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).

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

Roger Jaensch, Wetlands International - Oceania, on behalf of the Western Australian Department of Conservation & Land Management (DCLM), in 1998. Updated by DCLM staff in 2000 and 2003. Updated by Gareth Watkins, Department of Environment and Conservation (DEC) in 2009.

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DD MM YY

Designation date | Site Reference Number

All inquiries should be directed to Michael Coote, DEC, 17 Dick Perry Avenue, Technology Park, Kensington, Western Australia 6983, (Tel: +61-8-9219-8714; Fax: +61-8-9219-8750; email: Michael.Coote@dec.wa.gov.au).

2. Date this sheet was completed/updated:

16 February 2009

3. Country:

Australia

4. Name of the Ramsar site:

Lake Gore

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:

- Based on recent analysis of data, Lake Gore does not meet criteria 5 under which the site was originally nominated (see item 14).
- Increases in un-seasonal, episodic rainfall events have exacerbated the affects of catchment clearing, resulting in an altered hydrological regime at Lake Gore (i.e. increased extent and duration of inundation). It appears changes to the hydrological regime have caused adverse changes to waterbirds and the vegetation of the Lake Gore Ramsar Site. Waterbird species composition appears to be changing with increases in ducks and allies that require deeper open water habitat and decreases in those species that require an exposed shore zone and wading habitat. A period of inundation longer than natural thresholds has resulted in the death of riparian vegetation.

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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:

The boundary of Lake Gore Ramsar Site consists of the whole of Nature Reserve 32419 and includes the part of Crown Reserve 26885 that is east of the truncation from the intersection of the south east corner of lot 1983 on plan 182935 and the eastern side of an intersecting vehicle track, continuing to follow south along the eastern side of the vehicle track to intersect with the lowest astronomical tide of the Southern Ocean.

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

Latitude 33˚47 ' Longitude 121˚29 'E

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9. General location:

The Lake Gore Ramsar site is located in the south west of Western Australia (population 2,010,113 in 2005) (Australian Bureau of Statistics, 2007), approximately 730km south east of its capital Perth. It is within the local authority of the Shire of Esperance, approximately 34km west of the Esperance townsite (population 13,265 in 2004) (Australian Bureau of Statistics, 2006).

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

Approximate minimum 10 metres Australian Height Datum

Approximate maximum 20 metres Australian Height Datum

11. Area: (in hectares)

4 017 ha of which Lake Gore itself comprises 740 ha.

12. General overview of the site:

The site comprises of a permanent saline to hypersaline lake (Lake Gore) and part of a downstream system of permanent / seasonal lakes, flats, marshes and pools of various extents.

The Ramsar site provides significant waterbird habitat and refuge, and waterbird species listed under the international migratory agreements JAMBA, CAMBA, ROKAMBA and CMS have been observed at Lake Gore. The site also supports thousands of Australian Shelduck (*Tadorna tadornoides*), which utilise Lake Gore as a sanctuary during their moulting period. The numbers of Shelduck along with Banded Stilt (*Cladorhynchus leucocephalus*), Chestnut Teal (*Anas castanea*) and Hooded Plover (*Thinornis* rubricollis) recorded at the site have been significant, exceeding 1 % population thresholds. Lake Gore itself has supported the largest known populations of Hooded Plover in Western Australia.

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:

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.
Justification: Lake Gore regularly supports thousands of moulting Australian Shelducks (*Tadorna tadornoides*) and is therefore an important aspect of their life cycle, providing a refuge during this vulnerable period. The Lake is also used as a drought refuge by large numbers of other waterbirds (Jaensch & Watkins, 1999).

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.
Justification: Lake Gore has, until relatively recently, supported more than 1 % of the Western Australian population of Hooded Plover (*Thinornis* rubricollis [1 % last recorded in 2002]) and more than 1 % of the Australian population of Banded Stilt (*Cladorhynchus leucocephalus* [1 % last recorded in 1998]). The available data suggests that these population thresholds may again be met in the future.

The 1% population threshold is also met for the Australian Shelduck (*Tadorna tadornoides*) and the Chestnut Teal (*Anas castanea*). Regular counts exceeding population estimates (see: Wetlands International, 2006) have occurred at Lake Gore.

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-West Coast Australian Drainage Division

b) biogeographic regionalisation scheme (include reference citation):

Australian Natural Resources Atlas - Drainage Divisions (Government, 2007)

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16. Physical features of the site:

Topography
The Lake Gore Ramsar Site is confined by a granite escarpment to the north and by Quaternary dunes to the south. The Quaternary dunes consist of coastal sand dunes and a limestone ridge. Lake Gore itself covers an area of approximately 740 ha within the 4 017 ha Ramsar site.

The basin of Lake Gore is a broad shallow basin and the bathymetry ranges from approximately 15 - 20 m Australian Height Datum (AHD).

Geology
The site is situated in the Albany - Fraser Orogen that is made up of Proterozoic rocks, consisting of granite and gneisses formed approximately 2300 - 1800 million years ago (CALM, 1999; Short, 2000). The basement geology underlying the Lake Gore Ramsar Site is Archean crystalline basement of the Biranup complex. The regolith of the Ramsar site are overlain by alluvial, colluvial, aeolian and lacustrine deposits from streams and the erosion of the nearby escarpments (Simons, 2001; Street & Abbott, 2005).

Hydrology
The main hydrological input for Lake Gore is the Dalyup catchment, which consists of the Dalyup and West Dalyup River. Other hydrological inputs for Lake Gore are derived from the Coobidge Creek catchment that flows into Lake Gore through Carbul, Kubitch and Gidong Lakes, which lie external to the Ramsar boundary. There is also some groundwater seepage from aquifers surrounding the Ramsar site including a perched aquifer in the Quaternary dunes to the south, however, the amounts are not quantified (Street et al., 2005).

An inter-connected system of seasonal wetlands within the Ramsar site are fed by Lake Gore and the seasonally flowing Coobidge Creek catchment. All the wetlands within the site are of natural origin. When Lake Gore fills, it over flows via "Overflow Swamp" into Quallilup Lake, which is outside the Ramsar boundary. In extreme flood events, overflow from the Lake Gore and Coobidge Creek catchments merge westward via an ill-defined watercourse, from the "Overflow Swamp" to Barkers Inlet approximately 12 km away and then to the Southern Ocean.

Lake Gore has no confirmed direct hydrological connection with the Southern Ocean and is therefore described as a sub-terminal basin. However, it is possible that some palaeodrainage features exist east of Lake Gore and are a likely output to the Southern Ocean (Street et al., 2005).

The hydrological regime of Lake Gore and its surrounding catchments has been altered due to catchment clearing and episodic rainfall events.

Water quality and depth

Salinity concentrations in the ground and surface waters of the catchments surrounding the site ranges from saline to hypersaline, decreasing down the catchment toward the coast. More recently, acidic surface waters (i.e. < 7) have been recorded in the Dalyup and Coobidge Creek catchments. High concentrations of metals have been recorded in association with these acidic surface waters (see: Cook & Janicke, 2008; Lillicrap & Simons, 2009).

Salinity concentrations at Lake Gore are generally saline to hypersaline. Mean (± standard deviation) salinity concentrations for September from 1979 to 2007 were 44.2 (± 29.4) parts per thousand (ppt) and for November they were 53.5 (± 44.3) ppt. The pH of Lake Gore is generally alkaline (>7) and has ranged from 6.8 to 9.8.

Observations of Lake Gore suggest that the altered hydrological regime has caused increases in the extent and duration of water inundation (Tilo Massenbauer, Recovery Catchment Officer, DEC, pers. comm., 2008). Recent water depth data for Lake Gore suggest that it is remaining permanently inundated with an average depth of 1.5 m (n=36).

(data from: Department of Environment and Conservation, 2008a; Lane, 2008).

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17. Physical features of the catchment area:

The Dalyup catchment covers approximately 82,607 ha with the majority (80 - 90%) of the catchment cleared and dominated by broad acre agriculture (Beeston & Hopkins, 2001; Gee & Simons, 2002; Pen, 1999). Crops such as oats, wheat, barley, canola and lupins are the major crop types grown. Other forms of agriculture in the surrounding catchment include grazing for lamb, beef and wool production. Some farm forestry and hobby farming also exists.

The soils of the catchment are predominantly grey sandy duplex soils usually with ironstone gravels within the sandy topsoil and pale deep sands (Esperance land-systems). In the northern part of the catchment the soils are alkaline grey shallow sandy duplex soils of the mallee (Scadden land-system) (Brendan Nicholas, Soil Resource Officer, DAFWA, Esperance, pers. comm.).

The Dalyup catchment has a Mediterranean type climate which is characterised by a cool winter with reliable rainfall and a warm dry summer with occasional thunderstorms. The Dalyup catchment receives an annual average rainfall of 484 mm of rain and 76 % of this amount falls between April and October (Burgess, 2001; Water and Rivers Commission, 2002). Annual rainfall across the Dalyup catchment is variable, with the northern part of the catchment receiving an average of 368 mm of rain while the southern end of the catchment, which is 40 km away, receives an annual average of 590 mm (Burgess, 2001; Water and Rivers Commission, 2002).

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18. Hydrological values:

Lake Gore supplies water to nearby Lake Quallilup and other smaller unnamed lakes, marshes/ pools within the Lake Gore Ramsar Site. Lake Gore itself serves as a sediment trap, receiving sediment that washes down from the Dalyup catchment via the Dalyup River.

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19. Wetland Types

a) presence:

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

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

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

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

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

Q, (R,Ss)

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20. General ecological features:

The Lake Gore Ramsar Site is located in the South-West Botanical Province within the Fanny's Cove Vegetation System. The coastal dune vegetation is dominated by *Scaevola crassifolia* which occurs in front of the mallee *Eucalyptus angulosa* with an understorey of *Melaleuca pentagona* (Beard, 1973). Further inland there are thickets of tall *Acacia*, *Melaleuca* or scrub heath dominated by *Banksia speciosa* (Beard, 1973).

Lake Gore's wetland vegetation has been described as having a fringing belt of *Melaleuca cuticularis* that is variable in width, with sedges (*Schoenus brevifolius* and *Gahnia trifida*) and samphire species (*Suaeda australis* and *Sarcocornia quinqueflora*) around the high water mark (Halse, Pearson, & Patrick, 1993). *Melaleuca cuticularis* is replaced by *Acacia* sp. as the elevation increases on the northerly side of the Lake (Halse et al., 1993). The grass species *Sporobolus virginicus* and herb *Samolus repens* were also recorded at the high water mark (Halse et al., 1993). Massenbauer & Palmquist (2006) described 15 vegetation communities for the Lake Gore catchment (1,720 ha), which covers the majority of the Lake Gore Ramsar Site.

Death of the fringing *Melaleuca cuticularis* has been noted in the past (see: Halse et al., 1993). Recent vegetation surveys identified that at 2006, approximately 53 % or 920 ha (between 15.9 and 17.5 m AHD) of the riparian vegetation of the Lake Gore catchment was either dead or degrading (Massenbauer et al., 2006). The decline in vegetation condition has been attributed to increases in the timing and extent of inundation of the riparian zone (Tilo Massenbauer, Recovery Catchment Officer, DEC, pers. comm., 2008).

Waterbird surveys have resulted in a total of 53 species being recorded for the site, including 14 species listed under the international migratory agreements JAMBA, CAMBA, ROKAMBA and CMS. These species are listed as migratory and are protected under the *Environment Protection and Biodiversity Conservation Act 1999*.

Eight species of waterbirds have been recorded breeding at the Lake Gore Ramsar Site. The rocky outcrops on the northern side of Lake Gore provide an important "loafing" site for the flightless Shelducks (Jaensch, Vervest, & Hewish, 1988). The spit and shores to the north and northeast end of Lake Gore are considered to be important habitat areas for the Hooded Plover (Jaensch et al., 1988).

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21. Noteworthy flora:

There are no rare, threatened or endemic plants known at the site.

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22. Noteworthy fauna:

Lake Gore itself has recorded the largest known population of Hooded Plover (max 1570 January 1995), which at the time was approximately a third of the worlds known population (Newbey, 1996; Rose & Scott, 1997). Consequently, Lake Gore was considered the single most important wetland known for Hooded Plover throughout their range (Newbey, 1996). Since listing, the Hooded Plover have only been recorded exceeding the 1 % population threshold on one occasion (87, November 2002). The Hooded Plover is considered near threatened and in some regions it has become locally extinct (BirdLife

International, 2006; Raines, 2002). Under Western Australian legislation (*Wildlife Conservation Act 1950*) the Hooded Plover is a Priority four species (taxa in need of monitoring).

The maximum Banded Stilt count was in March 1988, where 20,000 Banded Stilt were recorded at Lake Gore. This species contributed toward the highest recorded waterbird count of 29,273 on the same date. Banded Stilt were last recorded exceeding the 1 % population threshold in 1998.

Two additional species, the Australian Shelduck and Chestnut Teal also provide justification for Ramsar Criterion 6. These two species were not included under this criterion at the time of listing as global population estimates were not available. The latest global population estimates (see: Wetlands International, 2006), in comparison with historical and current waterbird surveys, indicate that the counts exceed the 1 % population thresholds for these two species regularly.

Lake Gore still regularly supports thousands of Australian Shelduck which use the site during spring-summer for the critical moulting stage of their lifecycle. It is one of the most important moulting sites for Shelducks in south-Western Australia (Jaensch et al., 1999). The maximum count for Australian Shelduck was 12,000 in November 1986.

The maximum count for Chestnut Teal was 884 in February 2008.

(waterbird data from: Birds Australia, 2008a; Birds Australia, 2008b; Buchanan, 2003; Clarke & Lane, 2003; Department of Environment and Conservation, 2008b; Halse, 2007, 2008a, 2008b; Halse, Jaensch, & Munro, 1992; Halse, Jaensch, Munro, & Pearson, 1990; Halse, Pearson, & Vervest, 1995; Halse, Vervest, Pearson, Yung, & Fuller, 1994; Jaensch et al., 1988; Keighery, Halse, Harvey, & McKenzie, 2004; Newbey, 1996; Singor, 1999).

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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 site provides cultural services in the form of recreation; science and education; cultural heritage and identity; spiritual and inspirational and aesthetic amenity.

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:

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24. Land tenure/ownership:
a) within the Ramsar site: The site comprises of Nature Reserve 32419 for the purpose of 'Water and conservation of flora and fauna' and eastern part of Nature Reserve 26885 for the 'Conservation of flora'. Both are vested in the Conservation Commission.

b) in the surrounding area: Nature reserve, crown land and unallocated crown with freehold land, leasehold land, recreational reserve and marine reserve.

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25. Current land (including water) use:
a) within the Ramsar site: The principal land use within the Ramsar Site is nature conservation. In addition, low level passive recreational use occurs. Some active recreation occurs within the Ramsar boundary i.e. four wheel driving (4WD) activities. There are no developed facilities for nature-based recreation and this type of recreation is negligible within the Ramsar Site.

b) in the surroundings/catchment: The dominant land uses in the surface catchment are agriculture (cereal, other seed crops) and grazing of sheep. Some adjoining areas are reserved for nature conservation. Some recreational fishing by local residents occurs at or near Warrinup Beach, which is also popular for surfing. There is also a lime mine to the south of Lake Gore. Human population in the surface catchment of the Ramsar site is in the order of several hundreds of people.

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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:

An altered hydrological regime at Lake Gore is the largest threat to the ecological character of the site. Optimal waterbird habitats have been reduced and the riparian zone has been impacted, resulting in vegetation death (mainly *Melaleuca cuticularis*) and condition decline (Tilo Massenbauer, Recovery Catchment Officer, DEC, pers. comm., 2008).

There have been anecdotal reports of major algal blooms causing deposits of algal mats on the shores of Lake Gore. Elevated nutrient concentrations have been recorded for Lake Gore and there have been marked increases in nutrient levels in the sediment composition (Lane, 2008; Wilson, 2003).

Studies on the rates of sedimentation conducted in the centre of Lake Gore suggest a 50 times increase in sedimentation rates since widespread land clearing of the catchment occurred (Geoag, 2005). Pre-clearing sedimentation rates in Lake Gore were 8mm per 100 years, post clearing (last 50 years) sedimentation rates have been 400mm per 50 years (Geoag, 2005).

Some other potential threats include threats from non-native and alien species and from recreational activities.

b) in the surrounding area:

The threats occurring within the Ramsar site have their origins in the areas surrounding the Ramsar site. Clearing of native vegetation within the Dalyup and Coobidge Creek catchments has caused rising groundwater levels and increased surface water runoff (Komarzynski, 2001). The altered hydrological regime is increasing the extent and incidence of secondary salinisation, water erosion, siltation, sedimentation, flooding, acidity (ground and surface water) and waterlogging in the catchments (Comer, Gilfillan, Barrett, Grant, Tiedemann, & Andersen, 2001; Komarzynski, 2001; Water and Rivers Commission, 2002). Clearing for agriculture, combined with the installation of deep drainage to alleviate surface water problems on farms, has resulted in an altered hydrological regime for Lake Gore. This has been exacerbated by un-seasonal, episodic rainfall events resulting in floods in 1999, 2000 and 2007.

The acidic surface waters recorded in the Dalyup and Coobidge Creek catchments along with high concentrations of metals (see: Cook et al., 2008; Lillicrap et al., 2009) are also significant threats to the site's ecological character.

Another threat is climate change. The Indian Ocean Climate Initiative (2002) have indicated five major changes that have already occurred to the climate in the south west of Western Australia.

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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.

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?: No

d) Describe any other current management practices:

The Dalyup and West Dalyup Rivers Action Plan completed in 2002 addressed management issues in the Dalyup catchment and recommended some management actions (Water and Rivers Commission, 1999).

Most of the shoreline of Lake Gore has less than 50 m of buffer zone within protected areas.

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28. Conservation measures proposed but not yet implemented:

Under the Salinity Action Plan for Western Australia, the Lake Gore Ramsar Site has been designated as a potential Natural Diversity Recovery catchment (Department of Environment, 2003; Walshe, Halse, McKenzie, & Gibson, 2005). There is also potential in the site becoming part of a continuous "macro-corridor" of natural lands, including protected areas, along the South Coast between Albany and Esperance.

The Esperance Coastal Reserves Management Plan which includes the Lake Gore Ramsar Site is in preparation. The management plan is due for completion by DEC in 2009. The Lake Gore Ramsar Site Ecological Character Description will provide important information for its completion.

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29. Current scientific research and facilities:

- Depth, salinity and nutrient levels are currently being recorded by DEC. In addition to these, groundwater bores and piezometres are also being measured for depth and salinity concentrations. These measurements are recorded at least quarterly.
- Birds Australia, along with volunteers, still undertake waterbird surveys at Lake Gore including dedicated Hooded Plover surveys. Aerial bird surveys have also been conducted in 2006, 2007 and 2008.
- Vegetation floristics and structure, invertebrates, waterbirds and water quality were recorded in October 2008 at Lake Gore. This is part of the Statewide Resource Condition Monitoring project (see: Department of Environment and Conservation, 2008c).

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

Current CEPA for the Lake Gore Ramsar Site includes:

- Birds Australia has produced a Hooded Plover Management Plan which includes the Esperance region. The plan details specific threats to wetlands and Hooded Plovers. It also includes specific management and conservation strategies for the Esperance region; and
- Department of Agriculture and Food WA have a range advisory services which provide education about a range of catchment management issues including salinity and weed/pest management. They are also able to aid in cost benefit analysis for fertiliser application rates to prevent over application.

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31. Current recreation and tourism:

Low level passive recreation i.e. bird watching and camping. Other low level recreation occurs, mainly in Reserve 26885 and is associated with the coastline. It includes activities such as fishing, swimming and surfing. Some active recreation occurs also as 4WD tracks exist through the site.

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32. Jurisdiction:

Territorial: The State Government of Western Australia.
Functional: The Conservation Commission (vesting) and the Western Australian Department of Environment and Conservation (management on behalf of the Conservation Commission).

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33. Management authority:

The Esperance District (based in Esperance) of the South Coast Region, Western Australian Department of Environment and Conservation.

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34. Bibliographical references:

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Explanatory Note and Guidelines for completing the *Information Sheet on Ramsar Wetlands (RIS)*

Background and context

Recommendation 4.7 of the Conference of Contracting Parties established that the "data sheet developed for the description of Ramsar sites be used by Contracting Parties and the Secretariat in presenting information for the Ramsar database, and as appropriate in other contexts". The Recommendation listed the information categories covered by the "data sheet", including the "reasons for inclusion" (the Ramsar Criteria) and the Ramsar "*Classification system for wetland type*".

Resolution 5.3 reaffirmed that a completed "Ramsar datasheet" and site map should be provided upon designation of a Wetland of International Importance (hereafter referred to as a "Ramsar site") for the List of Wetlands of International Importance (the Ramsar List). This was subsequently reiterated in Resolutions VI.13, VI.16, and VII.12. This datasheet, formally entitled the *Information Sheet on Ramsar Wetlands* and abbreviated "*RIS*", provides a standardized format for recording information and data about the Ramsar site.

Resolution 5.3 also stressed that information concerning criteria for inclusion (on the Ramsar List), the functions and values (hydrological, biophysical, floral, faunal, social and cultural) of the site, and conservation measures taken or planned were particularly important categories of information; and it emphasized the importance of applying the Ramsar *Classification system for wetland type* when describing the wetland in the RIS.

Criteria for Identifying Wetlands of International Importance were first adopted in 1974 and refined by subsequent meetings of the Conference of the Parties. The form of the present Criteria was established by Recommendation 4.2 (1990), with additional criteria based upon fish adopted by Resolution VI.2. The Criteria were again substantively revised and, together with detailed guidance for their application, adopted by Resolution VII.11 as part of the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance.* An additional Criterion (Criterion 9) and amendments to the guidance for the application of other Criteria were adopted by COP9 (2005) Resolution IX.1 Annex B. These Criteria and guidelines are included as Annex II of this Explanatory Note.

The *Information Sheet on Ramsar Wetlands (RIS)* is completed and supplied to the Ramsar Secretariat when a Ramsar site is designated by a Contracting Party. In recognition that the status of designated Ramsar sites can and does change, both in terms of their ecological character, the threats to this character, and the conservation management process and actions underway, Resolution VI.13 has urged Contracting Parties to revise the data provided in the RIS at least every six years.

The RISs and their accompanying maps are held by the Ramsar Secretariat. The information provided by Contracting Parties in the RIS is used as the basis for entering data and information into the Ramsar Sites Database, managed on behalf of the Convention by Wetlands International under contract from the Ramsar Secretariat. The Database and its associated information on Ramsar sites is managed so as to provide an information service on Ramsar sites, including undertaking analysis and reporting to meetings of the Conference of the Parties on progress in

implementing the Strategic Framework and Vision for the List of Wetlands of International Importance (Resolution VII.11) and other Resolutions of the Conferences of the Parties.

The information provided by Contracting Parties in the RIS, including any supplementary information provided, and held in the Ramsar Sites Database is also made publicly available through the Ramsar Site Information Service Website (http://www.wetlands.org).

General guidance

The RIS must be completed in one of the Convention's three working languages, namely English, French, or Spanish. The RIS and this accompanying *Explanatory Note and Guidelines* are available in each of the three working languages.

The information provided in the RIS should be clear and succinct, and the total length of a completed RIS should not normally exceed 12 pages.

In the case of a wetland which has been well-studied and well-documented, or which is the subject of special field investigations, far more information may be available than can be accommodated in the RIS. Additional information, such as taxonomic lists of species' status, management plans, copies of published papers or photocopied reports on the site, should be appended to the RIS and are treated as part of the official record of the site. Photographs (prints, transparencies or electronic images) of the wetland are also especially welcome. It is essential that the source providing any such additional information be noted.

Where the Ramsar site being designated is a very large and complex wetland system, or consists of a suite of separate sub-sites, two levels of approach may be advisable: a broad approach for the system as a whole, and a more detailed approach for each key locality or sub-site within the system. Thus for a particularly large wetland complex it may be appropriate to complete an overall RIS for the whole site and a series of separate RIS datasheets for each key area or sub-site within the complex.

Resolution VI.1 highlights the importance of clearly defining the ecological character of Ramsar sites as the basis for monitoring these wetlands in order to maintain their ecological character. Key features of the ecological character of the site which should be maintained should include those identified as the justification for designation under each Ramsar Criterion applied to the designation. Further guidance on defining and describing ecological character features is provided in the *New Guidelines for management planning for Ramsar sites and other wetlands* (Resolution VIII.14).

Where a management plan has been prepared for the site being designated, the information provided in the RIS should be consistent with the plan's description of ecological character features, the values and functions of the wetland, the factors affecting or likely to affect its character, values and functions, and the management planning process, including monitoring.

When a management plan is prepared as part of the management planning process for the site after it has been designated as a Ramsar site, the information in the RIS should be checked and, if necessary, a revised RIS should be completed and sent to the Ramsar Secretariat.

The annex to Resolution VI.1 notes that there is a need to increase the value of the information collected for describing and assessing the ecological character of listed sites, and that emphasis should be given to:

- establishing a baseline by describing the functions, products and attributes of the site that give it benefits and values of international importance (necessary because the existing Ramsar Criteria do not cover the full range of wetland benefits and values which should be considered when assessing the possible impact of changes at a site) -- sections 14, 16, 18, 19, 20, 21, 22 and 23 of the RIS apply;

- providing information on human-induced factors that have affected or could significantly affect the benefits and values of international importance -- section 26 of the RIS applies;

- providing information on monitoring and survey methods in place (or planned) at the site – sections 27 and 28 of the RIS apply; and

- providing information on the natural variability and amplitude of seasonal and/or long-term "natural" changes (e.g., vegetation succession, episodic/catastrophic ecological events such as hurricanes) that have affected or could affect the ecological character of the site -- sections 18 and 26 of the RIS apply.

Guidance on information to provide in each numbered section of the *Information Sheet on Ramsar Wetlands (RIS)*

1. **Name and address of the RIS compiler:** The full name, institution/agency, and address of the person(s) who compiled the RIS, together with any telephone and fax numbers and e-mail address.

2. **Date:** The date on which the RIS was completed (or updated). Please use the *name* of the month, not its numerical equivalent. For example use 6 March [year] or March 6 [year] rather than 6/3/year or 3/6/year so as to avoid confusion arising from commonly used but differing formats for expressing dates.

3. **Country:** The official (short) version of the Contracting Party/country name.

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 parenthesis after the precise name. Ensure that the site name used is the same in this section and on the maps provided. **This name will be used precisely as given when the site is added to the Ramsar List.**

5. **Designation of new Ramsar site or update of existing site:** Indicate here if the RIS is being provided for the designation of a new Ramsar site or if it is provided as an update for an already designated Ramsar site. If the RIS is an update for an existing site, please also complete section 6 of the RIS (see below).

6. **For RIS updates only, changes to the site since its designation or earlier update:** In part a) of this section, indicate if there have or have not been any changes to the boundary delimitation and/or the area of the site since the previous RIS or other site information was supplied. If there are any changes to the designated site boundary and/or site area,

please tick the appropriate box or boxes to indicate the type of change being made. The Convention text makes provision for the designation of new sites and the extension of existing sites, but not for the reduction in area or deletion from the List of sites already designated. The Annex to COP9 Resolution IX.6, *Guidance for addressing Ramsar sites or parts of sites which no longer meet the Criteria for designation*, established procedures to follow should the deletion or reduction of a site be contemplated. If the boundary and/or the area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, in addition to the provision of an updated RIS.

In part b) of this section, please provide a short summary description of any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS or information was supplied for the site.

7. **Map of the Ramsar Site:** The most up-to-date available and suitable map of the wetland should be appended to the RIS (in hardcopy and, if possible, also in digital format). At least a hardcopy map is required for the inclusion of the site in the List of Wetlands of International Importance. The map must clearly show the boundary of the designated Ramsar site. Annex III provides detailed guidance on the provision of suitable Ramsar site maps and other spatial data. A list of the maps supplied and any other relevant maps of the Ramsar site that are available should be included in a note annexed to the RIS. If the map has been prepared in digital (GIS) format, please send a GIS file providing geo-referenced site boundary vectors and attribute tables, and please **also** send a separate image file, showing the site boundaries, in a common image format (TIFF, BMP, JPG, GIF, etc.).

8. **Geographical coordinates:** The geographical coordinates of the *approximate* centre of the site expressed in *degrees and minutes of latitude and longitude* (e.g. in the format: 01°24'S 104°16'E or 010°30'N 084°51'W). If relevant, specify the number of discrete units forming the site. If any disjunct units are situated at least 1.6 km* apart, the coordinates of the approximate centres of each of these units should be given separately (along with individual names or differentiating labels, e.g. "A, B, C"…, etc.). Any discrete units so identified in an RIS should also be clearly labelled on the site map(s). A single site occupying less than 1,000 hectares needs only one central set of coordinates. Location information on larger areas should be supplemented by providing the coordinates of the southwest and northeast corners of the Ramsar site. (See also sections 7, Map and 11, Area).

*This is approximately equivalent to one (1) minute of latitude or longitude (at the equator, in the case of longitude).

If the site is shaped in such a way that the approximate centre point cannot be easily specified, or if such a point falls outside the site or within a very narrow portion of the site, please explain this with a note, and provide the coordinates for the approximate centre point of the largest part of the site.

9. **General Location:** A description of the general location of the wetland. This should include the name of the large administrative region(s) (i.e., state, province, territory, canton, etc.) within which the site lies (e.g., Alberta, Canada; Punjab, Pakistan; Andalucía, Spain) and the site's distance (as either a straight line distance or distance by road) and compass bearing from the nearest "provincial", "district" or other significant

administrative centre, town, or city. The human population of the listed centre and its administrative regions (if possible, including at least two levels of administration/ jurisdiction) should also be stated.

10. Elevation: The average and/or minimum and maximum elevation of the wetland in metres above mean sea level, in metres. Clearly label each elevation provided, with e.g. "average", "maximum" or "minimum").

11. Area: The total area of the designated site, in hectares. If the areas of discrete site units are known, please also list each of these together with the names (or labels) used to identify and differentiate these units (see also section 7, Map).

12. General overview of the site: A brief paragraph about the wetland, providing a 'word picture' of the type of wetland and its importance, its main physical and ecological character features, its most important values and functions, and any particularly interesting features. Note also the most significant wetland types, especially if they are the most dominant as identified in 19 b).

13. Ramsar Criteria: Tick the box under the code for each *Ramsar Criterion for identifying wetlands of international importance* that is being applied to the designation of the site. Refer to Annex II of these guidelines for the Criteria and the detailed guidance provided for their application established by Resolution VII.11 (as updated and amended by Resolution IX.1 Annex B), *Strategic Framework and Guidelines for the future development of the List of Wetlands of International Importance*.

Note that many sites qualify for designation under more than one Criterion: be thorough and precise in selecting all of the Criteria that apply. The specific reasons justifying the application of each Criterion selected should be provided in section 14 on justification of Criteria selected under this section.

14. Justification for the application of each Criterion listed in 13 above: For each Criterion selected under the section above listing the Ramsar Criteria applied, a specific individual explanation of how that Criterion applies to the site. This section of the RIS is central to the concept of "**international importance**". The Criteria codes alone do not convey information on the specific way in which each Criterion applies to a particular site – therefore it is essential to provide sufficient precise description to explain and support each of the Ramsar Criteria codes selected. This text must not just restate the Criterion, but should provide the necessary details to describe the way in which a particular Criterion applies specifically at the site being designated. Refer to Annex II for the detailed guidance for the application of the Criteria (adopted by Resolution VII.11 and as amended by Resolution IX.1 Annex B).

A number of points concerning the correct use of specific Criteria and the Guidelines for their application should be particularly taken into account when preparing the justification for the application of the Criteria selected for designation:

i) The guidelines for the application of **Criteria 1 and 3** stress that these Criteria should be applied to a wetland in the context of the biogeographic region within which it occurs, but recognises that biogeographic regions can differ between wetland types. The biogeographical region context can also apply to certain reasons

for the designation of threatened ecological communities under **Criterion 2**. The biogeographic region encompassing the Ramsar site and the biogeographic regionalisation scheme applied should be provided in section 15, Biogeography;

ii) Concerning **Criterion 5** the guidelines indicate that the actual total number of waterbirds should be stated, and preferably, when available, the average total number from several recent years. It is not sufficient simply to restate the Criterion, i.e., that the site supports >20,000 waterbirds;

iii) For justification of designation under **Criterion 6** it is particularly important to recognise that this Criterion must be applied to the regular occurrence of >1% of a biogeographic population of a species or subspecies of waterbird, and to recognise that in most cases the biogeographic range of waterbird populations is larger than the territory of one Contracting Party. For each population listed under Criterion 6 the name of the biogeographic population, as well as the number of birds of this population regularly occurring in the site, should be listed. Recommended 1% thresholds for the application of Criterion 6 are provided by Wetlands International's publication *Waterbird Population Estimates* 4th Edition (2006) (available from mid-2006 at http://www.wetlands.org/), which also provides a description of the biogeographic range of each population. Earlier editions of *Waterbird Population Estimates* are now superseded and should not be used for Criterion 6 application. Note that this Criterion should be applied only to those waterbird populations for which a 1% threshold is available. However, for populations of waterbird species in taxa not presently covered by *Waterbird Population Estimates 3rd Edition,* the guidelines indicate that this Criterion may be applied if a reliable population estimate and 1% threshold is available from another source, and that in such cases the information source must be clearly specified. It is not sufficient simply to restate the Criterion, that the site supports >1% of a population, nor is it a correct justification to list populations with numbers in the site >1% of their *national* population, except when the population is endemic to that country.

iv) For all or some applications of **Criteria 2, 3, 4, 5, 6, 7, 8** and **9**, the name(s) of the species concerned (scientific name and vernacular name in English, French or Spanish) should be provided in the justification.

v) The Guidelines for the application of **Criterion 7** concerning fish and shellfish diversity indicate that a species list alone is not sufficient justification for the use of this Criterion, and that other features of high diversity, including life-history stages, species interactions, and level of endemism are required for the application of this Criterion.

vi) The guidance for the application of **Criterion 9** for non-avian animal species is similar to that in sub-paragraph iii) above for Criterion 6 for waterbirds. In particular, this Criterion must be applied to the regular occurrence of >1% of a biogeographic population of a species or subspecies of wetland-dependent animal, and it should be recognised that in many cases the biogeographic range of the population is larger than the territory of one Contracting Party. For each population listed under Criterion 9 the name of the biogeographic population, as well as the number of individuals of this population regularly occurring in the site, should be listed. An initial list of recommended 1% thresholds for the application of Criterion

9 are provided in the paper "*Population estimates and 1% thresholds for wetland-dependent non-avian species, for the application of Criterion 9*" (http://ramsar.org/ris/key_ris_criterion9_2006.pdf), which also provides a description of the biogeographic range of each population. Note that this Criterion should be applied only to those animal populations for which a 1% threshold is available. However, for populations of species in taxa not presently covered by that paper, the guidelines indicate that this Criterion may be applied if a reliable population estimate and 1% threshold is available from another source, and that in such cases the information source must be clearly specified. In the application of this Criterion, it is not sufficient simply to restate the Criterion, that the site supports >1% of a population, nor is it a correct justification to list populations with numbers in the site >1% of their *national* population, except when the population is endemic to that country.

15. Biogeography: The *biogeographic region* encompassing the Ramsar site and the *biogeographic regionalisation scheme* applied (with full reference citation) should be provided. Biogeographical specification is essential for the correct application of Criteria 1 and 3 and certain applications of Criterion 2 (see also sections 13. Ramsar Criteria and 14. Justification of Criteria). In this context the guidelines for the application of the Ramsar Criteria (see Annex II) define "bio(geographic) region" as "a scientifically rigorous determination of regions as established using biological and physical parameters such as climate, soil type, vegetation cover, etc." Note that for non-island Contracting Parties, in many cases biogeographic regions will be transboundary in nature and will require collaboration between countries to establish the locations of representative, rare or unique examples of different wetland types. It is also recognised that the nature of biogeographic regionalization may differ between wetland types according to the nature of the parameters determining natural variation (see Annex II of this *Explanatory Note and Guidelines*).

There are a variety of different global and supranational/regional biogeographic schemes in use. No single scheme may be universally appropriate or acceptable and Contracting Parties are urged (in the annex to Resolution VII.11) to apply a regionalization scheme which they determine to be the most appropriate and scientifically rigorous approach available, taking into account that the additional guidance adopted by Resolution IX.1 Annex B indicates that it is generally most appropriate to use a continental, regional or supranational scheme rather than a national or subnational one.

16. Physical features of the site: A succinct description of the principal physical characteristics of the site covering the following features (where relevant):

- Geology and geomorphology (general features);
- Soil type and chemistry range (Soil family name(s); indication of mineral vs. organic content; typical pH range of soil);
- Sediment characteristics;
- Origins (natural or artificial);
- Hydrology (including seasonal water balance, inflow, infiltration and outflow, salt-water intrusion). Further detail, notably the hydrological values and functions of the site should be included in section 18, Hydrological values;
- Water quality (typical physico-chemical characteristics);
- Depth, fluctuations and permanence of water;
- Tidal range and variations;

- Downstream area (especially in the case of wetlands that are important in flood control);
- Climate – include here only the most significant regular climatic features, e.g., annual rainfall and average temperature range, distinct seasons, typical flooding and drought periods, and any other normal climatic factors affecting the wetland. Recent major or extreme climate events, e.g., flood, drought, hurricane, cyclone or other storm, atypical period of extreme temperatures, etc., that have had an adverse impact on the site should be detailed under section 26, Factors adversely affecting the site's ecological character).

17. Physical features of the catchment area: A succinct characterisation of the catchment area, covering:

- surface area;
- general geology and geomorphological features;
- general soil types;
- climate (including characterisation of climate type).

18. Hydrological values: A description of the principal hydrological *values* of the wetland, for example the ecosystem services that they provide to people. This may include, but not necessarily be limited to, the site's role in flood control, groundwater replenishment, shoreline stabilization, sediment and nutrient retention and export, climate change modification, and water purification and maintenance of water quality. Hydrology of the site (as opposed to its hydrological values and functions) should be covered under section 16, Physical features of the site.

19. Wetland Type(s): In this section first list, by circling or underlining, the full range of wetland types occurring within the site, and then list the wetland types selected in order of their dominance (by area) starting with the wetland type with the largest area. The Ramsar Classification System for Wetland Type (see Annex I of this *Explanatory Note and Guidelines*) provides the description of what types of wetland are covered by each of the wetland type codes. Note that the wetland types are grouped in three major categories: marine-coastal, inland, and human-made wetlands, and that wetland types under two or more of these categories may be present within a Ramsar site, particularly if it is large.

Since some Marine/Coastal wetland types (e.g. Estuarine waters (type *F*) or Intertidal Forested Wetlands (type *I*)) can occur far inland from the coastline, and conversely Inland Wetlands types can occur close to the coastline, please also indicate with additional text in this section the general geographical location of the site relative to the coastline, as either inland or marine/coastal.

When listing the areal dominance of the wetland types, if possible provide the area or percentage of the total area of the designated site composed of each wetland type, although it is recognised that this may be difficult for large sites with a wide variety of wetland types. If the site is composed of more than one discrete unit and different wetland types or different dominance of types occur in different site units, also list the wetland type dominance for each unit (see also the guidance on sections 7, Map; 8, Geographical coordinates; and 9, Area).

If the designated site includes areas of non-wetland habitat, for example where such parts of a catchment are included, it is helpful here to also list the area, or percentage of the total area, of the site formed of these habitats.

20. General ecological features: A description of the wetland ecosystem with its main habitats, wetland and vegetation types, describing any zonation, seasonal variations, and long-term changes. Briefly describe ecological processes which maintain the wetland and the ecosystem services that characterise the wetland and the benefits derived from these services. A brief note on habitats and vegetation types in adjacent areas may be appropriate. Where important, information on specific food chains should be included in this section.

21. Noteworthy flora: Additional/supplemental information on plant species or communities for which the wetland is particularly important or significant should be provided here. **Do not duplicate** information that has already been provided in support of the site's international importance (in section 14, Justification of Criteria) or in section 20, General ecological features. Specify *why* each species or community listed is considered noteworthy (e.g., if it is an economically important species).

Endemic plant species, if they have not been considered towards the application of Criterion 3 at the site (e.g., if the *number* of endemic species was not considered "significant", following the guidance for that Criterion) can be listed here.

Also list here plant species that have been introduced (accidentally or intentionally) and/or those that are invasive. (Description of the impacts by invasive and/or alien species on the site should be provided in section 26, Factors adversely affecting the site's ecological character).

General species (occurrence) lists should not be included here or under other RIS sections, but such lists (properly labelled with site details) should be appended to the RIS when they are available.

22. Noteworthy fauna: Additional/supplemental information on animal species or communities for which the wetland is particularly important or significant should be provided here. **Do not duplicate** information that has already been provided in support of the site's international importance (in section 14, Justification of Criteria) or in section 20, General ecological features. Specify *why* each species or community listed is considered noteworthy (e.g., if it is an economically important species, or a "keystone" species, or a species associated with high wetland biodiversity values, e.g., turtles, crocodiles, otters, dolphins).

Endemic animal species that have not been considered towards the application of relevant Criteria at the site (e.g., because either the number of endemic species was not considered "significant" (Criterion 3) or the percentage of endemic fish did not reach the threshold *percentage* for the application of Criterion 7) should be listed in this section. Noteworthy zoogeographical features (relict populations, unusual range extensions, etc.) should be noted here.

Also list here animal species that have been introduced (accidentally or intentionally) and/or those that are invasive. (Description of the impacts by invasive and/or alien

species on the site should be provided in section 26, Factors adversely affecting the site's ecological character).

General species (occurrence) lists should not be included here or under other RIS sections, but such lists (properly labelled with site details) should be appended to the RIS when they are available.

23. Social and cultural values: in section a) provide a general account of the site's principal social and economic values and functions and "wise use" features presented in Ramsar Handbooks 1 to 6 (e.g., tourism, outdoor recreation, education and scientific research, agricultural production, grazing, water supply, fisheries production) and cultural values and functions (e.g., archaeological sites, historical associations and/or religious significance, including its significance to indigenous peoples). For more information, see the *Guiding principles for taking into account the cultural values of wetlands for the effective management of sites,* annexed to Resolution VIII.19. Whenever possible, indicate which of these values are consistent with the maintenance of natural wetland processes and ecological character. In section b) indicate whether the site is 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 so, provide information about this importance according to the categories adopted by Resolution IX.21. Details about values derived from non-sustainable exploitation or which result in detrimental ecological changes should be described in section 26, Factors adversely affecting the site's ecological character.

24. Land tenure/ownership: Details of ownership/tenure both of the Ramsar site and of the areas surrounding the site. If possible, express different tenure/ownership categories as the percentage of the site to which each applies (e.g., "50% state-owned"). Explain any complex tenure arrangements or formulas. Also explain terms which have a special meaning in the country or region concerned. In the next section (25, Current land use), describe the linkages between the different land tenures described in this section and specific land uses.

25. Current land (including water) use: All of the principal human activities in (a) the Ramsar site itself and (b) in the surroundings and catchment. Give information on the human population in the area, with a description of the principal human activities and main forms of land and water use at the wetland, e.g., water supply for domestic and industrial use, irrigation, agriculture, livestock grazing, forestry, fishing, aquaculture and hunting. Also mention here activities and uses related to research, education and recreation/tourism at the site, but provide the details about each of these in sections 29, 30 and 31, respectively). Some indication of the relative importance, scale and trend of each land and water use should be given whenever possible. Make note if activities or uses are restricted to certain distinct parts of the site (e.g., in only part of a large site or in distinct zones or within particular wetland types). In (b), summarize land and water use in the areas surrounding the site and in its greater catchment that may directly or indirectly affect the status of the designated wetland, and any land uses in downstream areas likely to be affected by the wetland. For further reference on water use, see the *Guidelines for the allocation and management of water for maintaining the ecological functions of wetlands* adopted by Resolution VIII.1; Resolution IX.1, Annex C (*An Integrated Framework for the Ramsar Convention's water-related guidance*); Annex Ci (*River basin management: additional guidance and a*

framework for the analysis of case studies); and Annex Cii (*Guidelines for the management of groundwater to maintain wetland ecological character*).

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects: The human and natural factors affecting the ecological character of the site, from both within and around the site (including the greater catchment, if relevant). These may include new or changing activities/uses, major development projects, etc., which have had, are having, or may have a detrimental effect on the natural ecological character of the wetland. For all adverse and change factors reported, supply measurable/quantifiable information (when such data exist), as well as information on the scale, extent and trend of the change factor and its impact: this information should provide a basis for monitoring of ecological character of the site.

It is important to specify both the agent for the change (e.g., diversion of water, drainage, reclamation, pollution, over-grazing, excessive human disturbance, or excessive hunting and fishing, etc.) and the resulting change and its impact (e.g., siltation, erosion, fish mortality, change in vegetation structure, habitat fragmentation, disturbed reproduction of species, physical or ecological change due to climate change, etc.). It is also important to differentiate between factors coming from within the site itself and those factors emanating from outside the site, but which are having or may have an impact on the site. One should also distinguish between potential and existing adverse factors.

When reporting on pollution, special notice should be taken of toxic chemical pollutants and their sources. These should include industrial and agricultural-based chemical effluents and other emissions.

Natural events, including episodic catastrophes (e.g., an earthquake or volcanic eruption) or natural vegetative succession which have had, are having, or are likely to have an impact on the ecological character of the site should be detailed, in order to facilitate monitoring.

Provide information on the history of introductions (accidental or deliberate) of invasive and/or alien species identified in sections 21, Noteworthy flora and 22, Noteworthy fauna and the impacts of any invasions.

27. Conservation measures taken: Provide details in the following areas, if appropriate.

a) Mention any nationally relevant protected area status, international conservation designations (in addition to Ramsar site status), and, in the case of transboundary wetlands, bilateral or multilateral conservation measures which pertain to all or part of the site. If a reserve has been established, give the date of establishment and size of the protected area. If only a part of the wetland is included within a protected area, the area of wetland habitat that is protected should be noted.

b) If appropriate, list the IUCN (1994) protected areas management category/ies which apply to the site. These are as follows:

Category	Definition
Ia Strict Nature Reserve:	Area of land and/or sea possessing some outstanding or

protected area managed mainly for science	representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.
Ib Wilderness Area: protected area managed mainly for wilderness protection	Large area of unmodified or slightly modified land, and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.
II National Park: protected area managed mainly for ecosystem protection and recreation	Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.
III Natural Monument: protected area managed mainly for conservation of specific natural features	Area containing one, or more, specific natural or natural/cultural feature which is of outstanding or unique value because of its inherent rarity, representative or aesthetic qualities or cultural significance.
IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention	Area of land and/or sea subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.
V Protected Landscape/ Seascape: protected area managed mainly for landscape/seascape conservation and recreation	Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinct character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.
VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems	Area containing predominantly unmodified natural systems, managed to ensure long term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

IUCN defines a "protected area" as: "An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means".

c) Describe here the management planning process for the site, including any management plan, if this has been developed and is being implemented, including whether it has been officially approved. Cite the management plan document(s) in section 34, Bibliographic references, and whenever possible provide a copy of the management plan as supplementary information to the RIS.

d) Also describe any other conservation measures taken at the site, such as restrictions on development, management practices beneficial to wildlife, closures of hunting, etc.

Include information here on any monitoring schemes and survey methods in place at the site. Describe any application at the site of the Ramsar *Conceptual Framework for the wise use of*

wetlands and the maintenance of their ecological character (Resolution IX.1 Annex A), or any other instance of the application of the Convention's guidance as compiled in the Ramsar 'toolkit' of Wise Use Handbooks ("wise use", i.e., sustainable use, is a central concept of the Ramsar Convention).

When updating the RIS for an existing Ramsar site, mention if the site is included on, or has been removed from, the Montreux Record and provide details of any Ramsar Advisory Missions that have been undertaken to the site.

Any application of integrated basin-scale/catchment management planning, or integrated coastal/marine zone management planning, involving or affecting the site should be noted. Provide a brief assessment of the effectiveness of protected area legislation or status of any protected areas whenever possible. Involvement of local communities and indigenous people in the participatory management of the site should also be described, in the context of the Ramsar guidelines on this process (Resolution VII.8).

28. Conservation measures proposed but not yet implemented: Provide details of any conservation measures that have been proposed, or are in preparation, for the site, including any proposals for legislation, protection and management. Summarize the history of any long-standing proposals which have not yet been implemented, and differentiate between those proposals which have already been officially submitted to the appropriate government authorities and those which have not as yet received formal endorsement, e.g., recommendations in published reports and resolutions from specialist meetings. Also mention any management plan which is in preparation but has not yet been completed, approved or implemented.

29. Current scientific research and facilities: Describe here any current scientific research programmes, including monitoring, and projects taking place in the site, and provide information on any special facilities for research that were mentioned in section 25. Current land (including water) use.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site: Describe here any existing programmes, activities and facilities for communications, education and public awareness (CEPA), including training, that were mentioned in section 25, Current land (including water) use. Also provide comment on the educational potential of the wetland. For further information on CEPA issues and the Convention on Wetlands, see the Ramsar Web site at http://ramsar.org/outreach_index.htm.

31. Current recreation and tourism: Provide details of any present use of the wetland for recreation and tourism that was mentioned in section 25, Current land (including water) use. Provide details of existing or planned visitor facilities or centres for recreation and tourism, and indicate the annual number of tourists visiting the site, if known. Also indicate the type of tourism and whether the tourism is seasonal.

32. Jurisdiction: Provide the full name and address of the government authority with a) *territorial jurisdiction* over the wetland, e.g., the state, region or municipality; and b) the name of the authority with *functional jurisdiction* for conservation purposes, e.g., the Department of Environment or Department of Fisheries, etc.

33. **Management authority:** Provide the name and address of the local office(s) of the agency(ies) or organization(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. Also provide details of any special or unique arrangements that pertain to the site's management.

34. **Bibliographical References:** A list of key technical references relevant to the wetland, including management plans, major scientific reports, and bibliographies, if such exist. Please list any functional/active Web site addresses dedicated to the Ramsar site or which prominently feature the site (e.g., a Web site detailing all of a country's Ramsar sites), and include the date that the Web site was most recently updated. When a large body of published material is available about the site, only the most important references need be cited, with priority being given to recent literature containing extensive bibliographies. Reprints or copies of the most important literature, including a copy of any management plan, should be appended whenever possible.

Annex I

Ramsar Classification System for Wetland Type

The codes are based upon the Ramsar Classification System for Wetland Type as approved by Recommendation 4.7 and amended by Resolutions VI.5 and VII.11 of the Conference of the Contracting Parties. The categories listed herein are intended to provide only a very broad framework to aid rapid identification of the main wetland habitats represented at each site.

To assist in identification of the correct Wetland Types to list in section 19 of the RIS, the Secretariat has provided below a tabulations for Marine/Coastal Wetlands and Inland Wetlands of some of the characteristics of each Wetland Type.

Marine/Coastal Wetlands

A -- **Permanent shallow marine waters** in most cases less than six metres deep at low tide; includes sea bays and straits.
B -- **Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows.
C -- **Coral reefs**.
D -- **Rocky marine shores**; includes rocky offshore islands, sea cliffs.
E -- **Sand, shingle or pebble shores**; includes sand bars, spits and sandy islets; includes dune systems and humid dune slacks.
F -- **Estuarine waters**; permanent water of estuaries and estuarine systems of deltas.
G -- **Intertidal mud, sand or salt flats**.
H -- **Intertidal marshes**; includes salt marshes, salt meadows, saltings, raised salt marshes; includes tidal brackish and freshwater marshes.
I -- **Intertidal forested wetlands**; includes mangrove swamps, nipah swamps and tidal freshwater swamp forests.
J -- **Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea.
K -- **Coastal freshwater lagoons**; includes freshwater delta lagoons.
Zk(a) – **Karst and other subterranean hydrological systems**, marine/coastal

Inland Wetlands

L -- **Permanent inland deltas**.
M -- **Permanent rivers/streams/creeks**; includes waterfalls.
N -- **Seasonal/intermittent/irregular rivers/streams/creeks**.
O -- **Permanent freshwater lakes** (over 8 ha); includes large oxbow lakes.
P -- **Seasonal/intermittent freshwater lakes** (over 8 ha); includes floodplain lakes.
Q -- **Permanent saline/brackish/alkaline lakes**.
R -- **Seasonal/intermittent saline/brackish/alkaline lakes and flats**.
Sp -- **Permanent saline/brackish/alkaline marshes/pools**.
Ss -- **Seasonal/intermittent saline/brackish/alkaline marshes/pools**.
Tp -- **Permanent freshwater marshes/pools**; ponds (below 8 ha), marshes and swamps on inorganic soils; with emergent vegetation water-logged for at least most of the growing season.

Ts -- **Seasonal/intermittent freshwater marshes/pools on inorganic soils**; includes sloughs, potholes, seasonally flooded meadows, sedge marshes.
U -- **Non-forested peatlands**; includes shrub or open bogs, swamps, fens.
Va -- **Alpine wetlands**; includes alpine meadows, temporary waters from snowmelt.
Vt -- **Tundra wetlands**; includes tundra pools, temporary waters from snowmelt.
W -- **Shrub-dominated wetlands**; shrub swamps, shrub-dominated freshwater marshes, shrub carr, alder thicket on inorganic soils.
Xf -- **Freshwater, tree-dominated wetlands**; includes freshwater swamp forests, seasonally flooded forests, wooded swamps on inorganic soils.
Xp -- **Forested peatlands**; peatswamp forests.
Y -- **Freshwater springs; oases**.
Zg -- **Geothermal wetlands**
Zk(b) – **Karst and other subterranean hydrological systems**, inland

Note: "**floodplain**" is a broad term used to refer to one or more wetland types, which may include examples from the R, Ss, Ts, W, Xf, Xp, or other wetland types. Some examples of floodplain wetlands are seasonally inundated grassland (including natural wet meadows), shrublands, woodlands and forests. Floodplain wetlands are not listed as a specific wetland type herein.

Human-made wetlands

1 -- **Aquaculture** (e.g., fish/shrimp) **ponds**
2 -- **Ponds**; includes farm ponds, stock ponds, small tanks; (generally below 8 ha).
3 -- **Irrigated land**; includes irrigation channels and rice fields.
4 -- **Seasonally flooded agricultural land** (including intensively managed or grazed wet meadow or pasture).
5 -- **Salt exploitation sites**; salt pans, salines, etc.
6 -- **Water storage areas**; reservoirs/barrages/dams/impoundments (generally over 8 ha).
7 -- **Excavations**; gravel/brick/clay pits; borrow pits, mining pools.
8 -- **Wastewater treatment areas**; sewage farms, settling ponds, oxidation basins, etc.
9 -- **Canals and drainage channels, ditches.**
Zk(c) – **Karst and other subterranean hydrological systems**, human-made

Tabulations of Wetland Type characteristics

Marine / Coastal Wetlands:

Saline water	Permanent	< 6 m deep	A
		Underwater vegetation	B
		Coral reefs	C
	Shores	Rocky	D
		Sand, shingle or pebble	E
Saline or brackish water	Intertidal	Flats (mud, sand or salt)	G
		Marshes	H
		Forested	I
	Lagoons		J
	Estuarine waters		F
Saline, brackish or fresh water	Subterranean		Zk(a)
Fresh water	Lagoons		K

Inland Wetlands:

Fresh water	Flowing water	Permanent	Rivers, streams, creeks	M
			Deltas	L
			Springs, oases	Y
		Seasonal/intermittent	Rivers, streams, creeks	N
	Lakes and pools	Permanent	> 8 ha	O
			< 8 ha	Tp
		Seasonal/intermittent	> 8 ha	P
			< 8 ha	Ts
	Marshes on inorganic soils	Permanent	Herb-dominated	Tp
		Permanent/ Seasonal/intermittent	Shrub-dominated	W
			Tree-dominated	Xf
		Seasonal/intermittent	Herb-dominated	Ts
	Marshes on peat soils	Permanent	Non-forested	U
			Forested	Xp
	Marshes on inorganic or peat soils	High altitude (alpine)		Va
		Tundra		Vt
Saline, brackish or alkaline water	Lakes	Permanent		Q
		Seasonal/intermittent		R
	Marshes & pools	Permanent		Sp
		Seasonal/intermittent		Ss
Fresh, saline, brackish or alkaline water	Geothermal			Zg
	Subterranean			Zk(b)

Annex II

Criteria for Identifying Wetlands of International Importance and Guidelines for their application

Adopted by the 7th (1999) and 9th (2005) Meetings of the Conference of the Contracting Parties, superseding earlier Criteria adopted by the 4th and 6th Meetings of the COP (1990 and 1996), to guide implementation of Article 2.1 on designation of Ramsar sites.

Group A of the Criteria. Sites containing representative, rare or unique wetland types

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.

Group B of the Criteria. Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

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

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.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

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

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Specific criteria based on fish

Criterion 7: A wetland should be considered internationally important if it supports a significant proportion of indigenous fish subspecies, species or families, life-history stages, species interactions and/or populations that are representative of wetland benefits and/or values and thereby contributes to global biological diversity.

Criterion 8: A wetland should be considered internationally important if it is an important source of food for fishes, spawning ground, nursery and/or migration path on which fish stocks, either within the wetland or elsewhere, depend.

Specific criteria based on other taxa

Criterion 9: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of wetland-dependent non-avian animal species.

Guidelines for the application of the Criteria

(based on the *Strategic Framework and Guidelines for the future development of the List of Wetlands of International Importance*)

Criterion 1:

1a) In applying this Criterion systematically, Contracting Parties are encouraged to:

i) determine biogeographic regions within their territory or at the supranational/ regional level;
ii) within each biogeographic region, determine the range of wetland types present (using the Ramsar Classification System for wetland type), noting in particular any rare or unique wetland types; and
iii) for each wetland type within each biogeographic region, identify for designation under the Convention those sites which provide the best examples.

1b) When selecting a biogeographic regionalisation scheme to apply, it is generally most appropriate to use a continental, regional, or supranational scheme rather than a national or subnational one.

1c) Objective 1 and, in particular 1.2 of the *Strategic Framework*, indicates that another consideration under this Criterion is to give priority to those wetlands whose ecological character plays a substantial role in the natural functioning of a major river basin or coastal system. In terms of hydrological functioning, the following is provided to assist Contracting Parties consider this aspect of determining priority sites under this Criterion. For guidance relevant to biological and ecological roles refer to Criterion 2 following.

1d) **Hydrological importance**. As indicated by Article 2 of the Convention, wetlands can be selected for their hydrological importance which, *inter alia*, may include the following attributes. They may:

i) play a major role in the natural control, amelioration or prevention of flooding;
ii) be important for seasonal water retention for wetlands or other areas of conservation importance downstream;
iii) be important for the recharge of aquifers;
iv) form part of karst or underground hydrological or spring systems that supply major surface wetlands;
v) be major natural floodplain systems;

vi) have a major hydrological influence in the context of at least regional climate regulation or stability (e.g., certain areas of cloudforest or rainforest, wetlands or wetland complexes in semi-arid, arid or desert areas, tundra or peatland systems acting as sinks for carbon, etc.);
vii) have a major role in maintaining high water quality standards.

Criterion 2:

2a) Ramsar sites have an important role in the conservation of globally threatened species and ecological communities. Notwithstanding the small numbers of individuals or sites that may be involved, or poor quality of quantitative data or information that may sometimes be available, particular consideration should be given to listing wetlands that support globally threatened communities or species at any stage of their life cycle using Criterion 2 or 3.

2b) General Objective 2.2 of the Strategic Framework urges Contracting Parties to seek to include in the Ramsar List wetlands that include threatened ecological communities or are critical to the survival of species identified as vulnerable, endangered or critically endangered under national endangered species legislation/programmes or within international frameworks such as the IUCN Red Lists or Appendix I of CITES and the Appendices of CMS.

2c) When Contracting Parties are reviewing candidate sites for listing under this Criterion, greatest conservation value will be achieved through the selection of a network of sites providing habitat for rare, vulnerable, endangered, or critically endangered species. Ideally, the sites in the network will have the following characteristics. They:

i) support a mobile population of a species at different stages of its life cycle; and/or
ii) support a population of a species along a migratory pathway or flyway – noting that different species have different migratory strategies with different maximum distances needed between staging areas; and/or
iii) are ecologically linked in other ways, such as through providing refuge areas to populations during adverse conditions; and/or
iv) are adjacent to or in close proximity to other wetlands included in the Ramsar List, the conservation of which enhances the viability of threatened species' population by increasing the size of habitat that is protected; and/or
v) hold a high proportion of the population of a dispersed sedentary species that occupies a restricted habitat type.

2d) For identifying sites with threatened ecological communities, greatest conservation value will be achieved through the selection of sites with ecological communities that have one or more of the following characteristics. They:

i) are globally threatened communities or communities at risk from direct or indirect drivers of change, particularly where these are of high quality or particularly typical of the biogeographic region; and/or
ii) are rare communities within a biogeographic region; and/or
iii) include ecotones, seral stages, and communities which exemplify particular processes; and/or

iv) can no longer develop under contemporary conditions (because of climate change or anthropogenic interference for example); and/or
v) are at the contemporary stage of a long developmental history and which support a well-preserved paleoenvironmental archive; and/or
vi) are functionally critical to the survival of other (perhaps rarer) communities or particular species; and/or
vii) have been the subject of significant decline in extent or occurrence.

2e) When selecting a biogeographic regionalisation scheme to apply under paragraph 2d (i) and/or (ii), it is generally most appropriate to use a continental, regional, or supra-national scheme rather than a national or subnational one.

2f) Note also the issues concerning habitat diversity and succession in paragraphs 46 to 49 of the Strategic Framework, "Boundary definition of sites".

2g) Be aware also of the biological importance of many karst and other subterranean hydrological systems.

Criterion 3:

3a) When Contracting Parties are reviewing candidate sites for listing under this Criterion, greatest conservation value will be achieved through the selection of a suite of sites that have the following characteristics. They:

i) are "hotspots" of biological diversity and are evidently species-rich even though the number of species present may not be accurately known; and/or
ii) are centres of endemism or otherwise contain significant numbers of endemic species; and/or
iii) contain the range of biological diversity (including habitat types) occurring in a region; and/or
iv) contain a significant proportion of species adapted to special environmental conditions (such as temporary wetlands in semi-arid or arid areas); and/or
v) support particular elements of biological diversity that are rare or particularly characteristic of the biogeographic region.

3b) Be aware also of the biological importance of many karst and other subterranean hydrological systems.

3c) When selecting a biogeographic regionalisation scheme to apply, it is generally most appropriate to use a continental, regional, or supranational scheme rather than a national or subnational one.

Criterion 4:

4a) Critical sites for mobile or migratory species are those which contain particularly high proportions of populations gathered in relatively small areas at particular stages of life cycles. This may be at particular times of the year or, in semi-arid or arid areas, during years with a particular rainfall pattern. For example, many waterbirds use relatively small areas as key staging points (to eat and rest) on their long-distance migrations between breeding and non-breeding areas. For Anatidae species, moulting sites are also critical.

Sites in semi-arid or arid areas may hold very important concentrations of waterbirds and other mobile wetland species and be crucial to the survival of populations, yet may vary greatly in apparent importance from year-to-year as a consequence of considerable variability in rainfall patterns.

4b) Non-migratory wetland species are unable to move away when climatic or other conditions become unfavourable and only some sites may feature the special ecological characteristics to sustain species' populations in the medium or long term. Thus in dry periods, some crocodile and fish species retreat to deeper areas or pools within wetland complexes, as the extent of suitable aquatic habitat diminishes. These restricted areas are critical for the survival of animals at that site until rains come and increase the extent of wetland habitat once more. Sites (often with complex ecological, geomorphological and physical structures) which perform such functions for non-migratory species are especially important for the persistence of populations and should be considered as priority candidates for listing.

Criterion 5:

5a) When Contracting Parties are reviewing candidate sites for listing under this Criterion, greatest conservation value will be achieved through the selection of a network of sites that provide habitat for waterbird assemblages containing globally threatened species or subspecies. These are currently poorly represented in the Ramsar List.

5b) Non-native waterbirds should not be included within the totals for a particular site.

5c) Criterion 5 should be applied not only to multi-species assemblages, but also to sites regularly holding more than 20,000 waterbirds of any one species.

5d) For populations of waterbirds of more than 2,000,000 individuals, a 1% threshold of 20,000 is adopted on the basis that sites holding this number are of importance under Criterion 5. To reflect the importance of the site for the species concerned, it is also appropriate to list such a site under Criterion 6.

5e) This Criterion will apply to wetlands of varying size in different Contracting Parties. While it is impossible to give precise guidance on the size of an area in which these numbers may occur, wetlands identified as being of international importance under Criterion 5 should form an ecological unit, and may thus be made up of one big area or a group of smaller wetlands. Consideration may also be given to turnover of waterbirds at migration periods, so that a cumulative total is reached, if such data are available.

5f) Turnover of individuals, especially during migration periods, leads to more waterbirds using particular wetlands than are counted at any one point in time, such that the importance of such a wetland for supporting waterbird populations will often be greater than is apparent from simple census information.

5g) However, accurate estimation of turnover and total number of individuals of a population or population using a wetland is difficult, and several methods (e.g., cohort marking and resighting, or summing increases in a count time-series) which have at times been applied do not yield statistically reliable or accurate estimates.

5h) The only currently available method which is considered to provide reliable estimates of turnover is that of unique capture/marking and resighting/recapture of individually-marked birds in a population at a migratory staging site. But it is important to recognize that for this method to generate a reliable estimate of migration volume, its application usually requires significant capacity and resources, and for large and/or inaccessible staging areas (especially where birds in a population are widely dispersed) use of this method can present insuperable practical difficulties.

5i) When turnover is known to occur in a wetland but it is not possible to acquire accurate information on migration volume, Parties should continue to consider recognizing the importance of the wetland as a migratory staging area through the application of Criterion 4, as the basis of ensuring that their management planning for the site fully recognizes this importance.

Criterion 6:

6a) When Contracting Parties are reviewing candidate sites for listing under this Criterion, greatest conservation value will be achieved through the selection of a suite of sites that hold populations of globally threatened species or subspecies. Consideration may also be given to turnover of waterbirds at migration periods, so that a cumulative total is reached, if such data are available.

6b) To ensure international comparability, where possible, Contracting Parties should use the international population estimates and 1% thresholds published and updated every three years by Wetlands International as the basis for evaluating sites for the List using this Criterion. As urged by Resolutions VI.4 (Ramsar COP6) and Resolution VIII.38 (COP8), for the better application of this Criterion, Contracting Parties should not only supply data for the future update and revision of international waterbird population estimates, but also support the national implementation and development of Wetlands International's International Waterbird Census, which is the source of much of these data.

6c) At some sites, more than one biogeographical population of the same species can occur, especially during migration periods and/or where flyway systems of different populations intersect at major wetlands. Where such populations are indistinguishable in the field, as is usually the case, this can present practical problems as to which 1% threshold to apply. Where such mixed populations occur (and these are inseparable in the field) it is suggested that the larger 1% threshold be used in the evaluation of sites.

6d) However, particularly where one of the populations concerned is of high conservation status, this guidance should be applied flexibly and Parties should consider recognizing the overall importance of the wetland for both populations through the application of Criterion 4, as the basis of ensuring that their management planning for the site fully recognizes this importance. This guidance should not be applied to the detriment of smaller, high conservation status populations.

6e) Note that this guidance applies just during the period of population mixing (often, but not exclusively, this is during periods of migration). At other times, it is generally possible to assign a 1% threshold accurately to the single population that is present.

6f) Turnover of individuals, especially during migration periods, leads to more waterbirds using particular wetlands than are counted at any one point in time, such that the importance of such a wetland for supporting waterbird populations will often be greater than is apparent from simple census information. For further guidance on estimation of turnover see the guidance under Criterion 5, paragraphs 5f-5i.

Criterion 7:

7a) Fishes are the most abundant vertebrates associated with wetlands. Worldwide, over 18,000 species of fishes are resident for all or part of their life cycles in wetlands.

7b) Criterion 7 indicates that a wetland can be designated as internationally important if it has a high diversity of fishes and shellfishes. It emphasises the different forms that diversity might take, including the number of taxa, different life-history stages, species interactions, and the complexity of interactions between the above taxa and the external environment. Species counts alone are thus not sufficient to assess the importance of a particular wetland. In addition, the different ecological roles that species may play at different stages in their life cycles needs to be considered.

7c) Implicit in this understanding of biological diversity is the importance of high levels of endemism and of biodisparity. Many wetlands are characterised by the highly endemic nature of their fish fauna.

7d) Some measure of the level of endemism should be used to distinguish sites of international importance. If at least 10% of fish are endemic to a wetland, or to wetlands in a natural grouping, that site should be recognized as internationally important, but the absence of endemic fishes from a site should not disqualify it if it has other qualifying characteristics. In some wetlands, such as the African Great Lakes, Lake Baikal in the Russian Federation, Lake Titicaca in Bolivia/Peru, sinkholes and cave lakes in arid regions, and lakes on islands, endemism levels as high as 90-100% may be reached, but 10% is a practical figure for worldwide application. In areas with no endemic fish species, the endemism of genetically-distinct infraspecific categories, such as geographical races, should be used.

7e) Over 734 species of fish are threatened with extinction worldwide, and at least 92 are known to have become extinct over the past 400 years. The occurrence of rare or threatened fish is catered for in Criterion 2.

7f) An important component of biological diversity is biodisparity, i.e., the range of morphologies and reproductive styles in a community. The biodisparity of a wetland community will be determined by the diversity and predictability of its habitats in time and space, i.e., the more heterogeneous and unpredictable the habitats, the greater the biodisparity of the fish fauna. For example, Lake Malawi, a stable, ancient lake, has over 600 fish species of which 92% are maternal mouthbrooding cichlids, but only a few fish families. In contrast, the Okavango Swamp of Botswana, a palustrine floodplain that fluctuates between wet and dry phases, has only 60 fish species but a wider variety of morphologies and reproductive styles, and many fish families, and therefore has a greater biodisparity. Measures of both biological diversity and biodisparity should be used to assess the international importance of a wetland.

Criterion 8:

8a) Many fishes (including shellfishes) have complex life histories, with spawning, nursery and feeding grounds widely separated and long migrations necessary between them. It is important to conserve all those areas that are essential for the completion of a fish's life cycle if the fish species or stock is to be maintained. The productive, shallow habitats offered by coastal wetlands (including coastal lagoons, estuaries, saltmarshes, inshore rocky reefs, and sandy slopes) are extensively used as feeding and spawning grounds and nurseries by fishes with openwater adult stages. These wetlands therefore support essential ecological processes for fish stocks, even if they do not necessarily harbour large adult fish populations themselves.

8b) Furthermore, many fishes in rivers, swamps or lakes spawn in one part of the ecosystem but spend their adult lives in other inland waters or in the sea. It is common for fishes in lakes to migrate up rivers to spawn, and for fishes in rivers to migrate downstream to a lake or estuary, or beyond the estuary to the sea, to spawn. Many swamp fishes migrate from deeper, more permanent waters to shallow, temporarily inundated areas for spawning. Wetlands, even apparently insignificant ones in one part of a river system, may therefore be vital for the proper functioning of extensive river reaches up- or downstream of the wetland.

8c) This is for guidance only and does not interfere with the rights of Contracting Parties to regulate fisheries within specific wetlands and/or elsewhere.

Criterion 9:

9a) When Contracting Parties are reviewing candidate sites for listing under this Criterion, greatest conservation value will be achieved through the selection of a suite of sites that hold populations of globally threatened species or subspecies. Consideration may also be given to turnover of individuals of migratory animals at migration periods, so that a cumulative total is reached, if such data are available (see guidance in paragraphs 5f-5i related to waterbirds which is also applicable to Criterion 9 in relation to non-avian animals).

9b) To ensure international comparability, where possible, Contracting Parties should use the most current international population estimates and 1% thresholds provided and regularly updated by IUCN's Specialist Groups though the IUCN Species Information Service (SIS) and published in the *Ramsar Technical Report* series, as the basis for evaluating sites for the List using this Criterion. An initial list of populations and recommended 1% thresholds is provided in the paper "*Population estimates and 1% thresholds for wetland-dependent non-avian species, for the application of Criterion 9*" (http://ramsar.org/ris/key_ris_criterion9_2006.pdf).

9c) This Criterion can also be applied to nationally endemic species or populations, where reliable national population size estimates exist. When making such an application of the Criterion, information concerning the published source of the population size estimate should be included in the justification for the application of this Criterion. Such information can also contribute to expanding the taxonomic coverage of the information on population estimates and 1% thresholds published in the *Ramsar Technical Report* series.

9d) It is anticipated that this Criterion will be applicable to populations and species in a range of non-avian taxa including, *inter alia,* mammals, reptiles, amphibians, fish and aquatic macro-invertebrates. However, only species or subspecies for which reliable population estimates have been provided and published should be included in the justification for the application of this Criterion. Where no such information exists, Contracting Parties should give consideration to designation for important non-avian animal species under Criterion 4. For better application of this Criterion, Contracting Parties should assist, where possible, in the supply of such data to the IUCN-Species Survival Commission and its Specialist Groups in support of the future updating and revision of international population estimates.

Annex III

Additional guidelines for the provision of maps and other spatial data for Ramsar Sites

The following guidance has drawn from the experience of Wetlands International and the Ramsar Secretariat, the World Heritage Convention, and the UNEP-World Conservation Monitoring Centre, and also from the guidance provided in: World Heritage Convention. 1999. *Meeting to recommend digital and cartographic guidelines for World Heritage site nominations and state of conservation reports.* In: WHC-99/CONF.209/INF.19. Paris, 15 November 1999. WWW document: http://www.unesco.org/whc/archive/99-209-inf19.pdf

1. The provision of a suitable map or maps is a requirement under Article 2.1 of the Convention – it is fundamental to the process of designating a Wetland of International Importance (Ramsar site), and is an essential part of the information supplied in the *Information Sheet on Ramsar Wetlands (RIS).* Clear mapped information about the site is also vital for its management.

2. This additional guidance recognises that Contracting Parties have increasing capacity to prepare and supply Ramsar site maps in digital formats (for example, through the use of electronic Geographical Information System (GIS) software) and to delineate site boundaries through the establishment of precise Global Positioning System (GPS) way-points.

3. Maps provided by a Contracting Party on designation of a Ramsar site should, as far as possible, and as high priority attributes:

   i) be prepared to professional cartographic standards: maps not prepared to professional cartographic standards are problematic, since even moderately-opaque hand-drawn site boundaries or cross-hatching (e.g., to indicate zonation) often obscure other important map features. Although coloured annotations may appear distinguishable from the underlying map features on the map original, it is important to remember that most colours cannot be differentiated in any black and white photocopies. Such additional information should be provided on additional outline maps;

   ii) show the Ramsar Site in its natural or modified environment and should be within the scale ranges specified below, depending upon the size of the site;

   iii) clearly show the boundary of the Ramsar site, and distinguish this from any existing or proposed buffer zones;

   iv) if the site is adjacent to, or now includes, a previously designated Ramsar site, the (former or active) boundaries of all of such sites should be shown, making clear the current status of all such previously designated areas;

   v) include a key or legend that clearly identifies the boundary and each other category of feature shown on the map and relevant to the designation of the site; and

   vi) show the map's scale, an indication of geographical coordinates (latitude and longitude), an indication of compass bearing (north arrow) and, if possible,

information on the map's projection. The map (or a companion map) should also show the position of several other features if feasible.

4. The most suitable map or set of maps for the designation of a Ramsar site will also clearly show the following, although provision of such information is of lower priority than the attributes listed in paragraph 3 above:

   i) basic topographical information;

   ii) the boundaries of relevant protected area designations and administrative boundaries (e.g., province, district, etc.);

   iii) clearly delineated wetland and non-wetland parts of the site, and depiction of the wetland boundary with respect to the site's boundary, especially where the wetland extends beyond the site being designated. Where available, information on the distribution of the main wetland habitat types and key hydrological features is also useful. Where there is substantial seasonal variation in the extent of the wetland, separate maps showing the wetland extent in the wet and in the dry seasons are helpful;

   iv) major landmarks (towns, roads, etc.); and

   v) distribution of land uses in the same catchment.

5. A general location map, showing the location of the Ramsar site within the territory of the Contracting Party, is also extremely useful.

6. Maps should not be trimmed, so that data managers and Ramsar Secretariat staff can consult any printed marginal notes or coordinate tick marks.

7. A map having all the above attributes, including being at the appropriate scale (see guidance below), will facilitate digitization of maps for inclusion in a Geographic Information System (GIS) if the map (or maps) are supplied only in printed form (i.e., when no digital coordinates are available).

8. To allow for subsequent digitization to be undertaken accurately and without distortion, the map should be an original print (two copies of which should be supplied) and not a photocopy.

9. Additionally, to facilitate copying and presentation, it is extremely helpful to include two other versions of the principal map(s):

   i) a colour photocopy of the map reduced to A4 size;
   ii) a GIS file providing geo-referenced site boundary vectors and attribute tables, if possible;
   iii) a TIFF, JPG, BMP, GIF or other common digital image file..

Scale of maps

10. The optimum scale for a map depends on the size of the site depicted. The optimal scales of maps for different sizes of Ramsar sites are:

Size of site (ha)	Preferred (minimum) scale of map
> 1,000,000	1:1,000,000
100,000 to 1,000,000	1:500,000
50,000 to 100,000	1:250,000
25,000 to 50,000	1:100,000
10,000 to 25,000	1:50,000
1,000 to 10,000	1:25,000
< 1,000	1:5,000

11. In summary, the map should be of suitable scale to depict the detail necessary to clearly indicate the features of the site described in the RIS and, particularly, to show a precise boundary.

12. For moderate to large sites, it is often difficult to show sufficient detail on standard A4 (210mm x 297mm) or Letter-format (8.5" x 11") sheets at the desired scale, so generally a sheet larger than this format is more appropriate. However, whenever possible, each map should be no larger than A3 (420mm x 297 mm) as larger formats present difficulties for subsequent copying.

13. When the site is large or complex and/or when it is composed of several sub-sites with discrete boundaries, a larger-scale map of each section or sub-site should be provided, accompanied by a smaller scale location map of the whole site which indicates the location of each sector or sub-site relative to the others. All such maps should follow the scale guidance above.

Boundary description (text)

14. When detailed topographical maps are not available, a description of the boundaries of the site should be provided to accompany the map(s), indicating topographic and other legally defined national, regional, or international boundaries followed by the site boundaries, together with the relationship of the Ramsar site boundary with the boundaries of any other existing protected area designations which cover part or all of the Ramsar site.

15. If the precise position of the site boundary has been determined using a Global Positioning System (GPS), Contracting Parties are encouraged to include an electronic or paper file listing each GPS latitude/longitude way-point determined and identifying these on a printed copy of the site map.

16. Where a revision to the boundary of a designated Ramsar site is being made in accordance with Resolution VIII.21, *Defining Ramsar site boundaries more accurately in Ramsar Information Sheets*, under the following circumstances:

    a) the site boundary has been drawn incorrectly and there has been a genuine error; and/or
    b) the site boundary does not accurately match the description of the boundary as defined in the RIS; and/or
    c) technology allows for a higher resolution and more accurate definition of the site boundary than was available at the time of Listing;

any change should be made clear in the revised RIS and/or on the site map, and the reasons for such refinement should be documented in the RIS.

Boundary description (digital)

17. Contracting Parties are encouraged, where possible, to submit geographic information about the Ramsar site in digital form, suitable for incorporation into a Geographic Information System (GIS).

18. For boundary and buffer zone delineation, data should be presented in vector form, prepared at the largest scale.

19. Other information, for example on wetland types and land uses, whether vector- or raster-based, should be submitted on one or more separate layers at the largest scale possible.

20. Metadata concerning the digitised formats should accompany the digital map(s) and should include digitising scale, projection system, attribute tables for each map layer, file format(s), and layering conventions used to prepare the data layers.

21. The primary native format files generated by the "Arc-Info" family of GIS (ESRI Corporation) or by "MapInfo" (Corporation) GIS enjoy increasingly wide use and can be imported and used by many GIS applications.

22. The Open GIS Consortium (OGC), a large group of GIS organizations including industry leaders, is addressing the issue of incompatible standards in geographic information technology. Progress on GIS standards, compatibility, and interoperability achieved under the OGC initiative should be noted and will be considered in the preparation of any updated advice on GIS file specifications for provision of digital maps for Ramsar sites.