Sungei Buloh Wetland Reserve

Singapore

EAAF NETWORK SITE CODE FOR OFFICE USE ONLY:

E	A	A	F	0	7	3

Site Information Sheet on East Asian-Australasian 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 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 *:

Compiler 1

Full name:

Sungei Buloh Wetland Reserve

Institution/agency:

Ministry of National Development, National Parks Board, Conservation Division

Postal Address:

National Parks Board, Conservation Division, Sungei Buloh Wetland Reserve, Wetland Centre, 301 Neo Tiew Crescent, Singapore 718925

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(65) 6794 1402

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Compiler 2

Full name:

Institution/agency:

Postal Address:

Telephone:

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E-mail: (e.g. example@mail.net)

2. Date this sheet was completed *:

DD/MM/YYYY

28/11/2018

3. Country *:

Republic of Singapore

4. Name of the Flyway Network site *:

Accepted English transcription of the Site's name.

Sungei Buloh Wetland Reserve

5. Map of site *:

The most up-to-date available and suitable map of the wetland should also be appended to the SIS (only in digital format and shape file). The map must clearly show the boundary of the site. Please refer to the "Digitising Site Boundaries in Google Earth" file linked here.

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

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

1°26'46.48"N, 103°43'35.95"E

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

Sea level from 0 to 6m

8. Area *:

The total area of the 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.

130ha

9. General overview of the site *:

A brief (two sentences) summary of the site, mentioning principal physical and ecological functions, and its importance for migratory waterbirds.

Located on the northwestern end of Singapore, Sungei Buloh Wetland Reserve (SBWR) and its nearby wetland sites contain diverse wetland habitats including mangroves, brackish and freshwater ponds, mudflats and marshes. The mudflats and ponds in the Reserve are actively managed to maximise their carrying capacity for an estimated 2,000 migratory shorebirds that roost and feed in this relatively small site during the migratory season each year.

10. Justification of Flyway Site Network criteria *:

Please provide waterbird count information (with year of latest count) that demonstrates that the site meets the criteria of the Flyway Site Network (Annex 1). That is:

- it regularly supports > 20 000 migratory waterbirds; or,
- it regularly supports > 1 % of the individuals in a population of one species or subspecies of migratory waterbird; or,
- it supports appreciable numbers of an endangered or vulnerable population of migratory waterbird
- it is a "staging site" supporting > 5 000 waterbirds, or > 0.25% of a population stage at the site.

A listing of the populations of migratory waterbirds covered by the East Asian – Australasian Flyway Partnership and the 1% thresholds is attached (Annex 3).

The "staging site" criterion is particularly difficult to apply and application of this should be discussed with the Secretariat. Also note that some species have several populations that are very difficult to distinguish in the field.

Data on Shorebird Count Information at Sungei Buloh Wetland Reserve

Common Name	Scientific Name	SBWR Max (1999-2005)	SBWR Max (between 2011-2018)
Pacific Golden Plover	*Pluvialis fulva*	2000 (Jan 2005)	578 (Nov 2011)
Lesser Sand Plover	*Charadrius mongolus*	1003 (Jan 2000)	940 (Dec 2012)
Whimbrel	*Numenius phaeopus*	498 (Dec 2005)	290 (March 2013)
Common Redshank	*Tringa totanus*	683 (Sep 2000)	550 (Oct 2014)
Marsh Sandpiper	*Tringa stagnatilis*	380 (Feb 2000)	118 (Nov 2011)
Common Greenshank	*Tringa nebularia*	219 (Jan 2001)	147 (Jan 2015)
Curlew Sandpiper	*Calidris ferruginea*	972 (Nov 1999)	135 (Oct 2012)

Sungei Buloh Wetland Reserve, the only protected network site in Singapore, is an important staging and wintering site for shorebirds in northwest Singapore and the Johor Straits.

11. Wetland Types *:

List the wetland types present (see Annex 2). List the wetland types in order of their area in the Flyway Network site, starting with the wetland type with the largest area.

a. Coastal Wetlands

Code*	Description
A	Permanent Shallow marine waters less than 6 meters deep at high tide
E	Sandy Shore
F	Estuarine water
G	Intertidal mudflats
I	Intertidal forested wetlands

b. Human-made Wetlands

Code	Description
1	Abandoned aquaculture ponds
2	Ponds

(* Guidelines for the Nomination of Sites for the Shorebird Site network Wetland type codes)

12. Jurisdiction *:

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

a. Territorial Jurisdiction over the site
Ministry of National Development

b. Functional jurisdiction
National Parks Board
Conservation Division
1 Cluny Road
Singapore Botanic Gardens
Singapore 259569

13. Management authority *:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland and the title and/or name and email address/phone number of the person or persons in this office with direct responsibility for managing the wetland.

Sungei Buloh Wetland Reserve
Wetland Centre, 301 Neo Tiew Crescent
Singapore 718925
How Choon Beng, Director
Phone Number: +65 67941406
Email: how_choon_beng@nparks.gov.sg

14. 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 Web site addresses dedicated to the site or which prominently feature the site, 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.

Books

1. Wetlands in the City - The Sungei Buloh Wetland Reserve
   Author: Chua Ee Kiam
   Publisher: Simply Green
   Published: 2010, Singapore, 1st Edition
   National Parks Board, Simply Green August 2010
2. Migratory Birds of Sungei Buloh Wetland Reserve
   Author: James Gan, Mendis Tan, David Li
   Publisher: National Parks Board
   Published: 2012, Singapore, 2nd Edition
3. Birds of our Wetlands
   Publisher: National Parks Board
   Published: 2018, Singapore

Website

1. Sungei Buloh Wetland Reserve webpage: https://www.nparks.gov.sg/sbwr

Selected references

Lim H. C. & Posa M. R. C. 2014. Distribution and prey of migratory shorebirds on the northern coastline of Singapore. *Raffles Bulletin of Zoology* (62): 701-717.

Ng, P. K. L., H. T. W. Tan & K. K. P. Lim, 2011. Sungei Buloh Wetland Reserve. Pp. 74–75. In: Ng, P. K. L., R. T. Corlett & H. T. W. Tan (editors), *Singapore Biodiversity. An Encyclopedia of the Natural Environment and Sustainable Development*, Editions Didier Millet, Singapore, 552 pp.

Ng, P. K. L., L. K. Wang & K. K. P. Lim, 2008. *Private Lives: An Exposé of Singapore's Mangroves.* Raffles Museum of Biodiversity Research. 240 pp.

15. Physical features of the site:

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

Sungei Buloh Wetland Reserve (SBWR) is a coastal area with both natural and man-made wetlands. Natural wetlands include mangroves, permanent shallow marine waters less than 6 m deep at low tide, sandy shore, estuarine waters and inter-tidal mudflats. Man-made wetlands include abandoned aquaculture ponds, freshwater ponds, drainage channels and ditches.

Water levels in the ponds at SBWR are maintained through the use of sluice gates and sluice channels that connect directly with the Johor Straits. The water in the brackish water ponds may vary between 0–4 m depending on the tidal conditions and whether the sluice gates are in operation.

16. Physical features of the catchment area:

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

Sungei Buloh Wetland Reserve has two main waterways with Sungei Buloh Besar in the East and Sungei Buloh Kechil in the West. The water from the surrounding agricultural area flows through the wetland reserve and out to Johor Straits. The water level at the shore and the riverine estuaries fluctuates two times a day with low tide and high tide.

17. Hydrological values:

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

As a low-lying wetland habitat in close proximity to island city-state, the mangroves of Sungei Buloh Wetland Reserve provides various benefits, buffering from flood control, carbon sequestration and storage, and shoreline stabilisation.

18. General ecological features:

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

SBWR and its surrounding wetland includes mudflats, ponds, mangroves and secondary forests habitats that support a rich biodiversity, of which many are threatened species in Singapore. SBWR is recognised as an important site for migratory shorebirds. SBWR also contains the largest mangrove forest (about 100 ha) on the mainland of Singapore, fed by 2 main natural rivers, Sungei Buloh Besar and Sungei Buloh Kechil.

19. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the SIS.*

(Please add here the species which do not come under sec no 14)

SBWR consists of at least 30 out of the 35 true extant mangrove species found in Singapore. Relatively undisturbed areas of mature mangrove (more than 50-70 years undisturbed) exist in the northeast sector of the Reserve and on a small island known as Pulau Buloh. Within the mature mangrove, a clump of epiphytic orchid *Cymbidium bicolour* spp. *pubescens* (last collected in 1891 and listed as extinct in Singapore's Red Data Book) was rediscovered in 2000. Besides being a wildlife refuge for various rare local mangrove flora species (eg *Sonneratia ovata*, Sonneratia caseolaris, *Ceriops tagal*, *Brownlowia tersa, Cassine viburnifolia*, etc.), the reserve also manages a Mangrove Arboretum that collects, propagates locally rare mangrove species found around the island within the coastal extension as a biological genetic repository.

20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 10. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the SIS.*

(Please add here the species which do not come under sec no 14)

Globally threatened migratory waterbird species include Far Eastern Curlew (*Numenius madagascariensis*), Nordmann's Greenshank (*Tringa guttifer*), Great Knot (*Calidris tenuirostris*), Chinese Egret (*Egretta eulophotes*), Masked Finfoot (*Heliopais personatus*) and near threatened migratory waterbird species such as Bar-tailed Godwit (*Limosa lapponica*), Black-tailed Godwit (*Limosa limosa*) and Asian Dowitcher (*Limnodromus semipalmatus*) have been recorded at the Reserve.

Near threatened migratory waterbirds.

Asian Dowitcher	*Limnodromus semipalmatus*
Black-tailed Godwit	*Limosa limosa*
Bar-tailed Godwit	*Limosa lapponica*
Eurasian Curlew	*Numenius arquata*
Grey-tailed Tattler	*Tringa brevipes*
Red Knot	*Calidris canutus*
Red-necked Stint	*Calidris ruficollis*
Curlew Sandpiper	*Calidris ferruginea*

Rare migratory waterbirds recorded in the recent years include the Northern Pintail (*Anas acuta*) in Dec 2016, last seen in Singapore in 1992; Ruff (*Calidris pugnax*) in Jan 2017, last seen in 2001 in Singapore.

Other globally threatened bird species include the Lesser Adjutant (*Leptoptilos javanicus*), Christmas Frigatebird (*Fregata andrewsi*), Greater Spotted Eagle (*Clanga clanga*), Straw-headed Bulbul (*Pycnonotus zeylanicus*) and Brown-chested Jungle Flycatcher (*Cyornis brunneatus*) in Sungei Buloh.

Other Near threatened bird species

Oriental Darter	*Anhinga melanogaster*
Himalayan Vulture	*Gyps himalayensis*
Grey-headed Fish Eagle	*Haliaeetus ichthyaetus*
Cinnamon-headed Green Pigeon	*Treron fulvicollis*
Jambu Fruit Dove	*Ptilinopus jambu*
Chestnut-bellied Malkoha	*Phaenicophaeus sumatranus*
Long-tailed Parakeet	*Psittacula longicauda*
Mangrove Pitta	*Pitta megarhyncha*
Japanese Paradise Flycatcher	*Terpsiphone atrocaudata*
Streaked Bulbul	*Ixos malaccensis*
White-chested Babbler	*Trichastoma rostratum*

In addition, rare birds like the Northern Boobook (Nonox japonica) was seen in 2013 and a new record for Singapore, Indian Paradise Flycatcher (*Terpsiphone paradisi*) was seen in 2017.

Other noteworthy animals that occur in the Reserve include Estuarine Crocodile (*Crocodylus porous*) and Smooth-coated Otter (*Lutrogale perspicillata*), both listed as critically-endangered species in Singapore's Red Data Book. The Malayan Water Monitor Lizard (*Varanus salvator*) is one of the most commonly seen animal in the reserve.

The King Cobra (*Ophiophagus Hannah*) occurs at Sungei Buloh Wetland Reserve and is listed as Vulnerable worldwide on the IUCN Red List since 2010. The Leopard Cat (*Prionailurus bengalensis*) is Critically Endangered (CR) in the Singapore Red Data Book 2008 has been sighted via camera traps in the reserve.

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:

The reserve attracts more than 100,000 visitors annually of which an estimated 90% are locals, and 10% are foreign visitors. It is Singapore's only legally gazetted reserve for wetlands and the first ASEAN

Heritage Park recognised in 2013. The first Volunteer Programme in the National Parks Board was also pioneered by Sungei Buloh Wetland Reserve in 1997.

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:

State-owned

b) In the surrounding area:

State-owned, some on private leases

23. Current land (including water) use:

a) Within the Flyway Network site:

Gazetted Nature Reserve under the Parks and Trees Act

b) In the surroundings/catchment:

Main land use is dominated by aquatic farming, vegetable cultivation and military training areas. A few significant land use areas include a reservoir, a golf course and a transmission station.

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:

Construction of a dam to form Kranji Reservoir in the mid-70s reduced the sediment supply into the Johor Strait, and may have contributed to the erosion along much of the coastline. The construction of this reservoir led to the loss of mangroves near the river mouth, but at the same time, led to the formation of rare freshwater marsh habitats in what is now known as Kranji Marshes.

b) In the surrounding area:

Poor industrial and farming practices in the surrounding areas can contribute to water pollution that may affect the health of the natural ecosystems nearby.

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:

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.

Sungei Buloh Wetland Reserve consists about 130 ha legally gazetted as a Nature Reserve in 2002. In 2003, it is designated as an ASEAN Heritage Park. In conjunction with the World Migratory Bird Day and the 25th anniversary of Sungei Buloh Wetland Reserve, the National Parks Board (NParks) announced that Mandai Mangrove and Mudflat will be conserved as a Nature Park. Mandai Mangrove and Mudflat is situated about 3 km to the east of Sungei Buloh Wetland Reserve and is one of the richest wetlands in Singapore. Collectively, the Wetland Reserve, Kranji Marshes and the new Nature Park safeguard a variety of complementary wetland habitats, including mangroves, mudflats and freshwater marshes, strengthening the conservation of wetland biodiversity in the northwestern part of Singapore.

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?:

Yes. The plan guides the management and operation of the areas managed by the Sungei Buloh Wetland Reserve branch of the Conservation Division of National Parks Board.

If yes, is it being implemented?: If no, is one being planned?

d) Describe any other current management practices:

Safeguarding and enhancing wetlands

The National Parks Board (NParks) has worked with other agencies to extend Sungei Buloh Wetland Reserve and develop areas around the Reserve as buffer zones, including the eastern extension which was launched in December 2014. These new habitats help to form a contiguous green corridor, supplementing the biodiversity of the reserve core. It also serves to minimize visitor impact to the core conservation area of the shorebird habitats whilst opening new opportunities for outreach and education, with a new visitor centre including amenities and facilities, barrier-free access paths, new coastal experiences such as viewing pods.

NParks also undertakes a series of habitat enhancement and maintenance in the wetlands before the start of each migratory season. The preparations ensure that the roosting and feeding habitats for the migratory birds are at their optimal conditions. In addition, equipment is put in place to commence the monitoring of migratory shorebirds.

The enhancement works include clearing of overgrown vegetation on raised embankments in brackish ponds as migratory shorebirds Redshanks prefer to roost on higher ground. NParks also carries out minor repairs on these embankments to keep erosion in check.

In addition, fire and oil-spill emergency drills are conducted annually in order to safeguard the reserve.

Maintenance of tidal ponds

Migratory shorebirds require a safe haven for roosting and feeding, preferring open areas that offer a clear line of sight to survey for predators such as raptors, rather than sites with tall trees that limit the view. To maintain such areas, there is a need to manage mangrove regeneration in the open brackish ponds where these birds roost and feed. Each year, after the migratory shorebirds return to their breeding grounds in

the northern hemisphere, NParks removes the young mangroves in these ponds with the involvement of community groups.

26. Conservation measures proposed but not yet implemented:

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

There are plans to expand and enhance roosting sites for migratory shorebirds in the Reserve and their buffer areas. A permit system is also being explored for its feasibility to allow keen bird-watchers to visit the core conservation areas of Sungei Buloh Wetland Reserve.

27. Current scientific research and facilities:

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

Research and long-term monitoring on migratory birds

Sungei Buloh Wetland Reserve has been carrying out bird banding and survey of shorebirds during the migratory season since 1990. Such long-term monitoring has provided NParks with important information such as the longevity and site fidelity of species.

From 2014 - 2015, 99 geo-locators were deployed on Common Redshanks. Between September 2015 and March 2016, seven of the tagged birds were recaptured and their data successfully analysed. Previously unknown information was obtained from this study, revealing information such as the birds' rest stops, breeding grounds and travelling speeds.

In 2015 and 2016, radio telemetry was used to find out with precision where the Wetlands' birds roosted and fed at during the tidal cycle. These details were critical in establishing the birds' movement patterns, and determining the primary feeding and roosting sites to aid in formulating conservation priorities. This is very important as the primary ecological role of Sungai Buloh is to provide secure high-tide roosting areas for migratory shorebirds around this region between Singapore's Northwest and Johor.

In 2017, NParks embarked on the use of higher precision and real time satellite tracking devices on the migratory birds. This will provide fine resolution information such as their range and locations without the need to recapture them.

Other surveys

Other surveys conducted by Sungei Buloh Wetland Reserve includes dragonfly surveys, mangrove insect and benthic surveys.

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

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

Outreach is one of the key thrusts of the reserve's work, reaching out to numerous visitors from the general public, schools and corporations.

Programmes

For example, there are 3 long-term programmes run in collaboration with multiple stakeholders:

1. Nature Nurtures, a collaboration with Shell Singapore reaching out to youths at risk, seeks to nurture their love and stewardship for environment through a one-year programme with mentors.
2. SUN Club, sponsored by Singapore Press Holdings, reaches out to special needs students to enjoy nature in a safe and enjoyable manner

3. Young Naturalist Programme (YNP) funded by HSBC, is run by volunteers to increase awareness and knowledge of wetlands through fun-filled activities in a day camp.

Visitor Centre, amenities and facilities

Officially opened to the public on 6 December 2014, the 31-hectare east extension is located to the east of SBWR. Highlights of the extension include a new Visitor Centre, two multi-purpose rooms, a mangrove gallery, viewing pods and a network of three new nature trails totally 1.65km. It also includes wheelchair friendly footpaths, large bus coaches parking bays and public transport bus stop.

These amenities support key events and a variety of educational programmes and outreach activities targeted at the recreational visitor.

Events

Sungei Buloh Wetland Reserve organizes and participates in activities throughout the year to raise awareness on the awareness of the wetlands and the importance of these habitats to the migratory birds in the East Asian-Australasian Flyway. This include green letter events such as World Wetlands Day, International Day for Biological Day, International Mangrove Day and most significantly, World Migratory Bird Day in October by celebrating their arrival with festive activities, workshops and guided tours.

29. Current recreation and tourism:

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

SBWR is a popular destination for avid bird-watchers, nature photographers and students to learn about mangroves, migratory and resident birds and other flora and fauna. Currently, the reserve attracts more than 100,000 visitors annually, of which an estimated 90% are residents and 10% are foreigners.

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	☐	☐	☐
commercial and industrial areas	☐	☐	☒
tourism and recreation areas	☐	☐	☐
Agriculture and aquaculture			
annual and perennial non-timber crops	☐	☐	☐
wood and pulp plantations	☐	☐	☐
livestock farming and ranching	☐	☐	☐
marine and freshwater aquaculture	☐	☒	☐
Energy production and mining			
oil and gas drilling	☐	☐	☐

mining and quarrying	☐	☐	☐
renewable energy	☐	☐	☐
Transportation and service corridors			
roads and railroads	☐	☐	☐
utility and service lines	☐	☐	☐
shipping lanes	☐	☐	☐
flight paths	☐	☐	☐
Biological resource use			
hunting and collecting terrestrial animals	☐	☐	☐
gathering terrestrial plants	☐	☐	☐
logging and wood harvesting	☐	☐	☐
fishing and harvesting aquatic resources	☐	☒	☐
Human intrusions and disturbance			
recreational activities	☐	☐	☐
war, civil unrest and military exercises	☐	☐	☐
work and other activities	☐	☐	☐
Natural system modifications			
fire and fire suppression	☐	☐	☐
dams and water management/use	☐	☐	☐
other ecosystem modifications	☒	☐	☐
Invasive and other problematic species and genes			
invasive non-native/alien species	☐	☒	☐
problematic native species	☐	☒	☐
introduced genetic material	☐	☐	☐
Pollution			
household sewage and urban waste water	☐	☐	☐
industrial and military effluents	☐	☒	☐
agricultural and forestry effluents	☐	☒	☐
garbage and solid waste	☐	☐	☐
air-borne pollutants	☐	☐	☐

excess energy	☐	☐	☐
Geological events			
volcanoes	☐	☐	☐
earthquakes/tsunamis	☐	☐	☐
avalanches/landslides	☐	☐	☐
Climate change and severe weather			
habitat shifting and alteration	☐	☐	☒
droughts	☐	☐	☐
temperature extremes	☐	☐	☒
storms and flooding	☐	☐	☒

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 recognized 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 charcter 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

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