis	85	
	<i>Threskiornis spinicollis</i>	Straw-necked ibis	17	
Turnicidae	<i>Turnix varia</i>	Painted button-quail	5	
Tytonidae	<i>Tyto alba</i>	Barn owl	7	
	<i>Tyto capensis</i>	Grass owl	2	
	<i>Tyto novaehollandiae</i>	Masked owl	21	
	<i>Tyto tenebricosa</i>	Sooty owl	7	
Zosteropidae	<i>Zosterops lateralis</i>	Silvereye	137	

Source: NPWS Atlas of NSW Wildlife (report generated on July 2007)

Status:

J = JAMBA, C = CAMBA, R = ROKAMBA

IUCN = IUCN Red List

E = Endangered, V = vulnerable in Australia

Observed by David Turner, Ranger NPWS

* introduced species

Vag. = vagrant sighting

Appendix 2: Map of boundaries and location of Myall Lakes Ramsar site

