

Information Sheet on EAA Flyway Network Sites (SIS) – 2017 version

Available for download from <http://www.eaaflyway.net/about/the-flyway/flyway-site-network/>

Categories approved by Second Meeting of the Partners of the East Asian-Australasian Flyway Partnership in Beijing, China 13-14 November 2007 - Report (Minutes) Agenda Item 3.13

Notes for compilers:

1. The management body intending to nominate a site for inclusion in the East Asian - Australasian Flyway Site Network is requested to complete a Site Information Sheet. The Site Information Sheet will provide the basic information of the site and detail how the site meets the criteria for inclusion in the Flyway Site Network. When there is a new nomination or an SIS update, the following sections with an asterisk (*), from Questions 1-14 and Question 30, must be filled or updated at least so that it can justify the international importance of the habitat for migratory waterbirds.
2. The Site Information Sheet is based on the Ramsar Information Sheet. If the site proposed for the Flyway Site Network is an existing Ramsar site then the documentation process can be simplified.
3. Once completed, the Site Information Sheet (and accompanying map(s)) should be submitted to the Flyway Partnership Secretariat. Compilers should provide an electronic (MS Word) copy of the Information Sheet and, where possible, digital versions (e.g. shapefile) of all maps.

1. Name and contact details of the compiler of this form*:

Full name: Mark Carey

Institution/agency: Australian Government Department of the Environment and Energy

Address : PO Box 787, Canberra, ACT, 2601

Telephone: +61 2 6274 1111

Fax numbers: +61 2 6274 1666

E-mail address: mark.carey@environment.gov.au

EAAF SITE CODE FOR OFFICE USE ONLY:

E	A	A	F	0	1	7
---	---	---	---	---	---	---

2. Date this sheet was completed*:

30/05/2017

3. Country*:

Australia

4. Name of the Flyway Network site*:

Forrestdale and Thomsons Lakes

5. Map of site*:

See attached

6. Geographical coordinates* (latitude/longitude, in decimal degrees):

Forrestdale Lake

Latitude: (approx.) 32° 10' S Longitude: (approx.) 115° 56' E

Thomsons Lake

Latitude: (approx.) 32° 09' S Longitude: (approx.) 115° 50' E

Forrestdale and Thomsons Lakes are located within the southern Perth metropolitan area, in southwestern Australia. Forrestdale Lake is located approximately 25 kilometres south east of Perth, in the City of Armadale. Thomsons Lake is located approximately 34 km southwest of Perth in the City of Cockburn. The wetlands are located approximately 8.5 kilometres apart, separated by freehold residential, rural and semi-rural (rural residential) land.

7. Elevation*:

Forrestdale Lake: 22.5 m Australian Height Datum

Thomsons Lake: 11.8 m Australian Height Datum

8. Area*:

Forrestdale Lake: 246 ha

Thomsons Lake: 538 ha

9. General overview of the site*:

Forrestdale and Thomsons Lakes are the best remaining examples of large, brackish, seasonal lakes with extensive fringing sedgeland typical of the Swan Coastal Plain. The lakes contain rich and diverse communities of aquatic invertebrates, and in a regional context, constitute an important breeding, migration stop-over and semi-permanent drought refuge area for waterbirds. The lakes support a WA listed priority ecological community, declared rare flora and other priority flora species.

10. Justification of Flyway Site Network criteria*:

Thomsons and Forrestdale Lakes are the best remaining examples of brackish, seasonal lakes with extensive fringing sedgeland typical of the Swan Coastal Plain. While these types of wetland were formerly common, extensive development of the Swan Coastal Plain has resulted in the loss of many of these wetlands, and most of the remaining wetlands of this type have been degraded through drainage, filling, eutrophication and the loss of fringing vegetation.

More than 20,000 waterbirds have been recorded on both Thomsons Lake (21,083 in February 1987) and Forrestdale Lake (22,196 in January 1986); however, these numbers do not occur regularly. While both lakes have historically supported more than 1% of the national population of various shorebird species a review of data in 2009 identified that these occurrences were not regular or recent (Maher and Davis 2009).

Thomsons Lake has recorded more than 1% of the national population of four shorebirds: Red-capped Plover (*Charadrius ruficapillus*) (up to 1,000, February 1986); Black-winged Stilt (*Himantopus himantopus*) (3,000 summer 1986); Red-necked Avocet (*Recurvirostra novaehollandiae*) (3,000 summer 1986); and Curlew Sandpiper (*Calidris ferruginea*) (2,500, March 1983). Forrestdale Lake has recorded more than 1% of the national population of five shorebirds: Red-capped Plover (up to 1,300); Black-winged Stilt (3,840); Red-necked Avocet (1,113); Long-toed Stint (*Calidris subminata*) (up to 80); and Curlew Sandpiper (2,000, January 1983).

The Australasian Bittern (*Botaurus poiciloptilus*), which is nationally listed as endangered, was recorded at Forrestdale Lake in 2011 and 2012. Curlew Sandpiper (*Calidris ferruginea*) is nationally listed as critically endangered and has been historically recorded at both lakes, with recent observations at Thomsons Lake in 2010 (October and November).

11. Wetland Types*:

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)

12. Jurisdiction*:

Territorial: Government of Western Australia

Functional: Conservation and Parks Commission of Western Australia (vesting) and the Western Australian Department of Biodiversity, Conservation and Attractions (management on behalf of the Conservation and Parks Commission).

13. Management authority*:

Western Australian Department of Biodiversity, Conservation and Attractions, Perth.

14. Bibliographical references*:

Balla, S.A. and Davis, J.A. (1993). *Wetlands of the Swan Coastal Plain. Volume 5. Managing Perth's Wetlands to Conserve the Aquatic Fauna*. Water Corporation of Western Australia and Western Australia Department of Environmental Protection, Perth.

Balla, S.A. and Davis, J.A. (1995). Seasonal variation in the macroinvertebrate fauna of wetlands of differing water regime and nutrient status on the Swan Coastal Plain, Western Australia. *Hydrobiologia* 299: 147–161.

Bamford, M.J. and Bamford, A.R. (1998). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 1996 and 1997*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (1999). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 1998*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (2000). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 1999–2000*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (2001). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 2000*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (2002). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 2001*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (2003). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 2002*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bamford, A.R. (2004). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 2003*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Wilcox, J. (2005). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 2004*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bancroft, W.J. (2006). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 1996-2005*. Bamford Consulting Ecologists. Report to the Water and Rivers Commission, Perth. Unpublished.

Bamford, M.J. and Bancroft, W.J. (2007). *Environmental Investigations for the Jandakot Groundwater Scheme Stage 2. Wetland Waterbird Monitoring; 1996–2006*. Bamford Consulting Ecologists. Report to the Department of Water, Perth. Unpublished.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). *New Atlas of Australian Birds*. Birds Australia, Melbourne.

Bartle, J., Graham, G., Lane, J. and Moore, S. (1987). *Forrestdale Lake Nature Reserve Management Plan 1987–1992*. Department of Conservation and Land Management, Perth.

CALM (2005a). *Forrestdale Lake Nature Reserve Management Plan 2005*. Department of Conservation and Land Management, Perth.

CALM (2005b). *Thomsons Lake Nature Reserve Management Plan 2005*. Department of Conservation and Land Management, Perth.

Commonwealth of Australia (2000). *Australia's Drainage Divisions – National Land and Water Resources Audit*, Commonwealth of Australia.

Crook, I.G. and Evans, T. (1981). *Thomsons Lake Nature Reserve*. Department of Fisheries and Wildlife, Perth.

- Cummings, B. and Hardy, A. (2000). *Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 – Summary Report*. Environment Australia, Canberra. (Also available online at <http://www.ea.gov.au/parks/nrs/ibra/version5-1/summary-report/index.html>).
- Davis, J.A. and Rolls, S.W. (1987). *A baseline biological monitoring programme for the urban wetlands of the Swan Coastal Plain, Western Australia*. Environmental Protection Authority Bulletin 265, Perth.
- Davis, J.A., Rosich, R.S., Bradley, J.S., Grows, J.E., Schmidt L.G., and Cheal, F. (1993). *Wetlands of the Swan Coastal Plain Volume 6. Wetland Classification on the Basis of Water Quality and Invertebrate Community Data*. Water Corporation of Western Australia and Western Australia Department of Environmental Protection. Perth.
- Davis, J.A., Strehlow, K., and O'Connor, J. (2008). *Biomonitoring of Selected Jandakot Wetlands (Macroinvertebrates) for Jandakot Groundwater Scheme Stage 2 Public Environmental Review 1996–2008*. Report to the Department of Water, Perth. Unpublished.
- Department of Environment (2004). *Section 46 Review of Environmental Conditions on Management of the Gngara and Jandakot Mounds – Stage 1 Proposal for Changes to Conditions*. Department of Environment, Perth.
- ERM Mitchell McCotter (2000). *Baseline Nutrient Study and Monitoring Summary – Forrestdale Lake, Final Report*. Report to the Department of Conservation and Land Management, Perth. Unpublished.
- Gray, M. (1994). *Forrestdale Lake and Adjacent Wetlands System 6 Area M95*. Wildflower Society of WA (Inc.), Nedlands, WA.
- Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994). *A Floristic survey of the southern Swan Coastal Plain*. Report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.). Unpublished.
- Halse, S.A., G.B. Pearson, and S. Patrick (1993). *Vegetation of depth-gauged wetlands in nature reserves of south-west Western Australia*. Technical Report No. 30, Department of Conservation and Land Management, Perth.
- Halse, S.A., Jaensch, R.P., Munro, D.R., and Pearson, G.B. (1990). *Annual waterfowl counts in south-western Australia – 1988/89*. Technical Report No. 25, Department of Conservation and Land Management, Perth.

Halse, S.A., R.M., Vervest, Munro, D.R., Pearson, G.B. and Yung, F.H. (1992). *Annual waterfowl counts in south-western Australia – 1989/90*. Technical Report No. 29, Department of Conservation and Land Management, Perth.

Halse, S.A., R.M., Vervest, Pearson, G.B., Yung, F.H., and Fuller, P.J. (1994). Annual waterfowl counts in south-western Australia – 1990/91. *CALMScience* 1: 107–129.

Halse, S.A., Pearson, G.B., and Yung, F.H. (1995). Annual waterfowl counts in south-western Australia – 1991/92. *CALMScience* 2: 1–24.

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. (1988). *Waterbirds in nature reserves of south-western Australia 1981–1985: Reserve accounts*. Royal Australasian Ornithologists Union (RAOU) Report No. 30.

Keeling, S. and McNee, S. 1984. Preliminary report on wader mortality at Forrestdale Lake. *WA Bird Notes* 29, 10-11.

Keighery, G.J. (2002a). *Flora of Thompson [i.e. Thomsons] Lake Nature Reserve*. Western Australian Department of Conservation and Land Management, Perth. Unpublished.

Keighery, G. (2002b). *Vascular flora of Forrestdale Lake Nature Reserve*. Western Australian Department of Conservation and Land Management, Perth. Unpublished.

Maher K and Davis J 2009, Ecological Character Description for the Forrestdale and Thomsons Lakes Ramsar Site, report prepared for the Department of Environment and Conservation.

McGuire, M. and Davis, J.A. (1999). *Biomonitoring of Selected Jandakot Wetlands (Macroinvertebrates) for Jandakot Groundwater Scheme Stage 2 Public Environmental Review 1996–1999*. Report to the Department of Water, Perth. Unpublished.

O’Conner, R., Quartermaine, G. and Bodney, C. (1989). *Report on an Investigation into Aboriginal Significance of Wetlands and Rivers in the Perth – Bunbury Region*. Western Australian Water Resources Council, Perth.

Pinder, A.M., Traylor, K.M. and Davis, J.A. (1991). *Chironomid control in Perth wetlands*. Report to Midge Research Steering Committee. School of Biological and Environmental Sciences, Murdoch University, Perth.

Polglaze (1986). *The Aboriginal Significance of Coolbellup/Wallibup Wetlands (North Lake and Bibra Lake)*. Unpublished.

- Ramsar Convention (2008). *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance of the Convention on Wetlands*. <http://www.ramsar.org>.
- Rolls, S.W. (1989). *The potential of Northern Hemisphere biotic indices as indicators of water quality in wetlands on the Swan Coastal Plain, Western Australia*. Honours thesis. Murdoch University, Perth, Western Australia.
- State of Western Australia (2000). *Bush Forever Volume 2*. Directory of Bush Forever Sites. Department of Environmental Protection, Perth.
- Storey, A.W., R.M. Vervest, Pearson, G.B., and Halse, S.A. (1993). *Wetlands of the Swan Coastal Plain. Volume 7. Waterbird Usage of Wetlands on the Swan Coastal Plain*. Water Corporation of Western Australia and Western Australia Department of Environmental Protection, Perth.
- Wetlands International (2006). *Waterbird Population Estimates*. Fourth Edition. Wetlands International. Wageningen, the Netherlands.
- Wild, S. and Davis, J.A. (2004) *Biomonitoring of Selected Jandakot Wetlands (Macroinvertebrates) for Jandakot Groundwater Scheme Stage 2 Public Environmental Review 1996–2004*. Report to the Water and Rivers Commission, Perth. Unpublished.
- Wild, S., Davis, J.A. and Strehlow, K. (2003). *Biomonitoring of Selected Jandakot Wetlands (Macroinvertebrates) for Jandakot Groundwater Scheme Stage 2 Public Environmental Review 1996–2003*. Report to the Water and Rivers Commission, Perth. Unpublished.

15. Physical features of the site:

Forrestdale and Thomsons Lakes are fresh/brackish, seasonal wetlands that dry out in summer or autumn. Both lakes are predominantly groundwater-fed with little surface drainage. Both lakes support large areas of seasonal open water that are dominated by submerged and floating macrophytes and are fringed by rushes and sedges, behind which are trees tolerant of seasonal waterlogging. The higher ground around the lakes supports open woodland.

Thomsons Lake occupies a depression between two sand dune systems – the Bassendean Dune System to the east, and the younger Spearwood System to the west (CALM 2005b). The two dune systems have occurred as a result of accumulation and subsequent distribution of beach sands and successive shorelines, and the major factors influencing their formation are thought to be a series of marine transgressions and prevailing westerly winds. Palaeobotany studies have revealed that the sediments of Thomsons Lake are between 30,000 and 40,000 years old, making them the oldest lake sediments discovered in Western Australia to date.

Forrestdale Lake is situated on the eastern edge of the gently undulating Bassendean Dune System, which are predominantly leached grey-white siliceous sands (CALM 2005a). The lake is a deflation basin rimmed by low sand ridges up to five metres high. On the north-eastern margin of the lake a rocky outcrop of lithified sandstone is present. The lake bed sediments are up to two metres thick and include silt, clay, peat, diatomite, marl and freshwater limestone (ERM Mitchell McCotter 2000).

16. Physical features of the catchment area:

Forrestdale and Thomsons Lakes are located within the southern Perth metropolitan area and are surrounded by medium density urban developments and some agricultural land. The lakes are situated in the Perth Basin, on the Swan Coastal Plain, on the eastern edge of the gently undulating Bassendean Dune System (Forrestdale Lake), and in the junction between the Bassendean Dune System and the Spearwood Dune System (Karrakatta unit – deep yellow sand over limestone – Thomsons Lake). The Swan Coastal Plain experiences a Mediterranean climate with a hot dry summer (December to February) and cool wet winter (June to August).

17. Hydrological values:

Forrestdale and Thomsons Lakes are examples of interdunal groundwater wetlands. Both lakes are situated on the Jandakot Groundwater Mound, which is a region of elevated groundwater table beneath the Swan Coastal Plain. Groundwater discharges from the mound into low lying depressions that support groundwater dependant vegetation and extensive wetland systems, the most notable of which are Forrestdale and Thomsons Lakes (CALM 2005a, b). The water levels in both lakes respond to variations in local groundwater supply, including natural processes such as seasonal rainfall, and as a result of modified land-uses within the catchment, particularly groundwater abstraction, drainage and urban development (CALM 2005a, b). Forrestdale Lake also receives a small amount of drainage from adjacent residential areas. A drainage scheme diverts water from residential subdivisions to the east of Thomsons Lake away from the lake. Strict criteria have been imposed for water level management in both lakes (DoE 2004).

18. General ecological features:

Forrestdale and Thomsons Lakes provide important habitat for waterbirds on the Swan Coastal Plain with 85 species of waterbird occurring at the two lakes and 27 species recorded breeding. Twenty nine of the recorded species are protected by the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention). Seventy-three waterbird species have been recorded at Thomsons Lake, including 20 species that are protected by JAMBA, CAMBA, ROKAMBA and Bonn Convention. Seventy-six waterbird species

have been recorded at Forrestdale Lake, with 23 of these protected by JAMBA, CAMBA, ROKAMBA and Bonn Convention. All species listed under JAMBA, CAMBA, ROKAMBA and Bonn Convention are identified as migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The highest number of waterbirds counted at Thomsons Lake was 21,083 in February 1987, and more than 10,000 waterbirds have been recorded in several years. Species occurring in significant numbers at Thomsons Lake are:

Australasian Shoveler (2,000 Mar 1982),
Australian Shelduck (1,600 Nov 1982),
Black-winged Stilt (3,000 Feb 1986),
Curlew Sandpiper (2,500 Mar 1983),
Eurasian Coot (7,000 Feb 1987),
Grey Teal (6,000 Feb 1986),
Hoary-headed Grebe (1,500 Nov 1982),
Pacific Black Duck (4,500 Dec 1985),
Red-capped Plover (1,000 Feb 1986),
Red-necked Avocet (2,000 Mar 1983),
Red-necked Stint (2,500 Mar 1983),
Sharp-tailed Sandpiper (1,000 Jan 1986).

The highest number of waterbirds counted at Forrestdale Lake was 22,196 in January 1986 and at least 10,000 have been recorded in several years. Species occurring in significant numbers at Forrestdale Lake are:

Australasian Shoveler (2,000 Jan 1984),
Australian Shelduck (1,650 Jan 1985),
Black Swan (1,416 Feb 1987),
Black-winged Stilt (3,840 Dec 1985),
Curlew Sandpiper (2,000 Jan 1983),
Eurasian Coot (7,670 Jan 1987),
Grey Teal (9,000 Mar 1987),
Hardhead (1,053 Oct 1982),
Hoary-headed Grebe (1,890 Jan 1987),
Pacific Black Duck (5,500 Mar 1987),
Red-capped Plover (1,300 Mar 1987),
Red-necked Stint (3,000 Mar 1982).

All waterbird count data are from Crook and Evans (1981), Bartle et al. (1987), Jaensch et al. (1988), Storey et al. (1993), Halse et al. (1990, 1992, 1994, 1995), Bamford and Bamford (1998, 1999, 2000, 2001, 2003,

2004), Bamford and Wilcox (2005), Bamford and Bancroft (2006, 2007), Barrett et al. (2003), which include surveys conducted between 1981 and 2007. Recent waterbird surveys have been limited.

The margins of both lakes support a large number of terrestrial birds, and other vertebrate species including the uncommon skink *Lerista lineata*. Both lakes support seven wetland frog species, and freshwater turtles *Chelodina oblonga* are also present in both lakes. A large diversity of macroinvertebrates have been recorded at these lakes. Macroinvertebrates from a total of 59 families and 3 taxa identified only to order have been collected from Thomsons Lake from 1985–2007, including 2 annelids, 4 molluscs, 15 crustaceans, 8 arachnids, and 33 insects. Macroinvertebrates from a total of 40 families and 3 taxa identified only to order have been collected from Forrestdale Lake from 1986–2007, including 2 molluscs, 12 crustaceans, 7 arachnids, and 22 insects.

Extensive stands of the submerged macrophyte *Myriophyllum salusigenium* have been recorded in open water at Thomsons Lake (Halse *et al.* 1993) and the floating macrophyte *Lemna* has also been recorded (Balla 1992). *Baumea articulata* and the introduced *Typha orientalis* grow around the edge of the lake. Behind the fringing zone is a belt of *B. juncea* and *B. articulata* with emergent *Viminaria juncea* and *Acacia saligna* shrubs, which gives way to a belt of trees, *Eucalyptus rudis* and *Melaleuca preissiana*, and the shrub *Jacksonia furcellata*. As the ground rises, these are replaced by open woodland dominated by *E. marginata*, *Banksia menziesii* and *B. attenuata*. Keighery (2002a) surveyed the vascular flora of Thomsons Lake and identified 491 taxa, including 360 native and 131 introduced species.

The submerged macrophytes *Ruppia polycarpa* and *Potamogeton pectinatus* sometimes form dense stands in the water at Forrestdale Lake and 26 species of algae, notably *Chara*, have also been recorded (Bartle *et al.* 1987). Fringing the area of seasonal open water at Forrestdale Lake there is an almost continuous belt of *Typha orientalis*, behind which *Baumea articulata*, *B. juncea*, *Juncus pallidus*, *Bolboschoenus caldwellii* and *Gahnia trifida* sometimes grow. Beyond these is a belt of trees, principally *Melaleuca raphiophylla*, with some *M. preissiana*, *M. incana*, *M. cuticularis*, *M. lateritia* and *Banksia littoralis* also present. *Acacia saligna* and *Eucalyptus rudis* occur on the landward side of this zone. The higher sandy ground on the eastern side of Forrestdale Lake supports open woodland dominated by *Banksia attenuata*. Keighery (2002b) surveyed the vascular flora of Forrestdale Lake Nature Reserve and identified 351 taxa; including 252 native and 99 introduced species.

19. Noteworthy flora:

Thomsons Lake Nature Reserve supports one WA listed 'Declared Rare Flora' species: *Caladenia huegelii* (Keighery 2002a); and three Priority taxa: *Dodonaea hackettiana* (State of Western Australia 2000), *Cardamine paucijuga* (Keighery 2002a) and *Eryngium pinnatifidum* subsp. *palustre* ms (Keighery 2002a). Forrestdale Lake Nature Reserve supports two WA listed 'Declared Rare Flora' species: *Diuris purdiei* (State of Western Australia 2000) and *Drakaea elastica* (State of Western Australia 2000); and nine Priority taxa:

Acacia lasiocarpa var. *bracteolata* (State of Western Australia 2000), *Eryngium pinnatifidum* subsp. *palustre* ms (State of Western Australia 2000), *Stylidium mimeticum* (State of Western Australia 2000), *Villarsia submersa* (State of Western Australia 2000), *Drosera occidentalis* (State of Western Australia 2000), *Verticordia lindleyi* subsp. *lindleyi* (State of Western Australia 2000), *Anthotium junciforme* (State of Western Australia 2000), *Schoenus benthamii* (Keighery 2002b) and *Jacksonia sericea* (*Jacksonia gracilis*) (Keighery 2002b).

20. Noteworthy fauna:

The Australasian Bittern *Botaurus poiciloptilus* was recorded at Thomsons Lake in six consecutive years (1981–1987) inhabiting tall sedgeland with enclosed areas of shallow open water or low sedges; however has not been recorded since 1991. The Australasian Bittern, which is nationally listed as endangered, was recently recorded at Forrestdale Lake in 2011 and 2012. Curlew Sandpiper (*Calidris ferruginea*) is nationally listed as critically endangered and has been historically recorded at both lakes, with recent observations at Thomsons Lake in 2010 (October and November). Two waterbird species recognised as priority species in Western Australia have been recorded at the lakes; Australian Little Bittern *Ixobrychus dubius* and Blue-billed Duck *Oxyura australis*.

Pectoral Sandpiper *Calidris melanotos* (up to four) and Ruff *Philomachus pugnax* (one) occur at Thomsons Lake in some years. Forrestdale Lake is one of the few sites in Western Australia where Little Ringed Plover *Charadrius dubius* and Little Stint *Calidris minuta* have been recorded more than once, and it is the only location in Western Australia where White-rumped Sandpiper *C. fuscicollis* have been recorded. None of these species have been recorded since the 1980s. However, the species recorded at Forrestdale Lake in particular are vagrants and it is remarkable they were ever recorded. Very few Ruff and Pectoral Sandpipers have been recorded in southwestern Australia and although are not considered to be as vagrant as the Little Stint, they are rare migrants and also unpredictable. It is therefore unsurprising that these species have not been recorded since the 1980s.

The margins of both lakes support diverse and abundant terrestrial bird life including Carnaby's Black-cockatoo (*Calyptorhynchus latirostris*), which is listed as endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, as rare or is likely to become extinct under the *Wildlife Conservation Act 1950* (Wildlife Conservation (Specially Protected Fauna) Notice 2008) and as endangered on the IUCN Red List of Threatened Species. Three reptile species found at Forrestdale Lake Reserve are significant because they are scarce or rare in the area and have relatively localised distributions: the Swamp Skink (*Acritoscincus trilineatum*), Lined Skink (*Lerista lineata*) and Crowned Snake (*Notechis coronatus*) (State of Western Australia 2000).

21. Social, economic and cultural values:

a) Describe if the site has any general social, economic 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:

Forrestdale and Thomsons Lakes provide an attractive natural environment within a metropolitan region that people can view, enjoy, or otherwise appreciate. Although the lakes are primarily reserved for nature conservation purposes, passive recreation that does not impact on natural values or ecosystems of the reserve is permitted. The main visitor activities at the lakes include birdwatching and bushwalking, horse riding and general recreation. Research is included in the purpose for Thomsons Lake Nature Reserve and Murdoch University has undertaken research at the lakes since the 1980s. Thomsons and Forrestdale Lakes are of cultural significance to the indigenous Noongar, as detailed below.

Forrestdale and Thomsons Lakes were important camping and hunting (particularly for turtles) sites for Aboriginal people (Polglaze 1986; O'Conner *et al.* 1989; Gray 1994). The lakes are associated with a powerful Waugal (an important Aboriginal mythological being). The Waugal is spiritually and mythologically important to Aboriginal people who believe that it created rivers and lakes, and maintains the flow of waters that feed its resting places. There are five registered sites of aboriginal significance at Thomsons Lake and two at Forrestdale Lake. These sites include ceremonial, mythological and historical sites, hunting sites, and sites with archaeological artefacts.

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? (Double-click the checkbox to check and choose "Checked" under "Default Value" from "Check Box Form Field Options" window)

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:

22. Land tenure/ownership:

a) Within the Flyway Network site:

Forrestdale Lake is located within Nature Reserve 24781 vested in the Conservation and Parks Commission of Western Australia and managed by the Department of Biodiversity, Conservation and Attractions.

Thomsons Lake is within Nature Reserve 15556 and has the same vesting and management.

b) In the surrounding area:

Both lakes are surrounded by freehold residential, rural and semi-rural (rural residential) land. Adjoining the eastern side of Forrestdale Lake Nature Reserve is reserve (27165) vested in the City of Armadale for the purpose of recreation, part of which is leased for use as a golf course. Adjoining the south-western side of Forrestdale Lake Nature Reserve is a parcel of bushland owned by the Western Australian Planning Commission. Both of these areas have been proposed for future addition to the Nature Reserve.

23. Current land (including water) use:

a) Within the Flyway Network site:

Thomsons Lake Nature Reserve is fenced to exclude feral predators. Both lakes are used principally for bird-watching, nature walks, horse-riding and recreation by surrounding residents and the general community.

b) In the surroundings/catchment:

The area to the north-east of Forrestdale Lake is urban and houses occur within 50 m of the lake. Land to the west of the lake has been developed for agricultural or housing purposes to within about 100 m of the lake edge. There is a substantial area of natural open woodland on the eastern side of the lake, which is used for horse-riding. There is a much larger area of bush around Thomsons Lake than remains around Forrestdale Lake; however, both lakes are remnants of natural vegetation in a largely developed landscape of agricultural and urban land.

24. 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 Flyway Network site:

Nutrient enrichment (eutrophication) is an issue of ongoing concern at both lakes and their biological value may decline if high levels of nutrient loading continue. The need to use pesticides to control chironomids (non-biting midges) in Forrestdale Lake (emerging adults can be a severe nuisance to nearby residents) is a potential threat to aquatic invertebrate and bird life. In 1984, approximately 220 waders were killed at Forrestdale Lake as a result of pesticide spraying to control midges (Keeling and McNee 1984). Large swarms of midges have not been evident at Forrestdale Lake in recent years because the lake has been dry over the summer period. However, if the climate becomes wetter again, this could lead to a sharp increase in nutrient enrichment and issues with odours, toxic algae and midges.

Problematic native plant species, particularly *Typha orientalis*, compete with other flora, alter the floristics of fringing vegetation, and reduce the amount of open water and thus waterbird habitat. Predation by cats and foxes reduces the survival of waterbirds, particularly hatchlings, at Forrestdale Lake, which is not protected by a predator-proof fence. Kangaroos enclosed within the predator-proof fence at Thomsons Lake have overgrazed native vegetation as numbers have increased. However, an ongoing culling program has ameliorated this problem. Spread of the disease known as 'dieback', caused by the pathogen *Phytophthora cinnamomi*, could lead to permanent changes to some littoral native plant communities and their dependent fauna.

b) In the surrounding area:

Increased groundwater abstraction and an increasingly drier climate have adversely affected the water levels and period of inundation at both lakes. Impacts include: a reduced amount of time for biota dependent on water e.g. aquatic plants, macroinvertebrates and waterbirds, to complete their lifecycle; reduced habitat availability for waterbirds and invertebrates; decline of fringing vegetation condition; and encroachment of vegetation (predominantly *Typha orientalis*) onto the lake bed. Over the past 20 years the area of *Typha* in the fringing vegetation of both lakes has increased substantially and poses a threat by changing floristics and reducing the extent of open water and wading habitat for shorebirds.

Increasing urbanisation of the catchment of both lakes may result in changes to the water balance or nutrient status of the lake, and may lead to an increased number of unplanned fires. Excessive disturbance of waterbirds by humans and dogs may occur at Forrestdale Lake (which lacks a predator-proof fence), especially in late summer/autumn when the lake is drying out.

25. Conservation measures taken:

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

Both lakes are located within Class A Nature Reserves, gazetted for the Conservation of Flora and Fauna .

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate, see Annex 3):

Ia ; Ib ; II ; III ; IV ; V ; VI ; N/A

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

Management plans for Thomsons Lake and Forrestdale Lake were published in 1981 and 1987, respectively. Revised plans for both lakes were released in 2005 and are being implemented (CALM 2005a,b)

d) Describe any other current management practices:

In 1992, Environmental Water Provisions (EWPs) were set for a number of wetlands including Thomsons and Forrestdale Lakes, and these were updated in 2004. The EWPs include a preferred minimum water level and an absolute minimum level, and were set to ensure the maintenance of the lakes' habitat value for migratory birds and rare, threatened and priority flora and fauna. The preferred minimum water level of Thomsons Lake is 11.3–11.8 m AHD, with an absolute minimum of 10.8 m AHD (DoE 2004). The lake bed level used in setting EWPs is 11.8 m AHD. This equates to a preferred minimum water level that is at the lake bed surface to 0.5 m below the lake bed, and an absolute minimum water level of 1.0 m below the lake bed surface. Thomsons Lake is supplemented with water to ensure these limits are not exceeded. The maximum permitted water level at Thomsons Lake is 12.8 m AHD, at which time water is pumped out to a level of 12.6 m AHD. The maximum levels were developed with the Environment Protection Authority's (EPA) approval, as an environmental condition on the rezoning of land to the east of Thomsons Lake from rural to urban (CALM 2005b). At Forrestdale Lake, the preferred summer minimum is 21.2–21.6 m AHD (reading from the staff gauge) and an absolute summer minimum of 20.2 m AHD (reading from monitoring well) (DoE 2004). The lake bed level used in setting EWPs is 21.6 m AHD. This equates to a preferred minimum water level that is at the lake bed surface to 0.4 m below the lake bed, and an absolute minimum water level of 1.4 m below the lake bed surface.

The current criteria for the Jandakot Mound limit the allowances for water levels to fall between the preferred and absolute minimum values for no more than two in six years. The 'two in six year' approach was adopted as a simplistic means of accounting for and mimicking the occurrence of drier years, during which water levels would be expected to be lower as a direct consequence of less rainfall. The criterion effectively requires that, on average, water levels should not be below the preferred minima for more than one third of years, and for no longer than two consecutive years in any six-year period (DoE 2004).

26. Conservation measures proposed but not yet implemented:

Adjoining the eastern side of Forrestdale Lake Nature Reserve is reserve (27165) vested in the City of Armadale for the purpose of recreation. Adjoining the southwestern side of Forrestdale Lake Nature Reserve is a parcel of bushland owned by the Western Australian Planning Commission. Both of these areas have been proposed for future addition to the Nature Reserve. The current management plans include the existing nature reserves and proposed additions.

27. Current scientific research and facilities:

Murdoch University has undertaken extensive studies of the water chemistry and aquatic invertebrate fauna of both wetlands (Davis and Rolls 1987; Rolls 1989; Pinder *et al.* 1991; Balla and Davis 1993, 1995; Davis *et al.* 1993; McGuire and Davis 1999; Wild *et al.* 2003; Wild and Davis 2004; Davis *et al.* 2008). Studies have been undertaken to determine the factors influencing waterbird usage of both lakes, including water chemistry, extent of vegetation and water levels. The Department of Water and Environmental Regulation (DWER) with assistance from the Friends of Forrestdale community group, undertakes regular monitoring of water levels, nutrients and chemistry in both lakes. DWER monitors environmental parameters including wetland vegetation, water quality, wetland birds and macroinvertebrates to provide an indication of whether changes in groundwater and wetland levels (primarily related to public and private groundwater abstraction, and climate) are having an impact on the identified ecological values of wetlands.

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

Existing interpretation facilities within Forrestdale and Thomsons Lakes are limited. There is a well established network of firebreaks and management access tracks within Thomsons Lake Nature Reserve that is used by bushwalkers. A boardwalk was installed at Forrestdale Lake in 1994 and there is a trail located around the perimeter of Forrestdale Lake Reserve ('the Forrestdale Trail'), and an ad hoc network of trails throughout the reserve. The Cockburn Wetlands Education Centre plays an important role in environmental education within the Beeliar Regional Park, which includes Thomsons Lake (CALM 2005b).

29. Current recreation and tourism:

Both lakes are used for passive recreation including bushwalking and birdwatching. Horse riding and mountain bike riding occur regularly along a multi-purpose limestone path ('the Forrestdale Trail') located around the perimeter of Forrestdale Lake Nature Reserve (CALM 2005a). Fire-breaks and management access tracks within Thomsons Lake Nature Reserve are regularly used as bushwalking trails while horse riding is only permitted along a narrow trail on the outside perimeter of the vermin-proof fence (CALM 2005b).

30. Threats*

Which of the following threats is present historically – when the threat stopped but the effects are still there (H), currently (C) or potentially (P)?

	Historically	Currently	Potentially
Residential and commercial development			
housing and urban areas	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Information Sheet on EAA Flyway Network Sites

commercial and industrial areas	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
tourism and recreation areas	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Agriculture and aquaculture

annual and perennial non-timber crops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
wood and pulp plantations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
livestock farming and ranching	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
marine and freshwater aquaculture	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Energy production and mining

oil and gas drilling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
mining and quarrying	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
renewable energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Transportation and service corridors

roads and railroads	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
utility and service lines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
shipping lanes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
flight paths	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Biological resource use

hunting and collecting terrestrial animals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
gathering terrestrial plants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
logging and wood harvesting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
fishing and harvesting aquatic resources	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Human intrusions and disturbance

recreational activities	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
war, civil unrest and military exercises	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
work and other activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Natural system modifications

fire and fire suppression	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
dams and water management/use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
other ecosystem modifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Invasive and other problematic species and genes

Information Sheet on EAA Flyway Network Sites

invasive non-native/alien species	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
problematic native species	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
introduced genetic material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Pollution

household sewage and urban waste water	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
industrial and military effluents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
agricultural and forestry effluents	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
garbage and solid waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
air-borne pollutants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
excess energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Geological events

volcanoes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
earthquakes/tsunamis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
avalanches/landslides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Climate change and severe weather

habitat shifting and alteration	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
droughts	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
temperature extremes	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
storms and flooding	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Please write here any additional threats and comments/queries you have on the threats.

Annex 1: Criteria for the inclusion of sites in the Flyway Site Network

(From the Partnership Text)

To be considered for inclusion in the Flyway Site Network, this Partnership adopts the following criteria:

- a. Convention on Wetlands (Ramsar, Iran, 1971) criteria for internationally important sites for migratory waterbirds. That is:
 - Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.
 - 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.

- b. The staging criteria as applied under the Asia - Pacific Migratory Waterbird Conservation Strategy. That is:
 - i. A staging site should be considered internationally important if it regularly supports 0.25% of individuals in a population of one species or subspecies of waterbirds on migration.
 - ii. A staging site should be considered internationally important if it regularly supports 5,000 or more waterbirds at one time during migration.

- c. Under exceptional circumstances a site can be nominated if it supports migratory waterbirds at a level or stage of their life cycle important to the maintenance of flyway populations. Justification of such nominations will be considered by the Partnership on a case by case basis.

Annex 2: 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 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**

Annex 3: IUCN Protected Areas Categories System

IUCN protected area management categories classify protected areas according to their management objectives. The categories are recognised by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas and as such are increasingly being incorporated into government legislation.

Ia Strict Nature Reserve

Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphical features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.

Ib Wilderness Area

Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.

II National Park

Category II protected areas are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.

III Natural Monument or Feature

Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.

IV Habitat/Species Management Area

Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

V Protected Landscape/ Seascape

A protected area where the interaction of people and nature over time has produced an area of distinct character with significant, ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.

VI Protected area with sustainable use of natural resources

Information Sheet on EAA Flyway Network Sites

Category VI protected areas conserve ecosystems and habitats together with associated cultural values and traditional natural resource management systems.