

Information Sheet on Ramsar Wetlands (RIS)

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

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework 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.

1. Name and address of the Official Respondent:

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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)

2. Date this sheet was completed/updated:

Designated: 10 May 1999

3. Country:

UK (Bermuda)

4. Name of the Ramsar site:

Hungry Bay Mangrove Swamp

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

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

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

a) Site boundary and area:

** 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.

The last Bermuda refuge for several crustacean species in addition to supporting wintering birdlife.

Criterion 4

Supporting wintering birdlife, especially herons, egrets and North American wood warblers.

Criterion 8

The swamp supports important populations of endangered native crabs (the last Bermudan refuge for several Crustacea — including largest remaining population of land crab *Cenobita clypeatus* and giant land crab *Cardisoma guahumi*).

See Sections 21/22 for details of noteworthy species

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	clay, mud, peat, sand
Geomorphology and landscape	coastal, enclosed coast (including embayment)
Nutrient status	
pH	
Salinity	brackish / mixosaline, saline / euhaline
Soil	mainly mineral, 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).

A tidal mangrove swamp up to 1 m deep at high water, in a shallow sea bay with a relatively narrow opening to the sea.

18. Hydrological values:

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

No special values known

19. Wetland types:

Marine/coastal wetland

Code	Name	% Area
I	Mangrove / tidal forest	99
Sp	Saline / brackish marshes: permanent	1

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.

Mangrove swamps with *Avicennia germinans*, *Conocarpus erectus*, *Rhizophora mangle* and some *Salicornia* sp. Bermuda's largest tidal mangrove swamp located in a shallow (mostly c. 1 m deep) sea bay with a relatively narrow opening to the sea. It is the largest example of Bermuda's mangrove swamps, which are the most northerly in the world.

Has the longest continuous sequence of mangrove peat layers in the Atlantic, and the first documented evidence of significant forest retreat caused by contemporary sea-level rise.

The swamp supports important populations of endangered native crabs (the last Bermudan refuge for several Crustacea — including largest remaining population of land crab *Cenobita clypeatus* and giant land crab *Cardisoma guahumi*), as well as wintering birds.

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.*

Both the two mangrove species to occur on Bermuda are found here: Black Mangrove *Avicennia germinans* and Red Mangrove *Rhizophora mangle*. Surrounding woodlands have a range of other trees including Buttonwood *Conocarpus erectus*.

On the south-east edge of the mangrove swamp there are areas of marsh plants, with Large Marsh Rush *Juncus acutus*, Sea Purslane *Sesuvium portulacastrum*, Sea Ox-eye *Borrchia arborescens*, Sea Lavender *Limonium carolinianum*, *Paspalum vaginatum*, *Sporobolus virginicus*, Woody Grasswort *Sarcocornia perennis* and West Indian Grass *Eustachys petraea*. These areas are not extensive, but are of interest as they illustrate the position of Bermuda on the northern margin of tropical mangrove distribution and on the southern margins of temperate saltmarsh distribution.

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**

A wintering area for Great Blue Heron *Ardea herodias*, Yellow-crowned Night Heron *Nyctanassa violacea*, Snowy Egret *Leucophoyx thula*, Mallard *Anas platyrhynchos*, Belted Kingfisher *Ceryle alcyon* and Northern Waterthrush *Seirus noveboracensis*.

The swamp supports the only significant surviving populations on Bermuda of the Giant Land Crab *Cardisoma guanhumi* (two colonies on the upper fringes of the mangrove swamp) and is the only location in Bermuda for the Land Hermit Crab *Cenobita clypeatus* (total of 54 individuals in 1990). The Mangrove Crab *Goniopsis cruentatus* also occurs. A number of other mangrove-living Crustacea occur.

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.

- Archaeological/historical site
- Scientific research
- Traditional cultural

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
Transport route	+	
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?
Dredging	2	Dredging may have occurred, resulting in the loss of seagrasses and potentially promoting the loss of mangroves along the western corner.		+	+

Erosion	1	<p>This area has suffered significant degradation of the Mangrove Swamp over the last three decades, culminating in the almost total destruction of the outer (western) third of the swamp, representing 25-30% of the total area of mangroves, during Hurricane Fabian in September 2003. The factor is partly a natural process, but exacerbated by global warming, the control of which is outwith the powers of the site managers. There is considerable evidence, in the form of layers of mangrove peat and stumps underlying the outer portion of Hungry Bay, that this mangrove swamp has been in retreat for hundreds, if not thousands, of years. This is largely due to natural causes, in particular the continuing rise in sea levels. Much of the recent damage is being caused by the eroding of the protective peninsula which separates the mangrove swamp from the open ocean, and the formation of a new tidal channel/over wash area which enables huge waves and storm surge from hurricanes to break directly into the outer third of the swamp. In this area, more than 75% of the red mangroves <i>Rhizophora mangle</i> were completely washed out by the roots and destroyed. Although most of the large, mature black mangroves <i>Avicenia nitida</i> were not uprooted, more than 50% have subsequently died after being smothered by a deep layer of sand and rubble swept into this area by the ocean surge during Fabian.</p> <p>In addition to the catastrophic damage resulting from hurricanes and storms, there is also evidence of long-term erosion of the organic peat/sediment substrate that underlies the present swamp and that the living mangroves actually grow in. Although this may be caused in part by sea-level rise, it appears to have been greatly accelerated by the cutting of a boat channel through the mangroves approximately 40-50 years ago. This has had the effect of concentrating and increasing the speed of tidal flow through the mangroves, sweeping away leaf fall from the mangroves and other vegetation as well as fine sediment that otherwise would be trapped and deposited around the prop root complexes. As a result, peat and substrate build-up has not been able to keep up with sea level rise and their continuing erosion, especially along the margins of the boat channels, has resulted in undermining and exposure of the mangrove root systems, making them less able to survive catastrophic storm events.</p>	+	+	+
Introduction/invasion of non-native animal species	1	Feral pigeons are displacing nesting tropic birds from cliff-hole and ledge nesting sites.	+		+

Introduction/invasion of non-native plant species	1	<i>Casuarina</i> is widespread along the peninsula, crowding areas within fringe of the mangrove swamp, potentially impacting giant land and hermit crabs. May also have an impact on endemic snails found within. Colonization by invasive large marsh rush <i>Juncus acutus</i> along the second-largest salt marsh.	+		+
Pollution – unspecified	2	Large amount of floating debris that comes in off the ocean and is swept into, and becomes trapped within the mangroves. The majority of this debris consists of a variety of plastic containers and products, some of them, like fuel containers and ice chests, quite large in size. There are also heavier items such as car and motorcycle wheels, refrigerators and heavy lumber that are also swept into the mangroves, especially during storms, and can cause significant damage to the supporting prop roots of the trees. The majority of the plastic debris is not of local origin but comes in from the open ocean, although some of the heavier items such as household appliances, car and motorcycle parts, have their origin at the solid waste dump at the Bermuda International Airport in Castle Harbour. Main source is oceanic pollution, outwith control of site managers.	+		+

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Dredging - Ban dredging in order to avoid continued deepening of bay, with consequent redistribution of sediments from shallow areas to deeper areas. Explore possible local replanting with mangroves from local stock (already experimentally demonstrated) to help retain sediments within bay.

Pollution – unspecified - Periodic clean-ups; education of adjacent landowners will be undertaken; plan for pollution control will be developed.

Erosion - Still suffering erosion, no action taken.

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 Development and Planning Act 1974 and Development Plan 1983. Designated as a Nature Reserve under Bermuda National Parks Act 1986. A Tree Preservation Order protects the mangroves.

28. Conservation measures proposed but not yet implemented:

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

National Nature Reserve (NNR) - It has been recommended that this area be managed as a nature reserve.

Pollution – unspecified - Periodic clean-ups; education of adjacent landowners will be undertaken; plan for pollution control will be developed.

Introduction/invasion of non-native plant species - Removal of *Casuarina* from the peninsula and replanting with native succulent or fruity species which may provide food for local species of interest. Phased removal of invasive species and replanting with local trees such as Bermuda cedar, palmetto and olive wood.

Introduction/invasion of non-native animal species - Shoot pigeons within the area; trapping in places where it may be feasible to do so.

Promote re-colonization and nesting; installation of artificial tropic bird nests.

Erosion - Some suggested management responses include:

- Stabilisation of the eroding outer edge of swamp
- Replanting of mangrove propagules on eroding swamp edge and creek banks
- A ban on motorised boats and jet-skis in mangrove creeks
- Closure of the new gap in the peninsula to reduce water flows in bay
- Boom across creek mouth to increase litter retention within the swamp
- Infilling of creeks no longer used

Active management at this swamp will contribute to knowledge of how to assist global mangrove swamps during sea-level rises predicted for the next decades.

Dredging - Ban dredging in order to avoid continued deepening of bay, with consequent redistribution of sediments from shallow areas to deeper areas. Explore possible local replanting with mangroves from local stock (already experimentally demonstrated) to help retain sediments within bay.

Private - The Management and protection of the Mangrove swamp would be greatly enhanced by the extension of the boundaries of the Reserve to include the peninsula that separates the swamp from the ocean. This area is however at present privately-owned and would require either government purchase or the consent of the landowner. An attempt in the early 1990s to purchase this land for addition to the Nature Reserve was unsuccessful.

National/Crown Estate - The acquisition of private properties on the seaward peninsula has been recommended.

29. Current scientific research and facilities:

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

Research conducted by J. Ellison into effects of sea-level changes on mangrove swamps.

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.

Activities:

Some recreational boat traffic.

Public access to the site is limited and only possible through private lands. Public access will not be encouraged.

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 Conservation Services, P.O. Box FL588, Flatts FLBX, Bermuda

Dept. of Parks, Botanical Gardens, 169 South Shore Rd, Paget DV04, 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

- Ellison, JC (1991) *Hungry Bay Mangrove Swamp, Bermuda. Present condition and future management*. Report of Bermuda Biological Station for Research, St George's
- Ellison, JC (1993) Mangrove retreat with rising sea level, Bermuda. *Estuarine, coastal and shelf science*, **37**(1), 75-87
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- Scott, DA & Carbonell, M (eds.) (1986) *A directory of neotropical wetlands*. IUCN/IWRB, Cambridge/Slimbridge
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- Thomas, MLH (1993) Mangrove swamps in Bermuda. *Atoll Research Bulletin*, **386**, 1-17
- Wingate, DB (1984) *Taking stock of Bermuda's wetland heritage*. Department of Agriculture and Fisheries, Hamilton

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