

# Information Sheet on Ramsar Wetlands (RIS)

*Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8<sup>th</sup> Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9<sup>th</sup> Conference of the Contracting Parties (2005).*

## Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

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## 1. Name and address of the Official Respondent:

### Joint Nature Conservation Committee

Monkstone House  
City Road  
Peterborough  
Cambridgeshire PE1 1JY  
UK  
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948  
Email: [RIS@JNCC.gov.uk](mailto:RIS@JNCC.gov.uk)

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Designation date

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Site Reference Number

Name and address of the compiler of this form:

Updated by UK Overseas Territories Conservation Forum, 102 Broadway, Peterborough,  
PE1 4DG, UK

(with assistance from Bermuda Dept. of Conservation Services)

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## 2. Date this sheet was completed/updated:

Designated: 10 May 1999

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## 3. Country:

UK (Bermuda)

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## 4. Name of the Ramsar site:

Pembroke Marsh East

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

**This RIS is for:** Updated information on an existing Ramsar site

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## 6. For RIS updates only, changes to the site since its designation or earlier update:

### a) Site boundary and area:

\*\* Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

**b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:**

**7. Map of site included:**

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

**a) A map of the site, with clearly delineated boundaries, is included as:**

- i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* ☐;
- ii) **an electronic format** (e.g. a JPEG or ArcView image)
- iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* ☐;

**b) Describe briefly the type of boundary delineation applied:**

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

**8. Geographical coordinates (latitude/longitude):**

32 17 00 N                                  64 46 00 W

**9. General location:**

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Hamilton

Pembroke Marsh East is located on the north-east edge of Hamilton, Pembroke Parish.

**Administrative region:** Bermuda

**10. Elevation** (average and/or max. & min.) (metres):    **11. Area** (hectares): 7.82

Min.	0.5
Max.	2
Mean	No information available

**12. General overview of the site:**

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

An extensive freshwater *Typha* sp. and *Cladium* sp. marsh with some open water channels up to 3 m deep. Supports a wide variety of passage and wintering waterfowl.

**13. Ramsar Criteria:**

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

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**14. Justification for the application of each Criterion listed in 13 above:**

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1

A good example of a *Typha* marsh that drains as an estuarine system into the sea and supports juvenile populations of certain fish species. The site regularly supports passage and wintering waterfowl and is an important breeding area for moorhen.

**15. Biogeography** (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

**a) biogeographic region:**

Bermuda / mid-North Atlantic Islands

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

**16. Physical features of the site:**

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

Soil & geology	peat
Geomorphology and landscape	estuary, lowland
Nutrient status	
pH	
Salinity	fresh
Soil	mainly organic
Water permanence	usually permanent
Summary of main climatic features	Subtropical; mild, humid; gales, strong winds common in winter.

**General description of the Physical Features:**

No information available

**17. Physical features of the catchment area:**

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

Marsh forms catchment area in the most heavily populated part of Bermuda and city of Hamilton; large interdune basin surrounded by steep dune hills. Surrounding land use is high density residential, industrial and landfill/dump site.

**18. Hydrological values:**

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

Flood water storage / desynchronisation of flood peaks

**19. Wetland types:**

Inland wetland

Code	Name	% Area
U	Peatlands (including peat bogs swamps, fens)	67
Tp	Freshwater marshes / pools: permanent	33

**20. General ecological features:**

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

A freshwater marsh in a peat basin connected to the sea by a 2 km drainage channel. The quality of the water is very significantly adversely affected by leachate from the adjacent dump (although this is no longer actively used for domestic waste disposal). A good example of a *Typha* marsh that drains as an estuarine system into the sea and supports juvenile populations of certain fish species. It is Bermuda's only estuary.

The site regularly supports passage and wintering waterfowl and is an important breeding area for moorhen.

The large capacity of the marsh buffers flooding from Hamilton city runoff during heavy rains.

Ecosystem services

**21. Noteworthy flora:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

The largest surviving cattail *Typha angustifolia* marsh on Bermuda, with some *Ceratophyllum demersum* and *Cladium jamaicensis*.

**22. Noteworthy fauna:**

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

**Birds****Species Information**

Formerly the most important breeding area in Bermuda for moorhen *Gallinula chloropus* (6 prs +) and American coot *Fulica americana* (1-2 prs). A wide variety of waterfowl are recorded on passage and in winter, including pied-billed grebe *Podilymbus podiceps*, American bittern *Botaurus lentiginosus*, least bittern *Ixobrychus exilis*, black-crowned night heron *Nycticorax nycticorax*, green heron *Butorides virescens* (= *B. striatus*), great blue heron *Ardea herodias*, common teal *Anas crecca*, blue-winged teal *A. discors*, ring-necked duck *Aythya collaris*, lesser scaup *A. affinis* sora rail *Porzana carolina* and purple gallinule *Porphyryla martinica*.

Common eel *Anguilla anguilla* has been recently recorded (2004) in the Pembroke drainage canal.

The introduced minnow *Gambusia affinis* occurs, and the marsh supports Bermuda's largest populations of North American eel and tarpon juveniles, which gain access to the pond via a drainage ditch connecting to Mill Creek 1.6 km to the west.

Several species of endemic freshwater snails, clams and a limpet were recorded in 1910, but not since.

**23. Social and cultural values:**

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

No special values known

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? No

If Yes, describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:
- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

**24. Land tenure/ownership:**

Ownership category	On-site	Off-site
National/Crown Estate	+	+
Private		+

**25. Current land (including water) use:**

Activity	On-site	Off-site
Nature conservation	+	
Urban development		+

**26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:**

*Explanation of reporting category:*

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

*NA = Not Applicable because no factors have been reported.*

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?

Drainage/land-claim: (unspecified)	1	<p>Much of this marsh was used as a site for dumping garbage and rubble from construction and excavation projects, initially from the City of Hamilton and Pembroke Parish but eventually from the whole island as other marsh dumpsites were either protected from dumping or filled in completely. The eastern two-thirds of this marsh basin was completely destroyed and buried under the main solid waste dumpsite for the entire island, a situation that continued until the early 1990s when this dumpsite was closed down and turned into a horticultural waste processing centre.</p> <p>The western third of this marsh basin, comprising 3.77 ha and making up the present Nature Reserve area, was never used for large-scale garbage dumping but was the site of an unsuccessful land-claim project in the 1920s and 1930s to make into horse-racing tracks.</p> <p>In addition, there has been continued sporadic small, incremental dumping and infilling of the remaining marsh, particularly on the eastern side bordering the dump, but in 2003 on the west side bordering Dutton Avenue. Most of this illegal infilling was carried out by the Government Department of Works &amp; Engineering, often because of poor communication between equipment operators and supervisors, and poor communication between the Parks Department and the Dept. of W&amp;E. There has also been a small amount of illegal dumping by private trucking operators.</p>	+	+	+
Pollution – unspecified	2	<p>This area has suffered greatly from toxic leachate and runoff from the refuse site which, although it has probably decreased since the closing of the solid waste dump, still continues to some extent from the thousands of tons of waste already present on site and entombed beneath rubble. The resulting major and chronic pollution seems to have killed off the killifish population at the site. The extent of pollution still occurring in the pond and marsh is unknown, although testing is planned for the near future. The last sampling carried out in the late 1990s confirmed that there was very little life in the pond at that time.</p> <p>The area around Pembroke Marsh East is now the most heavily populated and developed on Bermuda, resulting in a large amount of rain water runoff directly into the marsh from surrounding roads, car parks and industrial areas. This in all likelihood carries pollutants such as oils and fuels from normal sump drippings, fuel spills, incorrectly disposed-of oil-changes etc.</p>	+	+	+

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?  
 Pollution – unspecified - The marsh was included in a wide-scale scheme, launched in 1987, to rehabilitate the Pembroke Marsh Basin so as to improve local social and environmental conditions, especially through the relocation of rubbish disposal operations then occurring within the basin. A major development plan was

established for the basin but appears not to have been implemented because industrial activities impinge heavily on this site.

Drainage/land-claim: (unspecified) - The landfill site was closed in 1992, and is under restoration as parkland. There has been some restoration of canals, open water ponds and marsh vegetation on the south and east sides of the former dump area. In July 2004, following recommendations from the Govt. Conservation Division and solid waste managers, an amphibious ditch-digging machine was purchased by the Dept. of W&E to enable proper management of open water ditches in wetlands around Bermuda, in particular at Pembroke Marsh East.

Pollution – unspecified - The Pembroke Canal was built in the early 1930s to help maintain drainage and water flow from the Pembroke Marsh East basin to the ocean at Mill’s Creek. This canal was neglected and choked with trash and vegetation for many years, resulting in almost no water flow or drainage function, but is now undergoing extensive clearing and removal of pollutants (including fuel oil from the Bermuda Electric Light Company BELCO). This will hopefully help to restore some of its drainage function and be beneficial to the water quality in the marsh.

Is the site subject to adverse ecological change? YES

**27. Conservation measures taken:**

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
National Nature Reserve (NNR)	+	
Management plan in preparation	+	

**b) Describe any other current management practices:**

National Nature Reserve (NNR) - Zoned as a nature reserve under the Planning Act 1974 and the Development Act 1983. Designated as a Nature Reserve under the Bermuda National Parks Act 1986.

Management plan in preparation - A management plan for the nature reserve is to be implemented.

**28. Conservation measures proposed but not yet implemented:**

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

Pollution – unspecified - The marsh was included in a wide-scale scheme, launched in 1987, to rehabilitate the Pembroke Marsh Basin so as to improve local social and environmental conditions, especially through the relocation of rubbish disposal operations then occurring within the basin. A major development plan was established for the basin but appears not to have been implemented because industrial activities impinge heavily on this site.

Given the Government of Bermuda’s demonstrated commitment to the sustainable and wise-use of the wetland apparent through its listing in 1999 as a Ramsar site, an appropriate next step would be to seek the listing of Pembroke Marsh East Ramsar site on the Convention’s ‘Montreux Record’. This would then facilitate the provision of further management guidance through the input of a visiting group under Ramsar’s Management Guidance Procedure.

Introduction/invasion of non-native plant species - Clearing vegetation and active restoration (through transplantation of native species etc.)

**29. Current scientific research and facilities:**

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

Thomas (1997) studied the limnology of the Pembroke Canal. There have been various engineering studies on drainage problems in the marsh.

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

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

None reported

**31. Current recreation and tourism:**

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

None reported

**32. Jurisdiction:**

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

Ministry of the Environment  
Government of Bermuda, Government House,  
Hamilton, Bermuda

**33. Management authority:**

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Dept. of Parks, Botanical Gardens, 169 South Shore Rd, Paget DV04, Bermuda  
Dept. of Conservation Services, P.O. Box FL588, Flatts FLBX, Bermuda

**34. Bibliographical references:**

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

**Site-relevant references**

- Brooke, M, Ryan, P, Furbert, J & Stroud, D (2003) Pembroke Marsh East. In: *A sense of direction: a conference on conservation in UK Overseas Territories and other small island communities*, ed. by M. Pienkowski, 223-225. UK Overseas Territories Conservation Forum, Peterborough. [www.ukotcf.org](http://www.ukotcf.org)
- Chasemore (nd [1960]) *Drainage arrangements for the Pembroke Marsh/ Mill Creek Basin*. Unpublished report for Bermuda Government Public Works Department
- Department of Planning (1987) *The Pembroke Marsh Plan*. Department of Planning, Bermuda
- Hayward, SJ, Gomez, FH & Sterrer, W (eds.) (1981) *Bermuda's delicate balance: people and environment*. Bermuda National Trust, Paget
- Hepburn, I, Oldfield, S & Thompson, K (1992) *UK Dependent Territories Ramsar study: Stage 1*. Unpublished report to Department of the Environment, European and International Habitat Protection Branch, Bristol, from International Waterfowl and Wetlands Research Bureau/ NGO Forum for Nature Conservation in UK Dependent Territories, Slimbridge/ Sandy (Research contract, No. 7/2/126)
- Pienkowski, M (ed.) (2003) *A sense of direction: a conference on conservation in UK Overseas Territories and other small island communities, Bermuda 22nd–27th March 2003*. UK Overseas Territories Conservation Forum, Peterborough. [www.ukotcf.org](http://www.ukotcf.org)
- Pienkowski, MW (ed.) (2005) *Review of existing and potential Ramsar sites in UK Overseas Territories and Crown Dependencies*. (Contractor: UK Overseas Territories Conservation Forum, Peterborough.) Final report on Contract CR0294 to the UK Department for Environment, Food and Rural Affairs, Bristol. [www.ukotcf.org](http://www.ukotcf.org)
- Proctor, D & Fleming, LV (eds.) (1999) *Biodiversity: the UK Overseas Territories*. Joint Nature Conservation Committee, Peterborough
- Scott, DA & Carbonell, M (eds.) (1986) *A directory of neotropical wetlands*. IUCN/IWRB, Cambridge/Slimbridge
- Thomas, MLH (1997) Summary and recommendations. In: *Report on the ecological conditions of Pembroke Canal and the inner part of Mill Creek, 1996*. Bermuda Zoological Society, Flatts
- Ward, JL (1992) *Sustaining Pembroke Marsh: a case study of a dump*. Unpublished MA dissertation, University of Georgia
- Wingate, DB (1984) *Taking stock of Bermuda's wetland heritage*. Department of Agriculture and Fisheries, Hamilton



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