

# National Wetland

DIRECTORY of Sri Lanka



Central Environmental Authority





# National Wetland Directory of Sri Lanka

This publication has been jointly prepared by the Central Environmental Authority (CEA), The World Conservation Union (IUCN) in Sri Lanka and the International Water Management Institute (IWMI). The preparation and printing of this document was carried out with the financial assistance of the Royal Netherlands Embassy in Sri Lanka.

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**IUCN**  
The World Conservation Union



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## Abbreviations

ADB	-	Asian Development Bank
CBC	-	Ceylon Bird Club
CCA	-	Coast Conservation Act
CCD	-	Coast Conservation Department
CEA	-	Central Environmental Authority
CORDIO	-	Coral Reef Degradation in the Indian Ocean
CRMP	-	Coastal Resources Management Project
CTB	-	Ceylon Tourist Board
DFAR	-	Department of Fisheries and Aquatic Resources
DS	-	Divisional Secretary
DWC	-	Department of Wildlife Conservation
EPA	-	Environmental Protection Area
FARA	-	Fisheries and Aquatic Resources Act
FFPO	-	Fauna and Flora Protection Ordinance
FMA	-	Fishery Management Area
FOGSL	-	Field Ornithology Group of Sri Lanka
GA	-	Government Agent
GCRMN	-	Global Coral Reef Monitoring Program
GEF	-	Global Environmental Facility
GN	-	Grama Niladhari
IBA	-	Important Bird Areas
IUCN	-	The World Conservation Union
IWRB	-	International Waterfowl and Wetland Research Bureau
LLDC	-	Low Lying Areas and Development Cooperation
MASL	-	Mahaweli Authority of Sri Lanka
MEC	-	Mahaweli Economic Agency
MoE	-	Ministry of Environment
NAQDA	-	National Aquaculture Development Agency
NARA	-	National Aquatic Resources Research and Development Agency
NEA	-	National Environmental Act
NECCDEP	-	Northeast Coastal Community Development Project
PAM-WCP	-	Protected Area Management and Wildlife Conservation Project
PCMA	-	Participatory Coastal Management Act
RUK	-	Rekawa, Ussangoda, Kalametiya
SAI	-	South Asia Institute
SAM	-	Special Area Management
SCOTIA	-	Sustainable Coastal Tourism Project for Asia
SLLRDC	-	Sri Lanka Land Reclamation and Development Corporation
SLSAC	-	Sri Lanka Sub Aqua Club
TCP	-	Turtle Conservation Project
UDA	-	Urban Development Authority
UNDP	-	United Nations Development Programme
USAID	-	United States Agency for International Development
WNPS	-	Wildlife and Nature Protection Society

## Acknowledgments

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## **Message from the Hon. Minister of Environment**

Sri Lanka is a country blessed with a rich natural and cultural heritage. The hydraulic civilization, which dates back to the BC era, is testimony to the judicious use of skills, nature and natural resources by our forefathers. Wetlands whether man made or natural, has been the lifeline of this ancient civilization. Therefore, our early ancestors realised the importance of managing wetlands. They considered water as something “holy” that should not be tampered by human interventions. With advancements in science, we have now realised that wetlands possess not only ecological significance but economic value as well.

Among the natural wetlands in Sri Lanka, the Bundala, Anaiwilundawa and Maduganga wetlands have been recognised as having international significance. Similarly man-made wetlands, which are popularly known as “tanks”, play a vital role in the economic development of the country.

However, at present a majority of the wetlands in Sri Lanka are adversely affected by human activities such as unauthorised filling, waste disposal, pollution due to effluent discharges, clearing of natural vegetation in and around wetlands, spread of invasive alien species etc. Recognizing the continuous pressures on wetlands and also to ensure their protection, the government recently approved a National Policy on Wetlands together with Conservation Strategies.

Therefore, I welcome the collaborative effort of the Central Environmental Authority (CEA), The World Conservation Union (IUCN) and the International Water Management Institute (IWMI) in preparing a National Directory of Wetlands. I have no doubt that the Directory of Wetlands will form the basis for future management of wetlands in Sri Lanka.

I would also like to record our sincere appreciation to the Netherlands Government for their generous financial support for this national effort.

**Maithripala Sirisena, MP**

Minister of Environment

Govt. of Sri Lanka

## Background

The Asian Wetland Directory of 1989 identified 41 wetland sites of international importance in Sri Lanka, covering 274,000 ha in total. Of these, some 30% were under some form of protection, whereas 28% were completely protected according to the sources quoted. Subsequently, the Wetland Atlas of Sri Lanka prepared by the Central Environmental Authority in 1999 presented an overview of the above 41 wetland sites in the country. During the last 15 years, the Sri Lankan authorities have increasingly recognized the importance of wetlands and their management.

A major action pertaining to the conservation of wetlands in Sri Lanka was the establishment of a National Policy on Wetlands in 2004. The National Wetlands Steering Committee was also revived in 2003. These important initiatives were followed up with a draft wetland conservation strategy and action plan, which is currently being finalized. The Central Environmental Authority (CEA) is in the process of establishing a Wetland Management Unit (WMU), to facilitate the management of wetlands in Sri Lanka. Considering the dearth of information related to wetlands, the need to prepare an updated directory of wetlands in Sri Lanka was initially recognized at the national symposium on conservation of wetlands in Sri Lanka in 2003. The national policy and draft strategy on conservation of wetlands in Sri Lanka, prepared by the Ministry of Environment in 2004 further stressed the need to prepare an updated directory of wetlands in the country, to facilitate the conservation of wetland ecosystems.

Considering the above developments and needs related to conservation of wetlands in the country, the National Wetlands Steering Committee (NWSC) requested the services of the World Conservation Union (IUCN) and the International Water Management Institute (IWMI) to facilitate the Central Environmental Authority (CEA) in preparing an updated information base on wetlands in Sri Lanka. It was planned to have the updated information base on wetlands in two components: a digital database and a directory of selected representative wetlands in the island. Based on the request made by the NWSC, a joint proposal was prepared by IUCN and IWMI, which was subsequently approved by the NWSC. The wetland directory was jointly funded by the CEA and IUCN (through financial assistance from the Royal Netherlands Embassy in Sri Lanka), while the digital database was funded by IWMI. The project commenced in the first quarter of 2005 and will be completed by the end of 2006.

### *Scope of the wetland information base*

The wetland information base is intended to provide baseline information to facilitate the conservation and management of wetlands in Sri Lanka by relevant authorities. It would also enable to integrate wetland related environmental concerns into present and future development projects that may affect specific wetlands. The digital database will be an evolving one where it would be updated with new information on a regular basis by the WMU of the CEA, with technical inputs from wetland researchers, IWMI and IUCN.

# Methodology

## ***Establishment of a Steering Mechanism***

The project proposal (including the methodology for the establishment of a wetland information base, site selection, types of information for each site etc.) submitted by The World Conservation Union (IUCN) was evaluated and approved by the NWSC and its sub-committee on research. The NWSC functioned as the overall steering committee to monitor the progress of work, and a panel of expert reviewers was appointed to review the draft wetland directory and provide comments and suggestions to improve it.

## ***Definition and Classification of Wetlands***

The NWSC agreed to use the definition for wetlands adopted by the Ramsar Convention on Wetlands, the worldwide intergovernmental treaty on wetland conservation and sustainable use, as follows:

### ***Article 1.1***

*“Wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tides does not exceed six metres”*

### ***Article 2.1 provides that wetlands***

*“may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands”.*

The above definition incorporates a wide range of freshwater, brackish and saline ecosystems, and the following classification of wetlands was adopted for the current directory.

<b>Wetland Category</b>	<b>Types</b>
Freshwater (Inland wetlands)	Rivers and streams
	Floodplains
	Freshwater swamp forests
	Villus
	Peatlands
	Freshwater marshes
Saltwater (Coastal and marine wetlands)	Sea grass beds
	Coral reefs
	Mangroves
	Salt marshes
	Lagoons
	Estuaries
Man-made	Hydropower reservoirs
	Irrigation tanks
	Salt pans



### ***Criteria for selection of sites***

The selection of wetland sites to be included in the current directory was based on the following criteria:

- A site that ideally represents a particular category/type of wetland that is defined by the Ramsar Convention.
- High biodiversity significance (harbour many species of animals and plants, including provision of habitats for migratory birds).
- High degree of human dependence on wetland resources for sustenance.
- High degree of vulnerability to pressures associated with development.
- In the case of man-made wetlands, only those large enough to sustain high biodiversity and socio-economic benefits are included.
- An area that includes several small wetlands would be considered as a cluster.

### ***Types of information and arrangement of information sheets***

The types of information to be included and a short description of each information type is given below. An attempt has been made to follow a consistent pattern when completing each wetland information sheet. The wetland information sheets were arranged in an alphabetical order, in keeping with the advice of the NWSC.

- **Title:** The name of the wetland.
- **Location:** The geographical coordinates and general location of the site.
- **Area:** The area of the wetland habitat in hectares. In the case of some rivers and coastal zones, only the approximate length of the site is known.
- **Altitude:** The altitude of the wetland in meters above sea level.
- **Overview:** A brief description of the wetland, summarizing the principal physical and ecological features and highlighting the main conservation values.
- **Physical features:** A brief description of the principal physical features of the site, including information on hydrology, soil type and chemistry, water quality, depth, fluctuations and permanence, as well as a note on climatic conditions.
- **Ecological features:** A brief description of the main habitats and vegetation types present, with information on the dominant plant communities and species present.
- **Land tenure:** Details of the ownership of the wetland and the ownership of surrounding areas.
- **Noteworthy fauna:** The importance of the wetland for wildlife including aquatic mammals, waterbirds, aquatic reptiles, amphibians, fishes and invertebrates.
- **Noteworthy flora:** Information on any plant species or communities for which the wetland is particularly important.
- **Land use:** Details of the principal forms of land use and human activities at the wetland and in surrounding areas.
- **Possible changes in land use:** Any information available on proposed changes in land use and development plans which might affect the ecological character of the wetland.
- **Hydrological and biophysical values:** Information on the principal hydrological and biophysical values of the wetland.
- **Social and cultural values:** Information on the principal social and cultural values of the wetland.
- **Scientific research and monitoring:** Information on major research activities at the wetland and any ongoing monitoring activities.

- **Conservation education:** Information on any existing programmes and facilities for conservation education and training.
- **Recreation and tourism:** Information on the present and potential use of the wetland for recreation and tourism.
- **Conservation measures taken:** Details of any protected areas established at or around the wetland, and any other conservation measures taken at the site.
- **Conservation measures proposed:** Details of any proposals for the conservation of the wetland.
- **Disturbances and threats:** Details of existing and possible future threats to the wetland and its wildlife.
- **Management authority and jurisdiction:** Details of the authority responsible for the conservation and management of the wetland, and the authority or authorities with territorial and functional jurisdiction over the wetland.
- **References:** Abbreviated references to published literature, unpublished reports and expert personal communications relevant to the site.

### ***Gathering of data***

The data for each wetland was gathered through the review of secondary information (published papers, unpublished reports etc.) spanning the past two decades. The information was also supplemented with rapid field assessments conducted in most of the sites selected for the information base, and also through personal observations made by a few researchers.

### ***Preparation of maps***

The topographical maps of wetlands obtained from the Survey Department were digitized by the mapping specialists attached to CEA and IWMI. These were further refined and subjected to ground-truthing, to verify habitats, vegetation and land-use types. Each wetland site in the directory would include two GIS maps; a broader land cover map, and a specific site map depicting wetland types and habitats according to Ramsar definition and classification of wetlands.

### ***Constraints***

The ongoing conflict in the Northern and Eastern parts of the country was a major constraint for rapid assessment of wetlands in these areas. Most wetlands, especially in the Northern province, could not be accessed due to security reasons. Several wetlands especially in the Northern province lacked recent secondary data, and these include the Morawewa tank, Iranamadu tank, Rajangane reservoir, Kokilai and Nayar lagoons, Delft island, Chalai and Chundikulam lagoons, Uppar lagoon, Thondamannar lagoon, Adams bridge, Ullakkali lagoon, Vandaloo bay, and Thennady bay. Therefore, the above wetlands do not carry an information sheet in the current directory. Inconsistencies in some of the information sheets are related to inadequate data.

### ***List of wetlands and their current status***

The list of wetland sites included in this directory, the administrative districts they belong to, and their current threatened status is presented below. Each wetland has been assigned an overall threat status (high, moderate or low), based on the magnitude of the current disturbances and threats, and pressures related to development activities. Those that have been assigned a HIGH overall threat status require urgent actions to address and mitigate existing disturbances and threats.

<b>Site</b>	<b>District</b>	<b>Overall Threat Status</b>
Anaiwilundawa tank sanctuary	Puttalam	Moderate
Arugam lagoon	Ampara	Moderate
Bar reef	Puttalam and Mannar	Moderate
Batticaloa estuary	Batticaloa	Moderate
Bellanwila-Attidiya marshes	Colombo	High
Bentota estuary	Kalutara and Galle	Moderate
Bolgoda wetlands	Kalutara	High
Bundala National Park	Hambantota	Moderate
Colombo flood detention areas	Colombo	High
Giant's tank	Mannar	Low
Gregory's lake	Nuwara Eliya	High
Gulf of Mannar reefs	Puttalam and Mannar	Moderate
Hikkaduwa National Park	Galle	High
Horton Plains National Park	Nuwara Eliya	Low
Inginimitiya reservoir	Puttalam and Kurunegala	Low
Jaffna lagoon	Jaffna	Moderate
Kahandamodara mangrove	Hambantota	Moderate
Kalaoya estuary	Puttalam	Low
Kalawewa tank	Anuradhapura	Low
Kantale tank	Trincomalee	Low
Kaudulla tank	Polonnaruwa	Low
Koggala lagoon	Galle	High
Kotmale reservoir	Kandy and Nuwara Eliya	Moderate
Lahugala and Kitulana tank	Ampara	Low
Lunama-Kalametiya lagoons	Hambantota	High
Lunugamvehera reservoir	Moneragala and Hambantota	Moderate
Maduganga estuary	Galle	Moderate
Reservoirs of Maduruoya National Park	Ampara, Badulla and Polonnaruwa	Low
Maha and Karagan lewaya	Hambantota	High
Mahaweli flood plains	Trincomalee and Polonnaruwa	High
Minneriya reservoir	Polonnaruwa	Low
Mundel lake	Puttalam	High
Muthurajawela marshes	Gampaha	High
Nachchaduwa tank	Anuradhapura	Moderate
Negombo estuary	Gampaha	High
Nuwarawewa tank	Anuradhapura	Moderate
Padaviya tank	Anuradhapura	Low
Palatupana lagoon	Hambantota	Low
Palk bay and Vidattaitivu lagoon	Mannar, Kilinochchi and Jaffna	Moderate
Parakrama samudraya	Polonnaruwa	Moderate
Pasikudah-Kalkudah reef	Batticaloa	Moderate
Periyakarachchi and Sinnakarachchi lagoons	Trincomalee	Moderate

<b>Site</b>	<b>District</b>	<b>Overall Threat Status</b>
Pigeon island National Park	Trincomalee	Moderate
Polhena reef	Matara	High
Pottuvil lagoon	Ampara	Moderate
Puttalam estuary	Puttalam	High
Rekawa lagoon	Hambantota	Moderate
Ruhuna National Park	Moneragala and Hambantota	Low
Rumassala Marine Sanctuary	Galle	High
Senanayake samudraya	Moneragala and Ampara	Low
Tabbowa tank	Puttalam	Low
Thalangama tank	Colombo	Moderate
Udawalawe reservoir	Ratnapura and Moneragala	Low
Unawatuna reef	Galle	High
Vankalai triangle	Mannar	Low
Victoria Randenigala Rantambe reservoirs	Kandy, Nuwara Eliya and Badulla	Moderate
Wahalkada tank	Anuradhapura	Low
Walauwatta Wathurana swamp	Kalutara	High
Weerawila-Tissa-Debara-Yoda tanks	Hambantota	Moderate
Weligama reef	Matara	High
Wilpattu National Park	Puttalam and Anuradhapura	Low
Yala East National Park	Ampara	Low

# An Overview of the Wetlands of Sri Lanka and their Conservation Significance

S W Kotagama<sup>1</sup> and C N B Bambaradeniya<sup>2</sup>

<sup>1</sup>: Department of Zoology, Univ. of Colombo, <sup>2</sup>: The World Conservation Union (IUCN)

## Introduction

In the past, wetlands were considered as wastelands that could be reclaimed or changed for use by mankind. Development initiatives have regarded these areas suited only for such purposes, and as a consequence, many wetlands have been drained or used as dump sites for refuse and urban waste. With increasing knowledge however, we have come to understand that wetlands are amongst the world's most valuable and vulnerable environments on which a variety of plants, animals and human communities depend.

Initially, interest in wetlands centred on naturalists and waterfowl hunters, but today, a growing section of society has become aware of the benefits to be accrued from both marine and freshwater wetlands. Gradually, it is being recognized that, by using and maintaining wetlands in a sensible way, other sectors, such as agriculture, flood control, water purification, fisheries and recreation could be significantly improved.

In Sri Lanka, the conservation of wetlands has been vested mostly with the wildlife sector as reflected by the Fauna and Flora Protection Ordinance of 1938 and its amendments. However, for a number of reasons due recognition for the importance of conserving wetlands in the country has not effectively come off the ground until recently.

## What are wetlands?

Wetlands are simply habitats with permanent or temporary accumulation of water with associated floral and faunal communities. Interest in wetlands initially revolved around exploitation of the associated natural resources, mainly through waterfowl hunting. These interests resulted in the Convention on Wetlands, referred to as the Ramsar Convention – an intergovernmental framework for wetland conservation, being adopted in 1971. At this historic meeting held in Ramsar, Iran, a consensus evolved on a broad definition for wetlands. Designed to provide international protection to the widest possible group of wetland ecosystems, the Ramsar convention has defined wetlands as follows:

*“Areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.”*

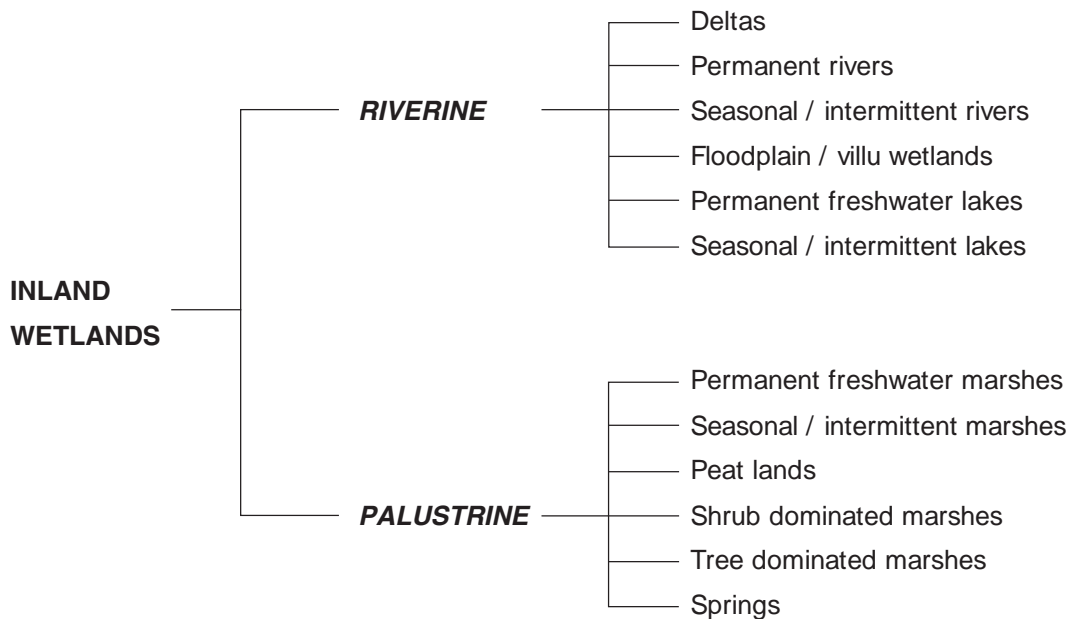
The wetlands of Sri Lanka, which fit into the Ramsar definition, can be divided into three broad categories:

- Inland natural fresh water wetlands (e.g. rivers, stream, marshes, swamp forests and *villus*)
- Marine and salt water wetlands (e.g. lagoons, estuaries, mangroves, sea grass beds, and coral reefs)
- Man-made wetlands (e.g. tanks, reservoirs, rice fields and salterns)

A short description of major wetland types in Sri Lanka, divided into four major groups and twelve types based on Samarakoon and Renken (1999) and Bambaradeniya (2004), is given below:

## 1. Inland natural fresh water wetlands

This group includes the 103 river systems, the numerous lakes or *wewas*, marshes etc.



### FRESH WATER INLAND WETLAND TYPES

Some of the major types are described below:-

**Streams and rivers:** Sri Lanka has an extensive network of rivers and streams that drains a total of 103 distinct natural river basins. In terms of length, these flowing water bodies cover more than 4500 km. Mahaweli, Walawe and Kelani rivers originate from the central highlands and flow through all three peneplains of the island. The river basins originating in the wet highlands are perennial while many of those in the dry zone are seasonal. The Mahaweli river accounts for the largest basin, covering 16% of the island and thereby has a high socio-economic and ecological value. The streams and rivers that flow through the high and mid altitude areas of the island have resulted in several water fall habitats.

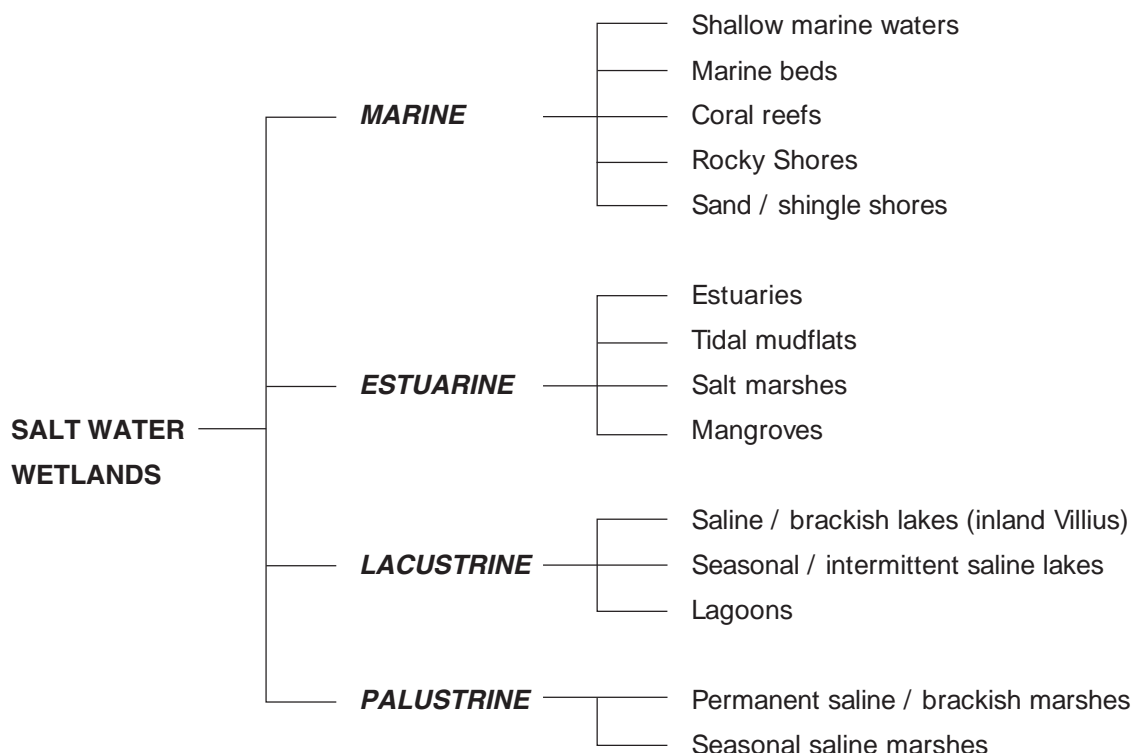
**The “Villu” wetlands:** Although there are no large natural lakes in Sri Lanka, there are several flood-plain lakes, commonly referred to as “Villus”, which cover a total area of 12500 ha. Often they are cut-off former river bends. Many of the larger “Villus” are located in the Mahaweli floodplain in the East. A typical example is the inter-connected Handapan and Pendiya Villus (796 ha), which is the largest in the entire Mahaweli Villu system.

**Fresh water Marshes:** These are shallow inland depressions located mainly in rural areas either connected to a river or receiving water through surface run-off river floodwater and ground water seepage. Partially decomposed organic material in such marshes form peat, characterized by water logged sticky soil. A typical example is the Muthurajawela Marsh which is the largest peat bog in Sri Lanka.

**Fresh water Swamp Forest:** This is a late successional stage of a freshwater marsh ecosystem, comprising of trees that are adapted to grow in shallow stagnant water. Swamp forests are seasonally inundated with river water. It is the rarest wetland type in Sri Lanka and a good example is the Walauwa-Watta Wathurana Swamp Forest (12 ha) located in the Kalu river basin.

## 2. Salt water wetlands

Consisting mainly of four groups and fourteen types. Most of these are located along the coastal belt. The only exception is the set of salt water bearing Villus in Wilpattu.



### SALT WATER/ BRACKISH WETLANDS

Some of the major types are described below:-

**Estuaries and Mangroves:** These are inter-connected coastal wetland types. Estuaries are formed in places where rivers enter the sea. The daily tidal fluctuation and the intermediate salinity between salt and freshwater (commonly termed “brackish water”) are main characteristics of this ecosystem. There are about 45 estuaries in Sri Lanka. The mangroves comprise very diverse plant communities that are adapted to grow in unstable conditions of estuarine habitat. The mangroves are a rapidly diminishing wetland type in Sri Lanka, consisting of less than 10,000 ha of discontinuously distributed patches along the coastline. Typical example of estuaries with mangrove wetlands in Sri Lanka includes Maduganga estuary, Bentota estuary and Kalaoya estuary. The latter is the largest mangrove in Sri Lanka.

**Lagoons:** These are salt or brackish water coastal wetlands separated from the sea by a low sand bank with one or more relatively narrow permanent or seasonal outlets to the sea. These can also harbour other coastal wetland types such as mangroves, mud flats and sea grass beds. About 42 lagoons are found around the coast in Sri Lanka. Examples include the Bundala Lagoon, Mundel Lake, and Kalametiya Lagoon

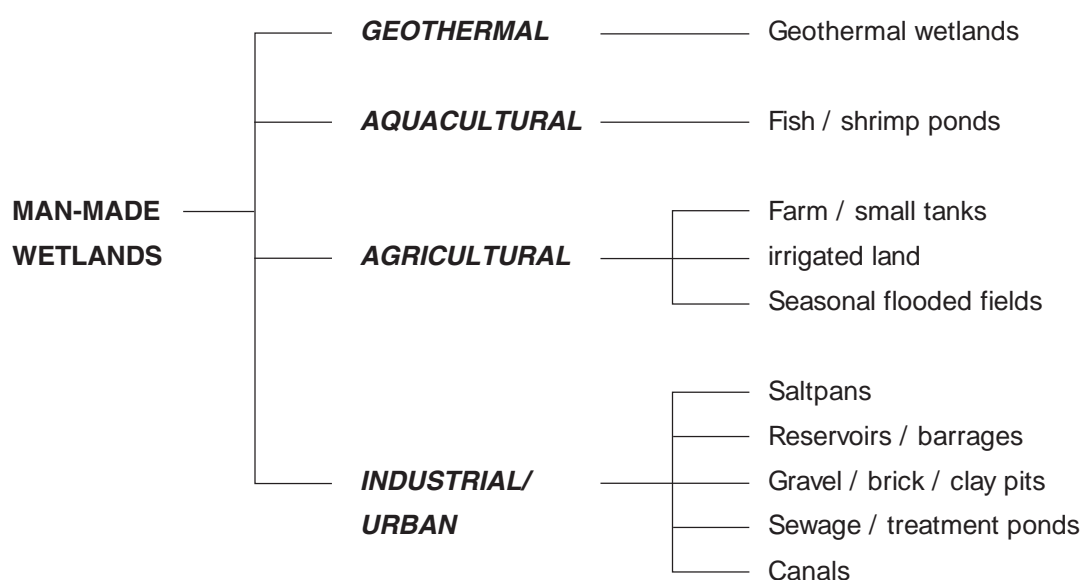
**Coral reefs and Sea grass beds:** These are two important sub-tidal marine wetlands (below 6 m in depth) in Sri Lanka. Coral reefs consist of calcareous structures secreted by a group of marine invertebrates. Coral reefs are famous for their spectacular beauty. The rich biological diversity of coral reefs could be compared to that of a tropical rainforest. Extensive coral reef habitats can be found in the Gulf of Mannar region, Trincomalee to Kalmunai in the east coast and in several areas of the south and south-western coast, including Rumassala and Hikkaduwa.

Sea grass beds are composed of rooted, seed bearing marine plants. These are found in shallow, sheltered marine waters, as well as in lagoons and estuaries. Most extensive sea grass beds are present in the northwest coastal waters of Sri Lanka (eg. Kalpitiya to Mannar).

**Inland Salt Villus:** Salt water containing Villus within the Wilpattu National Park is a unique ecosystem, which appears as shallow lakes (referred to as 'vila') in sandy soils.

### 3. Man-made wetlands

Consist of three groups and nine different wetland types. With a unique and ancient hydrological civilization, the country is dotted with a large number of man-made water bodies referred to as "wewas". It is said that Sri Lanka probably has the highest number of man-made water bodies in the world with an estimated total of more than 10,000 wewas countrywide. Linked to these tanks are many kilometers of canal systems, thousands of hectares of paddy fields.



#### MAN-MADE WETLANDS

Some of the major types are described below:-

**Tanks and Reservoirs:** Although there are no natural lakes in Sri Lanka, an array of ancient irrigation tanks has substituted the former wetland type. Numbering nearly 10,000, these man-made wetlands depict the rich cultural heritage of Sri Lanka. The major irrigation reservoirs (each more than 200 ha) cover an area of 7820 ha, while the seasonal/minor irrigation tanks (each less than 200 ha) account for 52250 ha. Typical ancient irrigation tanks include the Parakrama Samudraya and the Minneriya tank.

**Rice Fields:** Rice fields are characterized by the presence of a standing water body, which is temporary and seasonal. Hence, flooded rice fields can be considered agronomically managed marshes. They are temporary and seasonal aquatic habitats, managed with a variable degree of intensity. The total area under rice cultivation at present is about 780,000 ha (approximately 12% of the total land area), which is distributed over all the agro-ecological regions except for areas located at very high elevation. Approximately 75% of rice lands in Sri Lanka are located within inland valley systems of varying form and size while the rest are found in alluvial plains and also on terraced uplands in the interior.



## Significance of Wetlands in Sri Lanka

All wetlands comprise of a combination of soils, water, plants and animals. The interplay between these elements allow wetlands to perform several functions that are beneficial to humankind, while generating healthy wildlife, fisheries and forest resources. The combination of these functions, together with the rich biological diversity and cultural heritage of wetlands makes these ecosystems invaluable to people all over the world. The loss of wetlands results in the loss of these benefits, leading to harmful consequences on human welfare and to the extinction of species that are ecologically dependant on wetlands. The importance of wetlands can be elaborated under three major categories; **uses, functions and attributes**.

**Wetland Uses:** *Uses are direct economic benefits gained by people through exploitation of wetland resources. Major wetland uses are highlighted in Table 1.*

**Table 1: Major wetland uses in Sri Lanka**

Uses/Products	Examples from Sri Lanka	Wetlands exploited
Water supply and transportation a) For domestic supply b) For irrigation	Labugama, Kalatuwawa Minneriya tank, Mahaweli river	Rivers, Streams, Tanks, Reservoirs
Agricultural products for human consumption	Rice, Leafy vegetables	Rice fields, Marshes, Tanks
Medicinal herbs	“Lunuwarana” ( <i>Bacopa moneri</i> ); Neeramulliya ( <i>Hygrophylla shulli</i> )	Marshes
Raw material for handicrafts and mats	“ Kaduru” ( <i>Cerbera mangas</i> ) wood for masks, Pandanus leaves	Marshes, Mangroves
Hydro-electricity	Victoria, Randenigala and Rantambe reservoirs	Waterfalls, Reservoirs
Fish and crustaceans for consumption	Edible freshwater and brackish water fish and crustacean species	Rivers, Tanks, Reservoirs, Lagoons, Estuaries
Fish and plants of ornamental value	Black Ruby Barb, Cherry Barb, <i>Cryptocoryne</i> spp., <i>Aponogeton</i> spp.	Streams, Marshes,
Material for religious ceremonies/offerings	Nelum/Olu/Manel flowers	Marshes, Ponds
Salt	Hambantota lagoon	Salterns
Recreation/tourism	Bundala wetlands	Tanks, Lagoons, Waterfalls

**Wetland Functions:** *These are benefits of wetlands that support or protect human activity. Major wetland functions are summarized in Table 2.*

**Table 2: Major wetland functions**

<b>Major Functions</b>	<b>Contributory Wetlands</b>
Mitigation of floods	Marshes, Tanks, Rice fields
Protection from storms/Prevention of coastal erosion	Mangroves, Coral reefs
Retention of sediments	Mangroves, Coastal marshes
Purification of water/Removal of toxic compounds	Marshes
Carbon Sink	Marshes
Breeding habitats of edible fish	Mangroves, Marshes, Sea grass beds

**Wetland Attributes:** *These are benefits to a country that do not provide direct economic benefits. Two important wetland attributes include sustenance of a rich biological diversity and cultural heritage.*

The biodiversity of wetlands in Sri Lanka is clearly characterized by the rich array of wetland ecosystem/habitat types and the higher number of animal and plant species that they harbor. For example, amongst the total inland vertebrate species in Sri Lanka, about 30% are ecologically dependent on wetlands. Among the migratory birds that visit Sri Lanka annually, more than 50% are directly dependent on wetlands for food and shelter. Furthermore, the future survival of approximately 32% of the nationally threatened vertebrate faunal species in Sri Lanka is dependent on wetland ecosystems of the island.

In Sri Lanka, wetlands such as rivers and floodplains have been the cradle of historic civilizations. The man-made wetlands in Sri Lanka, especially the ancient irrigation tanks and rice fields, clearly highlight the rich cultural heritage associated with wetlands. It is generally believed that Indo-Aryan immigrants started rice cultivation in Sri Lanka more than 2500 years ago. This was a period at which a settled civilization developed in the dry zone and an elaborate irrigation system was established for rice cultivation. The earliest reference to the establishment of tanks to conserve water for irrigation of rice in Sri Lanka was about 420 BC. Considering the size of these tanks and the network of neatly built sluices/canals, the technology of our ancestral irrigation engineers is truly astonishing.

### **Threats to Wetlands in Sri Lanka**

A majority of the wetlands in Sri Lanka are facing various threats that are posed by harmful human activities. An analysis of the identified threats pertaining to the wetlands listed for Sri Lanka in the Directory of Asian Wetlands (Scott, 1989) brings out some very interesting information. The most frequently reported threat appears to be **siltation**. It should be realized that this is usually not caused by factors in the wetland itself but by actions on lands adjacent or away from the wetland.

The development of aquaculture poses serious threats to wetlands. Since the white spot attack, the rate of conversion has changed to a situation where most ponds been abandoned, thus leaving many desolate areas. The future threat of conversion still looms due to the high price of shrimp.

The present broad threats can be summarized under four major categories; habitat deterioration/degradation, direct loss/exploitation of species, spread of invasive alien species and natural phenomena.

**Habitat deterioration/degradation:** Several factors have resulted in the deterioration and degradation of the quality of wetlands, which are highlighted in Table 3.

**Table 3: Causes of habitat deterioration/degradation and resultant impacts**

Contributory Factors	Impacts	Affected wetlands
Reclamation	Loss of wetlands and their biodiversity	Urban Marshes (eg. Bellanwila-Attidiya, Muthurajawela)
Clearing of vegetation	Loss of habitats and species	Mangroves (eg. Mangroves in the Coastal areas of the Puttalam District)
Water pollution <ul style="list-style-type: none"> <li>• Organic pollution</li> <li>• Other Chemical effluents</li> <li>• Sewage disposal</li> </ul>	Loss of species Loss of species, Harmful effects on humans Eutrophication, Spread of harmful diseases	Marshes (eg. Muthurajawela) Rivers (eg. Kelani river) Tanks, Marshes, Estuaries (eg. Parakrama Samudraya, Beira lake)
Garbage disposal	Eutrophication, Spread of harmful diseases	Marshes (eg. Muthurajawela, Bellanwila-Attidiya)
Regulation of water flow (Dams)	Gradual disappearance of lowland wetlands	Villu ecosystems in the Mahaweli Floodplain
Unplanned irrigation structures	Changes in water quality	Coastal lagoons (eg. Kalametiya, Malala)
Mining (Sand/coral)	Loss of habitats and species	Rivers, Coral reefs

**Direct loss/exploitation of species:** Overexploitation of wetland plants and animals has resulted in several species facing the risk of extinction. Factors that contribute to direct loss/exploitation of species are highlighted in Table 4.

**Table 4: Causes of species loss/exploitation and their effects**

Contributory Factors	Impacts	Affected Species
Poaching (for consumption)	Reduction of population of targeted birds and mammals	Waterfowl (Ducks and Teals), Otter
Ornamental fish trade	Reduction of local fish	Black Ruby Barb, Cherry Barb, Mono etc.
Ornamental plant Trade	Reduction of aquatic plant population and loss of habitats for aquatic animals	<i>Cryptocoryne</i> spp., <i>Aponogeton</i> spp.
Water Pollution	Reduction of aquatic animals, adverse effects on human health	Fish, Amphibians, Piscivorous birds, Otter

**Spread of invasive alien species (IAS):** Introduction of several exotic aquatic animal and plant species that have eventually escaped into wild habitats are posing a serious threat to native aquatic biodiversity. Observations made during the past five years have enabled to document 10 species of invasive alien fauna (8 species of fish, one turtle and one aquatic mollusc) and 12 species of invasive alien flora spreading in different wetland ecosystems throughout Sri Lanka (Bambaradeniya, 2002). Among them, 4 species of fauna (Tilapia - *Oreochromis mossambicus*, Walking catfish - *Clarias batrachus*, Rainbow Trout - *Oncorhynchus mykiss* and Mosquito fish - *Gambusia affinis*) and two species of flora (Water Hyacinth -

*Eichhornia crassipes* and Giant Mimosa - *Mimosa pigra*) are included in the list of the world's 100 worst invasive alien species. The ornamental fish trade has been the sole contributory factor to the introduction of invasive alien aquatic species into Sri Lanka. The major impacts of IAS are summarized in Table 5.

**Table 5: Impacts of invasive alien species on wetlands in Sri Lanka**

Impacts of IAS	Example of Invasive species	Affected native wetland species / ecosystems
Direct exploitation or destruction of native species	Predatory species: Rainbow Trout ( <i>Oncorhynchus mykiss</i> ), Clown-knife Fish ( <i>Chitala ornata</i> ), Walking Catfish ( <i>Clarias batrachus</i> ), Red-eared Slider Turtle ( <i>Trachemys scripta</i> )	Endemic freshwater fish
Superior competitors for resources	Tilapia ( <i>Oreochromis mossambicus</i> ), Water Hyacinth ( <i>Eichhornia crassipes</i> ), Pond Apple ( <i>Annona glabra</i> ) and 'Diyapara' ( <i>Wormia suffruticosa</i> )	Native aquatic fish and plants; lowland floodplains and irrigation tanks
Deterioration of the quality of wetlands	Salvinia ( <i>Salvinia molesta</i> ), Water Hyacinth ( <i>Eichhornia crassipes</i> )	Tanks, Marshes, Estuaries
Agricultural	Apple Snail ( <i>Pomacea</i> spp.), Water pests/weeds Hyacinth ( <i>Eichhornia crassipes</i> ), Salvinia ( <i>Salvinia molesta</i> )	Rice fields, Tanks, Irrigation canals

**Natural Phenomena:** Wetlands are threatened by natural phenomena as well. For instance, the recent prolonged drought in the Hambantota area resulted in the drying off of several tanks, streams, salt marshes and lagoons, causing death to several wetland animal species. The rise of seawater temperature (due to climate change) resulted in the bleaching of coral reefs, especially in the southwestern part of Sri Lanka. For example, the Hikkaduwa Coral Reef, which was once a rich habitat, is now virtually a dead reef (Rajasuriya *et al.*, 2000). The December 2004 Tsunami also resulted in the degradation of coastal wetlands such as mangrove, lagoons and estuaries.

### Conservation of wetlands in Sri Lanka

Interest in conservation of wetlands can be traced back in the recent history to the late nineteenth century. Around 1897, enactments to protect the coastal belt systems were promulgated. The Fauna and Flora Protection Ordinance of 1937 can be considered as a major step in wetland conservation. Using this legislation, wetlands of importance to birds have been declared by the Department of Wildlife Conservation as sanctuaries and other protected areas. The ordinance has also provided protection to fauna in the immediate limits of any water body.

Sri Lanka signed the RAMSAR Convention in 1971, but ratified it only in 1990. But interest in wetlands had remained high in the countries conservation agenda, as preliminary inventories of wetlands were produced in 1982 (Hoffmann 1982).

In 1984, Sri Lanka hosted the regional meeting of the International Council of Bird Protection- Asian Continental Section. The main theme of the meeting was wetland conservation. As a gesture the government committed to ratify the Ramsar convention, but action was initiated in this regard only in 1990. The discussion laid the foundation for the preparation of the Asian Wetland Directory, which was published in 1989.

By 1986, the interests on wetlands picked up with four workshops held by the National Aquatic Resources Agency (NARA), Natural Resources, Energy and Science Authority (NARESA) and the Coast Conservation Department (CCD).

Interest in the development of the Muthurajawela Marsh was a major activity which led to a comprehensive study of the marsh and the preparation of an ecological profile and a management plan. This was the first ever attempt to develop any wetland on the basis of “wise use” criteria. The report was published in 1992.

Since 1987, it was recognized that wetlands were falling under the responsibility of numerous agencies and as such the need to introduce coordination was recognized. Accordingly by 1989, an interim Wetland Steering Committee was established by the Central Environmental Authority. This action received Cabinet approval in 1990. Efforts to prepare a wetland Commission, legislation and policy were mooted through this Steering Committee.

The Wetland Conservation Project of the Central Environmental Authority resulted in the preparation of numerous wetland site reports, management plans, guiding texts and the consolidation of the wetland division of the CEA. Concurrent strengthening of implementation agencies however did not go in parallel and thus there is a gap between planning and implementation of conservation actions.

Since the ratification of the Ramsar Convention in 1990 with the entry of Bundala Sanctuary (presently National Park), Sri Lanka has included and declared two other Ramsar wetland sites; the Anaiwilundawa ancient cascading tank system and the Maduganga estuary and mangrove ecosystem. Several wetlands fall within existing protected areas (Table 06). The government of Sri Lanka has already drafted a National Wetland Policy to enhance the conservation of wetlands, and an institutional mechanism has been established to coordinate wetland conservation activities. The latter mechanism includes the revival of the National Wetlands Steering Committee, while a wetland management unit has been established under the Central Environmental Authority. A digital database on wetlands is currently being prepared, through a collaborative project between the Central Environmental Authority, the World Conservation Union (IUCN) and the International Water Management Institute (IWMI).

At present, there are several government and non-government organizations involved in wetland conservation and management related activities in Sri Lanka. In addition, several researchers attached to national universities and private research institutions are involved in wetland related research activities.

**Table 6: Protected wetlands in Sri Lanka (under Department of Wildlife Conservation)**

<b>Wetland Types</b>	<b>Protected Area</b>
Highland streams	Peak Wilderness Sanctuary, Horton Plains National Park
Freshwater / salt Villu	Wilpattu National Park; Floodplain National Park, Yala NP
Freshwater Marsh	Bellanwila-Attidiya Sanctuary, Muthurajawela Marsh, Sri J'Pura-Kotte Marsh Sanctuary.
Ancient Irrigation Tanks	Anaiwilundawa Sanctuary, Minneriya National Park; Kaudulla National Park; Giants Tank Sanctuary: Tabbowa Sanctuary
Reservoirs	VRR Sanctuary; Maduruoya National Park
Lagoons	Bundala National Park, Yala National Park
Mangrove	Wilpattu National Park; Kalametiya Sanctuary
Coral Reefs	Pigeon Islands Sanctuary; Hikkaduwa National Park; Rumassala Sanctuary; Bar reef sanctuary

Amidst these conservation initiatives, majority of the inland freshwater wetlands in Sri Lanka are under threat due to adverse anthropogenic activities. The present development activities that have been planned for economic growth of the country exert further pressure on existing wetlands, especially on marshes in low-lying urban/sub-urban areas. Therefore, the future sustenance of inland wetlands and their biological resources within the context of increasing allocation of wetland and water resources for a growing human population is a challenge that needs to be addressed wisely. Conservation biologists and environmentalists will have to work in close collaboration with development planners and policy makers, in order to find viable solutions to the above challenges that would play a decisive role in the future conservation of inland freshwater wetlands in Sri Lanka.

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- Scott DA (1989) *A Directory of Asian Wetlands*, The World Conservation Union (IUCN), Cambridge, UK.



# Wetland Types



1. Coral Reef  
© Nishan Perera



2. Lagoon  
© Virukshi Weerasinga



3. Estuary  
© IUCN



4. Waterfall  
Nashin Perera © IUCN



5. Mangroves  
Nashin Perera © IUCN



6. Marsh  
© IUCN



7. River  
© Nalin Perera



8. Tank  
© Virukki Weerasinge



9. Reservoir  
© Nishan Perera



10. Stream  
© Nalin Perera



11. Swamp Forest  
© IUCN



12. Rice Field  
Nalin Perera © IUCN



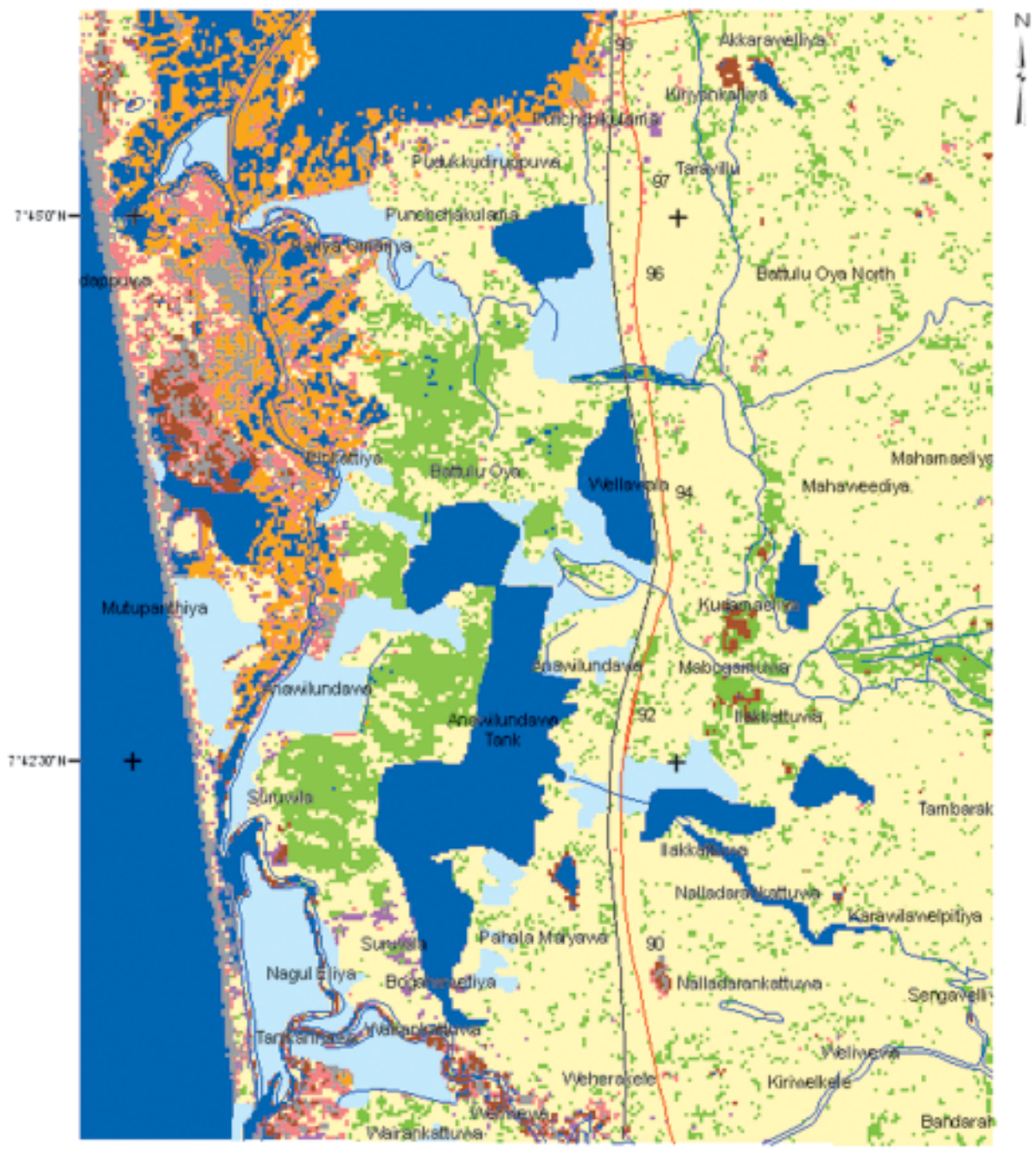
13. Villu  
© Charma Bambaradeniya



14. Salt marsh  
© Charma Bambaradeniya



# Anaiwilundawa Tank Sanctuary



Source: LandsatETM+ 15 December 2000  
 Ground Truthing - December 2005  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Anaiwilundawa Tank Sanctuary

## Location:

7° 45' 0 N and 79° 47' 0 E to 7° 42' 0 N and 79° 59' 0 E; 856852 N and 365834 E to 851308 N and 371333 E; 15 km North of Chilaw, in the Puttalam District of the North-western Province.

## Area:

Total area is 1,397 ha while the tank area is 188 ha.

## Altitude:

0 – 1 m

## Overview:

An ancient system of seven cascading tanks dating back to the 12<sup>th</sup> century; the site is a unique wetland in the Indian Ocean. The tanks range between 12-50 ha in size and are surrounded by traditional rice fields, scrubland, homesteads, coconut plantations and aquaculture farms. Based upon its unique biodiversity, cultural heritage and functional values, the Anaiwilundawa Sanctuary was declared a Ramsar site in 2001. In addition, BirdLife International recognises this site as an IBA.

## Physical features:

The tanks, which are less than 4m deep, vary in size between 12-50 ha, totalling an area of approximately 188 ha. The seven tanks are separated from each other by low earthen bunds, which are now largely overgrown. The tanks sustain about 412 ha of traditional paddy fields, which are interspersed with islets of natural vegetation. Underlain by crystalline rocks of Precambrian age, the tanks are covered by Quaternary deposits that include sand dunes, clay, silt and red earth. The wetland complex sits on the side of an ancient lagoon that formed behind a barrier beach. Climatically, the area is located in the Dry Zone, receiving 1000-1500mm of rainfall annually. Mean annual temperature is approximately 26°C. The major water supplies are derived from the surface runoff from the Rathambala Oya basin (215 km<sup>2</sup>) and spill water from the Katupotha tank located upstream.

## Ecological features:

Major wetland habitat types include fresh water wetlands (cascading tanks, rivers, irrigation canals, marshes, paddy lands), salt-water wetlands (mangroves, salt marshes and maritime grasslands, brackish water canals, beach and sea shore vegetation) and seasonally inundated vegetation mosaics around tank fringes. Some of the tanks in the cascade dry out completely during the dry season. A series of distinctive plant assemblages occur in the mosaic of tanks, which are influenced by salinity level, biological impacts, water level fluctuations, depth and other ecological parameters. The lentic zone of a tank in the cascade includes open areas, areas covered with floating macrophytes (native species such as *Nelumbo nucifera* and *Nymphaea pubescens*, and exotics such as *Eichhornia crassipes*) and areas with a mixture of submerged, rooted and floating vegetation (consisting of *Nymphaea pubescens*, *Utricularia* sp., *Ceratophyllum demersum*, *Polygonum* spp., and *Ludwigia adscendens*). The peripheral belt of tanks consists of seasonally flooded grasslands with short grass species such as *Cynodon dactylon*, and sedges such as *Cyperus* spp., with *Fimbristylis* spp. being common.



A total of 290 plant species (24 aquatic plants, 120 woody plants, 61 shrub, 49 herbaceous, 34 climbers) and 281 vertebrate species (47 fish, 11 amphibians, 34 reptiles, 168 birds, 21 mammals) have been recorded from the habitats associated with this wetland.

**Noteworthy fauna:**

Among the vertebrate species recorded, 10 are endemic (3 fish, 1 amphibian, 3 reptiles, 2 birds, and 1 mammal) while 21 are nationally threatened (2 fish, 1 amphibian, 6 reptiles, 8 birds and 4 mammals). The threatened and/or locally declining vertebrates include several wetland dependent species (Fish - *Esomus thermoicos*, *Clarias brachysoma*; Amphibians - *Rana gracilis*; Reptiles - *Lissemys punctata*, *Melanochelys trijuga*, *Crocodylus porosus*; Birds - *Pelecanus philippensis*, *Phalacrocorax carbo*, *Porzana fusca*, *Fulica atra*; Mammals - *Lutra lutra*, *Prionailurus viverrinus*). Among the bird species, there are 37 winter visitors, including several species of waders and waterfowl. Species of economic importance include fish (*Oreochromis mossambicus*, *O. niloticus*, *Anguilla bicolor*, *Channa* spp., *Etroplus* spp., *Mystus* spp.) and prawns (*Macrobrachium* spp., *Penaeus* spp.).

**Noteworthy flora:**

One endemic species (*Vernonia zeylanica*) and two nationally threatened species (*Aponogeton natans* and *Diospyros ebenum*) have been recorded from the site. The seasonally inundated vegetation mosaic found around the tank fringes is a unique habitat type associated with ancient irrigation tanks and is dominated by large trees such as *Terminalia arjuna*, *Diospyros malabarica* and *Vitex leucoxyton*. Mangrove species (*Avicennia marina*, *Lumnitzera racemosa*, *Rhizophora mucronata*) are noteworthy as this is a rapidly depleting vegetation type in the area. *Hydrophila spinosa* is a commonly used indigenous medicinal plant.

**Land use:**

Major types of land and wetland use include prawn farming, coconut and paddy cultivations and the building of homesteads.

**Possible changes in land use:**

Reclamation of tank beds for homesteads and coconut plantations, expansion of shrimp farms, extraction of clay from tank beds and unregulated cattle grazing.

**Hydrological and biophysical values:**

Anaiwilundawa is a rain fed tank system. Its main sources are surface run-offs from the Rathambala Oya basin with a catchment of 215 km<sup>2</sup>, and spill water from the Katupotha tank located upstream. The tanks store rainwater that is used for irrigation. In addition they play a major role in flood control, aquifer recharge, absorption or retention of pollutants or sediments, and nutrient export.

**Social and cultural values:**

Historical records indicate that this cascading tank system was established in the 12<sup>th</sup> century. The local communities in the area consist mainly of traditional farmers and fishermen, who have been involved in these livelihoods since historic times. Approximately 90% of the estimated 2,500 families in and around the sanctuary depend on agriculture, primarily paddy cultivation, using water from the tanks. The traditional fishing community carries out their activities in a sustainable manner, owing to the high productivity of this system.

**Scientific research and monitoring:**

At present, no facilities exist for research. However, regular monitoring of waterfowl is being conducted by the CBC.

**Conservation education:**

University students (both undergraduate and postgraduate) are taken to the site for field courses on wetland ecology.

**Recreation and tourism:**

Although few visitors (both local and foreign) visit the area, no planned activities exist at present.

**Conservation measures taken:**

The area was declared a sanctuary under the FFPO in 1997. In 1994, the CEA prepared a wetland site report and conservation management plan for this site.

**Conservation measures proposed:**

The wetland site report and conservation management plan prepared by the CEA and the biodiversity assessment conducted by IUCN made recommendations for the conservation and management of this site.

**Disturbances and threats:**

The site was a waterfowl hunter's paradise before it was declared as a Sanctuary. Although this has considerably reduced poaching, illegal hunting is still occasionally reported. The mangroves are being cleared for prawn culture, while several other woody plants especially in the seasonally inundated forests are exploited for domestic purposes. Spread of invasive alien aquatic plants such as *Eichhornia crassipes* and *Salvinia molesta* has resulted in the displacement of native floating plants and facilitates siltation of the tanks. Excessive use of chemical fertilizer and biocides in the cultivation of paddy and coconut is a further threat to the tank. Reclamation of tank beds for homesteads and coconut plantations, mining of clay from the tank beds, and unregulated cattle grazing are also issues of major concern.

**Land tenure:**

The wetlands (tanks and marshes) are state owned, while the surrounding terrestrial areas are privately owned.

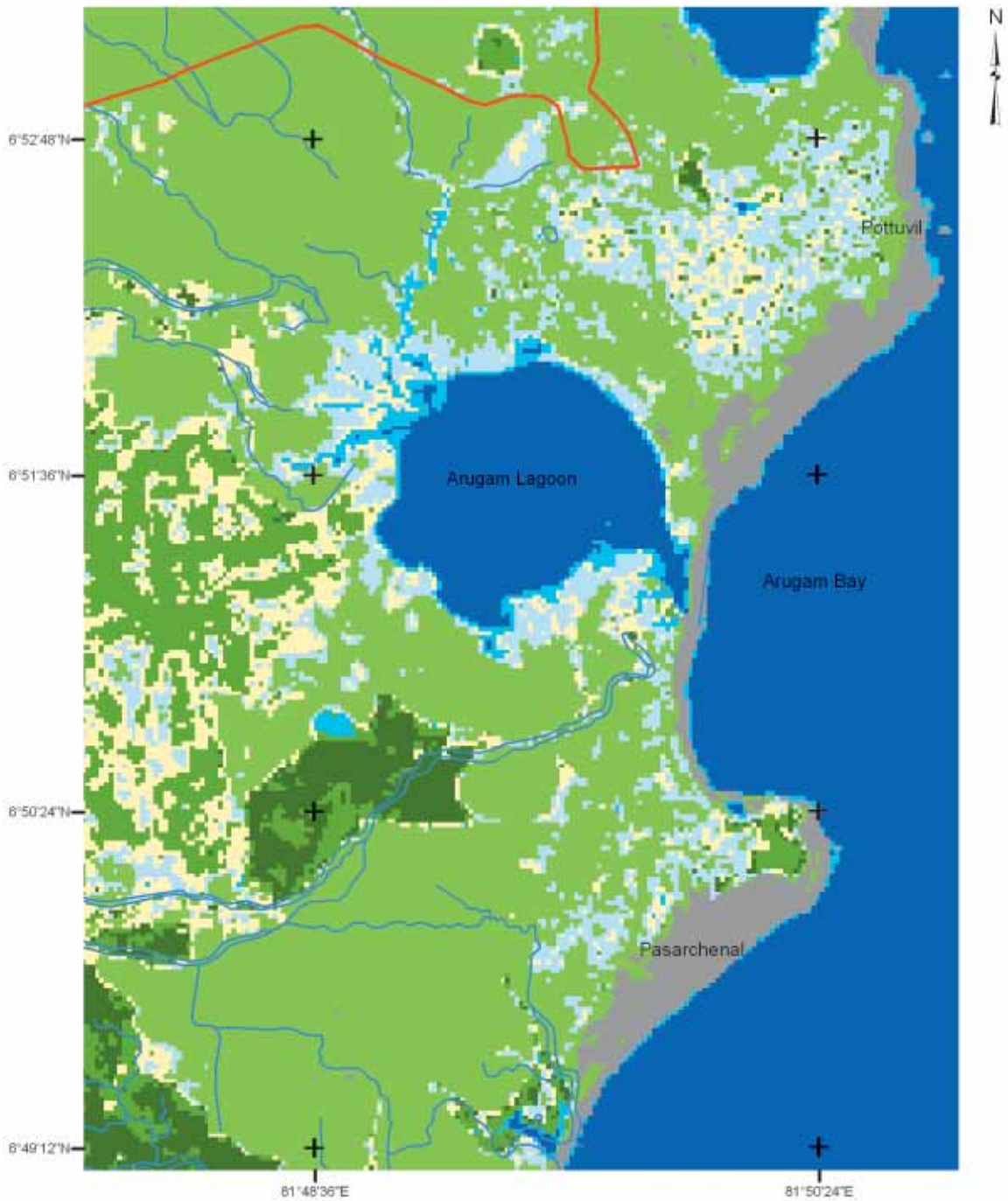
**Management authority and jurisdiction:**

This area is under the jurisdiction of the North-western Provincial Council and for conservation purposes, the DWC.











**References:**

CEA/ARCADIS Euroconsult (1994a); Perera et al. (2005); [www.ramsar.org](http://www.ramsar.org)

# Arugam Lagoon



### Legend

Land Cover	
	Water (deep)
	Water (shallow)
	Marshy land
	Sand
	Paddy land
	Natural vegetation (low dense)
	Natural vegetation (moderate dense)
	Natural vegetation (high dense)
	Main road
	Waterways

Source: Landsat ETM+ 26th July 2000  
 Ground Truthing - October 2004  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006










# Arugam Lagoon Wetlands based on Ramsar Classification



0 0.5 1 2 Kilometers

### Legend

#### Class Name

- |  |  |
|--|--|
|  Sea  |  Sand, shingle or pebble shores |
|  Coastal freshwater lagoons                                   |  Non-wetlands                   |
|  Water storage areas  |  Main road                      |
|  Irrigated land   |  Waterways                      |
|  Seasonal/intermittent saline/brackish/alkaline marshes/pools |  |

Source: Landsat ETM+ 26th July 2000  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Arugam Lagoon

## Location:

6° 57' 0 N and 81° 46' 15 E to 6° 50' 0 N and 81° 51' 30 E; 768290 N and 584691 E to 755407 N and 593920 E; 3km south of Pottuvil in the Ampara District, of the Eastern Province.

## Area:

300 ha

## Altitude:

Sea level

## Overview:

Arugam Kalpuwa is a shallow, brackish water lagoon with some fringing mangroves and extensive marshy areas to the north. It is an important habitat for large numbers of water birds, and the lagoon is also important for prawn fisheries. Surrounding areas also have extensive rice fields. The area is a popular tourist destination, and is well known among surfers for the waves off the nearby beaches. Pollution, unplanned development and sand mining are threatening the lagoon and adjacent natural ecosystems.

## Physical features:

The lagoon is located in Arugam Bay, and the coastline in the area contains sand dunes, headlands and broad barrier beaches. It is connected to the sea by a narrow channel and is seasonally tidal. Much of the area has been altered for human use, either for agriculture, human settlements, or tourism development. Arugam Bay is situated in the low country dry zone, where the temperature can vary from 18°C on rainy nights to 38°C during the day in drier months, with a mean average annual temperature of 27.4°C. The area receives about 700 – 1,700 mm of rainfall per year with 60% falling during the northeast monsoons between October to February. Most of the province has a dry spell of three months with fairly dry conditions prevailing between May-September. Salinity within the lagoon varies seasonally and can be over 30 ppt at times. Winds are generally moderate, ranging from 7–15 km per hour with stronger winds during the evening.

## Ecological features:

The lagoon is an important habitat for large waterbirds, including migratory ducks, shorebirds, gulls and terns. The lagoon is surrounded by open forest, grassland, rice paddies and other cultivated land while some mangrove forests are also found. Additionally, there are numerous home gardens, which comprise part of the urban landscape. Natural ecosystems are mostly in a degraded to semi-degraded state. Trees such as *Terminalia arjuna*, *Thespsia populnea*, and mangroves such as *Rhizophora mucronata*, *Bruguiera* spp., *Acanthus* spp. and *Avicennia marina* are common.

## Noteworthy fauna:

Aquatic birds include *Phalacrocorax* spp., *Ardea cinerea*, *Casmerodius albus*, *Anastomus oscitans* and *Himantopus himantopus*.



**Noteworthy flora:**

Information not available

**Land use:**

Fishing is carried out in the lagoon, mainly as a subsistence fishery for prawns. Grazing of livestock and cultivation of rice and other crops is carried out in the adjacent areas. Some areas have been developed for tourism infrastructure such as hotels and guesthouses.

**Possible changes in land use:**

Based on the current trends in land use in the area, an increase in land used for agriculture, tourism development and livestock grazing can be expected.

**Hydrological and biophysical values:**

The lagoon is important for flood control, and is also important for nutrient cycling within the coastal ecosystems of Arugam Bay, including near-shore marine waters.

**Social and cultural values:**

The lagoon is important for traditional subsistence fishing for local communities. There are also numerous archaeological sites in the vicinity, including the Muhudhu Maha Viharaya, a 2000-year-old Buddhist temple of particular importance.

**Scientific research and monitoring:**

No detailed surveys have been carried out on the lagoon. IUCN has conducted some rapid assessments including an assessment of Tsunami impact on natural ecosystems of the area.

**Conservation education:**

Information not available

**Recreation and tourism:**

Surfing is the most popular tourist attraction in the area, and although the lagoon is not extremely important as a tourist attraction, it adds to the scenic value of the area. Even during periods of civil unrest, the Arugam Bay area maintained the most vibrant tourism economy of the east coast, largely due to surfing. Arugam Bay has also been identified for tourism development by the CTB.

**Conservation measures taken:**

Under the USAID funded PCMA, an early warning system, sustainable fisheries and tourism, good governance, and capacity building projects are being implemented in the Arugam Bay area. The lagoon fishery is managed by the Pottuvil and Arugam Bay Fisherman Association, which regulates fishing effort and methods.

**Conservation measures proposed:**

The Arugam Bay area has been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Pollution of the lagoon by agrochemicals draining from the adjacent rice fields and disposal of sewage and domestic waste affect water quality. Unplanned and unregulated tourism development including construction within the setback areas and encroachment into the wetland area have degraded natural habitats, along with extensive cattle grazing and land clearing for agriculture. Sand mining is carried out near the lagoon mouth and may affect its hydrology and salinity by causing the bar to remain open for a longer period. The spread of invasive alien species such as *Salvinia molesta*, *Xanthium indicum* and *Pistia stratiotes* are also threatening native vegetation and the hydrology of the lagoon. The lagoon was also badly affected by the December 2004 Tsunami.

**Land tenure:**

The lagoon is state owned, while the surrounding areas are partly state-owned and partly private owned.

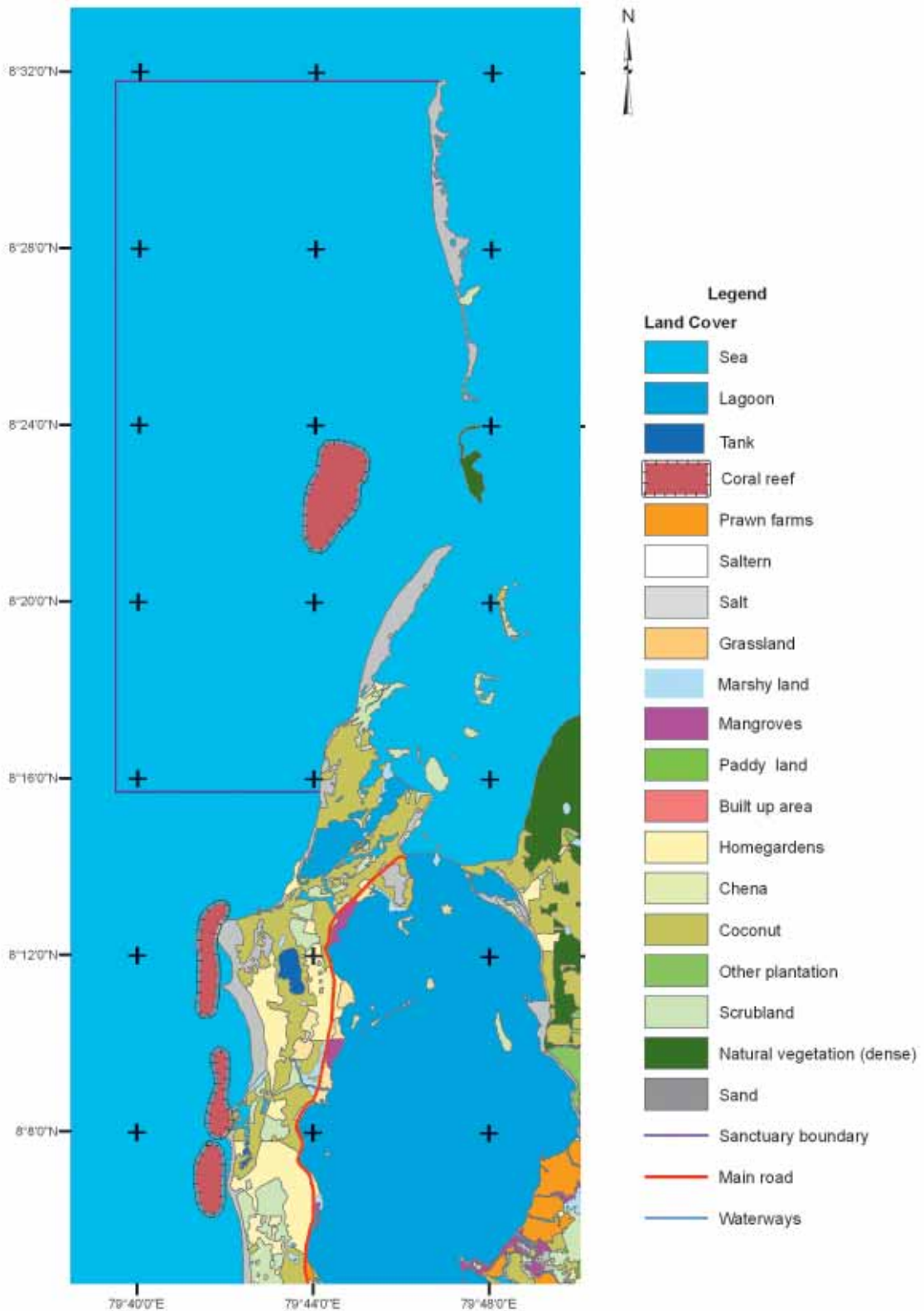
**Management authority and jurisdiction:**

The area is under the jurisdiction of the local DS.

**References:**

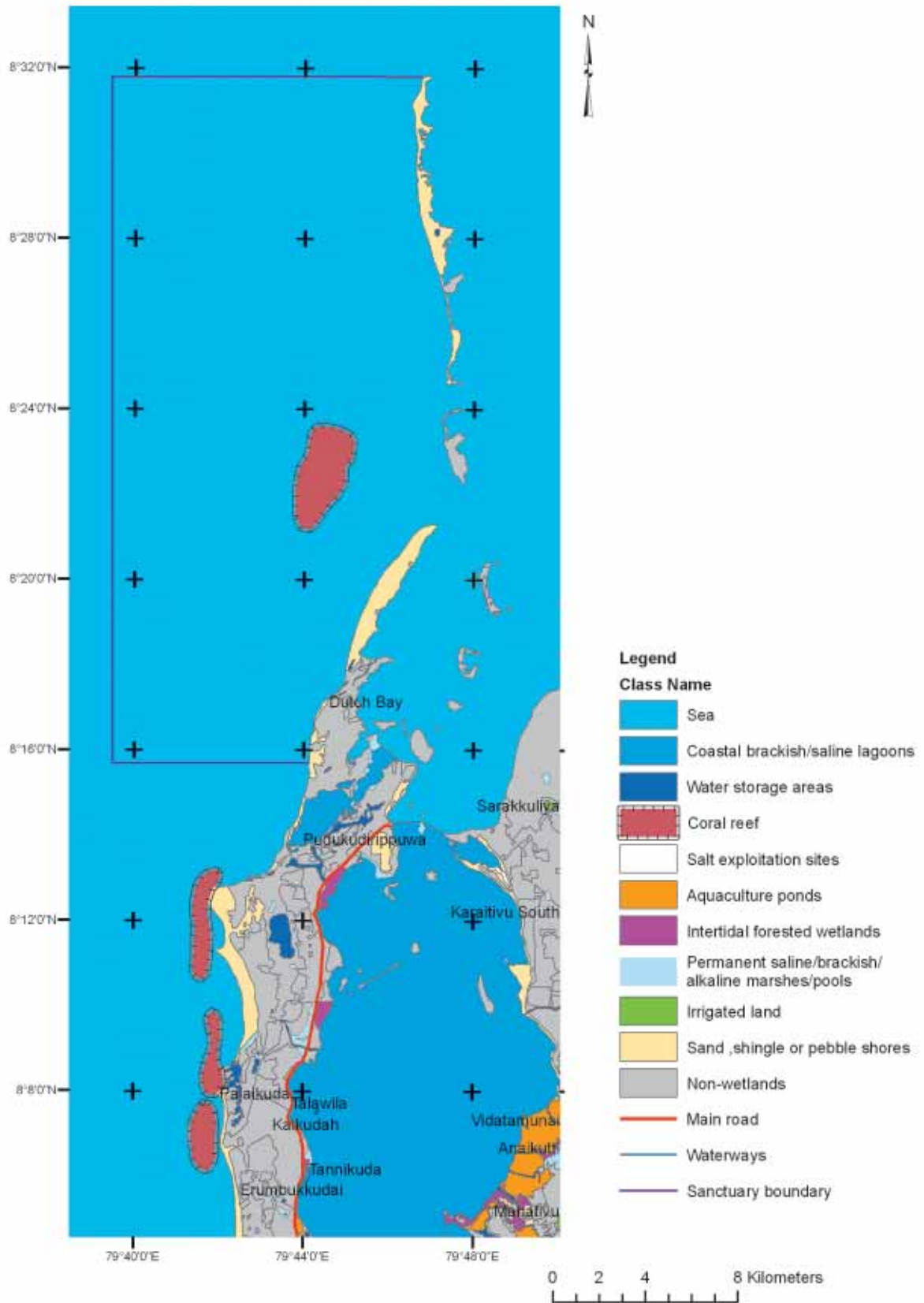
ARCADIS Euroconsult (2003a); ARCADIS Euroconsult (2003b); IUCN (2005a); Mallawatantri (2005)

# Bar Reef Marine Sanctuary



Sources: 1:30,000 Scale Admiralty Chart No:1586  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

## Bar Reef Marine Sanctuary Wetlands based on Ramsar Classification



Sources: 1:30,000 Scale Admiralty Chart No:1586  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Bar Reef Marine Sanctuary

## Location:

8° 32' 0 N and 79° 40' 0 E to 8° 8' 0 N and 79° 48' 0 E; 943513 N and 353252 E to 899234 N and 367795 E; northwest of the Kalpitiya Peninsula in the North-western Province.

## Area:

Sanctuary area is 30,670 ha

## Altitude:

Sea level to a depth of over 30m

## Overview:

The Bar Reef Marine Sanctuary is a complex of offshore continental shelf patch reefs constituting one of the largest coral reef systems in Sri Lanka. The marine sanctuary includes shallow coral reefs and sandstone habitats located deeper than the true coral reefs. The sanctuary is located offshore of the Puttalam estuarine system which includes Dutch Bay and Portugal Bay, in a relatively remote region of the country. The area was declared as a Marine Sanctuary in 1992 due to its rich species diversity and extensive coral reefs. It is the only MPA within the country that covers a considerably large area and encompasses multiple habitat types. Despite the effects of coral bleaching, Bar Reef remains one of the most biologically diverse coral reefs in Sri Lanka. It has also shown strong signs of natural recovery from coral bleaching compared to many other reefs in the country.

## Physical features:

The reef is located relatively offshore with the nearest coral patches located approximately 2 km from the shore. The coral reef is located in depths of 1-10m while the major sandstone habitats are located between 18-30m. Coral patches within the shallow coral reef vary in size from a few meters to hundreds of meters across. The coral reef area is composed mainly of branching and tabulate corals although fairly large coral domes are found at around 10m depth. The deeper reefs are mainly sandstone substrate with corals growing on it. It is characterized by rocks, small hills and flat plateau like structures with holes and crevices. The reef is subjected to strong winds and currents during the southwest monsoon between May to October, which often results in decreased underwater visibility. Northerly surface currents during the southwest monsoon bring turbid water from the nearby Puttalam estuary and several small river outlets (Aruvi Aru, Kal Aru, Modaragam Aru, and Kala Oya). Geographically the area lies in the northwestern dry zone of Sri Lanka with low rainfall, intense sunlight and seasonal strong winds. Annual rainfall ranges between 1,000 – 1,200 mm and average temperatures are around 28.2°C.

## Ecological features:

The Bar reef consists of a number of continental shelf patch reefs and sandstone habitats. The shallow coral areas are currently dominated by branching and tabulate species of *Acropora* and extensive colonies of *Pocillopora damicornis*. The reef once contained extensive areas of *Echinopora lamellosa*, which died due to coral bleaching. One hundred and twenty two species of stony corals belonging to 54 genera have been recorded from the reef while over 400 species of reef and reef-associated fish have also been documented. Several species of marine birds such as sea gulls, terns and waders are also common in the area, while marine mammals inhabit deeper waters within and adjacent to the sanctuary. Until 1998, the

Bar Reef was one of the best coral reefs in Sri Lanka with live coral cover of around 80%. The reef was also not under intense fishing pressure as the area was relatively inaccessible due the restrictions imposed by the Navy. However, intense coral bleaching resulted in nearly 100% mortality of corals. Coral cover has since increased to nearly 40%, mainly due to the rapid growth of *Acropora cytherea* and *Pocillopora damicornis*.

#### **Noteworthy fauna:**

A new species of damselfish (*Chrysiptera kuiteri*) was found in the sanctuary, while the only Sri Lankan records of *Chaetodon semeion* and *Centropyge flavicauda* have also been from the area. Several globally threatened fish species such as *Cheilinus undulates*, *Aetomylaeus nichofii*, *Epinephelus lanceolatus* and *Rhincodon typus* have been recorded within the sanctuary. Two species of shark namely, *Carcharhinus melanopterus* and *Trionodon obesus* are regularly encountered. Marine mammals include small cetaceans such as *Tursiops truncatus* and *Stenella longirostris*, large whales such as *Balaenoptera musculus* and *Physeter macrocephalus*, and the dugong (*Dugong dugon*). The reef is also an important habitat for economically valuable species of spiny lobsters (*Panulirus versicolor*, *P. ornatus* and *P. pencillatus*) and important food fish species belonging to the families Carangidae, Serranidae, Lutjanidae, Haemulidae and Lethrinidae. Globally endangered marine turtles (*Eretmochelys imbricata*, *Chelonia mydas* and *Lepidochelys olivacea*) also visit the area.

#### **Noteworthy flora:**

Seagrasses such as *Thalassia* spp. *Halodule* spp. *Syringodium* spp. and *Halophila* spp.

#### **Land use:**

Extractive uses such as fishing, and collection of sea cucumbers and ornamental fish are carried out within the sanctuary.

#### **Possible changes in land use:**

Increasing fishing pressure including the use of destructive fishing methods is leading to decreased fish stocks. Intensive dynamite fishing can lead to extensive destruction of the reef structure and associated biodiversity resulting in adverse impacts on fisheries. A change in fishing practices and fish catches has already been documented around the Kandakuliya area.

#### **Hydrological and biophysical values:**

The reefs within the sanctuary function as an integral part of a larger marine and coastal ecosystem consisting of the Puttalam estuary and adjacent coastal waters which include coral and sandstone reefs, sea grass habitats and soft-bottom communities. Large reef systems such as Bar Reef invariably play an important role in regulating ocean currents, water movement, and nutrient cycling.

#### **Social and cultural values:**

Reefs in the area support numerous fisheries livelihoods. This includes both permanent communities and migrant fishermen who operate from seasonal fishing camps located on remote islands off the tip of the Kalpitiya peninsular.

**Scientific research and monitoring:**

Bar Reef has been extensively studied by NARA since the early 1990s, and a NARA regional research centre is located in Kalpitiya. Currently NARA carries out long term monitoring with assistance from the GCRMN and CORDIO.

**Conservation education:**

A visitor centre is being constructed at Kudawa under the SAM process of the ADB funded CRMP.

**Recreation and tourism:**

There is some limited recreational diving, although there are no official dive tour operators based in the area. Currently, there is no major tourism activity within the sanctuary, but the CTB has earmarked the Kalpitiya area as an important area for tourism development. The CRMP is also attempting to promote nature based tourism and conservation education.

**Conservation measures taken:**

In 1992, the Bar Reef was declared as a Marine Sanctuary under the FFPO based on the recommendations of NARA. The reef area was selected for SAM under the ADB funded CRMP and a management plan has been developed. A major initiative under this management plan is the establishment of multiple-use areas within the sanctuary. Efforts are underway to demarcate sanctuary boundaries and initiate regular patrolling of the sanctuary.

**Conservation measures proposed:**

The CRMP has proposed several management measures including the demarcation of sanctuary boundaries and provision of infrastructure and capacity building to patrol the area and implement regulations, conducting awareness campaigns for local communities and user groups, and providing alternative livelihood programmes for coral resource users.

**Disturbances and threats:**

Use of destructive fishing techniques (such as bottom-set nets, moxy nets, purse seine nets and blast fishing) and over-fishing have severely degraded the reef and fishery resources. Predation of corals by infestations of the invasive *Acanthaster planci* resulted in reef degradation in the 1970's and 1980's. Coral bleaching during an El Niño event resulted in mass coral mortality within the Bar Reef and destroyed large areas of previously healthy coral reefs.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

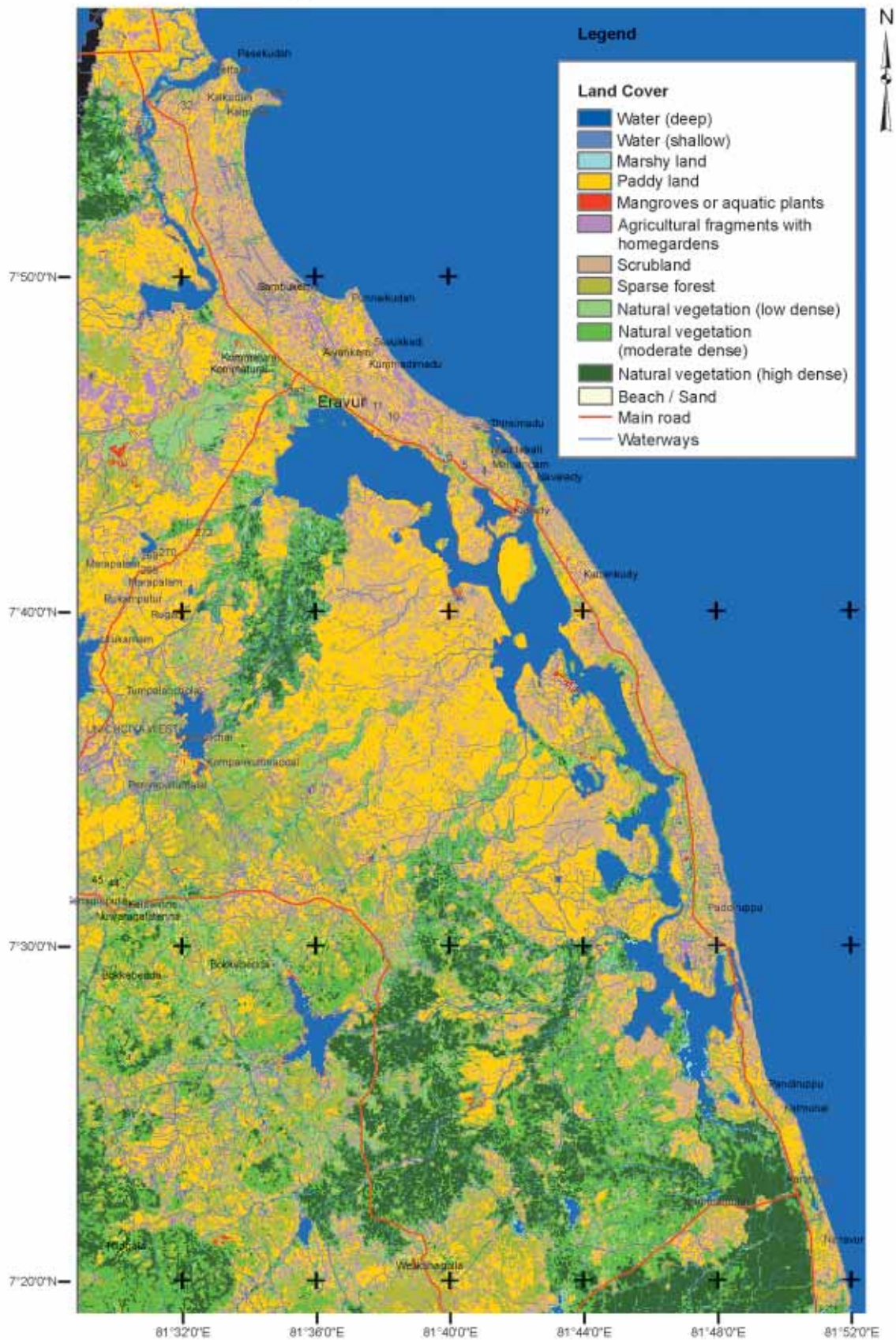
DWC

**References:**

CCD (2006a); Dayaratne et al. (1997); IUCN (2005b); Öhman et al. (1993); Öhman et al. (1997); Perera et al. (2002); Rajasuriya (1997); Rajasuriya (2005); Rajasuriya et al. (1995).



# Batticaloa Lagoon



Source: Landsat ETM+ (06 Sep 2)  
 (Datum WGS 84, Projection UTM)  
 Prepared by: GIS Lab/R&SP/EMA/CEA/2006



# Batticaloa Lagoon

## Wetlands based on Ramsar Classification



**Legend**

**Class Name**

- Water bodies
- Seasonal Intermittent fresh water marshes / pools
- Irrigated land
- Intertidal marshes
- Sand, shingle or pebble shores
- Main road
- Waterways



Source: Landsat ETM+ (06 Sep 2)  
 (Datum WGS 84, Projection UTM)  
 Prepared by: GIS Lab/R&SP/EMA/CEA/2006

# Batticaloa Estuary

## Location:

7° 58' 0 N and 81° 29' 0 E to 7° 20' 0 N and 81° 52' 0 E; 880644 N and 553268 E to 810690 N and 595658 E; in the Eastern Province. More than 90% of the lagoon is located in the Batticaloa District while the southern end is located within the Ampara District.

## Area:

11,500 ha

## Altitude:

Sea level

## Overview:

Encompassing two Districts, the Batticaloa estuary is the third largest brackish water system in Sri Lanka and is connected to the sea at two points. The wetland is highly productive for fisheries, and rich in biodiversity. Extensive mangroves are found around the estuary while extensive seagrass beds are also a feature of the estuary. Numerous areas of freshwater swamps are also found along with dry scrublands. More than 10,000 families depend on the lagoon fishery for livelihoods and food security. The estuary also served as an important seaport for trade during the 19<sup>th</sup> century. Habitat degradation, pollution and land reclamation are threatening the biodiversity and hydrological functions of the estuary.

## Physical features:

The estuary stretches 56 km from north to south with a maximum width of 4 km. The water body shows the characteristic features of a bar built estuary, indicating a high rate of siltation. It opens to the sea via two narrow channels during the wet season when the tidal amplitude is about 10 cm. The salinity varies from nearly 40 ppt near the mouth in some seasons, to 0 ppt in locations furthest from the mouth and close to freshwater sources. Generally, the northern half of the estuary is more saline than the south, and there appears to be two distinct sections separated by a constricted area less than 200 m wide near Kaluvanchikudiyiruppu village. The causeway at Koddaikallar also forms a barrier for freshwater and brackish water exchange. The estuary is located within the dry zone of Sri Lanka, which has a hot and humid tropical climate. The mean annual temperature is 27.4°C, although temperature may vary from 18°C on cooler nights during the rainy seasons to 38°C during the day in May. It receives about 1500 mm of rain annually, mainly during the northeast monsoon from October to February. Freshwater input is received from 19 tanks, 5 major lakes, 11 rivers and streams, as well as numerous irrigational channels belonging to the Mahaweli development areas.

## Ecological features:

There are around 321 ha of mangroves fringing the estuary, and the best mangroves are found near Mattakkali and Pankudaweli where species such as *Rhizophora apiculata*, *R. mucronata*, *Sonneratia ovalis*, *Dolichandrone spathacea*, *Bruguiera gymnorhiza*, *Avicennia officinalis* and *Cerbera manghas* are found. Large areas that formerly had well-developed mangroves are now dominated by secondary scrubby mangroves such as *Acrostichum aureum* along with small trees such as *Cerbera manghas*, *Clerodendron inerme* and *Exoecaria agallocha*. Open areas are dominated by saltmarsh species such as *Sesuvium portulacastrum* and *Suaeda maritima*. Extensive seagrass beds dominated by *Enhalus* and *Halophila can*

be found throughout the northern part of the estuary, which is more brackish. There are large expanses of freshwater swamp in the southern end of the estuary, dominated by invasive *Eichhornia crassipes* and *Salvinia molesta* along with a multitude of freshwater species such as *Alternanthera sessilis*, *Azolla pinnata*, *Ceratophyllum demersum*, etc. Around 65 bird species have been recorded from the wetland.

#### **Noteworthy fauna:**

Invertebrates that are important for food such as *Penaeus monodon*, *P. indicus*, *P. semisulcatus*, *Metapenaeus dobsoni*, *M. ensis*, *Scylla serrata* and *Portunus pelagicus* are found in the estuary. Introduced fish species such as *Oreochromis mossambicus* and *Oreochromis niloticus* are common and make up a major part of the fish caught in the estuary fisheries. Other noteworthy fish species include *Etroplus suratensis* and *E. maculatus*. Threatened birds such as *Leptoptilus javanicus* and *Pelecanus philippensis*, and threatened reptiles such as *Crocodylus palustris* are also found in the estuary.

#### **Noteworthy flora:**

Information not available

#### **Land use:**

The northern part of the estuary supports an extensive shellfish fishery, while fishing for finfish and crustaceans is carried out throughout the estuary. The eastern bank of the estuary is densely inhabited, while the western borders encompass extensive irrigated paddy fields. Several larger islands in the estuary (e.g. Buffalo Island) are used for rice cultivation and a few aquaculture ponds have been constructed near Urani and Kattankudy. Freshwater in the southern part of the estuary is used for irrigation of agricultural lands.

#### **Possible changes in land use:**

Due to the prevailing civil unrest, it is possible that the fisheries and agricultural activities will decrease. The total population of the divisions that border Batticaloa has increased 84% from 1971 to 1999, and such increases in human population may also lead to increased reclamation of wetland areas for settlements. Expansion of aquaculture including shrimp farms is also a possibility.

#### **Hydrological and biophysical values:**

The wetlands are important for flood prevention, and the sandbar across the northern outlet is opened when the water level inside the estuary becomes too high during the monsoon season. During this period, marine finfish and crustaceans migrate into the estuary, replenishing fish stocks through a natural cycle. The estuary also acts as a sink for nutrients, particularly from agricultural run-off.

#### **Social and cultural values:**

The local economy is mainly based on agriculture and fisheries and many families depend on natural resources of the estuary for livelihoods and food security. The waterways of the estuary were once the main mode of transport for local people until the Kottamunai, Kalladi and Valayaravu bridges were constructed, and the estuary also served as the main seaport for trade during the 19<sup>th</sup> century. In addition, there are numerous historical and important cultural sites nearby, such as the Kannaki Amman Kovil and the Dutch Fort at Puliyantivu that dates back to 1680.

**Scientific research and monitoring:**

NARA and the Eastern University have conducted several studies on the estuary. Currently, the department of geography of the SAI is carrying research on community-based resource use and conflict transformation in fisheries.

**Conservation education:**

Information not available

**Recreation and tourism:**

Batticaloa was a relatively popular tourist destination prior to the civil unrest, the estuary was an important scenic location, and was also used for activities such as bird watching, fishing and boating. However, tourism has currently declined due to the conflict.

**Conservation measures taken:**

One of the first conservation initiatives was the development of an Environmental Profile of the Batticaloa District by the CEA in 1993. In 2002, the estuary was declared a FMA under section 31 of the FARA. Under the ADB funded NECCDEP, numerous activities such as fisheries and aquaculture development, promotion of eco-tourism, mangrove replanting, improvement of sanitation infrastructure, development of sanitary solid waste disposal facilities, and improvement of causeway flow are being undertaken. In 2005, a USAID project cleared tsunami debris from the estuary with the assistance of the Sri Lanka Navy.

**Conservation measures proposed:**

Several proposals have been made to develop and manage fisheries and aquaculture, improve and develop alternate livelihoods, restore mangrove habitats, and improve sanitation and waste management under the ADB funded NECCDEP. Batticaloa estuary has also been proposed as a SAM site by the CCD.

**Disturbances and threats:**

The mangrove cover has declined from 1,490 ha to 321 ha during a 20-year period due to infrastructure development, construction of aquaculture ponds and more recently due to security reasons. The estuary has become a dumping ground for domestic and municipal wastes as well as untreated effluents from industries such as rice mills, dyeing and shrimp farming, and frequent algal blooms due to eutrophication and resulting fish kills have been reported. During the 2004 tsunami, the estuary was inundated with debris and silt. In some places, the flow and exchange of water within the estuary is impeded by causeways with culverts of insufficient capacity. Spread of invasive alien species such as *Parthenium hysterophorus*, *Eichhornia crassipes* and *Salvinia molesta* is also becoming problematic in the area.

**Land tenure:**

The lagoon is state owned, while the adjoining areas are privately owned.

**Management authority and jurisdiction:**

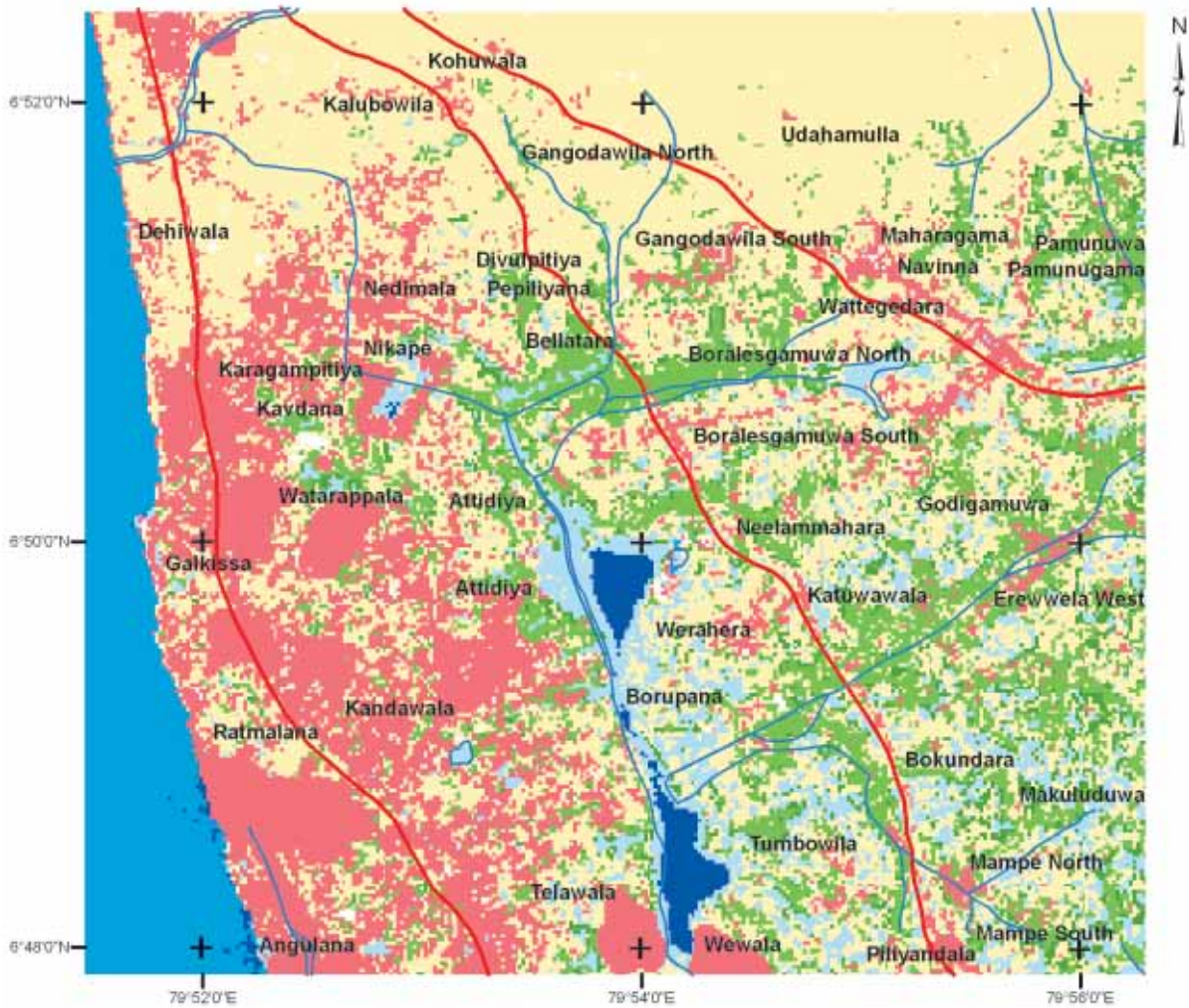
DFAR and relevant DS

**References:**

ARCADIS Euroconsult (2003c); Arulanathan (2002); The Government of Sri Lanka (2003); Jayasingham (2000); Kotagama et al. (1989b); Vinobaba (1999)



# Bellanwila-Attidiya Sanctuary



0 0.5 1 2 Kilometers

## Legend

### Land Cover

- |   |                                       |   |           |
|---|---------------------------------------|---|-----------|
|  | Sea                                   |  | Waterways |
|  | Water bodies                          |  | Main road |
|  | Marshy land                           |   |           |
|  | Paddy land                            |   |           |
|  | Built up area                         |   |           |
|  | Homegardens with vegetation fragments |   |           |
|  | Natural vegetation                    |   |           |

Source: Landsat ETM+ 13th March 1992  
 Ground Truthing: Ikonos  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006


# Bellanwila-Attidiya Sanctuary Wetlands based on Ramsar Classification



0 0.5 1 2 Kilometers

## Legend

### Class Name

	Sea		Waterways
	Water storage areas		Main road
	Permanent freshwater marshes/pools		
	Irrigated land		
	Non-wetlands		

Source: Landsat ETM+ 13th March 1992  
Ground Truthing: Ikonos  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Bellanwila-Attidiya Sanctuary

## Location:

6° 52' 0 N and 79° 52' 0 E to 6° 48' 0 N and 79° 56' 0 E; 759157 N and 374779 E to 751770 N and 382129 E; in the southeastern outskirts of Colombo city, in the Colombo District of the Western Province.

## Area:

c. 372 ha.

## Altitude:

0-6m.

## Overview:

This is primarily a freshwater marsh ecosystem, surrounded by a rapidly developing urban landscape. The marshes serve as an important flood retention area, which provides protection to the surrounding inhabited areas. Additionally, the wetland is an important stopover for a number of migratory birds and an important roosting site for herons and egrets. As a result it has been identified as an IBA by BirdLife International. At present, much of the wetland is in a highly degraded state due to several adverse anthropogenic factors.

## Physical features:

The wetland is interconnected to the flood plains of the Bolgoda system through the Bolgoda Canal. Several other man made canals connect the Attidiya marshes to the Colombo marshes. A small man made lake is also located within the wetland system. Attidiya is located within the wet zone and receives an annual rainfall of 2500-5000mm. The average annual temperature is around 27° C with average humidity of around 80%.

## Ecological features:

The wetland consists of shallow freshwater ponds, marshes and seasonally flooded grasslands, with scattered shrubs and small trees. There is significant biodiversity including 77 species of butterflies and 37 species of dragonflies. Of this, 5 species of butterflies are considered nationally threatened. Additionally, 15 species of nationally threatened and endemic vertebrates have been recorded from the wetland. Bird life is profuse, and to date, over 168 species have been recorded. More than 30 species of freshwater fish have been recorded, including several exotic species.

## Noteworthy fauna:

The marsh harbours several species of endemic fish, including *Esomus thermoicos*, *Clarias brachysoma*, *Aplocheilus dayi*, and *Channa orientalis*. Among the amphibians, endemics include *Bufo atukoralei*, *Polypedates cruciger*, *Rana gracilis*, while the site also harbours *Rana aurentiaca*. Aquatic reptiles include freshwater turtles (*Melanochelis trijuga*, *Lissemys punctata*) serpents (i.e. *Xenocrophis asperrimus*, *Acrochordus granulatus*) and the crocodile (*Crocodylus palustris*). Water birds include uncommon species such as *Pelecanus philippensis*, *Rallus striatus*, *Porzana fusca*, *Gallicrex cinerea*, *Phalacrocorax carbo* and *Rostratula benghalensis*. Rare mammals such as *Prionailurus viverrinus* and *Lutra lutra* also inhabit this marsh, while troops of the endemic *Trachypithecus vetulus* occur in bordering trees. The endemic mammal *Paradoxurus zeylonensis* has also been recorded.



**Noteworthy flora:**

The dominant floral species in this site are invasive aliens. Bellanwila-Attidiya also harbours the endemic sedge *Eleocharis lankana*.

**Land use:**

The wetland is used for collecting reeds for making mats and collection of fuel wood. Some small-scale agriculture is carried out in the periphery, along with grazing of livestock such as water buffalo, cattle, goats and pigs. Fishing for finfish and shrimps is carried out in the water bodies. Much of the areas bordering the sanctuary have been reclaimed and used for urban development.

**Possible changes in land use:**

Both legal and illegal reclamation of wetland area for housing and urban development and reduction in activities such as fishing and livestock grazing.

**Hydrological and biophysical values:**

The marshes and canals are essential for flood detention and drainage.

**Social and cultural values:**

Being an urban wildlife sanctuary within close proximity to Colombo city, the marsh provides valuable opportunities for bird watching, conservation education and scientific research. Additionally, it provides an important biodiversity refuge and breathing space in an urban landscape. The wetland is also culturally significant as a historically important temple is located adjacent to it. Traditionally, lotus flowers used in religious ceremonies have been collected from the wetland.

**Scientific research and monitoring:**

A comprehensive study of the amphibian fauna of the marsh was conducted from 1995-1997. Periodic surveys of other wildlife have also been conducted.

**Conservation education:**

The Environmental Education Unit of the CEA is currently building a visitor center at the Sanctuary.

**Recreation and tourism:**

Several private companies conduct bird watching excursions to the marsh.

**Conservation measures taken:**

The wetland was declared as a Sanctuary under the FFPO in 1990. In 1993, the CEA produced a wetland site report and management plan. The Sanctuary has been zoned for conservation with public nature park functions in the Dehiwala-Mt. Lavinia Municipal Council Urban Development Plan.

**Conservation measures proposed:**

Detailed conservation measures have been proposed in the conservation management plan prepared by the CEA.



**Disturbances and threats:**

Factories in the vicinity release effluent in the waterways passing through the marsh, which then enter the Bolgoda Lake. The Dehiwela-Mt Lavinia municipal council uses the northern and eastern parts of the marsh for garbage dumping. Such factors have an impact on water bird habitat quality and cause large-scale fish kills. These fish kills have decimated the local populations of several species of fish, including *Aplocheilichthys dayi*, which is endemic to Sri Lanka. The economically important freshwater shrimp *Macrobrachium rosenbergii* has almost been exterminated in the marsh. Habitats have been lost due to clearing of shrubs for construction purposes in the surrounding areas, as well as human encroachment into the marsh from its periphery. On-going landfill of marshland, largely with household rubbish, has been observed on the West bank of Bolgoda Canal (northern end) and at land fronting the marsh at the Bellanwila Temple site. Road kills on main roads and consumption of meat from terrapins and birds cause a decline in these species. In addition, egg collection is a threat to the bird populations inhabiting the marsh. The spread of floral (*Annona glabra*, *Eichhornia crassipes*, *Pistia stratiotes*, *Salvinia molesta*, *Lantana camara*) and faunal (*Pomacea* spp., *Chitala ornata*, and *Trachemys scripta*) invasive alien species is also a major threat to native biodiversity in the wetland. The disturbances and threats are so large that some amphibian species underwent a rapid decline between 1997 and 2000. Need urgent actions to mitigate existing threats.

**Land tenure:**

The marsh is state owned, while surrounding areas are mostly privately owned or owned by the Bellanwila Temple.

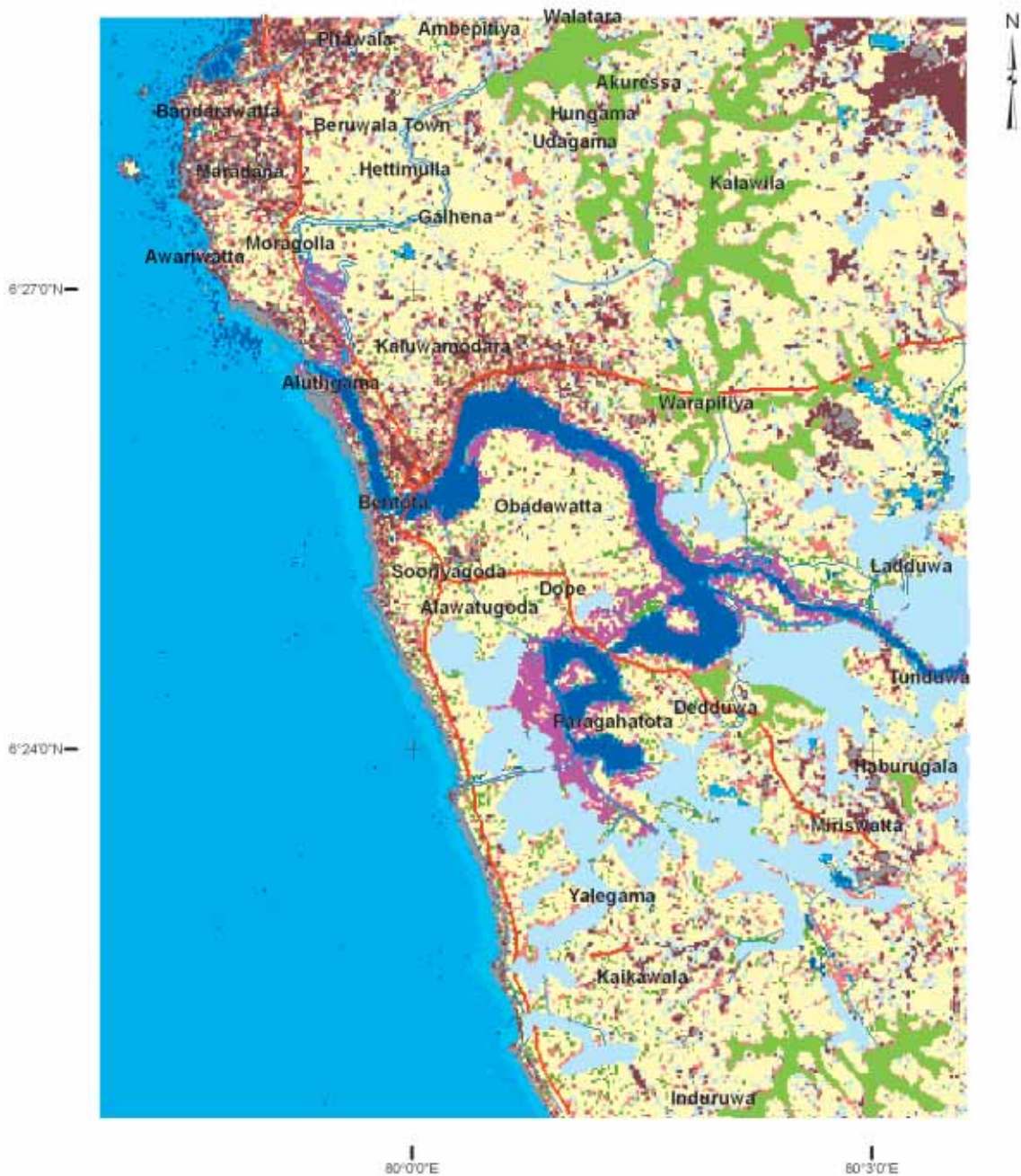
**Management authority and jurisdiction:**

The DWC has jurisdiction over the Sanctuary. The UDA, LLDC, CEA and the Department of Irrigation have responsibilities over the wetlands and low-lying areas adjacent to the Sanctuary.













**References:**

Bambaradeniya (2002); BirdLife International (2005); CEA/ARCADIS Euroconsult (1994c); de A Goonatillake et al. (2001); Kotagama et al. (1989)

# Bentota Estuary

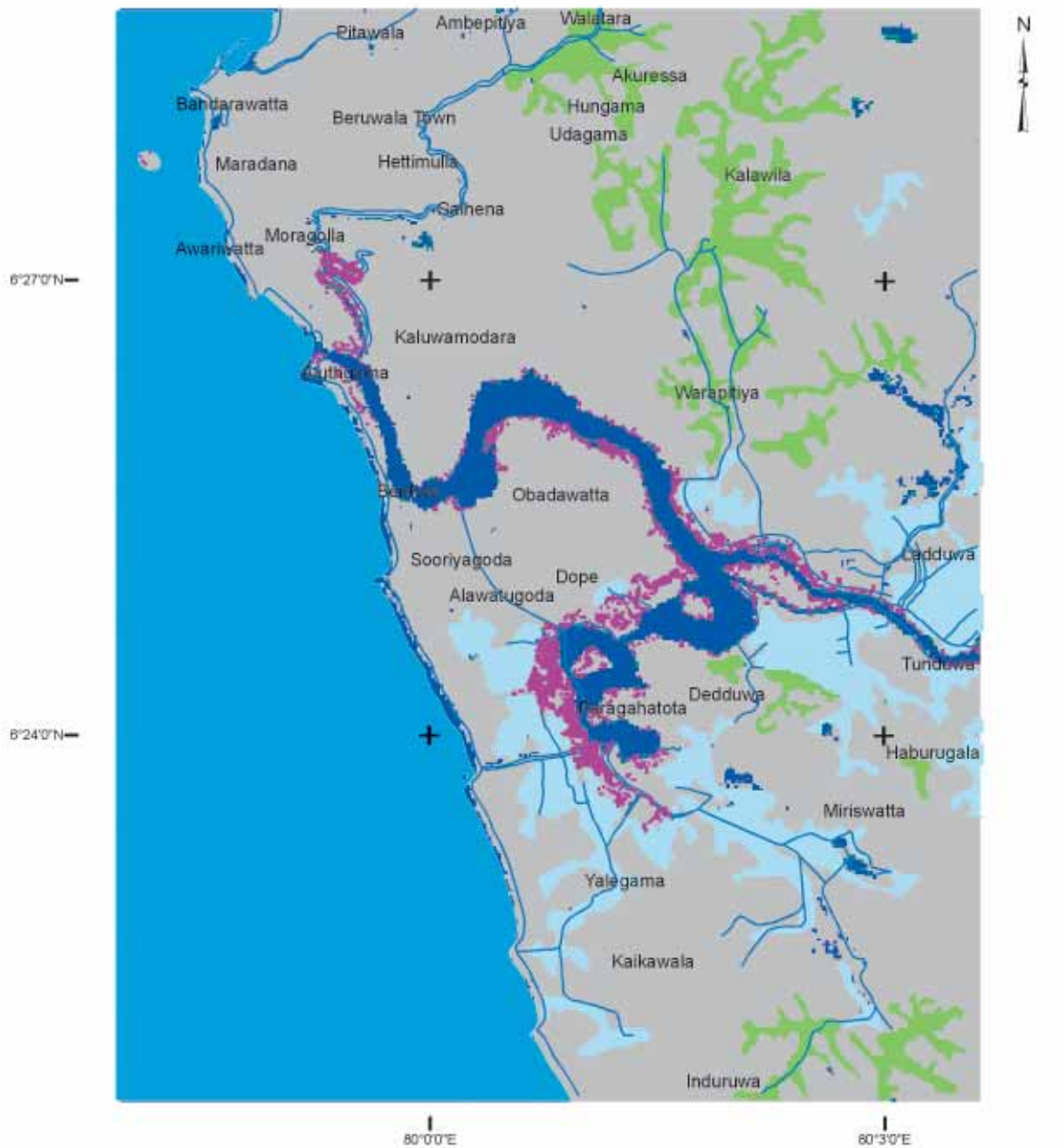


**Legend**



Land Cover			
	Sea		Homegardens
	Internal water bodies		Natural vegetation (moderate dense)
	Water with aquatic plants		Sand
	Mangroves		Exposed soil
	Marshy land		Main road
	Paddy land		Waterways

Source: Landsat ETM+ 14th March 01  
 Ground Truthing - 2006/01/31  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Bentota Estuary Wetlands based on Ramsar Classification



### Legend

Class Name	
	Sea
	Permanent rivers/streams/creeks
	Intertidal forested wetlands
	Permanent freshwater marshes
	Irrigated land
	Shrub dominated wetlands
	Non-wetlands
	Waterways
	Main road

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - 2005/12/23-24  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Bentota Estuary

## Location:

6° 27' 0 N and 80° 0' 0 E to 6° 22' 0 N and 80° E 5' 0 E; 713057 N and 389419 E to 703827 N and 398619 E; south of Aluthgama, within the Kalutara and Galle Districts, of the Western and Southern Provinces respectively.

## Area:

1,700 ha.

## Altitude:

5m

## Overview:

This wetland site is made up of the Kahagalla Estuary, canals and marshes, thus, over its range it varies from brackish water to freshwater.

## Physical features:

The funnel-shaped river mouth is a result of the daily tidal movements and the prevailing northerly sea current that forms a long sand spit at the sea outfall. The wetland complex is located in the wet zone of Sri Lanka and experiences an annual rainfall of 2500-3000mm. Most rain is received during April-June and October-November. The average monthly temperature ranges between 26-29°C, while the average monthly humidity is approximately 79% with very little variation during the year.

## Ecological features:

The vegetation types along the river include riverine mangroves (*Bruguiera-Rhizophora-Sonneratia-Acrosticum* community and *Nypa fruticans* assemblages), bank scrub and lentic macrophytic assemblages (consisting of submerged and floating vegetation). The vegetation types along the river-land perpendicular gradient include mangrove, mangrove-mixed swamps and the invasive *Wormia suffruticosa* and *Annona glabra* stands. Abandoned paddy fields and peat bogs are also found in the border of the estuary. The vertebrate fauna documented from the estuary include 159 species, including 12 endemic species.

## Noteworthy fauna:

Among the freshwater fish recorded, *Esomus thermoicos*, *Rasboroides vaterifloris*, *Aplocheilus dayi*, *Puntius singhala* and *Clarias brachysoma* are endemic. The most common amphibians in the mangrove include *Euphlyctis hexadactyla* and *Limnonectes limnocharis*. Among the reptiles recorded, *Varanus salvator* is fairly common. The presence of two largest endangered reptiles - *Python molurus* and *Crocodylus porosus* is of conservation significance. The aquatic birds include herons and egrets (*Butorides striatus*, *Dupetor flavicollis*, *Nycticorax nycticorax*, *Ardea purpurea*, *Mesophoyx intermedia*), waterfowl (*Dendrocygna javanica*), Kingfishers (*Pelargopsis capensis*, *Alcedo atthis*), large water birds (*Threskiornis melanocephalus*, *Anastomus oscitans*), and raptors (*Haliaeetus nipalensis*, *Haliastur Indus*). The mammals inhabiting the mangrove include the endemic *Trachypithecus vetulus* and *Moschiola kathygre*, while the rare *Prionailurus viverrinus* and *Lutra lutra* are also present.



**Noteworthy flora:**

The well-developed riverine mangroves in the estuary are dominated by the *Bruguiera sexangula*, *Rhizophora apiculata*, and *Sonneratia caseolaris* community. Bank scrub formations consist mainly of *Pandanus* spp., *Hibiscus tiliaceus* and the tall reeds such as *Phragmites karka*. The mangrove mixed swamps consist of *Sonneratia caseolaris*, *Cerbera manghas*, *Syzygium* spp., *Acrosticum aureum*, *Acanthus ilicifolius*, *Cyperus* spp., and *Fimbristylis* spp. Lianas or climbers such as *Flagellaria indica* and *Lygodium microphyllum* can be seen entangled in the trees from top to bottom.

**Land use:**

The estuary is primarily used for fisheries and sedge cultivation for mat weaving. The mangrove stands are exploited for timber and other purposes. This area is also extensively used by the tourism and recreation industry.

**Possible changes in land use:**

Increased mangrove deforestation for livelihood purposes and increased land reclamation in this area for development are major forms of land use change. Additionally, the area has been identified as a tourism development zone which could lead to an increase in land reclamation and tourism activities.

**Hydrological and biophysical values:**

Information not available

**Social and cultural values:**

This area comprises of a number of historical and cultural sites of interest. One such site is the Galapatha Vihare temple constructed by King Devanampiyatissa during the Anuradhapura era. Other temples of interest are the Vanawasa Vihare temple, Bodimaluwa temple, Ben Vehera and Bodhi Samipa Viharaya.

**Scientific research and monitoring:**

Occasional surveys have been conducted by conservation organisations and academic institutions.

**Conservation education:**

Information not available

**Recreation and tourism:**

Activities such as kayaking, boat rides and windsurfing are organised by hotels and water sports centres.

**Conservation measures taken:**

The CEA produced a wetland site report and conservation management plan in 1994. Honduwa island located within the estuary has been declared as a sanctuary under the FFPO.

**Conservation measures proposed:**

The wetland site report prepared by the CEA has recommended a conservation management plan for the area. This site is listed as a proposed SAM site by the CCD. Other conservation measures that have been proposed include, conducting regular biodiversity surveys, placing regulations on mangrove exploitation,

establishment of a fisheries society that can monitor fishing gear used within the wetland, control of pollution and regulation of tourism activities.

**Disturbances and threats:**

Invasive alien plant species such as *Annona glabra* and *Wormia suffruticosa* have invaded the mangrove and marshy areas forming uniform stands. In addition, anthropogenic activities such as land reclamation, pollution and mangrove deforestation are prevalent.

**Land tenure:**

The majority of the land is state-owned while some land around the estuary mouth is privately owned.

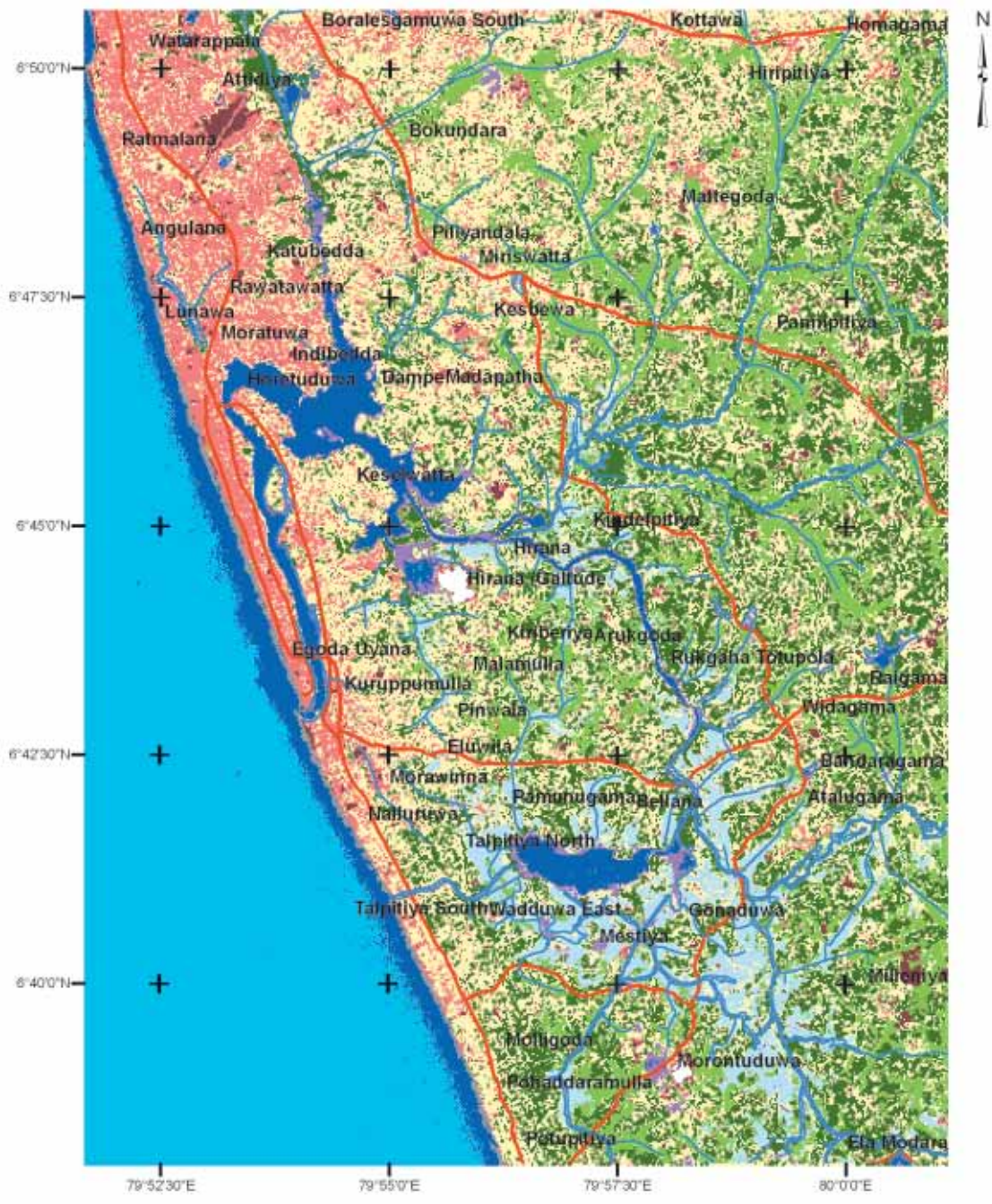
**Management authority and jurisdiction:**

Honduwa Island Sanctuary is under the management jurisdiction of the DWC.












**References:**


Bambaradeniya et al. (2006); CEA/ARCADIS Euroconsult (1994d)

# Bolgoda Wetlands



### Legend

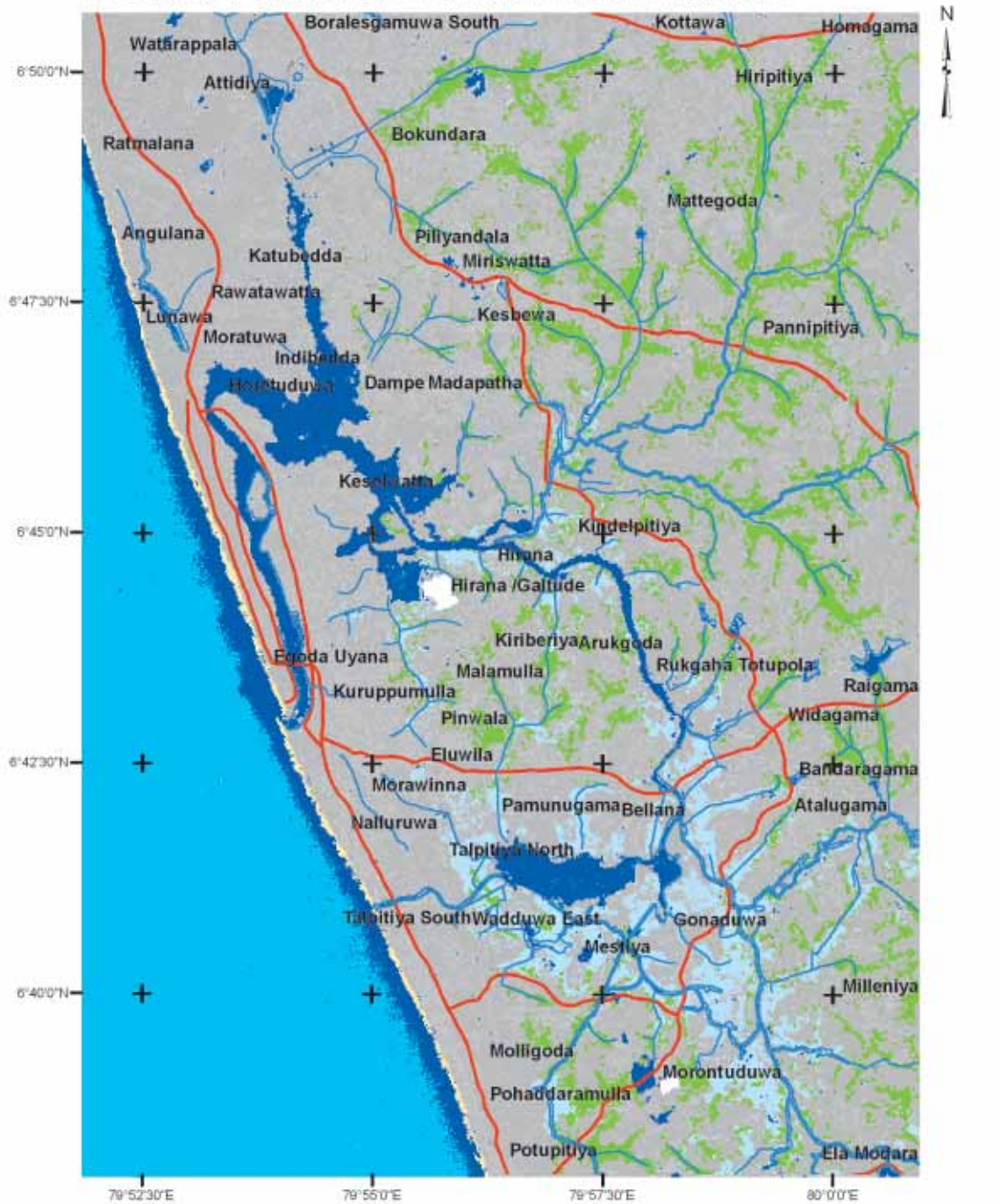
Land Cover			
	Sea		Natural vegetation (high dense)
	Water bodies		Sand
	Marshy land		Exposed soil
	Paddy land		Waterways
	Homegardens		Main road
	Built up area		

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - 2005/12/23  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Bolgoda Wetlands

## Wetlands based on Ramsar Classification



0 1 2 4 Kilometers

### Legend

Class Name	
	Sea
	Permanent rivers/streams/creeks
	Sand, shingle or pebble shores
	Permanent saline/brackish/alkaline marshes/pools
	Irrigated land
	Non-wetlands
	Waterways
	Main road

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - 2005/12/23  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Bolgoda Wetlands

## Location:

6° 50' 0 N and 79° 52' 0 E to 6° 38' 0 N and 80° 0' 0 E; 755472 N and 374770 E to 733327 N and 389460 E; 30 km south of Colombo in the Kalutara District, of the Western Province.

## Area:

The Kalu and Kelani river basins including the Bolgoda River cover an area of 1,245 ha. The extent of the marshes is unknown.

## Altitude:

Near Sea level

## Overview:

The Bolgoda Lake is a shallow brackish water body in the Bolgoda watershed that is located between the southern border of the Kalu Ganga basin and the northern border of the Kelani river basin in the wet zone of the country. It is categorised as a semi-closed lagoon, as it is not connected to the sea throughout the year.

## Physical features:

This lake system drains a substantial area (374 km<sup>2</sup>) wedged between the western parts of the Kalu and Kelani river basins. It is made up of two basins namely the north lake and the south lake, which are connected by a narrow stream. The north lake, a part of which belongs to the Colombo and Kalutara Districts is the larger one. It is fed by Weras Ganga and Bolgoda Ganga, which bring water from the South Lake. It discharges to the sea through the Panadura estuary. The South Lake is situated in the Kalutara District and is fed by Panape Ela. It is connected to the sea via Thalpitiya Ela. Bolgoda Ganga, the canal that connects these two water bodies is joined by Rambana Ela, which drains the water of the Maha Oya into the lake system. This shallow dual basin estuary is mainly fed by monsoonal rain in addition to minor inflows, which are exclusively confined to the first penepain in the wet zone. It receives an annual rainfall of about 2,569.3 mm and the mean annual temperature is 27.1° C. The substratum of the Bolgoda Lake comprises of a high percentage of clay and silt. Depth varies from a few centimetres to more than 2m, but a large area of the lake is situated between the 1m and 2m isobaths. The tidal amplitude of the Lake varies between 1 cm and 75 cm.

## Ecological features:

The lake and marshes are surrounded by scrubland, coconut cultivations, home gardens and an urban landscape. The vertebrate fauna recorded in the Bolgoda south lake include 45 fish, 16 amphibian, 40 reptile, 97 bird and 31 mammal species.

## Noteworthy fauna:

These wetlands support a number of endemic fauna including fish (*Esomus thermoicos*, *Channa orientalis*, *Clarias brachysoma*, *Aplocheilus dayi*); reptiles (*Otocryptis weigmanni*, *Cylindrophis maculatus*, *Lycodon osmanhilli*, *Oligodon sublineatus*, *Xenocrophis asperrimus*); birds (*Loriculus beryllinus*, *Megalaima flavifrons*, *Pellorneum fuscapillum*); mammals (*Trachypithecus vetulus*) and amphibians (*Bufo atukoralei*,

*Rana gracilis*, *Polypedatus cruciger*). Additionally, these wetlands are known to harbour rare species such as *Loris tardigradus*, *Pelecanus philippensis*, *Prionailurus viverrinus*, *Lutra lutra* and *Crocodylus palustris*. The commercially valuable, but invasive *Oreochromis mossambicus* is also found in these waterways.

#### **Noteworthy flora:**

The marshy areas harbour species such as *Sonneratia caseolaris*, *Nypa fruticans*, *Syzygium* spp., and *Acrostichum aureum*.

#### **Land use:**

The natural vegetation within the 6,000 ha watershed has been substituted by two major crops (paddy and rubber) and village gardens. Several densely populated townships are located along the coastal boundary of the watershed; as such, the entire watershed is subjected to infrastructure development. Additionally, this wetland supports local fisheries.

#### **Possible changes in land use:**

Increased clearing of land for infrastructure development due to growing population pressures in the surrounding areas and due to its popularity as a holiday-home destination.

#### **Hydrological and biophysical values:**

The lake water is being used to irrigate the paddy fields in the surrounding area. Additionally, the local communities use it for several domestic purposes.

#### **Social and cultural values:**

As this site is located close to the city of Colombo, it serves as a popular holiday destination for families, many of whom own their own homes. Additionally, it is easily accessible to bird-watchers.

#### **Scientific research and monitoring:**

NARA has conducted some comprehensive water quality studies on this wetland in the past. The YZA conducted the last comprehensive study on biodiversity of this area in 1995.

#### **Conservation education:**

Information not available

#### **Recreation and tourism:**

This area attracts avid bird-watchers and holiday-home owners due to its proximity to the city.

#### **Conservation measures taken:**

This site was declared a FMA by the DFAR in 2001.

#### **Conservation measures proposed:**

The Bolgoda Lake is a proposed EPA under the NEA of the CEA. Other conservation measures have been proposed in Silva (1996).

**Disturbances and threats:**

The release of industrial effluents from textile factories and printers located in the surrounding areas into the Weras Ganga. Eutrophication caused by pesticides and fertilisers used in agriculture and domestic waste also contaminate the lake. As the major east-west shipping routes lie along the southern coast, maritime waste may also enter the lake via the Panadura estuary. Other issues such as intense recreational activities and improper land use in the upper watershed, land reclamation and mangrove deforestation are on the increase. In addition, invasive alien species such as *Typha angustifolia*, *Eichhornia crassipes*, *Annona glabra* and *Chitala ornata* pose problems to the native biodiversity. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned but surrounded by private lands.

**Management authority and jurisdiction:**

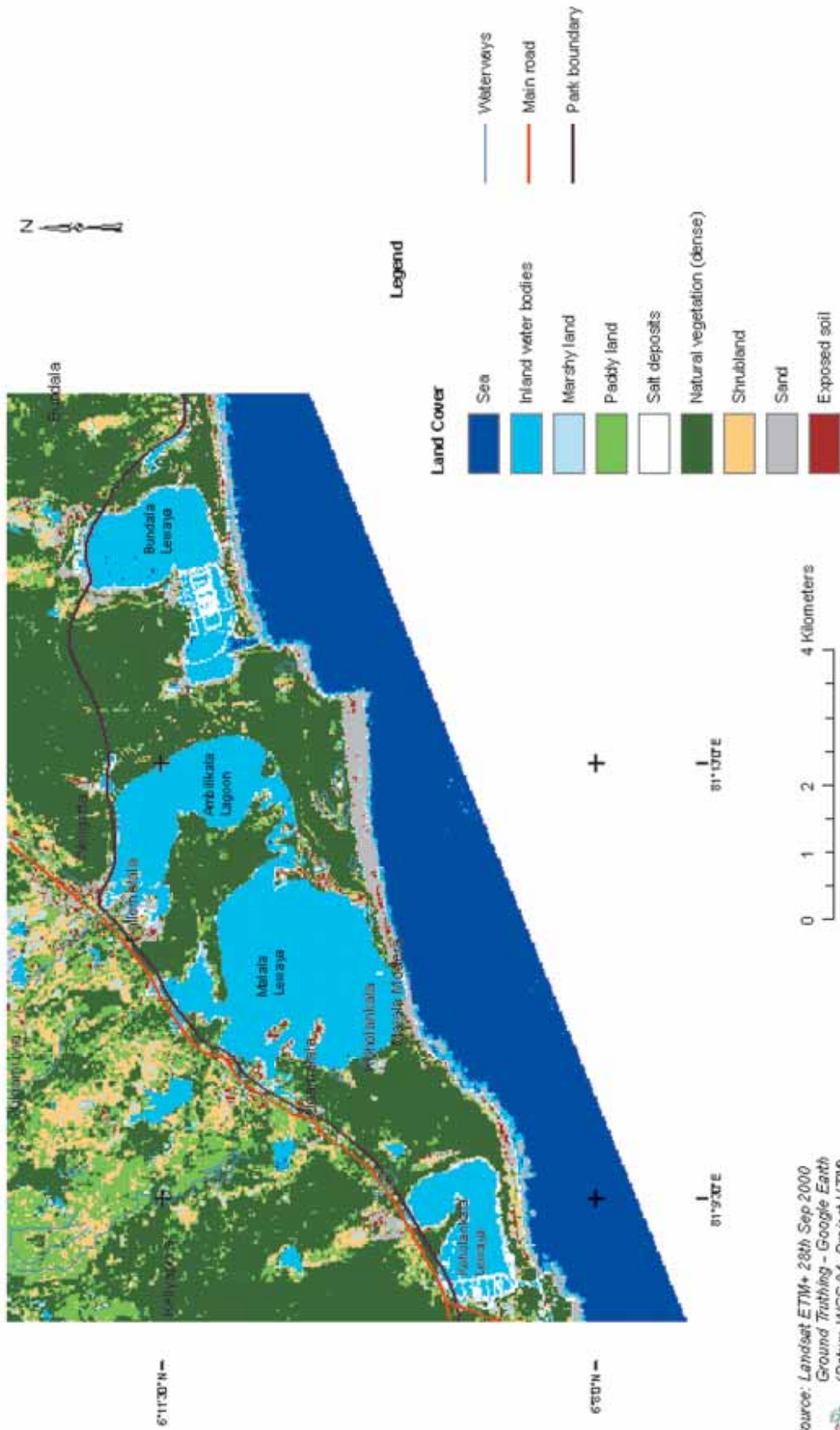
DFAR manages the fisheries.

**References:**

Ranwella (1995); Silva (1996)

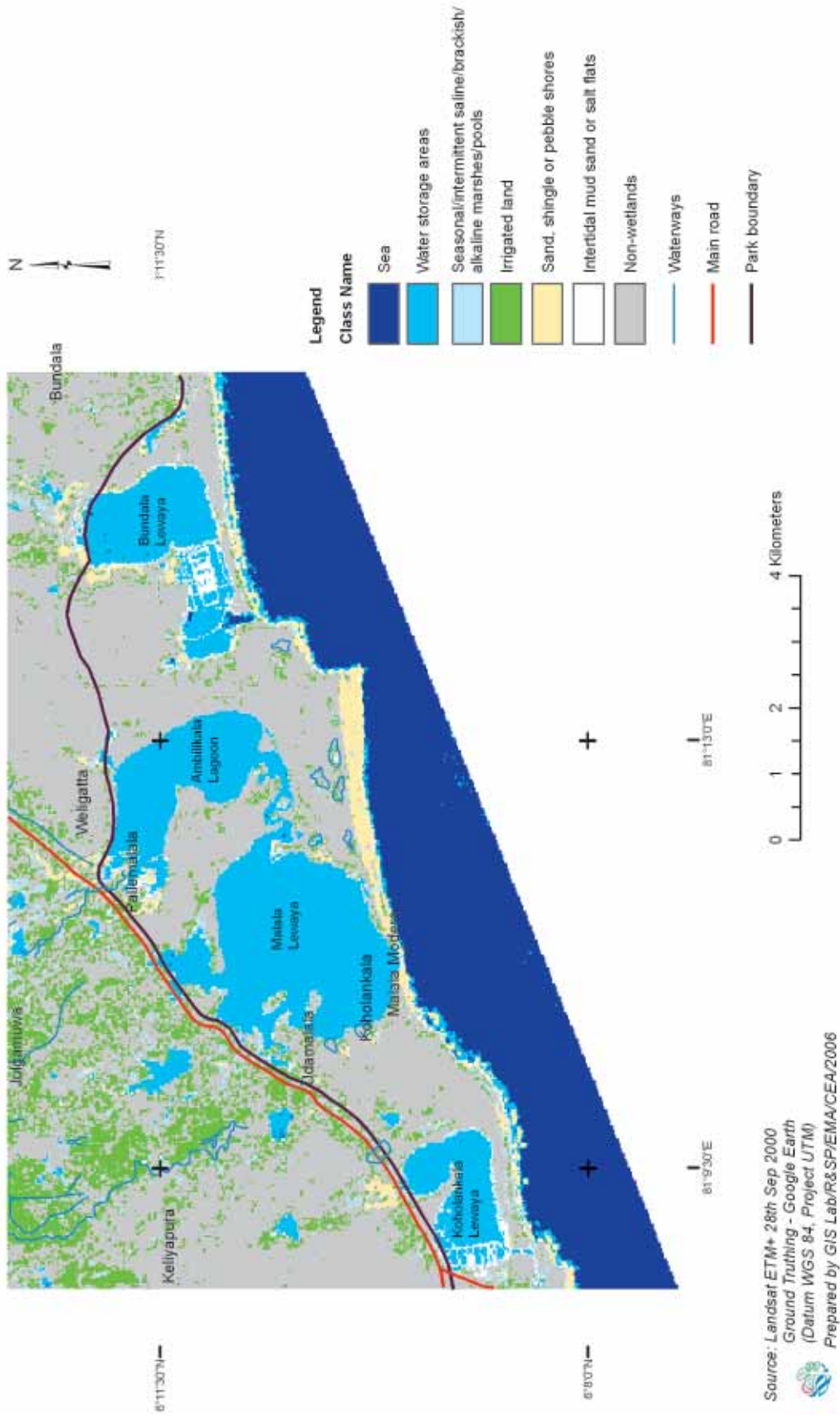


# Bundala National Park



Source: Landsat ETM+ 28th Sep 2000  
 Ground Truthing - Google Earth  
 (Datum WGS 84, Project UTM)  
 Prepared by GIS Lab/R&S/PIEMA/CEA/2006

# Bundala National Park Wetlands based on Ramsar Classification





## Wetland Cluster within Bundala National Park

### Location:

6° 13' 15 N and 81° 08' 0 E to 6° 8' 0 N and 81° 16' 30 E; 687157 N and 514750 E to 677951 N and 529505 E; about 250 km southeast of Colombo in the Hambantota District of the Southern Province.

### Area:

Total area of National Park is 3,698.010 ha; of which 1,990 ha are wetlands.

### Altitude:

Near sea level

### Overview:

The wetlands within the Bundala National Park consist of 4 shallow brackish water lagoons, salt marshes, mangroves, salterns, seasonal water holes/tanks and streams and the seashore. The adjacent seacoast and surrounding terrain is generally flat with sand dunes and sparse dry evergreen scrub. This biologically rich area is an internationally important wintering ground for migratory water birds, the highlight being the Greater Flamingo (*Phoenicopterus ruber*). In 1991, Bundala became the first wetland to be declared as a Ramsar site in Sri Lanka.

### Physical features:

The area is underlain mainly with hornblend-biotite gneiss of the eastern Vijayan series and can be divided into three main relief zones: beach and sand dune area; immediate inland coastal plain including the lagoon area; and hinterland of the eroded peneplain forming the undulating country of low hill and wide valleys. The low country dry zone climate prevails in the area, with an average annual rainfall of 1,074 mm. The mean annual temperature is around 27°C, with a maximum of 30°C and a minimum of 24°C. The average relative humidity is 80%. Of the four lagoons, Bundala (520 ha) is a brackish water lagoon with an average depth of less than 1 m, separated from the sea by a natural sandbar. Part of the Bundala lagoon has been converted into a saltern. Embilikala (430 ha) is a low saline lagoon immediately west of the Bundala Lagoon. Malala (650 ha) is similar to Embilikala and is connected to it by a narrow channel. It receives freshwater from the Malala Oya Stream. The westernmost lagoon, Koholankala (390 ha) has been developed for salt production and is subjected to widely fluctuating water levels. Salinity levels exceed 30 ppt during dry periods.

### Ecological features:

The area consists of seven major terrestrial vegetation/habitat types (dry thorny scrubland, arid zone forests, sand dune vegetation, gentle sea shore vegetation, arid zone maritime grasslands/pastures, riverine forests, anomalous Mesquite scrublands) and six wetland types (salt marsh, mangrove, brackish water lagoons, sandy and rocky sea shore, seasonal water holes and tanks, salterns). A total of 383 plant species have been documented from these habitats, with dry thorny shrubs and herbs being the predominant plant life in Bundala. A very small and degraded patch of mangrove can be found at the Bundala lagoon outlet area, consisting of *Lumnitzera racemosa*. 324 species of vertebrates have been recorded, which include 32 species of fish, 15 species of amphibians, 48 species of reptiles, 197 species of birds and 32 species of mammals. Among the invertebrates, 52 butterfly species are included.

**Noteworthy fauna:**

The fish species present in the Bundala wetlands include salt-water dispersants (*Anguilla bicolor*), marine forms (*Ambassis gymnocephalus*), brackish water forms (*Chanos chanos*) and freshwater forms (*Channa striata*). Among the vertebrate fauna associated with wetland habitats in Bundala, two species of herpetofauna (*Bufo atukoralei*, *Xenochrophis asperrimus*) are endemic. Breeding populations of two species of crocodiles (*Crocodylus palustris* and *C. porosus*) inhabit mainly the Malala and Embilikala wetlands. The beach adjoining the national park is a nesting ground for all five species of globally endangered marine turtles that visit Sri Lanka. About 100 species of water birds inhabit the wetland habitats in Bundala, half of them being annual migrants. The highlight of Bundala is the migratory Greater Flamingo (*Phoenicopterus ruber*), which visits in large flocks of over 1000 individuals, from Rann of Kutch – India. Other water birds which are present in large numbers include waterfowl (i.e. *Dendrocygna javanica*, *Anas querquedula*), cormorants (*Phalacrocorax niger*, *P. fuscicollis*), large water birds (*Ardea cinerea*, *Threskiornis melanocephalus*, *Platalea leucorodia*, *Anastomus oscitans*, *Mycteria leucocephala*), medium sized waders (*Tringa* spp.) and small waders (*Charadrius* spp.). Rare water birds include *Ephippiorhynchus asiaticus*, *Leptoptilus javanicus* and *Fulica atra*.

**Noteworthy flora:**

The vegetation of the Bundala salt marshes/tidal flats consist of salt tolerant plant species such as *Salicornia brachiata* and *Halosarcia indica*. The small patch of mangrove consists of a few trees of *Lumnitzera racemosa*. The canal that links the Malala and Embilikala lagoons is covered with Cattail reed (*Typha angustifolia*).

**Land use:**

Bundala and Koholankala lagoons are mainly used for salt production. Some fishing takes place in Embilikala Kalapuwa and Malala Lewaya, while the sanctuary is a popular tourist destination.

**Possible changes in land use:**

Drainage of irrigation water from the Kirindi Oya Irrigation and Settlement Project (KOISP) and the Bandagiriya Irrigation Scheme, located upstream of the park system, has adversely affected water quality in Malala and Embilikala lagoons. Salinity levels have dropped due to increased freshwater flow, and other irrigation schemes planned within the Ruhuna basin may further affect the wetlands within the park. This may affect fish populations and fisheries based within the lagoons.

**Hydrological and biophysical values:**

The interconnected network of canals and the existing marshes provide natural flood control services. The presence of the sand dunes provides shoreline stabilisation and protection from natural disasters such as tsunamis and storm surges.

**Social and cultural values:**

The irrigated areas upstream of the Park provide livelihood opportunities for around 3,000 farmer families within the park vicinity. Prior to the implementation of the KOISP in 1987, around 400 families were engaged in prawn fishing in Malala and Embilikala Lagoons.

**Scientific research and monitoring:**

In 1996, NARA conducted detailed surface water quality monitoring in Malala lagoon. In 2001, IUCN undertook a biodiversity assessment of the park. Numerous waterfowl surveys and shore bird censuses have been conducted. IWMI has undertaken several studies related to the impact of irrigation activities.

**Conservation education:**

A visitor centre has been established adjoining the park office.

**Recreation and tourism:**

The National Park is a popular attraction for both local and foreign tourists. Tour companies and guides operate wildlife tours (especially bird watching) within the Sanctuary.

**Conservation measures taken:**

The site was declared a Sanctuary under the FFPO in 1969, and was subsequently upgraded to a National Park in 1992. However, the park was regazetted in 2004 and the original park area was reduced from 6,210 ha to 3,698.010 ha. In 1993 a wetland site report and conservation management plan was developed by the CEA under the Wetland Conservation Project. In 1991, Bundala was declared as the first Ramsar site in Sri Lanka. In 2005, Bundala was declared a Man and Biosphere Reserve by UNESCO. The DWC prepared a detailed management plan for Bundala in 1997, under a GEF project. The recommendations of this plan are gradually being implemented. The DWC has also initiated several conservation projects in Bundala, including a turtle conservation programme, and an invasive alien species eradication programme targeting the removal of *Prosopis juliflora* and *Opuntia dillennii*. In June 2006, an area adjoining Bundala National Park covering an area of 3,339.38 ha was declared as the Wilmanna Sanctuary.

**Conservation measures proposed:**

The conservation management plan prepared by the CEA, the biodiversity assessment report prepared by IUCN and the management plan prepared by the DWC have all proposed several management initiatives. These include the re-demarcation of the park boundary and extension of the boundary to include the northern scrubland, relocating families living inside the park, initiating a programme to control the spread of invasive alien species, creating appropriate irrigation structures to halt the flow of irrigation water and management of livestock grazing within the park.

**Disturbances and threats:**

Drainage of excess water from irrigation systems, and release of sludge from the saltern into Bundala lagoon, has affected the quality of water in the lagoons. The spread of two invasive alien plants (*Prosopis juliflora* and *Opuntia dillennii*) around the tidal flats in Malala and Embilikala lagoons has resulted in the loss of habitats for wading birds. The spread of *P. juliflora* is facilitated by unmanaged herds of livestock, which graze around the lagoons.

**Land tenure:**

The entire wetland complex is state owned. The DWC owns most of the area other than Koholankala lagoon, which is on lease to the National Salt Corporation from the government. The surroundings and catchments are partly state owned and partly private property.

**Management authority and jurisdiction:**

DWC

**References:**

Amerasinghe et al. (2001); Bambaradeniya et al. (2002a); CEA/ARCADIS Euroconsult (1993a); De Silva (1999); IIMI (1995); Matsuno (1999); [www.ramsar.org](http://www.ramsar.org)



# Colombo Flood Detention Areas

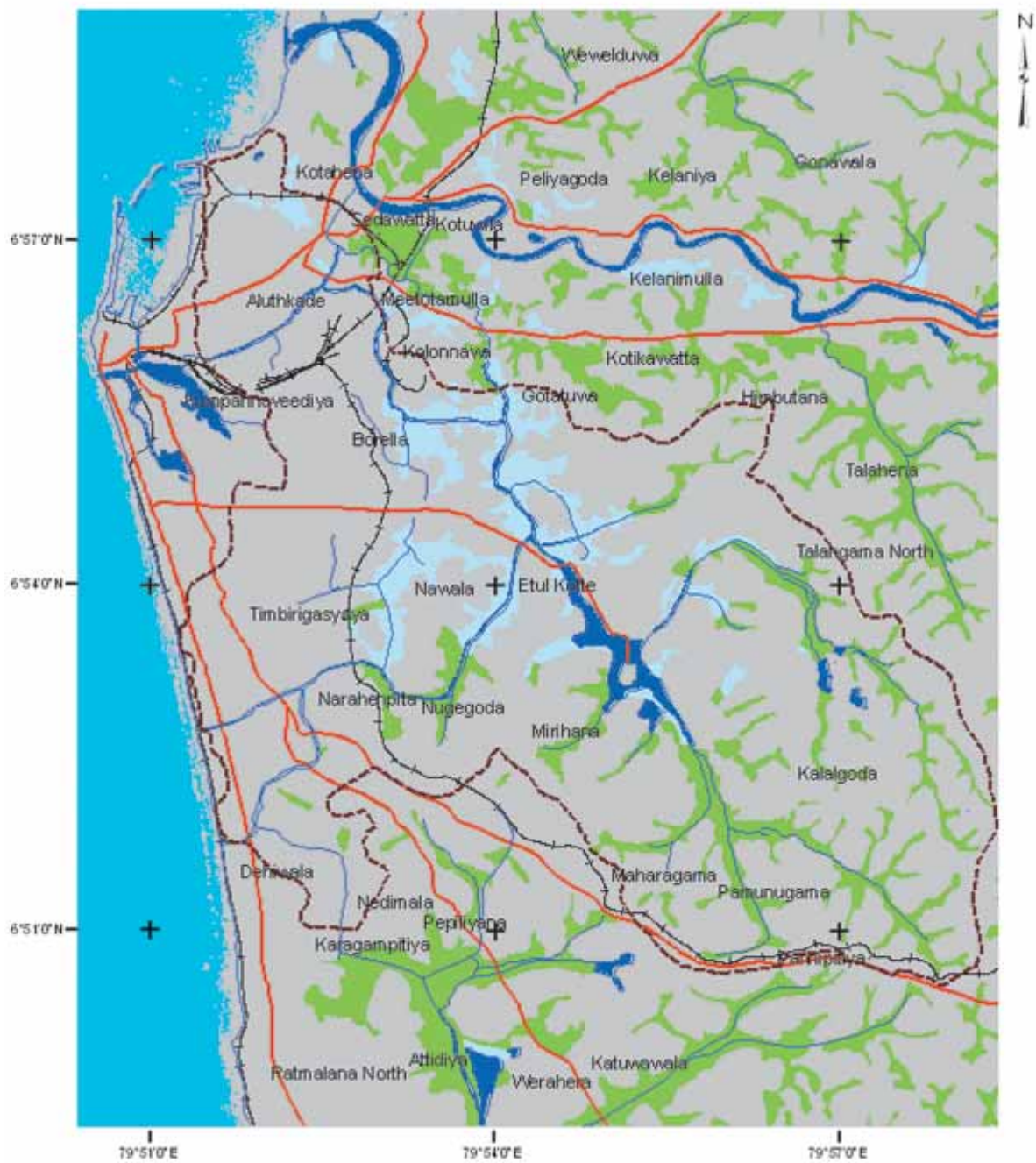


Legend	
<b>Land Cover</b>	
Sea water	Natural vegetation (low dense)
Water bodies	Sand
Paddy land	Exposed soil
Grassland (Playground)	Railway line
Homegardens	Main road
Built up area	Waterways
	Catchment area

Source: Landsat ETM+ 14 March 2001  
 Ground Truthing - April 2006  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/PEMA/CEA/2006












## Colombo Flood Detention Areas Wetlands based on Ramsar Classification



0 1 2 4 Kilometers

### Legend

#### Class Name

- |   |                                     |   |                |
|---|-------------------------------------|---|----------------|
|  | Ponds                               |  | Railway line   |
|  | Permanent fresh water marshes/pools |  | Main road      |
|  | Permanent rivers/streams/creeks     |  | Waterways      |
|  | Irrigated land                      |  | Catchment area |
|  | Non-wetlands                        |   |                |

Source: Landsat ETM+ 14 March 2001  
Ground Truthing - April 2006  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/EMA/CEA/2006



# Colombo Flood Detention Areas

## Location:

7° 0' 0 N and 79° 50' 15 E to 7° 0' 0 N and 80° 0' 0 E; 773909 N and 371132 E to 773866 N and 389543 E; in the Colombo District, of the Western Province.

## Area:

Approximately 400 ha (Kolonnawa marsh = 214.3 ha; Kotte marsh = 97.4 ha; Heen marsh = 87.7 ha)

## Altitude:

Below mean sea level to 1.0 m above sea level

## Overview:

The Colombo marshes constitute three interconnected marshes that form a unique environment in the Greater Colombo area. The marshes are extremely important for flood detention within the Colombo City. They are a part of a large marsh system connected to the Attidiya and Bellanwila Sanctuary and also provide refuge for wildlife within the urban areas of Colombo. However, due to their urban location, the marshes are under threat from pollution and land filling.

## Physical features:

The area belongs to the Southwestern Precambrian group and probably has a geological history similar to that of the Negombo estuary and the Bellanwila-Attidiya marsh which are also located within the greater Colombo region. The major soil groups found in the area are Red-Yellow Podzolic Plinthite Soil, Half Bog Soil and Alluvial Soils. The marshes lie within the wet zone and receive a mean annual rainfall of 2,000mm. The average annual temperature ranges between 25° C and 27° C.

## Ecological features:

The marshes are surrounded by urban landscapes, degraded natural habitats, and managed habitats such as paddy fields and home gardens. Natural areas contain extensive reed beds and *Annona glabra* dominated scrubland habitats.

## Noteworthy fauna:

The marshes harbour several species of endemic fish, including *Esomus thermoicos*, *Clarias brachysoma*, *Aplocheilus dayi*, *Channa orientalis* and *Puntius singhala*. Among the amphibians, *Polypedates cruciger* and *Rana gracilis* are endemic to Sri Lanka. Aquatic reptiles include freshwater turtles (*Melanochelis trijuga*, *Lissemys punctata*) endemic serpents (i.e. *Xenocrophis asperimus*) and the crocodile (*Crocodylus palustris*). Common water birds include *Pelecanus philippensis*, *Dendrocygna javanica*, *Alcedo atthis*, *Amaurornis phoenicurus*, *Phalacrocorax niger*, *Mesophoyx intermedia*, *Egretta garzetta* and *Ardeola grayii*. Rare mammals such as *Prionailurus viverrinus* and *Lutra lutra* also inhabit these marshes, while troops of the endemic *Trachypithecus vetulus* can be found in the bordering trees.

**Noteworthy flora:**

Floating *Nymphaea* spp. occur in a patchy manner. Patches of *Syzygium* spp. and *Pandanus* spp. are also scattered around the wetlands. Several species of grasses (i.e. *Cynodon dactylon*) and sedges (i.e. *Fimbristylis* spp., *Eleocharis* spp.) are also present.

**Land use:**

The wetlands are not used extensively for human activities although some small-scale fisheries, agriculture and animal husbandry are carried out. The wetlands are also used for recreational purposes. Additionally, large areas of the wetlands are used as land fills for development and dumping of waste.

**Possible changes in land use:**

Increased land reclamation for urbanisation will reduce the importance of the wetlands for other uses.

**Hydrological and biophysical values:**

The marshes are extremely important for flood detention during heavy rains, and are a vital part of the drainage system of the greater Colombo area.

**Social and cultural values:**

The proximity of the wetlands to Colombo City provides easy access for bird watching, conservation education and recreational activities. The present parliament of Sri Lanka is also located within the wetland system. The Diyawanna Oya and surrounding marshes were important natural defensive barriers for the ancient capital city of Kotte and are therefore of historical importance, and the area has been described in ancient poetry.

**Scientific research and monitoring:**

The wetlands have been studied by a number of universities and have been the focus of numerous student research projects.

**Conservation education:**

Educational programmes, especially for school children have been conducted by a number of state organisations, NGO's and volunteer organizations.

**Recreation and tourism:**

Some areas of the wetlands are popular with families as recreational areas. A large country club and a golf course are also located nearby.

**Conservation measures taken:**

In 2006 the CEA in collaboration with the MoE commenced a programme to conserve and manage the wetland system including canals and surrounding areas. The marshes have been included in the Greater Colombo Flood Control and Environment Improvement Project being executed by the SLLRDC. The CEA has also published a wetland site report and conservation management plan for the Colombo Flood Detention Areas in 1995.

**Conservation measures proposed:**

Detailed conservation measures to conserve critical wetland habitats and manage water quality have been outlined in the CEA conservation management plan.

**Disturbances and threats:**

The major threat to the wetland system is land reclamation activities and landfills for large-scale housing schemes due to the increasing urban population and resulting demand for land. Clearing of vegetation and undergrowth in peripheral areas is also a problem, while the spread of invasive alien plant species such as *Lantana camara*, *Annona glabra*, *Eichhornia crassipes*, *Salvinia molesta* and *Typha angustifolia* is a major threat to native plant species. The spread of carnivorous invasive alien fish such as *Chitala ornata*, and *Poecilia reticulata* has affected the populations of endemic fish species. Haphazard dumping of solid waste and sedimentation have also led to pollution of the waterways, reduced water exchange and the flood detention capacity. Need urgent actions to mitigate existing threats.

**Land tenure:**

The four flood detention areas, Kolonnawa North Marsh, Kolonnawa East Marsh, Kotte Marsh and Heen Marsh are all state owned.

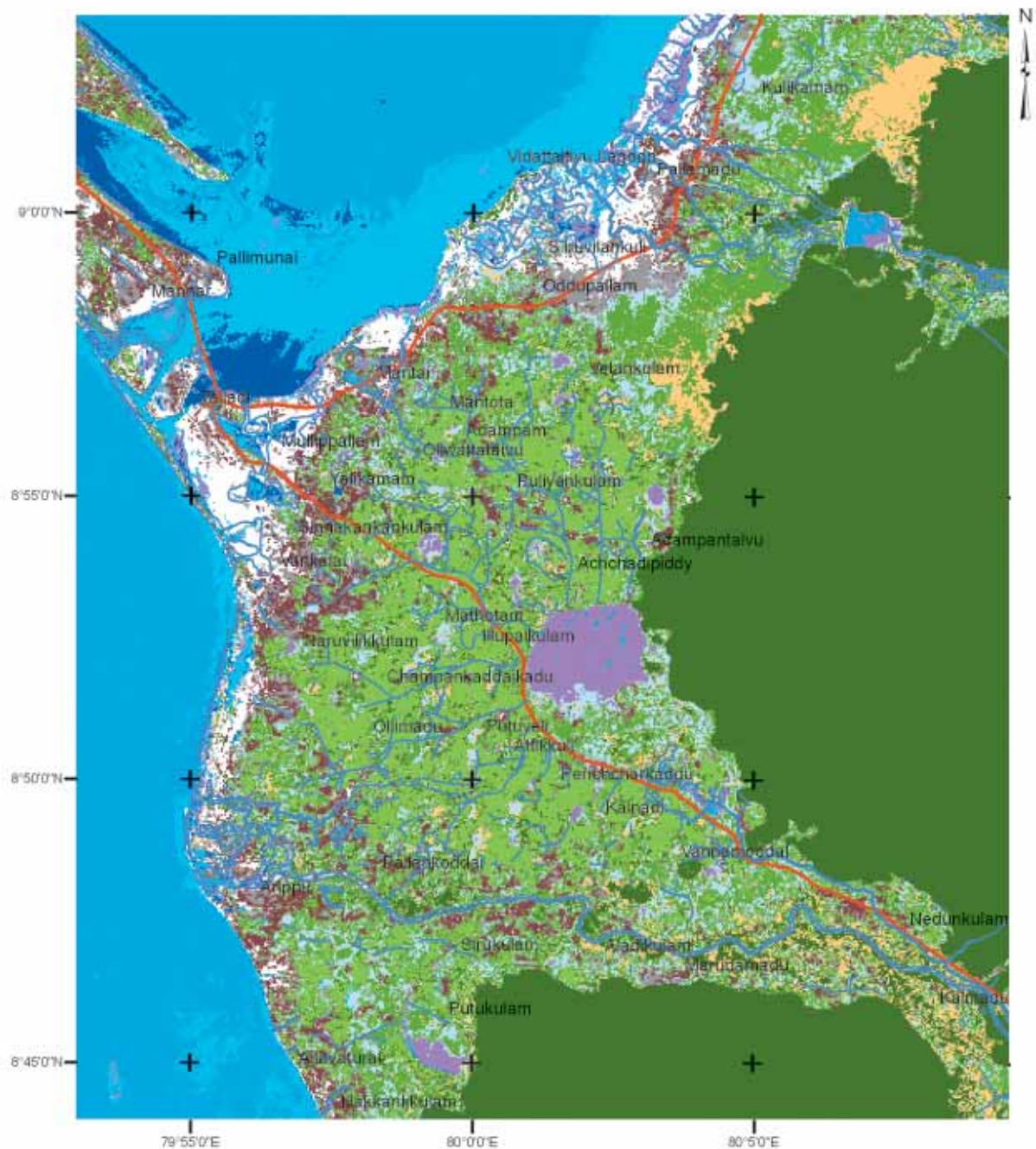
**Management authority and jurisdiction:**

Sri Jayawardenapura Kotte DS, Kolonnawa DS, and the SLLRDC.

**References:**














CEA/ARCADIS Euroconsult (1995a); Perera and Perera (2006)

# Giant's Tank



## Legend

### Land Cover

	Sea water (deep)		Natural vegetation (dense)
	Sea water (shallow)		Sand
	Brackish water		Exposed soil/Mudflats
	Water bodies		Main road
	Water with aquatic plants		Waterways
	Mangroves		
	Marshy land		
	Paddy land		

Source: Landsat ETM+ 6th February 1988  
(Datum WGS 84, Projection UTM)

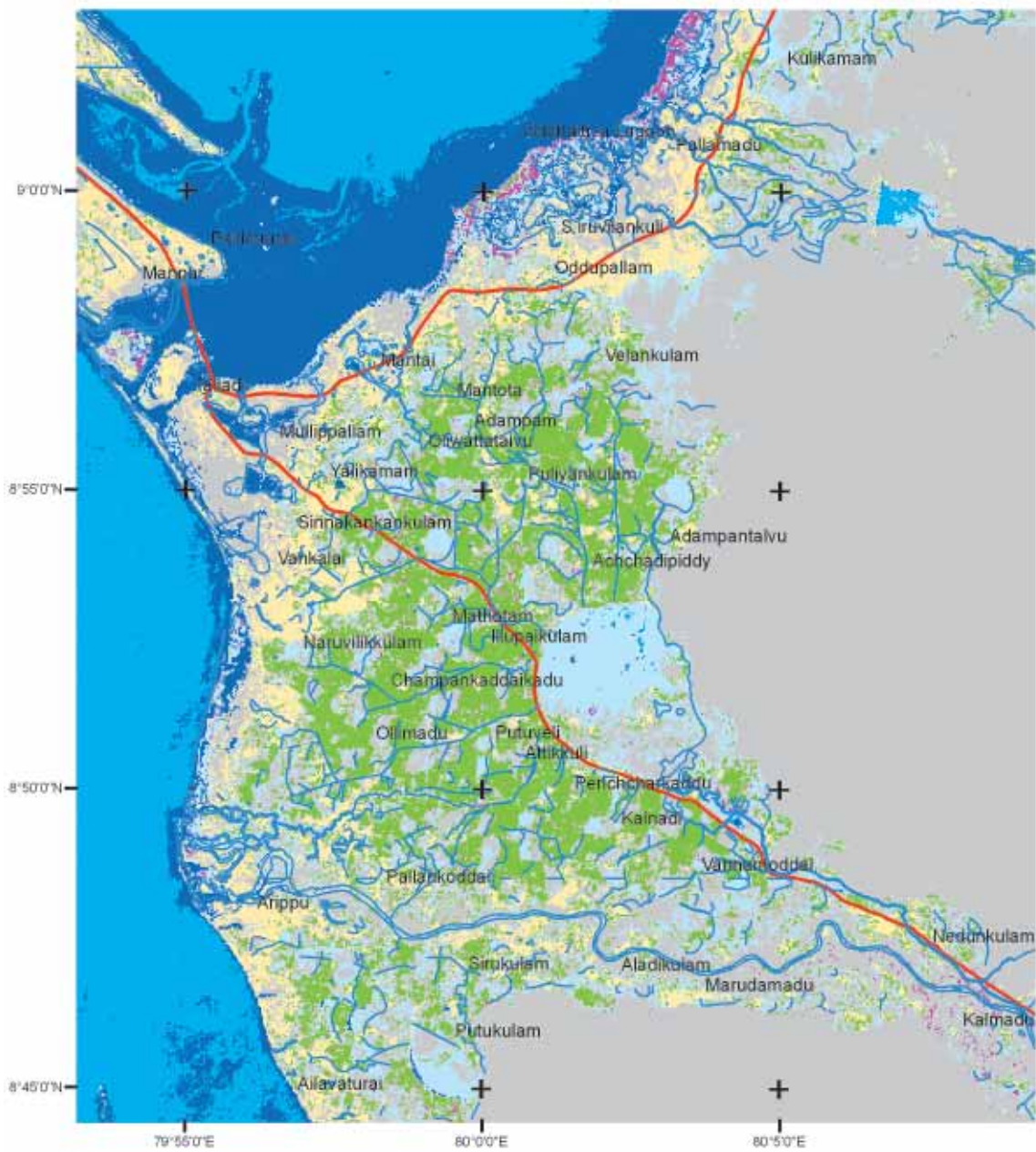


Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Giant's Tank

## Wetlands based on Ramsar Classification



0 2 4 8 Kilometers

### Legend

#### Class Name

- Sea
- Permanent shallow marine waters
- Intertidal forested wetlands
- Intertidal mud, sand or salt flats
- Seasonal/intermittent freshwater marshes/pools
- Irrigated land
- Non-wetlands
- Main road
- Waterways

Source: Landsat ETM+ 6th February 1988  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Giant's Tank

## Location:

9° 0' 0 N and 79° 55' 0 E to 8° 45' 0 N and 80° 5' 0 E; 995028 N and 380920 E to 967336 N and 399173 E; about 25 km southeast of Mannar in the Mannar District, of the Northern Province.

## Area:

2,500 ha

## Altitude:

40 m above mean sea level

## Overview:

Giant's tank is a large ancient irrigation tank situated in the northwestern semi-arid zone. It belongs to three AGA/DS divisions and feeds 162 minor tanks, 61 of which are in Manthai West. The tank irrigates about 11,000 ha of paddy land. At the end of the monsoon season, excess water is stored in a tank upstream (Tekkam Anicut) and used to irrigate an additional 2,500 ha. Giant's tank directly benefits 2,560 farm families. It has also been identified as an IBA by BirdLife International.

## Physical features:

Giant's tank being located in the Mannar District in the semi-arid zone is characterised by high temperatures and low rainfall. The monthly temperatures range between 26.5°C and 30.0°C with highs normally recorded between May and August. Mannar receives nearly 60% of its rainfall during the northeast monsoon, which lasts from October through December. The land area is relatively flat and sits at low elevations.

## Ecological features:

The aquatic macrophytic vegetation is dominated by species such as *Nelumbo nucifera* and *Nymphaea stellata*. The arid zone forests and dry scrubland are the major vegetation types that can be observed in the surrounding landscape. The large, shallow areas of the tank are ideal habitat for large colonies of aquatic birds particularly during the migratory season. A total of 124 species of birds have been recorded in and around Giant's tank. This tank also regulates the downstream water flow to more than 100 other small tanks.

## Noteworthy fauna:

Native fish harvested by local fishermen include *Ompok bimaculatus*, *Puntius sarana*, *P. dorsalis* and *Heteropneustes fossilis*. Aquatic reptiles include *Lissemys punctata*, *Melanochelys trijuga* and *Crocodylus palustris*. Giant's tank, being a large storage tank, is an ideal habitat for aquatic birds such as *Hydroprogne caspia*, *Chlidonias hybrida*, *Anhinga melanogaster*, *Fulica atra*, *Rostratula benghalensis*, *Ciconia episcopus*, *Ceryle rudis*, *Haliaeetus leucogaster* and *Ichthyophaga ichthyaetus*. The elusive pheasant *Francolinus pondicerianus* has also been recorded in the tank vicinity. The noteworthy mammal species include *Elephas maximus*, *Macaca sinica*, *Lutra lutra*, *Prionailurus viverrinus* and *Axis axis*. Among the odonates, *Brachythemis contaminata*, *Ischnura senegalensis* and *Orthetrum Sabina* are common, while *Pseudagrion decorum* has also been recorded here recently.

## Noteworthy flora:

Floating vegetation include *Nelumbo nucifera* and *Nymphaea stellata*.

**Land use:**

The tank supports a small-scale inland fishery while the surroundings are mainly used for irrigated agriculture and chena cultivation.

**Possible changes in land use:**

Allocation of more land for irrigated agriculture

**Hydrological and biophysical values:**

Giant's tank is an important water storage tank in the Mannar District, which feeds 164 minor tanks in the downstream area.

**Social and cultural values:**

The inland fishery activities are an important livelihood for the local communities.

**Scientific research and monitoring:**

The waterbirds of this site are monitored by the CBC.

**Conservation education:**

Information not available

**Recreation and tourism:**

Giant's tank is a popular destination for bird watchers but tourism has been seriously affected due to the uneasy security situation prevailing in these areas.

**Conservation measures taken:**

The catchment area and its surroundings have been protected as a Sanctuary by the DWC.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Illegal logging occurs in the surroundings.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

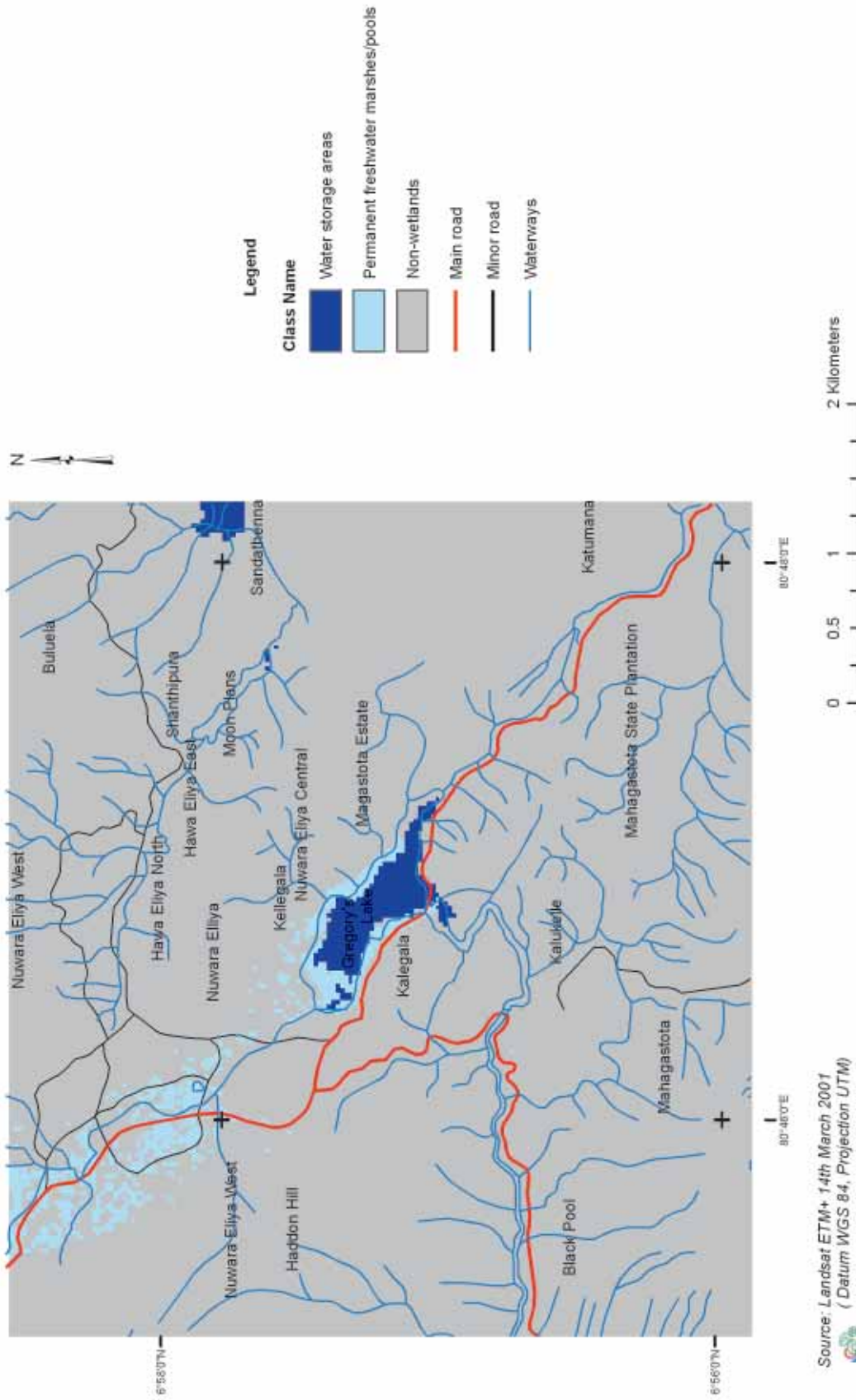
Irrigation Department

**References:**

BirdLife International (2005); de S Wijeyratne and Salgado (2003) <http://www.manrecap.com/mannar-district.html>; Wijeyamohan et al. (2002); Wijeyamohan et al. (2006)



# Gregory's Lake Wetlands based on Ramsar Classification



Source: Landsat ETM+ 14th March 2001  
( Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/EMA/CEA/2006



# Gregory's Lake

## Location:

6° 57' 0 N and 80° 45' 0 E to 6° 56' 0 N and 80° 48' 0 E; 768229 N and 472384 E to 766384 N and 477907 E; within the municipality area of the city of Nuwara Eliya; Nuwara Eliya District; Central province.

## Area:

The area of the Gregory's Lake is 0.4 km<sup>2</sup> with a perimeter of about 3.5 km.

## Altitude:

1,914 m above MSL

## Overview:

This is a man-made tank, named after Sir William Gregory, Governor of the then Ceylon from 1872 to 1877. The swamp, which existed at this location, was converted into the water body of the Lake Gregory by damming Nanu Oya stream. This is a unique artificial wetland created in the heart of the high altitude city of Nuwara Eliya. It is located just 610 m below the Pidurutalagala peak, which is the highest peak in Sri Lanka. The Lake is bounded on all sides by roads, and the surrounding area has been severely altered by agricultural expansion, and urban sprawl. Because of the Lake's aesthetic value and scenic attraction, many holiday homes and tourist hotels have been established around it.

## Physical Features:

Lake Gregory is a small, man-made Lake, located in the wet montane zone of Sri Lanka. A major tributary of this Lake is the Nanu Oya stream that originates from the Pidurutalagala Peak. Nanu Oya receives many small tributaries on its downhill journey to the Lake. Most of the streams in the catchment area have been changed over the years for commercial agriculture developments. These agriculture developments and tourist expansions are threatening the future of the present day Lake. Lake Gregory receives an average annual rainfall of 2,000-2,500mm, and a mean annual temperature of approximately 16°C. The underlying area of the Lake consists of highly crystalline charnockitic genesis rocks of Precambrian age.

## Ecological Features:

Major habitat types around the Lake area include freshwater marshes, streams, degraded montane forests and agricultural lands (tea plantations, vegetables cultivations etc.). The aquatic vegetation in the Lake consists of phytoplankton, and rooted macrophytes. The fauna recorded from the Lake environs include 11 species of invertebrates and 77 species of vertebrates.

## Noteworthy Fauna:

The freshwater fish populations in the Lake consist entirely of exotics, dominated by *Oreochromis* spp. and *Cyprinus* spp. Among the aquatic amphibians, the endemic *Polypedates eques* and *Lankanectus corrugata* inhabit the streams and marshes around the Lake. Aquatic birds that visit the Lake include cormorants (*Phalacrocorax niger*), egrets (*Egretta garzetta*, *Mesophoyx intermedia*), herons (*Ardeola grayii*) and kingfishers (*Alcedo atthis*, *Halcyon smyrnensis*), while raptors include *Elanus caeruleus* and *Circus* spp. Among the mammals, *Lutra lutra* and *Prionailurus viverrinus* inhabit the surrounding environs. The riparian



areas and associated streams harbour several endemic crab species (*Perbrinkia* spp. and *Ceylonthelphusa* spp.).

**Noteworthy Flora:**

The phytoplankton communities are dominated by *Myxophyceae* (blue green algae). The floating macrophytes in the Lake are dominated by two exotic species; *Salvinia molesta*, and *Pistia stratiotes*. The other rooted aquatic plants that are common in the Lake include *Hydrilla verticillata*, *Nymphaea* spp., and *Cabomba* sp. Predominant plant species in the Lake bank include *Aristea eckloni*, *Pogostemon reflexus*, *Eriocaulon brownianum*, and *Osbeckia parvilolia*.

**Land Use:**

The surrounding environs consist of marshes, home gardens, vegetable cultivations, tea plantations, hotels and commercial centers.

**Possible Changes in Land use:**

Reclamation of the lake area for commercial agricultural expansion, and human settlements are the major land use changes expected.

**Hydrological and biophysical values:**

The water from Lake Gregory is predominantly used for irrigating green houses and other horticultural activities, particularly during the dry season. The general perception of the local community is that the water in the lake is not very clean as a result of stagnation and due to the large amount of dissolved agro chemicals.

**Social and cultural values:**

The Lake serves as an aesthetic and recreational site for visitors to Nuwara Eliya. The water within the lake acts mainly as a supply for the surrounding agricultural lands during the dry season and not as a source of potable water for the town residents. Domestic tourism is an important component of the local economy.

**Scientific research and monitoring:**

No research facility exists at present.

**Conservation Education:**

University students are taken to this site for courses on water quality testing.

**Recreation and Tourism:**

Although there are many tourist hotels in the area surrounding the lake, it is not the sole attraction for visitors to the area. The municipal council leases out permits for boat operators to make boating available to visitors. The CTB in its Tourism Master Plan proposes to introduce recreational facilities at the Lake Gregory.

**Conservation measures taken:**

The CEA produced a conservation management plan for this site in 1997. Additionally, a small patch of forest bordering the Lake was recently declared as a protected area under the DWC. In the Nuwara Eliya

Urban Development Plan, unsuitable agricultural activities on slopes have been prohibited in order to reduce erosion and subsequent silting of the lake.

**Disturbances and threats:**

Major threats to Lake Gregory include the reclamation of the Lake area for commercial agricultural expansion, expansion of human settlements and the subsequent increase in pollution. The rapid and uncontrolled increase in invasive plant species (e.g. *Salvinia molesta*, *Pistia stratiotes*, *Eichhornia crassipes*) is also threatening the beauty and ecological value of the lake. The unregulated application of agrochemical and organic manure has already changed the water quality of the lake. Accumulation of heavy metal in the Lake is inevitable unless regular flushing is carried out. Need urgent actions to mitigate existing threats.

**Land tenure:**

The Lake is state owned while the surroundings are both privately owned and state owned.

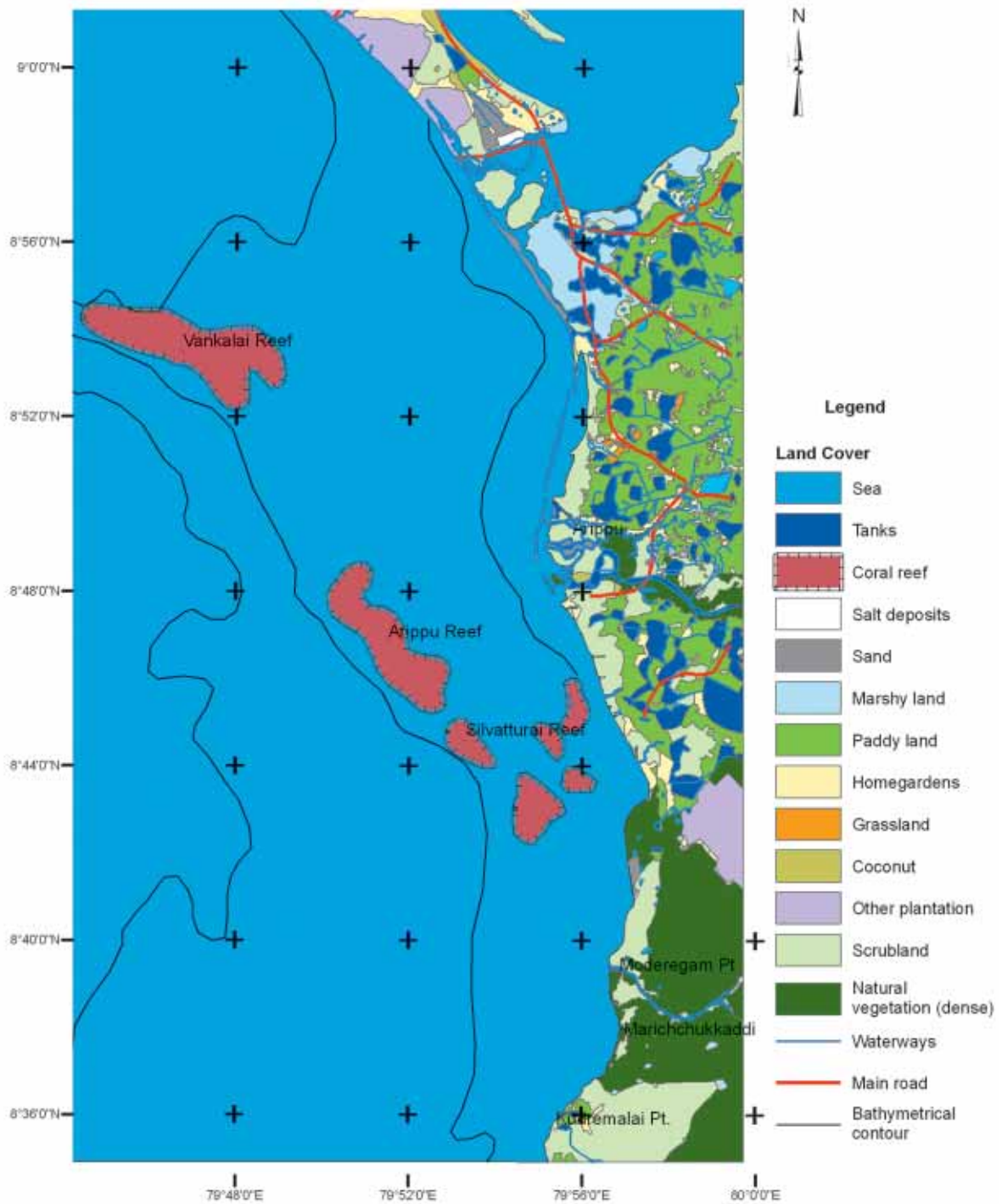
**Management authority and jurisdiction:**

The Lake falls under the jurisdiction of the Nuwara Eliya Municipal Council while the UDA is responsible for zoning and for the development of regulations, and has prepared a Recreation Master Plan for this wetland and its surrounds. Although a major dredging programme was carried out by the UDA some years ago, responsibilities related to its maintenance lie with the Municipal Council.

**References:**

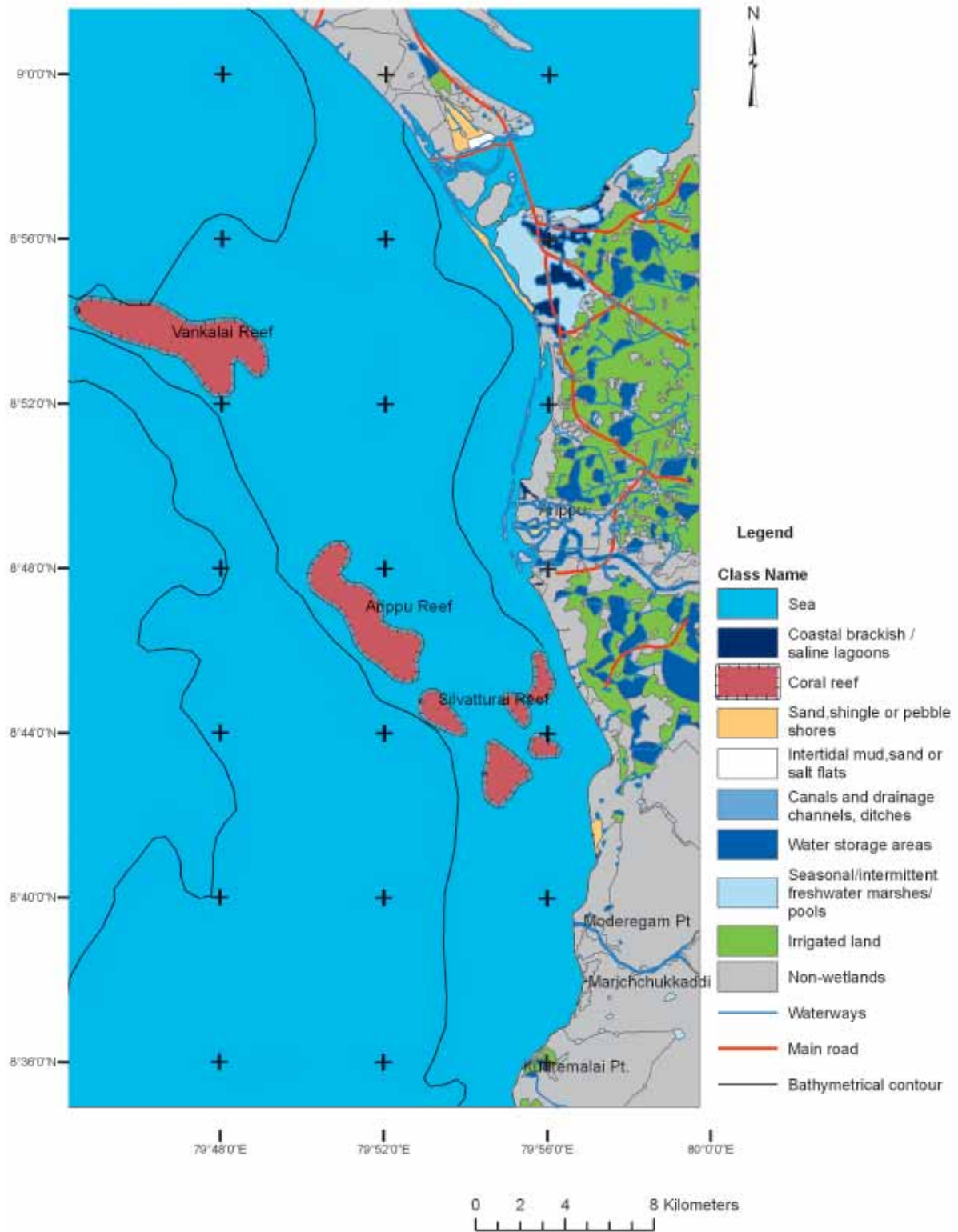
CEA/ARCADIS Euroconsult (1997a); Pradeep Samarawickrema (personal communication)

# Gulf of Mannar Reefs



Source: 1:30,000 scale, Admiralty Chart No. 1583  
 U.K. Hydrographic Office- August 1984  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

## Gulf of Mannar Reefs Wetlands based on Ramsar Classification



Source: 1:30,000 scale, Admiralty Chart No. 1583  
U.K. Hydrographic Office- August 1984  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Gulf of Mannar Reefs

## Location:

9° 0' 0 N and 79° 48' 0 E to 8° 36' 0 N and 80° 0' 0 E; 995068 N and 368094 E to 950773 N and 389963 E; in the North-western coast north of Talawila and south of Mannar Island, Puttalam and Mannar Districts of the North-western and Northern Provinces.

## Area:

Exact reef area unknown.

## Altitude:

Sea level to depths of over 30m

## Overview:

The Gulf of Mannar has some of the most extensive reef formations and marine seagrass beds in the country. In addition to the coral reef systems of the Bar Reef, there exist several other reef formations to the south off Kandakuliya and Talawila, and northwards towards Mannar, including reefs off Silavaturai and Vankalai. The status of reefs within the northern Gulf of Mannar are not well known due to a lack of access, but many reefs in the southern Gulf of Mannar are now in a degraded condition due to overfishing and the use of destructive fishing methods. However, the area supports high species diversity due to its extent and variety of habitats.

## Physical features:

Reefs in this area are very similar to those within the Bar Reef, and consist of shallow continental shelf patch reefs and deeper sandstone reefs. Most coral patches are located within depths of 1-10m, while sandstone habitats are located deeper, often down to 30 m or deeper. The reef in Talawila rises sharply from a sandy bottom on its shoreward side to an outer reef slope on the seaward side. There is a shallow reef built upon sandstone and dead coralline structures in Mampuri. Coral patches off Kandakuliya and Silavaturai resemble those of the Bar Reef.

## Ecological features:

Shallow reefs off Silavaturai and Vankalai are dominated by branching and tabulate *Acropora* spp. Reefs off Kandakuliya are heavily degraded and are now overgrown by algae with little live coral. Talawila reef and Mampuri reef have relatively low coral cover but support high species diversity dominated by the genera *Favia*, *Favites*, *Goniastrea*, *Leptoria*, *Platygyra*, *Pocillopora* and *Acropora*. The reefs are important habitats for commercially important fish belonging to the families Lutjanidae, Lethrinidae, Haemulidae, Serranidae and Carangidae.

## Noteworthy fauna:

Several globally threatened fish species such as *Cheilinus undulates*, *Aetomylaeus nichofii*, *Epinephelus lanceolatus* and *Rhincodon typus* have been recorded from the area while two species restricted to Sri Lanka (*Chlorurus rhakoura* and *Plectorhinchus ceylonensis*) are also found in the area. *Carcharhinus melanopterus* and *Trionodon obesus* are also common in shallow reef areas while one nationally protected species (*Labroides bicolor*) has been recorded from the area. The reefs are visited by all 5 species of



globally endangered marine turtles found in Sri Lanka (*Eretmochelys imbricata*, *Dermochelys coriacea*, *Chelonia mydas*, *Lepidochelys olivacea* and *Caretta caretta*). Important marine mammals include small cetaceans such as *Tursiops truncatus* and *Stenella longirostris*, large whales such as *Balaenoptera musculus* and *Physeter macrocephalus*, and the dugong (*Dugong dugon*)

**Noteworthy flora:**

There is a high diversity of marine algae including *Halimeda* spp., *Caulerpa* spp., and *Sargassum* spp. Marine seagrasses include the genera *Thalassia* and *Halodule*.

**Land use:**

Fisheries, including collection of ornamental fish, chanks and sea cucumbers are the major activities carried out on the reefs.

**Possible changes in land use:**

Continued reef degradation may lead to decreased fish catches and changes in fishing methods and catch composition. This has already been witnessed in the Kandakuliya area where bottom set nets have degraded the reef resulting in reduced production of high value fish species. Increased competition for resources is also driving fishermen to use more destructive fishing methods such as the use of dynamite and purse seine nets, as well as target new resources and species.

**Hydrological and biophysical values:**

The Gulf of Mannar region comprises the most extensive and diverse system of coral reefs in Sri Lanka. Together with the abundance of other habitats such as sandstone reefs and seagrasses, this area constitutes a unique eco-region within the Indian Ocean. Reefs to the north off Silavaturai and Vankalai may be the source of coral recruits for reefs located further south including the Bar Reef, as recruitment is thought to occur during periods when currents move southwards during the northeast monsoon. The reefs also play an important role in regulating local current patterns and are important in stabilizing shorelines and assisting in the accretion of sediments and sand cays within the northern Gulf of Mannar.

**Social and cultural values:**

This area is of historic importance due to the location of some of the earliest ports and settlements in Sri Lanka. Reefs in the area are also important for supporting livelihoods and the food security of local communities.

**Scientific research and monitoring:**

Reefs in the southern Gulf of Mannar, such as Kandakuliya and Talawila, have been studied by NARA. Reefs in the northern Gulf of Mannar have not been studied due to the conflict situation in the area.

**Conservation education:**

Information not available

**Recreation and tourism:**

Information not available

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

The Gulf of Mannar area has been proposed as a SAM site by the CCD.

**Disturbances and threats:**

The use of destructive fishing methods such as dynamite and bottom set nets has caused extensive damage to reefs in the area, while overfishing is depleting populations of reef fish and pelagic species. By-catch of marine turtles and cetaceans is also a problem, while poaching of turtles and turtle eggs is carried out, particularly around Mannar. Coral bleaching has also resulted in extensive mortality of corals in shallow areas while infestations of the invasive *Acanthaster planci* have degraded some reefs in the past.

**Land tenure:**

State owned

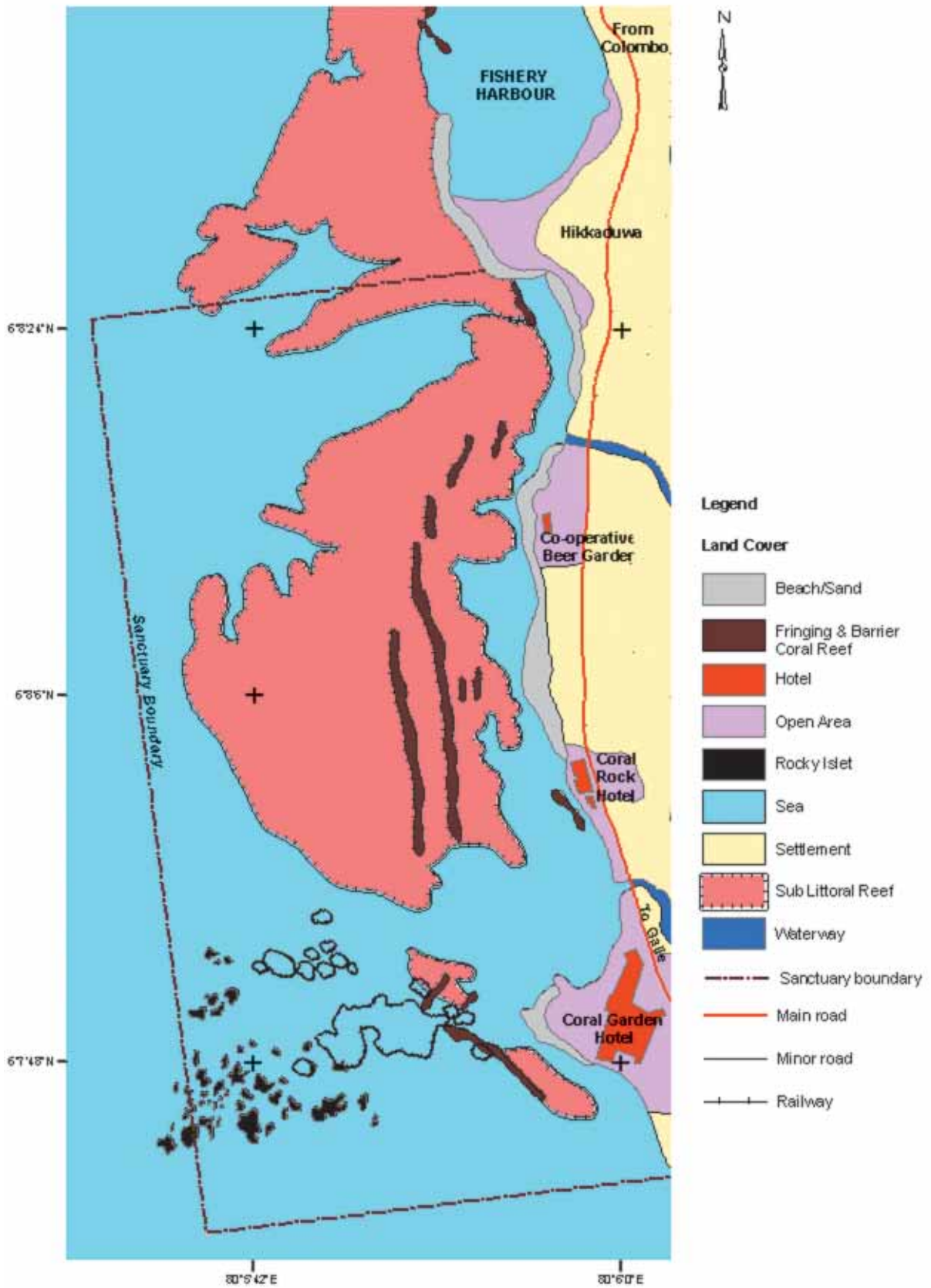
**Management authority and jurisdiction:**

DFAR for managing fisheries, and the CCD for management of the coastal zone.

**References:**

Öhman et al. (1993); Öhman et al. (1997); Rajasuriya (2005); Rajasuriya et al. (1995); Rajasuriya et al. (1997)

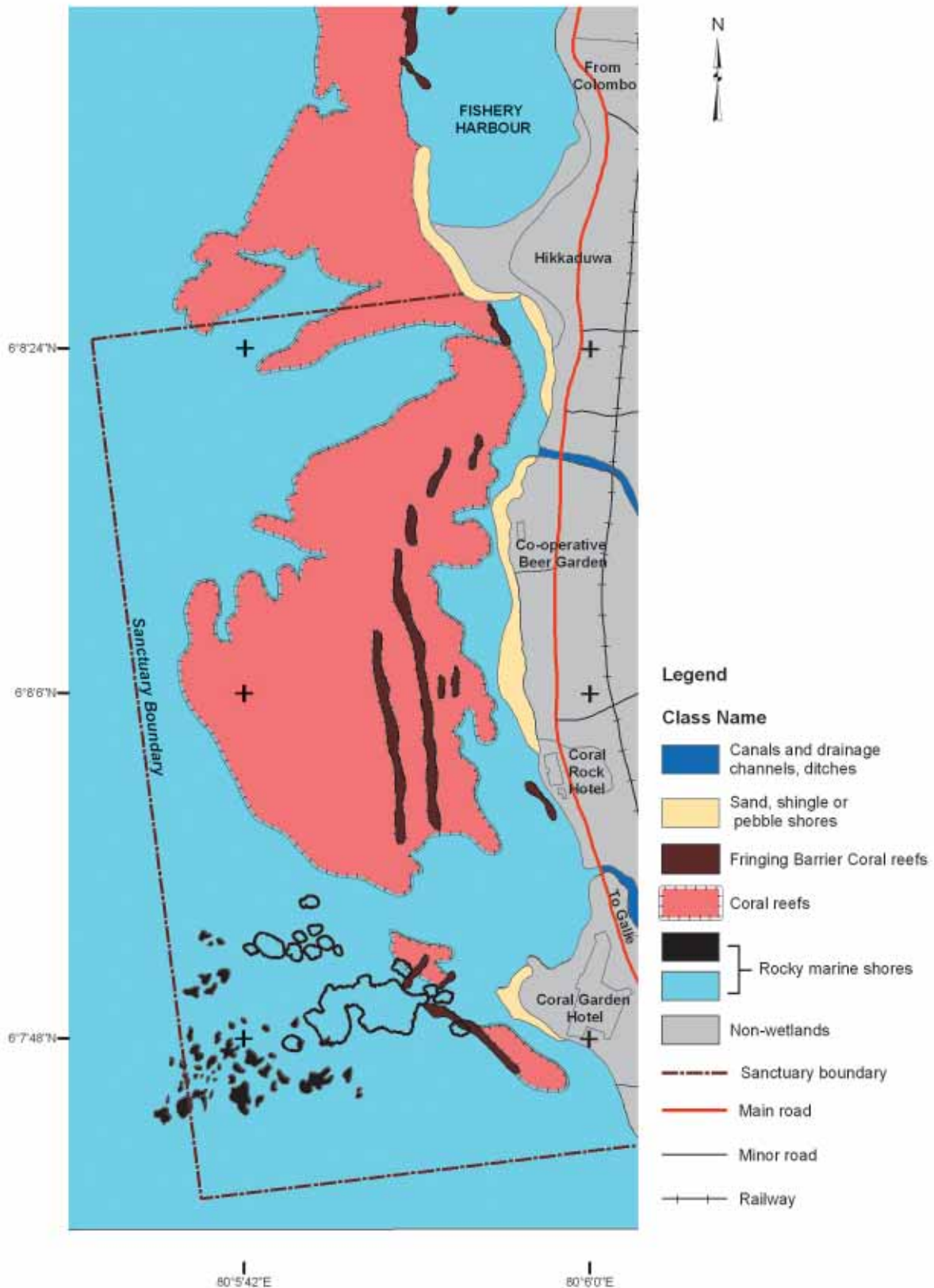
# Hikkaduwa National Park



Source: 1:2000 Scale, NARA 2006  
 Wetland Atlas 1999  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/PIEMA/CEA

0 0.1 0.2 0.4 Kilometers

# Hikkaduwa National Park Wetlands based on Ramsar Classification



Sources: 1:2000 Scale, NARA 2006  
Wetland Atlas 1999  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA



# Hikkaduwa National Park

## Location:

6° 8' 42 N and 80° 5' 33 E to 6° 7' 39 N and 80° 6' 0 E; 678030 N and 398574 E to 676185 N and 400415 E; along the coast of Hikkaduwa, in the Galle District, of the Southern Province.

## Area:

National Park area is 104 ha

## Altitude:

Sea level to a depth of around 5m

## Overview:

Hikkaduwa is Sri Lanka's first Marine Protected Area (MPA) and encompasses a coastline of approximately 1.35 km between the southern breakwater of the Hikkaduwa fisheries harbour and rocky islets near the Coral Gardens Hotel. The fringing reef at Hikkaduwa is a typical representation of shallow fringing reef systems along the southern coast of Sri Lanka. The reef is relatively small but contains high biodiversity and has been of conservation interest since the 1960's due to its location in the vicinity of one of the most popular tourist destinations in Sri Lanka. It was declared as a sanctuary in 1979 and later a National Park in 2002. At present the reef is highly degraded due to both natural and anthropogenic impacts.

## Physical features:

The Hikkaduwa reef has a shallow reef crest enclosing a shallow reef lagoon on the leeward side. The lagoon has a depth of 0.5-1.5m and is dominated by stands of live and dead coral interspaced by sand. The seaward side of the reef crest has an outer reef slope composed primarily of limestone and some live coral. The Hikkaduwa Ganga and several small canals open out to the sea near the reef. Sediment transport along the coastline is predominantly northwards. Hikkaduwa is located in the south western wet zone and receives an annual rainfall of over 2,000 mm. Mean average temperature is around 27° C. The area is influenced by the southwest monsoon, which results in rough seas and strong winds and currents from May to October. This also increases the turbidity of the water, both due to freshwater input and re-suspension of bottom sediments.

## Ecological features:

The reef is dominated by foliaceous species of *Montipora*, while encrusting, massive and branching species are also present. The inshore areas of the reef contain several large colonies of massive corals belonging to the families Faviidae and Poritidae. There is relatively high diversity of corals with 60 species belonging to 31 genera being recorded from the reef. Over 170 species of reef fish belonging to 76 genera have also been recorded. The 1998 coral bleaching event resulted in a decrease in live coral cover, which is currently around 13%. Prior to bleaching, the reef had a live coral cover of 47% dominated by branching and foliaceous species.

## Noteworthy fauna:

The coral species *Porites desilveri* is restricted to Sri Lanka. Among the reef fish, *Chlorurus rhakoura* and *Pomacentrus proteus* are also restricted to coral reefs in Sri Lanka. Sharks such as *Carcharhinus*



*melanopterus* are regularly found along the outer reef slope, while many species of fish of commercial importance are found within the reef lagoon. Three species of globally endangered marine turtles (*Eretmochelys imbricata*, *Chelonia mydas*, *Lepidochelys olivacea*) visit the reef.

**Noteworthy flora:**

Marine algae such as *Halimeda* sp. and *Padina* sp.

**Land use:**

The beach is a very popular tourist area with activities such as snorkelling, swimming and coral viewing through glass bottom boats occurring frequently. The reef lagoon was used for the anchoring of fishing boats, but this has been discontinued with the development of the fishery harbour.

**Possible changes in land use:**

The degradation of the reef due to human impacts and coral bleaching has reduced its appeal for tourists, and it is possible that the use of the reef for recreational purposes such as coral viewing may decrease. Increased sedimentation has resulted in filling of the reef lagoon with sand and accretion of the beach leading to smothering of corals and reduction of the reef area.

**Hydrological and biophysical values:**

The Hikkaduwa area contains a complex of coastal ecosystems including marine habitats, beaches and low-lying wetlands, while a few rocky islets are located off the coast. Coral reefs such as Hikkaduwa are extremely important in shoreline protection and assist in dissipating wave energy during the monsoon season and storms. The reef also influences the current patterns and water movement along the coastline. Due to its protected status, the reef is an important refuge for many commercially important fish species, especially those collected for the ornamental fish trade.

**Social and cultural values:**

Tourism is the main livelihood of the community, many of whom operate hotels, restaurants, shops, diving centres and glass bottom boats. The beach and reef lagoon are extremely popular with locals and tourists.

**Scientific research and monitoring:**

The Hikkaduwa coral reef is one of the most studied marine ecosystems in Sri Lanka. Scientists and naturalists have studied the reef since the 1960's, with comprehensive studies being undertaken in the 1970's and 1980's. Since the 1990's it has been a site for long-term monitoring carried out by NARA with support from the GCRMN and CORDIO. Several universities have also conducted research programs within the reef.

**Conservation education:**

Numerous education programmes have been conducted for the hotel and glass bottom boat operators dependant on the reef, as well as for local school children. SAM process has attempted to facilitate greater community participation in decision-making and management.

**Recreation and tourism:**

Tourism is highly developed with many hotels, guesthouses, restaurants and shops situated in the surrounding areas. The coral reef has traditionally been a major attraction, although interest has declined

with the degradation of the reef. Apart from glass bottom boats, numerous dive shops offer SCUBA diving opportunities for tourists.

**Conservation measures taken:**

In 1961, the reef was declared as a Fisheries Protected Area under the Fisheries Ordinance to halt indiscriminate fishing. Subsequently, the Hikkaduwa Marine Sanctuary was created in 1979 under the FFPO covering an area of 44.5 ha. In 1998 it was declared as a Nature Reserve and the protected area extended to 104 ha, following which it was upgraded to the status of a National Park in 2002. Hikkaduwa was also one of the pilot sites for implementing SAM planning by the CCD from 1992 - 1996. This process has been re-initiated under the ADB funded CRMP project in 2002. Dive operators, NGOs, local CBOs and volunteer groups have organized numerous beach and reef clean-ups. Post tsunami clean-ups to remove debris were organized by IUCN, SLSAC and NARA.

**Conservation measures proposed:**

The SAM Plan for Hikkaduwa has identified several management needs such as the demarcation of MPA boundaries, establishment of signs declaring protected area and status, multiple use zoning, measures to reduce pollution, and restriction of the number of glass bottom boats.

**Disturbances and threats:**

High sedimentation, physical damage to corals from glass bottom boats, pollution and uncontrolled tourism are degrading the reef ecosystem and decreasing water quality. The reef was also severely degraded by coral bleaching due to increased water temperatures during an El Niño event in 1998. The invasion of dead coral by algae, particularly *Halimeda*, could reduce the surface area available for new coral recruitment. Moderate to high mechanical damage to corals and smothering by sediment was also observed subsequent to the 2004 Tsunami. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned

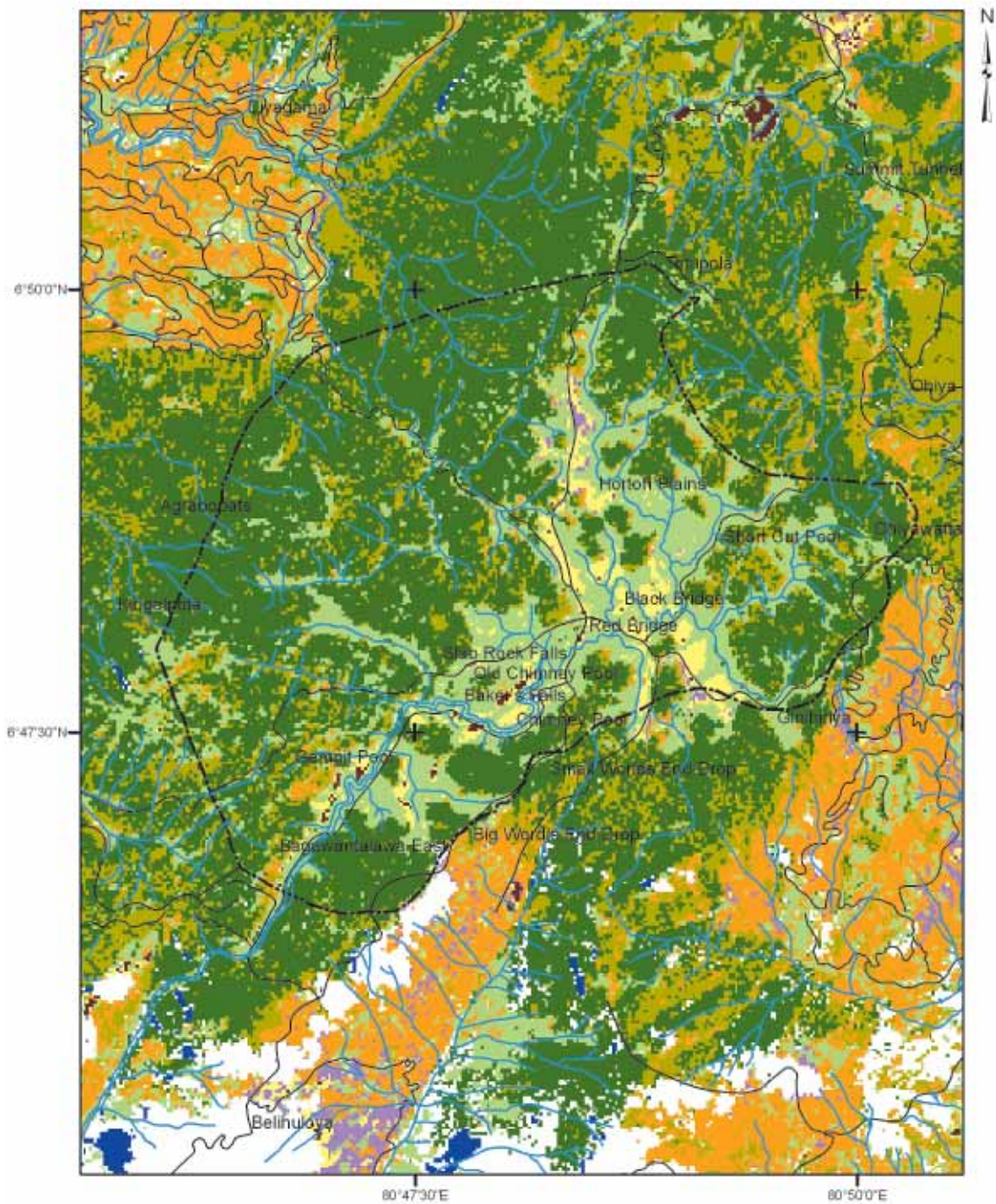
**Management authority and jurisdiction:**

DWC

**References:**

CEA/ARCADIS Euroconsult (1999); De Silva (1985); HSAMMSCC (1996); Nakatani et al. (1994); Rajasuriya (1997); Rajasuriya (2005); Rajasuriya et al. (1995);

# Horton Plains National Park



0 0.375 0.75 1.5 2.25 Kilometers

### Legend

#### Land Cover

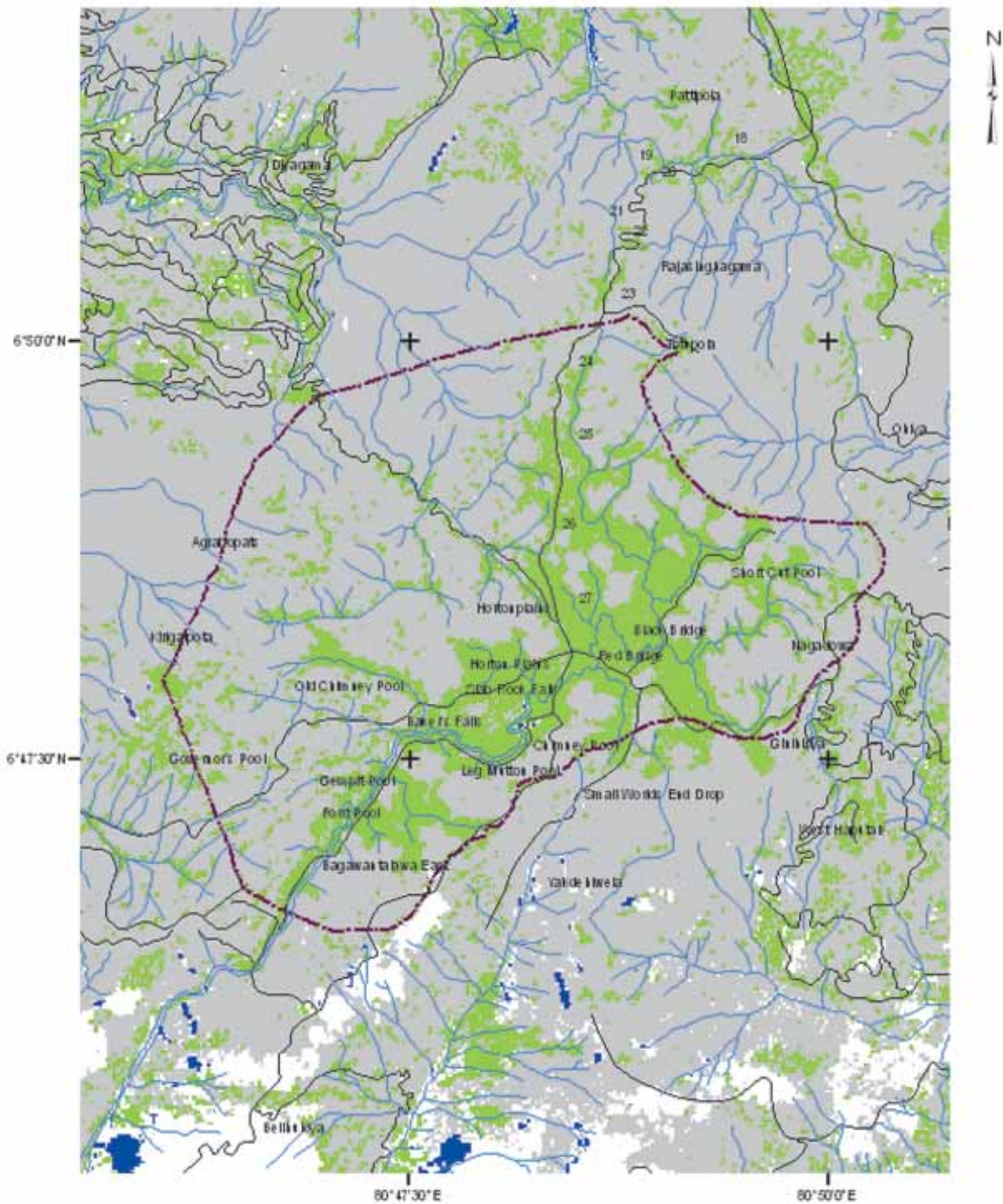
- |                                       |               |
|---------------------------------------|---------------|
| Water                                 | Exposed soil  |
| Grassland                             | Main road     |
| Grassland (very short in height)      | Minor road    |
| Tea plantation                        | Waterways     |
| Natural vegetation (dense)            | Park boundary |
| Forest plantation                     |               |
| Agricultural fragments with homestead |               |

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - January 2006  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Horton Plains National Park

## Wetlands based on Ramsar Classification



0 0.5 1 2 Kilometers

### Class Name

- Water storage areas
- Seasonal/intermittent freshwater marshes/pools
- Non-wetlands

### Legend

- Waterways
- Minor road
- Park boundary

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - January 2006  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Horton Plains National Park

## Location:

6° 51' 15 N and 80° 45' 30 E to 6° 45' 0 N and 80° 50' 30 E; 75174 N and 472378 E to 746116 N and 481582 E; about 32 km south of Nuwara Eliya town in the Nuwara Eliya District, of the Central Province.

## Area:

The National Park is 3,160 ha in extent and is contiguous with the eastern part of the Peak Wilderness Sanctuary.

## Altitude:

1,200 – 2,300 m

## Overview:

The area contains the largest single extent of wet montane patana grasslands and montane dwarf-forests in Sri Lanka. Horton Plains is regarded as one of the most important water catchment areas in the country as the lower part of the grassland is important for collection and storage of the headwaters of a number of important rivers such as the Mahaweli, Walawe and Kelani. Slow flowing streams, waterlogged swamps and waterfalls are the prominent wetland types. The area is rich in biodiversity with high endemism. Horton Plains National Park (HPNP) is also a popular tourist destination in Sri Lanka.

## Physical features:

The HPNP is located on the southern plateau of the central hills. It is dominated by Mount Totupolakanda (2,357m) to the north and by Mount Kirigalpotta (2,389m) to the west, which are Sri Lanka's third and second highest peaks respectively. The Precambrian rocks found in this area belong to a Highland series and consist mainly of granite rocks. The soil is of the red-yellow podsollic group while a thick black layer of decayed and decaying leaf and plant matter covers the surface layer. The mean annual rainfall is over 2000 mm, while high humidity and frequent cloud cover limits the amount of sunlight reaching the plants. The temperature can vary from highs of up to 27°C during the day to less than 5°C during the night. Strong winds are common during the southwest monsoon period and can sometimes reach gale force strengths.

## Ecological features:

The vegetation cover can be divided into two distinct regions of which 2,000 ha consists of wet patana and the balance 1,160 ha is covered with sub-tropical montane evergreen forests. 744 plant species distributed among 20 families have been recorded. The grasslands are plagioclimax communities characterized by frequent fire and grazing. The grasslands are dominated by *Arundinella villosa* and *Chrysopogon zeylanicus*. Wet or water logged swamps and slow flowing streams can be found between knolls and depressions. Submerged aquatic macrophytes like *Aponogeton jacobsonii* the sedge *Isolopis fluitans* and a bladderwort *Utricularia* spp. are found in the slow flowing streams of Horton Plains. The bamboo *Arundinaria densifolia* exists along most of the stream banks. In waterlogged depressions and swampy areas *Juncus primatocarpus*, *Garnotia mutica*, *Eriocaulon* spp. and *Exacum trinervium* are common species. Twenty four species of mammals, 87 species of birds, 9 species of reptiles and 8 species of amphibians have been recorded.



**Noteworthy fauna:**

Only two exotic fish species inhabit the streams; *Cyprinus carpio* and *Oncorhynchus mykiss*. The streams harbour many species of endemic crustaceans, including *Caridina singhalensis*, and *Perbrinkia* spp. Endemic amphibians associated with the streams include *Polypedates eques*, *P. longinasus*, *Limnonectes greenii*, *Lankanectes corrugata*, and *Microhyla zeylanica*. Among the birds, the endemic *Myophonus blighi* and *Gallus lafayetti* visits the edges of streams and ponds, while the raptors *Circus* spp. visits the wetlands during the migratory season. A large herd of *Cervus unicolor* occurs in the park, while *Prionailurus viverrinus* and *Lutra lutra* visit the wetlands for feeding on aquatic organisms.

**Noteworthy flora:**

Notable plant species in the park includes endemic trees such as *Calophyllum walkeri*, *Rhododendron zeylanicum*, shrubs such as *Rhodomyrtus parviflora*, *Gaultheria fragrantissima*, herbs such as *Exacum trinervium* and *E. walkeri*, *Drosera indica*, and Giant ferns (*Cyathea* spp.).

**Land use:**

The HPNP is mainly surrounded by a forest reservation which is under the control of the Forest Department, while two tea estates exist at Diyagama and Ginihiriya. Individuals from the peripheral villages collect timber, fuelwood and herbal plants and use the park area as a grazing ground for their livestock.

**Possible changes in land use:**

Increased demand for natural resources could lead to an increase in the use of the park for human uses such as collection of firewood and livestock grazing

**Hydrological and biophysical values:**

Horton Plains is the most important watershed of the country and serves as an important catchment area for the Mahaweli Ganga, Walawe Ganga, and Kelani Ganga. Due to its elevation, there is substantial moisture content in the land as a result of fog interception and cloud deposition. This additional contribution comprises about 25 percent of the total precipitation. However, most of this additional moisture escapes back into the atmosphere as evaporation from the canopy.

**Social and cultural values:**

Recent studies have discovered pre-historic stone tools dating back to the Balangoda culture, indicating that Horton Plains is one of the most significant pre-historic human settlements in the country.

**Scientific research and monitoring:**

The University of Peradeniya and the Institute of Fundamental Science at Hantane have carried out several research projects, especially on forest die-back and water quality.

**Conservation education:**

A visitor centre located in the park provides information on the biodiversity and conservation of the important montane ecosystems. Additionally, the DWC conducts programmes on waste management within the park area.

**Recreation and tourism:**

Horton Plains is a very popular tourist destination, with the main attraction being Worlds End. The beauty of the landscape, the flora and faunal heritage and the opportunities for recreation attract local and foreign tourists in large numbers. There are four bungalows/guest houses in the area.

**Conservation measures taken:**

Under British rule, this area received some form of protection under the administrative order issued in 1873, which prohibited clearing and felling of forests above 1,520m. In December 1969, Horton Plains was declared a National Reserve, and subsequently elevated to the status of a National Park in 1988 under the FFPO. The CEA produced a wetland site report and conservation management plan for this site in 1995. Under the ADB funded PAM project, a management plan for the park was developed in 2005.

**Conservation measures proposed:**

The 2005 management plan identifies the following activities: Diversion of the public road, strengthening law enforcement, prevention of illegal gem mining and rehabilitation of mined pits, establishment of trekking trails with suitable interpretation points, establishment of a montane conservation education center, habitat management and improvement, demarcation of boundaries and their maintenance and improved coordination with the Forest Department. Other measures have been listed in the conservation management plan produced by the CEA.

**Disturbances and threats:**

Problems associated with tourism such as removal of plants, littering, fires, off-road driving and walking, and noise pollution are some of the major issues within the popular areas of the park. Other threats and disturbances include illegal gem mining and timber felling (particularly from the forest reservation) and collection of plants for ornamental and medicinal purposes, encroachment, poaching and movement of vehicles along the public road at night. The spread of invasive alien species such as *Ulex europaeus*, *Pteridium* spp. and *Pennisetum* spp. is threatening native plant species. The carnivorous *Oncorhynchus mykiss* may have affected the populations of endemic aquatic organisms such as amphibians and crustaceans. Progressive dieback of forest has affected 22 plant species, with *Calophyllum walkeri* being the most affected.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

DWC, while the adjoining forest reservation is under the jurisdiction of the Forest Department.

**References:**

CEA/ARCADIS Euroconsult (1995c); DWC (2004); DWC (2005a); Gunawardena (2000)

# Inginimitiya Reservoir



**Legend**

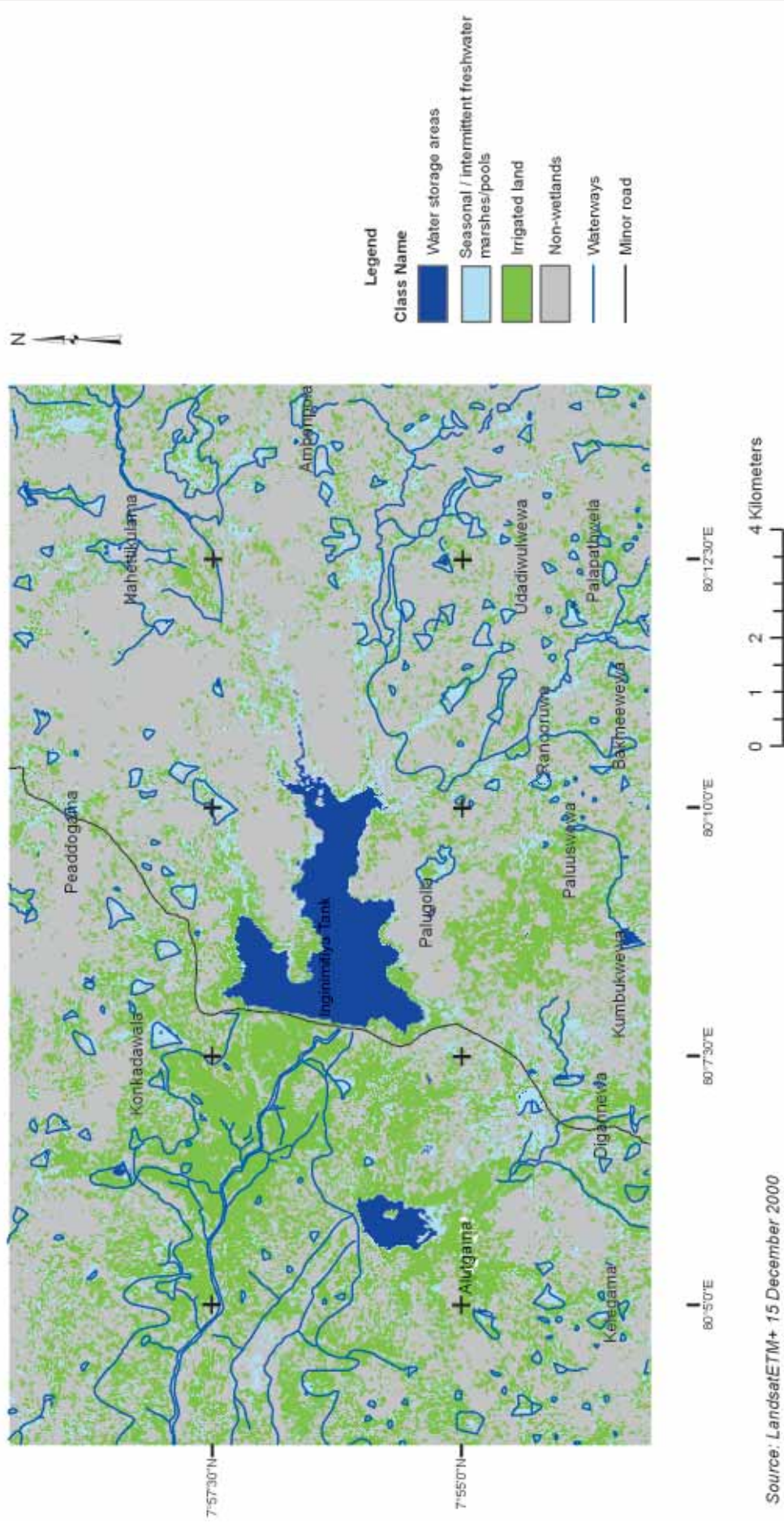
Land Cover	
	Water
	Water with aquatic plants
	Marshy land
	Paddy land
	Homegardens
	Scrubland
	Waterways
	Minor road

Source: LandsatETM+ 15 December 2000  
 Ground Truthing - December 2005  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006





# Inginimitiya Reservoir Wetlands based on Ramsar Classification



Source: Landsat/ETM+ 15 December 2000  
 Ground Truthing - December 2005  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMAV/CEA/2006





# Inginimitiya Reservoir

**Location:**

7° 57' 0 N and 80° 7' 0 E to 7° 55' 0 N and 80° 10' 0 E; 878874 N and 402642 E to 875177 N and 408146 E; about 130 km from Colombo, in the Puttalam and Kurunegala Districts, of the North-western Province.

**Area:**

2,041 ha

**Altitude:**

Less than 50m msl

**Overview:**

Inginimitiya is the largest irrigation reservoir in the Puttalam District and was commissioned in 1985. It facilitates supply of water to 2,551 ha of agricultural land, including new land area of 1,880 ha. The tank was constructed by damming the Mi Oya, aimed at doubling the area under paddy and other staple crop cultivation. However, the performance of the project has been unsatisfactory due to the shortage of water in the reservoir.

**Physical features:**

The Mi Oya is the main water source of the water to the reservoir and originates from the Dambulla hills, which are located in the dry zone of Sri Lanka. Due to the shortage of water in the reservoir, only 75% of irrigable land is cultivated successfully during the Maha season. The irrigation reservoir and its catchment area lies within the Kurunegala District in the region that experiences an annual rainfall below 1,500 mm. The command area of the reservoir is in the Puttalam District. Dry spells and absolute droughts are common in the Puttalam District and have recorded between 120 –200 days of drought in some years. Analysis of past rainfall patterns (1956 –1975) indicate highly erratic rainfall, with the annual average varying from 740 mm to 2,210 mm. In recent years it has been around 841 mm per year. The temperature averages around 27°C for the majority of the year. Soils in the area are sandy loam to sandy clay loam, while imperfectly drained soil covers one half of the area.

**Ecological features:**

Major wetland habitat types include managed fresh water wetlands (tank, irrigation canals, marshes, paddy lands and streams). Detailed information on ecological features and biodiversity associated with this reservoir is lacking.

**Noteworthy fauna:**

Several species of aquatic birds inhabit the reservoir dominated by egrets, herons and cormorants.

**Noteworthy flora:**

Tree species such as *Terminalia arjuna*, *Diospyros malabarica* and *Vitex leucoxylon* can be found around the reservoir.

**Land use:**

The tank is mainly used for fisheries while its surrounding areas are used for paddy cultivation. Additionally, depending on the availability of water, chillies, Bombay onion, red onion, corn, green gram, cowpea and soya beans are also grown in the area. Livestock farming and brick production are also other land use activities in the reservation area.

**Possible changes in land use:**

The Inginimitiya project is facing serious water shortage problems due to prevailing drought conditions in the area. During the past 25-year period, the annual average basin rainfall decreased by 162.5 mm. This has led to changing crop cultivation patterns.

**Hydrological and biophysical values:**

The tank water is used for irrigation purposes. Besides rainwater, the tank is the only source of water supply for paddy cultivation in the downstream areas.

**Social and cultural values:**

Some people work at their fields during the day and catch fish at night. Around 25% of the fishermen catch for commercial purposes, while the others catch for personal consumption. Approximately 50% of the people in the surrounding areas consume fish on a daily basis. About 25-30 families raise cattle and buffaloes and some farmers have more than 300 individuals in a herd. There is a large ceremony called the 'Aluth Sahal Mangalya' held near the tank after each paddy harvest.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

Tourism is mostly restricted to local tourists with approximately 5 vehicles visiting the area per weekend, mainly to view the reservoir and for other recreational purposes including bathing. There are no tourist facilities in the area.

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Forest clearing, human-elephant conflict, destructive fishing practices and increased salinity in the wells and tank water are major threats in this area. The spread of invasive alien plants such as *Salvinia molesta* and *Eichhornia crassipes* is also posing acute problems to the aquatic biodiversity. Agricultural extension services operating in the project area are not effective mainly due to the absence of extension workers.

**Land tenure:**

State owned

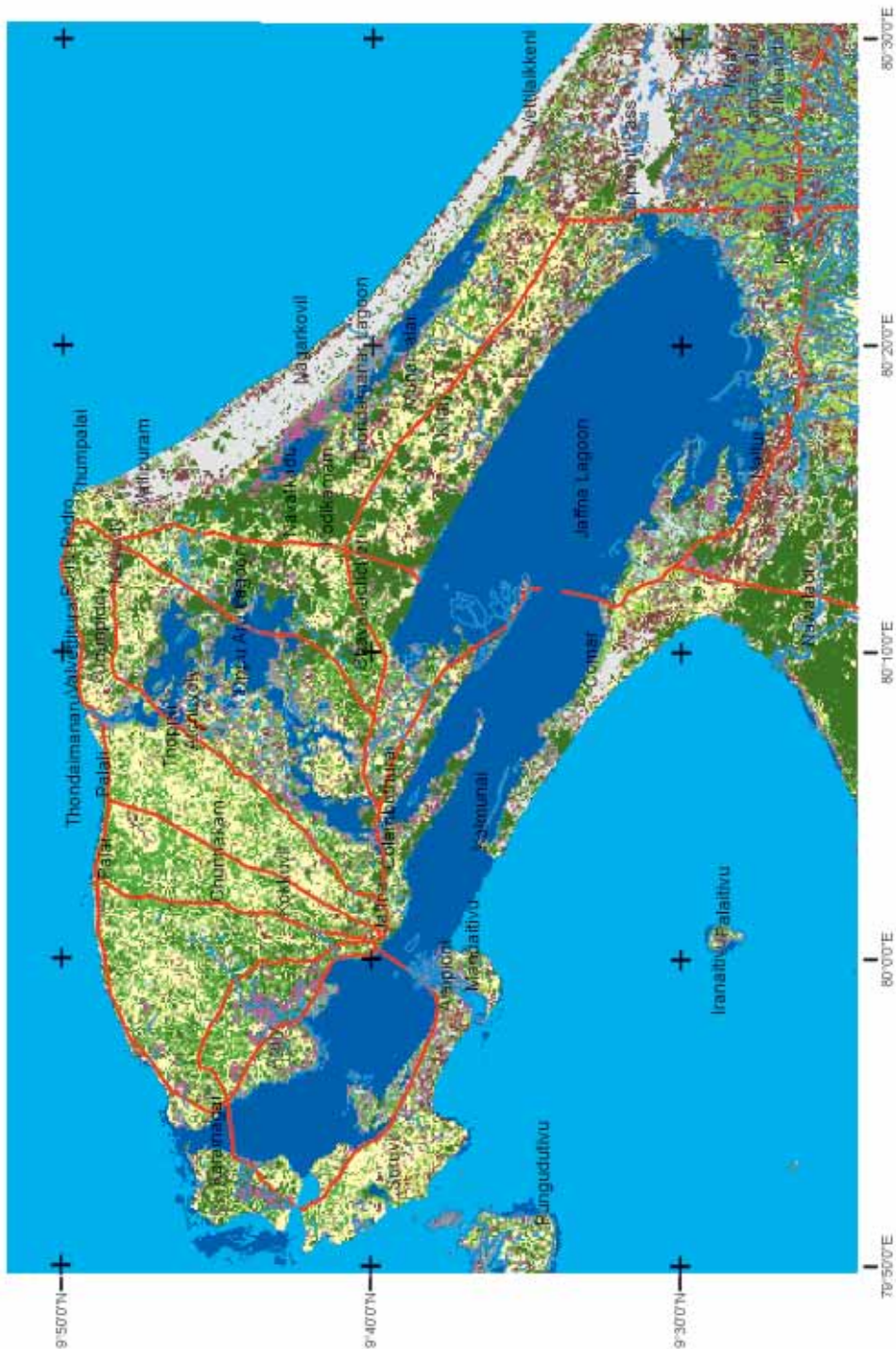
**Management authority and jurisdiction:**

The tank area is under the purview of the Irrigation Department while the settlement area is under the Local Government Agency.

**References:**

Ministry of Irrigation and Water Management (2002); Murray et al. (unknown); OECF (1993); Vimalachandran (1994)

# Jaffna Lagoon



**Legend**

Land Cover	Color
Sea	Light Blue
Lagoon water	Dark Blue
Mangroves	Purple
Marshy land	Light Blue
Paddy land	Light Green
Natural vegetation with homestead	Yellow
Natural vegetation (low dense)	Orange
Natural vegetation (moderate dense)	Light Green
Natural vegetation (dense)	Dark Green
Salt Pans	Light Grey
Sand	Dark Grey
Mudflats	Dark Red
Waterways	Blue
Main road	Red

Source: Landsat ETM+ 6th Sept 2001  
 Ground Truthing - Google Earth  
 (Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&S/PIEMA/CEA/2006







# Jaffna Lagoon

**Location:**

9° 50' 0 N and 79° 50' 0 E to 9° 20' 0 N and 80° 30' 0 E; 1087208 N and 372066 E to 1031744 N and 445094 E; adjoining Palk Bay, in the Jaffna, Kilinochchi and Mannar Districts, of the Northern Province.

**Area:**

c. 45,000 ha

**Altitude:**

Sea level

**Overview:**

The Jaffna lagoon is a semi-enclosed water body connected to the Palk Bay. It is surrounded by a dry zone land mass and due to being more greatly influenced by freshwater input, has different physical conditions to that of the larger Palk Bay. The lagoon contains a number of coastal wetland habitats and is an important breeding area for numerous marine species. Jaffna lagoon has been identified as an IBA by BirdLife International.

**Physical features:**

The lagoon opens into the north eastern part of Palk Bay by way of three narrow openings and one wide opening, and is also influenced by tides in the Bay. The lagoon is long and narrow, extending from Elephant Pass in the southeast to Kayts in the northwest. The lagoon is relatively shallow with the maximum depth being less than 3 m. The shoreline is composed mostly of sandy soil while the bottom is mostly mud. The salinity in the lagoon is greatly influenced by rainfall and freshwater run-off from surrounding areas, and varies from a low of around 10.3 ppt during the rainy season to a high of around 45.49 ppt during the dry season. The lagoon is located in the dry semi-arid zone with an average temperature of around 27° C and an annual rainfall between 500-700 mm. Most rain is received during the northeast monsoon from October to February.

**Ecological features:**

The lagoon is surrounded by a dry zone land mass dominated by sandy areas and dry zone scrublands. The lagoon contains extensive inter-tidal mudflats while mangroves are found along the shores of the lagoon. The shallow depths and muddy substrate support prawns, crabs and small fish species such as leiognathids, engraulids and clupeids.

**Noteworthy fauna:**

The lagoon and adjoining areas are important for numerous waterbirds.

**Noteworthy flora:**

Predominantly mangroves

**Land use:**

Fisheries, particularly prawn fisheries.

**Possible changes in land use:**

Fisheries are currently restricted due to the security situation and would increase if the security improves in the area. Vegetation such as mangroves is liable to be cleared for security reasons.

**Hydrological and biophysical values:**

The lagoon plays a role in flood control during times of heavy rainfall. Being part of the larger Palk Bay area it plays an important role in regimenting tidal movements, currents and salinity in surrounding water bodies.

**Social and cultural values:**

Fisheries have been important economic activities of coastal communities, and many are engaged in small scale fisheries using traditional methods such as cages, traps and cast nets.

**Scientific research and monitoring:**

Some studies have been undertaken by the Jaffna University and the DFAR prior to the conflict situation.

**Conservation education:**

Information not available

**Recreation and tourism:**

Information not available

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

The Jaffna lagoon has been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Clearing of shoreline vegetation for security reasons has degraded much of the mangroves in the area. The development of the Sethusamudram Ship Canal is also likely to impact upon the ocean circulation, physical conditions and biological cycles within the Palk Bay area, and could affect the biodiversity and biological cycles within the lagoon.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

DFAR for managing fisheries, and the CCD for management of the coastal zone. The Jaffna DSS also has jurisdiction over adjoining lands.

**References:**

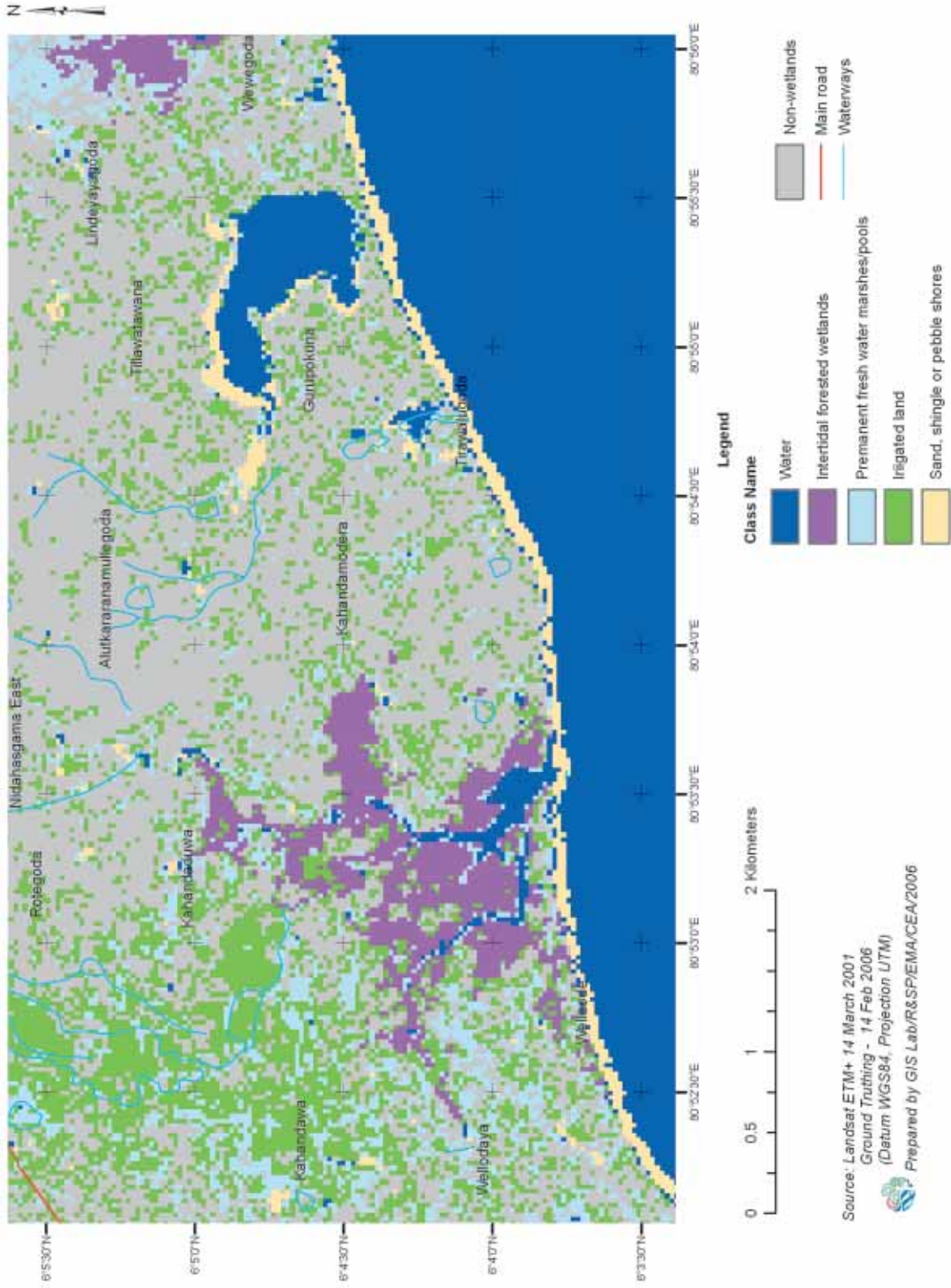
Sachithanathan (1969); Sachithanathan and Perera (1970); Sivalingam (2005)







# Kahandamodara Mangroves Wetlands based on Ramsar Classification



Source: Landsat ETM+ 14 March 2001  
 Ground Truthing - 14 Feb 2006  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Kahandamodara Mangroves

## Location:

6° 7' 0 N and 80° 52' 0 E to 6° 5' 0 N and 80° 57' 0 E; 676103 N and 485247 E to 672417 N and 494467 E; 212 km south of Colombo, in the Hambantota District, of the Southern Province.

## Area:

215 ha

## Altitude:

Sea level

## Overview:

Kahanda estuary is a branched shallow wetland with a few mangrove islands, comprising 215 ha of mangrove forest. The estuary opens to the sea through a narrow canal on the southern side and is rich in mangrove species. The consistently high water level has contributed to protect the dense mangrove vegetation around the estuary from human exploitation.

## Physical features:

The coastal plain has been formed primarily through the erosion of crystalline rocks, and extensive recent sedimentary deposits. Kahanda is located in the dry zone, and receives most of the rainfall from the northeast monsoons, with an annual rainfall of between 1,000–1,250 mm. The average temperature is around 26.6°C–27.2°C. The estuary receives fresh water mainly from the Ranna Oya, which is connected to the Urubokka Oya that has been developed and successfully utilised for irrigation of paddy land. The coastal area has rocky and sandstone habitats that shield the estuarine delta of Kahandamodara.

## Ecological features:

The shallow and branched estuary has facilitated the establishment of a mangrove community harbouring a diversity of plants and about 12 mangrove species have been recorded from the area. There is a preponderance of *Nypa fruticans* compared with the nearby (6 km away) Rekawa lagoon, where this species is very sparse. At least 20 species of fish have been recorded from the estuary, which includes fresh water and brackish water forms.

## Noteworthy fauna:

The mangroves provide refuge for mammals such as the endemic *Macaca sinica*, and two rare cat species (*Prionailurus viverrina* and *P. rubiginosus*). Among the reptiles, *Varanus salvator* is common in the estuary. Two species of endemic amphibians (*Rana gracilis* and *Limnonectes keertisinghei*) can be found in this area. The dense mangrove vegetation and branched estuary has made this wetland an ideal nesting and feeding habitat of water birds such as herons (i.e. *Ardeola grayii*, *Ardea cinerea*, *Nycticorax nycticorax*) egrets (i.e. *Mesophoyx intermedia*, *Egretta garzetta*) and bitterns (*Ixobrychus cinnamomeus*, *I. sinensis*).

**Noteworthy flora:**

The mangrove in Kahanda is noted for the abundance of *Nypa fruticans* stands. Other woody mangrove vegetation includes *Avicennia officinalis*, *Dolichandrone spathaceae*, *Lumnitzera racemosa*, *Excoecaria agallocha*, *Aegiceras corniculatum*, *Sonneratia caseolaris*, *Heretiera littoralis* and *Bruguiera sexangula*. *Cassine glauca* is the only endemic species found in this area. Among the plants that occur in mangroves of the southern coast, *Ardisia willisii*, *Cerbera odollam*, *Nypa fruticans*, *Barringtonia racemosa*, *Bruguiera sexangula*, *Mimusops elengi* and *Sapium indicum* is restricted to the Kahanda estuary area.

**Land use:**

The wetland and its surroundings are used for fisheries, human settlements and the establishment of tourist guesthouses and cabanas. The opening of the estuary is used for bathing and washing.

**Possible changes in land use:**

There is a plan to develop prawn farms in the area, which can be a major threat to the future survival of mangroves. There is also a possibility of potential discharge of industrial effluents from the Bata-atha Industrial complex in the future.

**Hydrological and biophysical values:**

The Kahanda estuary is important for flood control. It is also part of a continuous system of wetlands encompassing the Tangalle and Hambantota Districts.

**Social and cultural values:**

There are about 225 families residing in the area who, due to the levels of poverty in the area, depend highly on the mangrove resources for food and livelihoods. The mangal areas are utilized to extract clay for the brick industry, *Nypa* fronds for thatching, *Pandanus* leaves for weaving and *Acrostichum* ferns for food. Some villagers are employed in lagoon fisheries especially during the monsoon periods. The coir industry is organised on a small scale. Obeysekararamaya, a Buddhist temple with a 19th century image house is found in the vicinity.

**Scientific research and monitoring:**

IUCN has conducted several biodiversity assessments in the area.

**Conservation education:**

Some awareness training was provided for selected community members through the GEF funded RUK project.

**Recreation and tourism:**

The lagoon is of great scenic beauty but is still relatively unknown among tourists.

**Conservation measures taken:**

The Forest Department has identified the area to be protected as a Conservation Forest under the Forest Ordinance. Additionally the Forest Department and IUCN prepared a management plan for 10 selected mangrove sites located south of Colombo, including Kahandamodara. The Hambantota Integrated Coastal Zone Management Plan has also come up with management options for the mangroves and their

surrounding environs. Mangrove restoration activities have been implemented by local CBO's and the Forest Department subsequent to the tsunami.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Removal of mangroves for firewood and construction of human settlements, including tourist cabanas has degraded critical habitats. The hotels situated close to the lagoon have no proper garbage disposal facilities and garbage disposal can develop into a major threat to this lagoon. Some villages living in Kahanda upper area are involved in illegal gem mining, which has lead to degradation of habitats in these areas. A large tract of mangrove in the eastern border of the estuary, dominated by *Heretiera littoralis* and *Sonneratia caseolaris* was destroyed by the Tsunami.

**Land tenure:**

The estuary is state owned while surrounding areas are privately owned.

**Management authority and jurisdiction:**

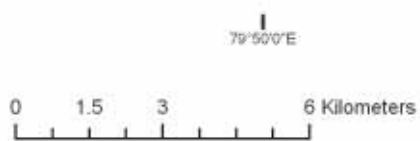
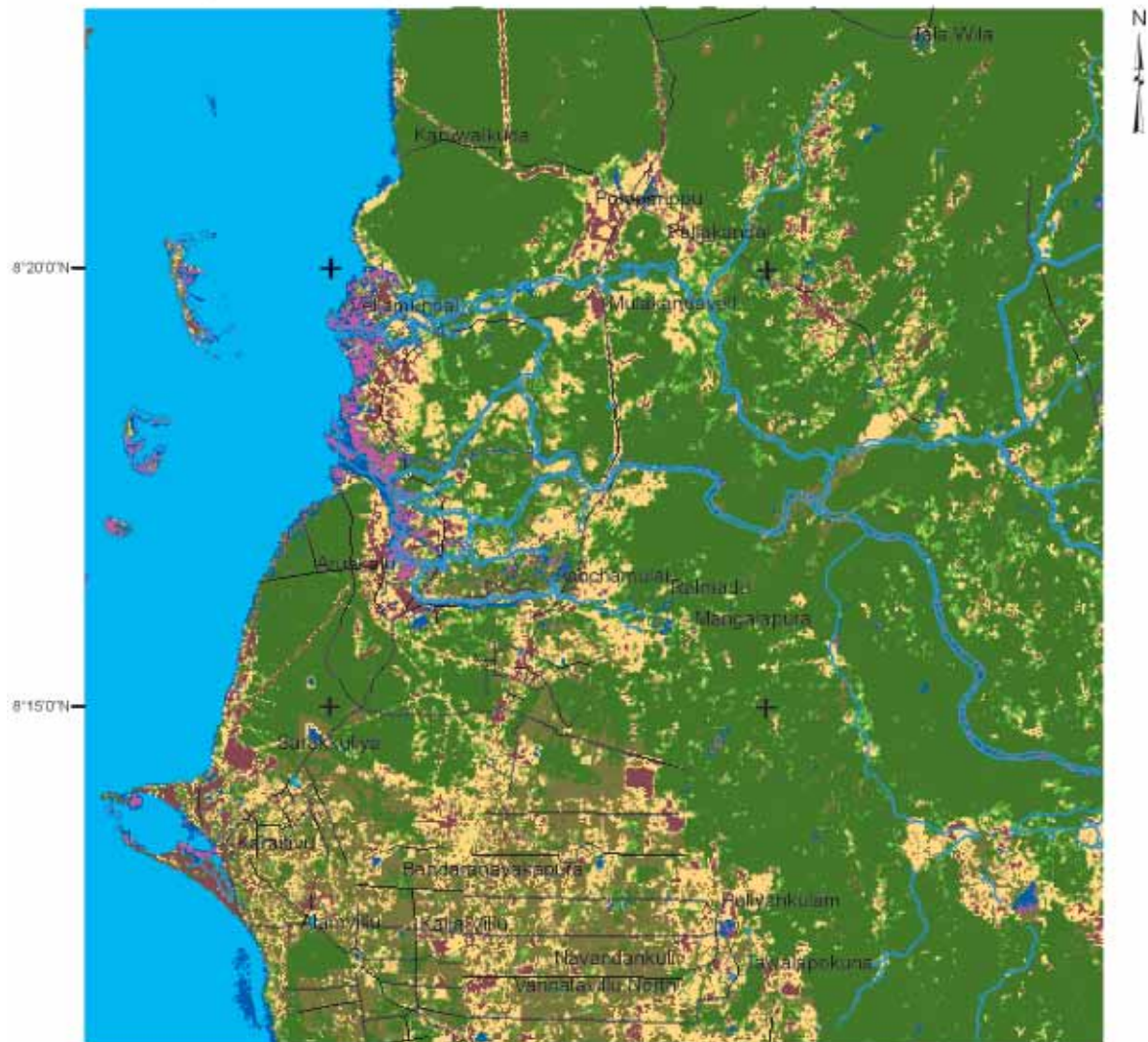
Tangalle DS

**References:**

CCD/IUCN/UNDP (2005); IUCN (2000a); IUCN (2003a); Southern Development Authority of Sri Lanka/ CCD (2000)













# Kala Oya Estuary




## Legend

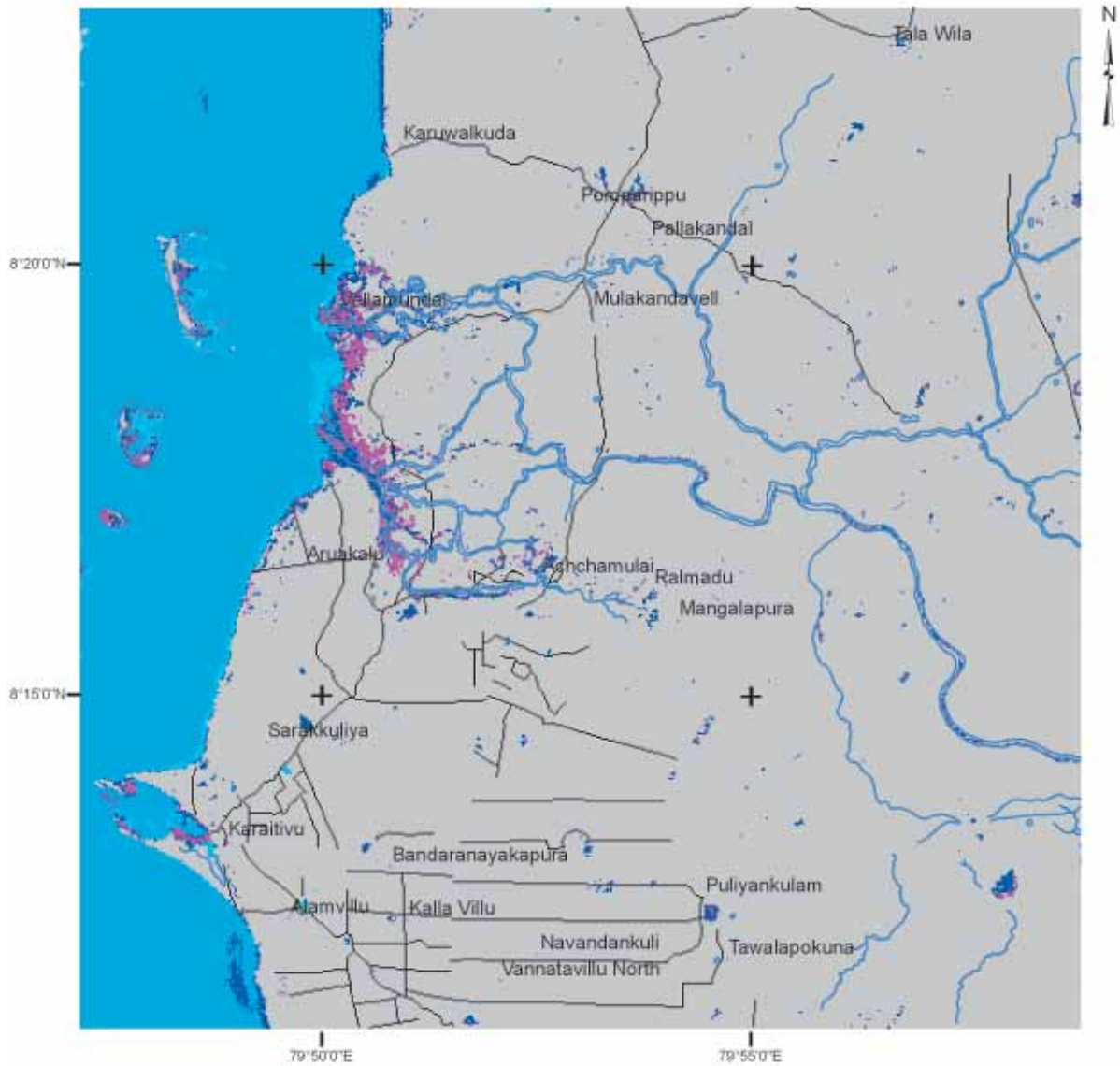
### Land Cover

- |   |                                     |   |            |
|---|-------------------------------------|---|------------|
|  | Sea                                 |  | Waterways  |
|  | Water bodies                        |  | Minor road |
|  | Mangroves                           |   |            |
|  | Scrubland                           |   |            |
|  | Coconut                             |   |            |
|  | Natural vegetation (moderate dense) |   |            |
|  | Natural vegetation (dense)          |   |            |
|  | Exposed soil                        |   |            |

Source: Landsat ETM+ 6th Feb 1988  
(Datum WGS 84, Projection UTM)

 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Kala Oya Estuary Wetlands based on Ramsar Classification



## Legend

### Class Name

- Sea
- Seasonal/intermittent/irregular rivers/streams/creeks
- Intertidal forested wetlands
- Non-wetlands
- Waterways
- Minor road

Source: Landsat ETM+ 6th Feb 1988  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Kala Oya Estuary

## Location:

8° 22' 0 N and 79° 54' 0 E to 8° 12' 0 N and 79° 57' 0 E; 925003 N and 378884 E to 906559 N and 384342 E; adjacent to the Puttalam estuary and Dutch Bay, within the Puttalam District; North-western Province.

## Area:

1,837 ha of riverine mangrove

## Altitude:

Sea level

## Overview:

Kala Oya estuary is a bay estuary, as the main stream of the Kala Oya and its tributaries discharge freshwater into the Dutch bay before entering the sea. The estuarine area includes the brackish water areas of Kala Oya, Dutch Bay and the Puttalam estuary. The amount of freshwater received is controlled by the water retention capacities of the tank system within the Kala Oya basin. Kala Oya estuary harbours the largest tract of intact riverine mangrove in Sri Lanka. This ecosystem functions as an important breeding ground for many marine species and is rich in biodiversity. Presently, the Kala Oya estuary is in good condition as the area is sparsely populated and partially borders the Wilpattu National Park.

## Physical features:

As the area lies within the dry zone of the country, the temperature varies between 30.4 –33.6°C with an average monthly rainfall of 120 mm. The highest rainfall occurs from November to December (225 mm) while the driest periods are characterized by as little as 25 mm of rainfall per month. The estuarine system is very shallow, with depths of 1.5-3 m, except in the deep channels, where depths of 4-5 m have been recorded. The major sources of freshwater are the tanks in the Kala Oya basin.

## Ecological features:

The Kala Oya estuary supports a healthy mangrove ecosystem distributed over a wide area along the banks of Kala Oya, Lunu Oya and other streams. This mangrove forest is the largest in the country and extends upstream about 2 km from the river mouth. As in many other mangrove ecosystems in the dry coastal regions of Sri Lanka, *Rhizophora mucronata* and *Avicennia marina* are the major constituent species. Due to differences in depth, salinity and biodiversity, the estuarine system can be differentiated into two major parts, the outer estuary and the inner estuary. The area between the mouth of the estuary and the brackish water area of the Kala Oya is considered the inner estuary, while the Dutch bay and Puttalam estuary area is considered the outer estuary. Saltmarshes are situated behind the mangroves and the stability of this ecosystem depends on the salinity in the soil. Sea grass beds are found in the Dutch bay. The distribution and abundance of the estuarine fauna is dependant on the tidal influences. About 55 fish species belonging to 33 families and 8 shellfish species belonging to 2 families have been recorded from the Puttalam estuarine area, including the Kala Oya estuary.

**Noteworthy fauna:**

The estuary harbours a variety of fish species, including freshwater and brackish water forms. Common species of economically important fish include *Anguilla bicolor*, *Etroplus suratensis*, *Chanos chanos*, *Oreochromis mossambicus*, *Mugil cephalus* *Sardinella* spp., and *Caranx* spp. The estuary supports fairly healthy populations of locally declining non-fish vertebrates such as colony-nesting water birds (i.e. *Pelecanus philippensis*), reptiles (*Acrochordus granulatus*, *Crocodylus palustris*, *Lissemys punctata*) and mammals (i.e. *Lutra lutra*). Crustaceans form an important component of invertebrate fauna associated with the mangals, including Portunid crabs such as *Scylla serrata*, *Portunus pelagicus* and *Macrophthalmus* spp. Besides, penaeid shrimps and the mud lobster *Thalassina anomala* are also present. A noteworthy mollusc is *Geloina coaxans*, which is an edible bivalve.

**Noteworthy flora:**

The two major constituent mangrove species in this area are *Avicennia marina* and *Rhizophora mucronata*. Other true mangrove species such as *Brugueira cylindrica*, *Exoecaria agallocha*, *Lumnitzera racemosa*, *Rhizophora apiculata* and *Sonneratia alba* are commonly found in the area.

**Land use:**

Wetland resources are primarily used for subsistence purposes. Artisanal fisheries for fish, shrimps and crabs are done at a low capacity, although a few use destructive fishing gear. The local communities collect fuel wood from the surrounding areas while some people are engaged in small-scale sand mining operations.

**Possible changes in land use:**

The growing pressure to establish more prawn farms in the tidal zone would hinder the tidal exchange and lead to the depletion of the mangroves. A decline in the rainfall trends in the lower basin area such as Puttalam has been reported, which will lead to less freshwater inputs to the estuary. The improvement of the roads leading to Gange wadiya from Eluwankulam has increased accessibility to Kala Oya estuary and hence the number of local-holiday makers reaching the area. They use boats to reach upstream areas of the Kala Oya. This should be monitored and necessary action taken to ensure regulation in the number of visitors. A proposal has been made to construct a shrimp farm in the salt marsh/mangrove area near Iliya, close to Eluwankulam-Gange wadiya road, which is a potential threat to the whole estuarine ecosystem.

**Hydrological and biophysical values:**

Principally this estuary plays a vital role in flood prevention in the lower lying areas. Additionally, the nutrient rich wetland acts as a nursery and feeding ground for a multitude of fish and shellfish species.

**Social and cultural values:**

The mangroves are cut to fulfill requirements for timber, particularly in the villages of Gange wadiya and Eluwankulam. The use of gill nets, harpoons and traps is common in the estuary and upstream, but the number of river fisherman is less than the number of lagoon fisherman. There are several fishing camps in the area e.g. Gange wadiya. The territoriality of the local fishermen discourages those from other villages from trespassing, which in turn prevents the overexploitation of resources. After the meat of the edible bivalve *Gelonia coaxans* is extracted, the shell is used for making lime.



**Scientific research and monitoring:**

Institutions such as the MASL, CEA, NARA, IWMI, IUCN and Sri Lanka Wildlife Conservation Society have conducted various studies in the area. According to NARA the extent of mangrove and salt marsh vegetation in Serakkuliya, Karathivu and Gange wadiya have not changed significantly over the years.

**Conservation education:**

Information not available

**Recreation and tourism:**

With the re-opening of the Wilpattu National Park in 2003 the number of tourists traveling to the area has increased. Although there are no tourist hotels in the vicinity, around 300 tourists from the Kalpitiya area visit the estuary by boat.

**Conservation measures taken:**

IUCN in collaboration with the DS office of Wanathavilluwa established a revolving fund to provide loans to fisherman. This scheme intends to discourage the use of destructive fishing gear by providing easy access to alternate fishing equipment. Additionally, two training programmes on boat repairing and crab fattening were conducted under the same project. The environment and wildlife of this area is relatively well protected primarily due to the presence of a police camp in the vicinity.

**Conservation measures proposed:**

IUCN has proposed a large marine and coastal Ramsar wetland site, which includes the Kala Oya estuary. Zoning of the area for tourism, protection, mangrove rehabilitation and fisheries related activities has also been proposed.

**Disturbances and threats:**

Clearance of mangrove forests in the inner part of the Kala Oya estuary for fuel and timber is a growing concern. This is clearly evident in the area bordering the Gangewadiya fisheries village, where part of the southern border of the estuary is devoid of mangroves. Use of detrimental fishing practices (i.e. push nets, blast fishing) affects aquatic biodiversity in the estuary. Excessive sediment loading during the rainy season is also a concern, and Gange wadiya is increasingly becoming unsuitable for brackish water fisheries due to the silting of the river. This has caused the river mouth area to decrease from 15 ft to 2 ft within a 30-year span. Sand mining and unsustainable harvesting of bivalves from the mangrove areas are also threats to the estuary. Although this area escaped destruction due to the civil unrest in the area, the increased access after the CFA has led to an increase in the number of visitors interested in hunting and camping.

**Land tenure:**

The estuary is State owned. Surrounding home gardens and cultivated lands are privately owned.

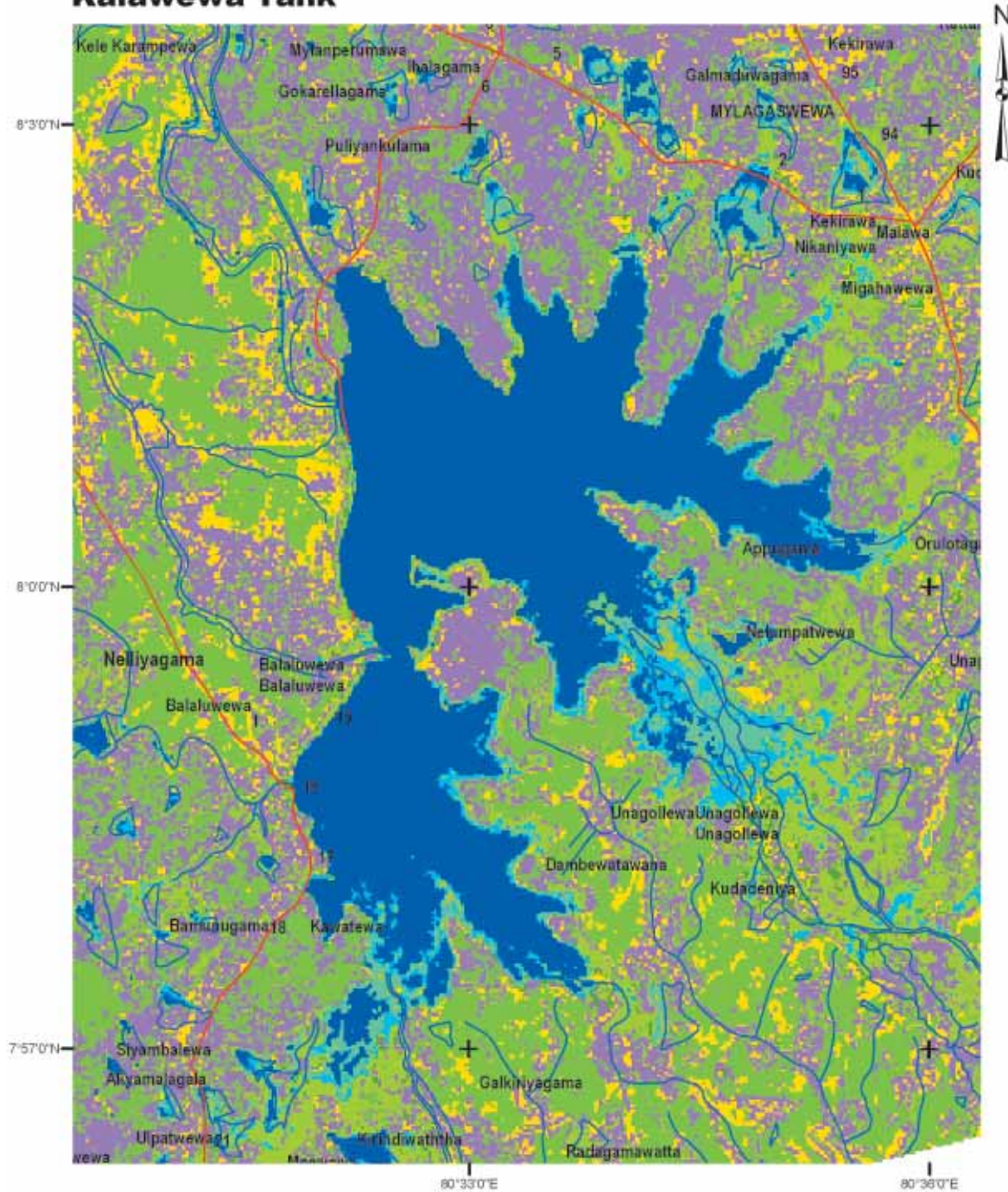
**Management authority and jurisdiction:**

GA of Puttlalam District. The DWC has jurisdiction over the area falling within the Wilpattu National Park.

**References:**

MASL (2005); Perera et al. (2005)

# Kalawewa Tank



## Legend

### Land Cover

- Water with aquatic plant
- Water (shallow)
- Water (deep)
- Paddy land
- Agricultural fragments
- Homegardens
- Grassland
- Natural vegetation (low dense)
- Natural vegetation (moderate dense)

- Main road
- Waterways

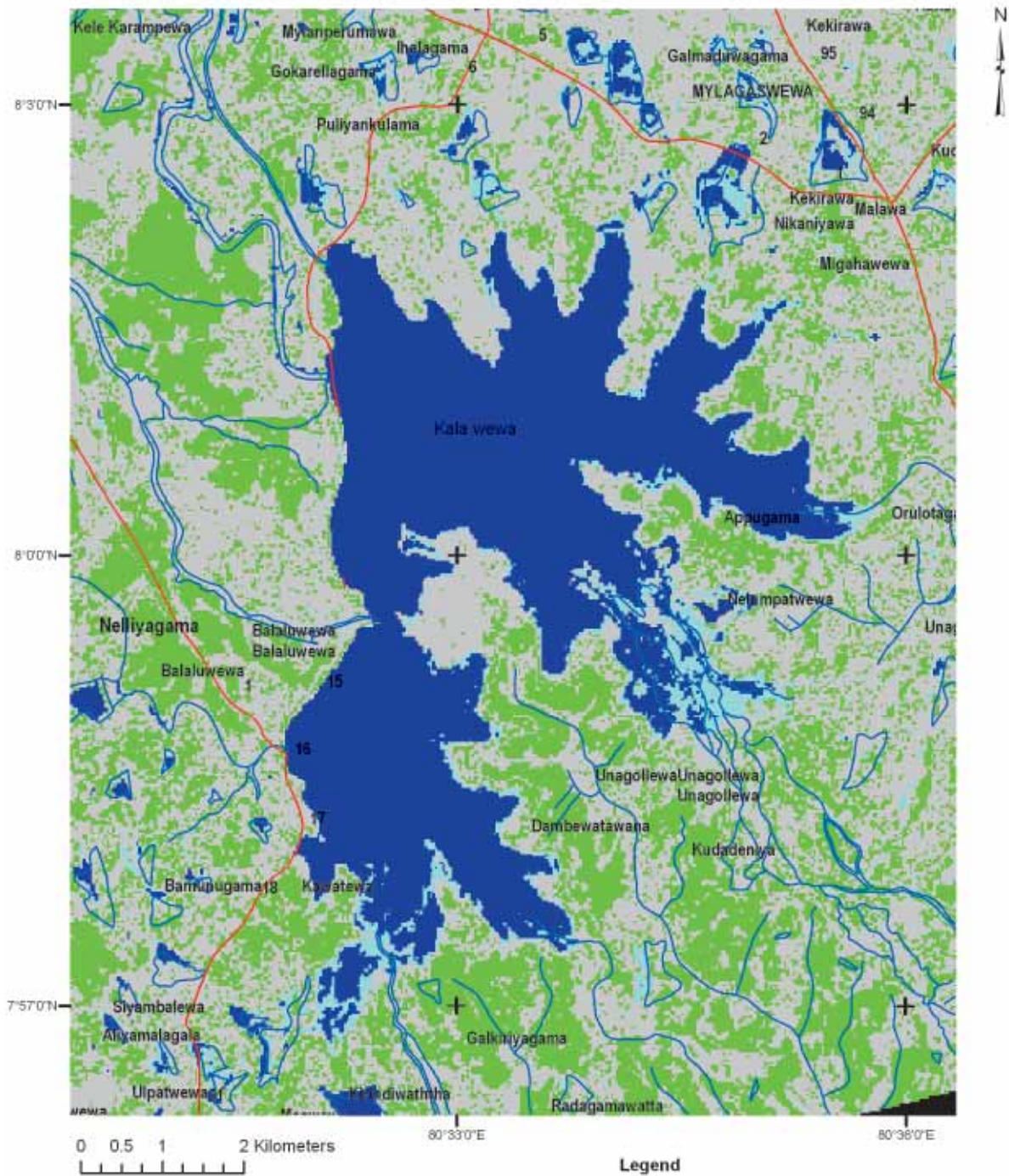
0 0.5 1 2 Kilometers

Source: Landsat ETM+ (14 March 2001)  
 Ground Truthing - 2005 August  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Kalawewa Tank

## Wetlands based on Ramsar Classification



### Legend

#### Class Name

- Water storage area (tanks)
- Seasonal Intermittant fresh water marshes/pools
- Irrigated land
- Non-wetlands
- Main road
- Waterways

Source: Landsat ETM+ (14 March 2001)  
 Ground Truthing - 2005 August  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Kalawewa Tank

## Location:

8° 3' 0 N and 80° 30' 0 E to 7° 57' 0 N and 80° 36' 0 E; 889859 N and 444906 E to 878792 N and 455915 E; northwest of Dambulla in the Anuradhapura District, of the North-central Province.

## Area:

2,590 ha at full supply level

## Altitude:

130 m above mean sea level

## Overview:

Kalawewa is a large, ancient irrigation tank, which was built by King Dhatusena (455-473 AD) by damming the Kala Oya. This ancient tank was restored in 1887 and again in 1939. Kalawewa plays a pivotal role in the modern Mahaweli irrigation scheme, as it is one of the main storage tanks in North-central Sri Lanka. There is a thriving inland fishery in the Kalawewa – Balaluwewa system. The vegetation, particularly the grasses in the drawdown area, presents the primary source of fodder for sizable herds of cattle and buffaloes in these areas.

## Physical features:

Kalawewa is the largest water storage tank in the Kala Oya basin, with an active surface storage capacity of 123 mcm. The command area of the Kalawewa is 23,800 ha. Since the implementation of the Mahaweli Development Project, the tank receives water through the Dambulu Oya, a main headwater tributary of the Kala Oya. Kalawewa is located within the dry zone of Sri Lanka, the area receives rainfall mainly during September – November (northeast monsoon), with an average annual rainfall of 1,219 mm. Mean monthly temperature is around 27.9°C while the mean monthly relative humidity varies from 60% (March) to 80% (December). During the southwest monsoon period strong, dry winds blow constantly over the plain, making the area drier. The soil in this area consists of reddish-brown earths and low humic gley soils typical of the northern lowland region, with some alluvial soils being found in the river valleys.

## Ecological features:

The aquatic vegetation comprises mainly of phytoplanktons, while rooted, floating and submerged macrophytes are also present. *Terminalia arjuna* and *Nauclea orientalis* dominate the seasonally inundated plant communities associated with the tank fringes of the Kalawewa. The undergrowth in this area is not dense and it is ideal habitat for wildlife. Flagship species such as Asian elephants are frequently recorded in this area. Herbaceous flora mainly comprises of annuals with a decrease in diversity towards the waterline. The grass *Cynodon dactylon* is the only species found in the shallow areas along the waterline. The surrounding landscape includes natural vegetation types such as dry mixed evergreen forests and man-made habitats such as chena cultivations, paddy fields and home gardens.

## Noteworthy fauna:

The freshwater fish are dominated by exotic species such as *Oreochromis mossambicus*, *Labeo rohita*, and other carp species. Indigenous species such as *Etrplus* spp, *Puntius* spp and *Channa* spp. have been



recorded from Kalawewa. Aquatic reptiles include *Crocodylus palustris*, *Lissemys punctata* and *Melanochelys trijuga*. This is also an ideal habitat for large colonies of water birds including *Pelecanus philippensis*, *Phalacrocorax niger* and *Anastomus oscitans*, *Phalacrocorax fuscicollis*. Raptors such as *Haliaeetus leucogaster* and *Ichthyophaga ichthyaetus* are also notable species that are found at Kalawewa. Mammals that visit the tank include *Elephas maximus*, *Prionailurus viverrinus* and *Lutra lutra*.

#### **Noteworthy flora:**

Dry mixed evergreen forest patches are found distributed around the tank, which harbour valuable timber species such as *Manilkara hexandra* and *Vitex pinnata*. The seasonally inundated swamps are dominated by *Terminalia arjuna*.

#### **Land use:**

Fishing activities are done using bottom set nets, cast nets and drift nets. The surrounding forest is a source of medicinal plants while paddy cultivations and chena cultivations are also found. Animal rearing is a common livelihood particularly in the middle basin.

#### **Possible changes in land use:**

Allocation of more land to agriculture and increased conversion of land for the Mahaweli Irrigation Scheme are potential methods of land use change.

#### **Hydrological and biophysical values:**

Kalawewa acts as an important water storage tank in the Kala Oya basin. It stores Mahaweli irrigation water from upstream and releases the water for agriculture in the Maha season according to downstream irrigation requirements. The water level of the perennial tank fluctuates, depending on the amount of water released for irrigation hence the tank has an extensive draw down area, which gets exposed during periods of low water level.

#### **Social and cultural values:**

Locally found reeds are utilized for the production of handicrafts. Brick making also takes place to some extent using the sediment from the draw down area.

#### **Scientific research and monitoring:**

MASL has initiated a pilot study in order to prepare a basin management plan within the Kala Oya basin. Kalawewa is included in this study. The Institute of Fundamental Studies has undertaken numerous water quality studies in the tank.

#### **Conservation education:**

Information not available

#### **Recreation and tourism:**

As the tank is situated within the culturally important and touristically popular Anuradhapura District, a large number of tourists visit the area annually. Elephant and bird watching are popular activities among the tourists. There is a new hotel under construction in the area.

**Conservation measures taken:**

Part of the tank catchment and fringing region falls under the Kahalle-Pallekelle Sanctuary.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

The invasive alien species *Lantana camara* is extensively found in this area. Other disturbances include the deforestation of the seasonally inundated forest and clearing of land for expanding cultivations.

**Land tenure:**

State owned

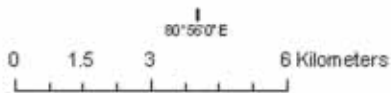
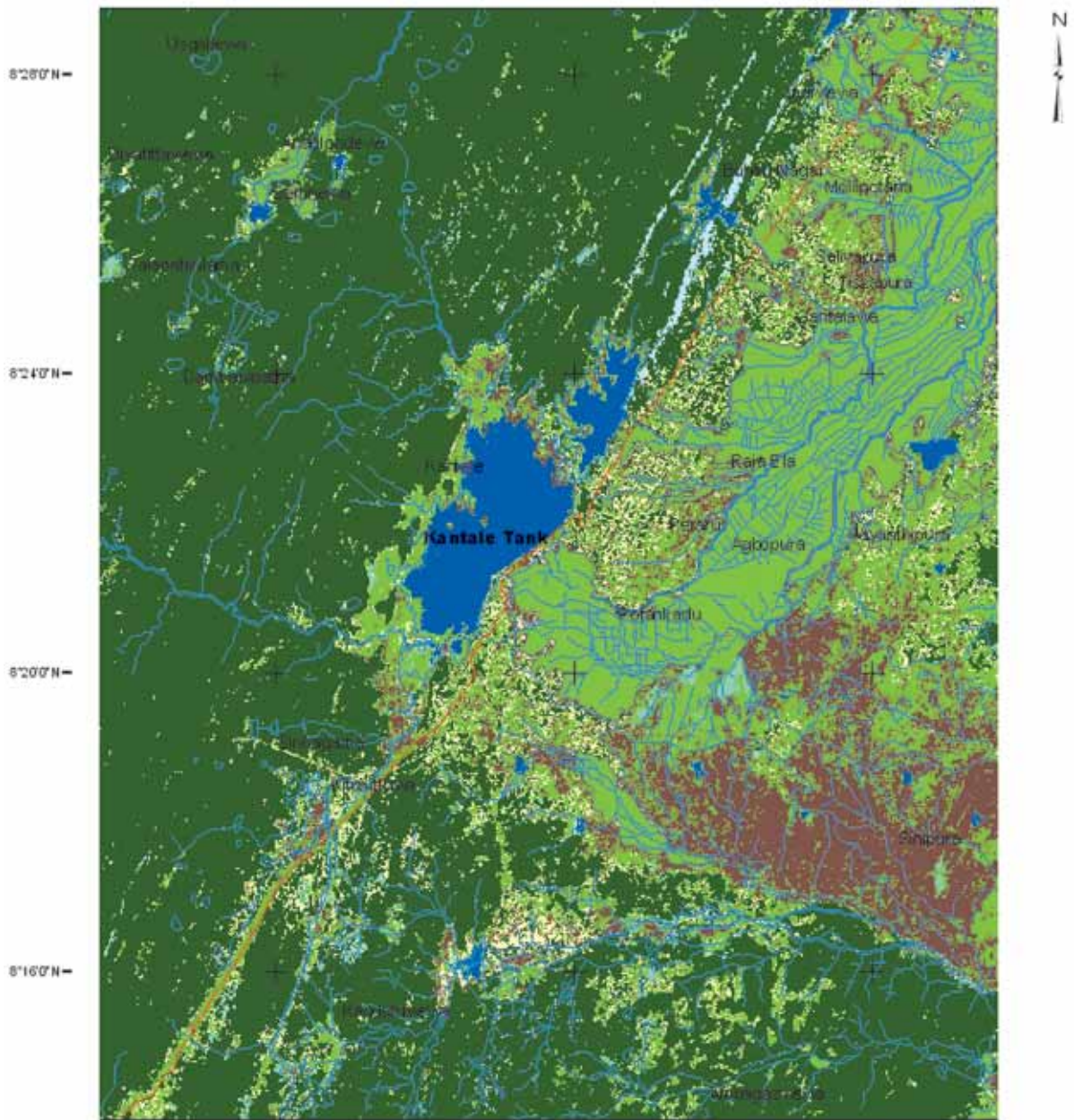
**Management authority and jurisdiction:**

The Kalawewa area comes under the mandate of the Ipologama DS Division, which comprises of 32 Grama Niladhari divisions. The tank comes under the jurisdiction of the MASL. The DWC has jurisdiction over the Kahalle-Pallekelle Sanctuary.

**References:**

Dissanayake (2000); MASL (2005); Silva (1996)

# Kantale Tank



### Land Cover

- Water
- Water with aquatic plants
- Marshy land
- Paddy land
- Homegardens
- Natural vegetation (high dense)
- Exposed soil

### Legend

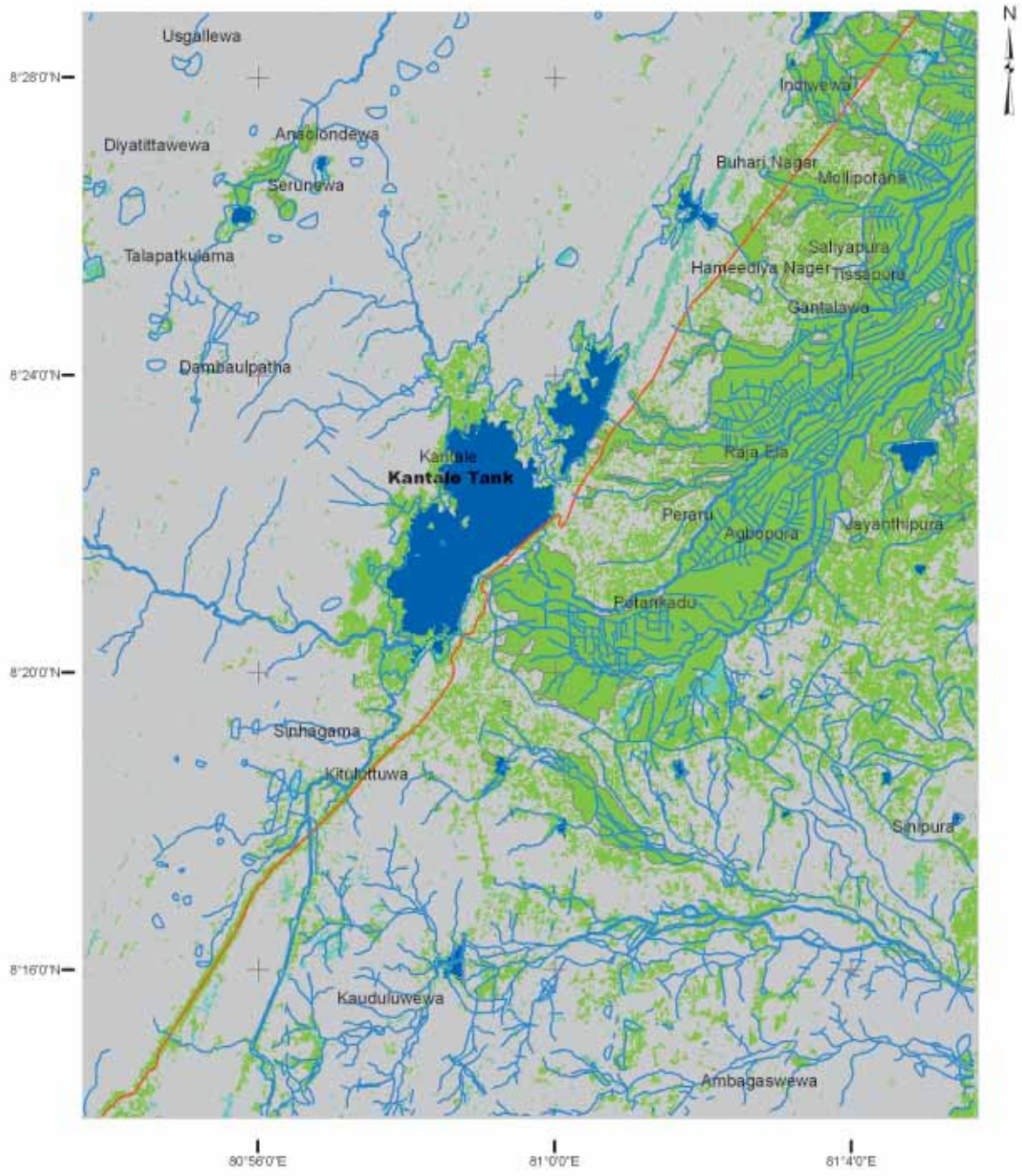
- Waterways
- Main road

Source: Landsat ETM+ 06 Sep 2001  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/CEA/2006



# Kantale Tank

## Wetlands based on Ramsar Classification



**Legend**

Class Name	Description
	Water storage areas
	Seasonal/intermittent fresh water marshes/ pools
	Irrigated land
	Non-wetlands
	Waterways
	Main road

0 1.5 3 6 Kilometers

Source: Landsat ETM+ 06 Sep 2001  
(Datum WGS84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Kantale Tank

## Location:

8° 27' 0 N and 80° 55' 0 E to 8° 15' 0 N and 81° 50' 0 E; 934048 N and 490827 E to 912032 N and 591779 E; about 35km southwest of Trincomalee in the Trincomalee District, of the Eastern Province.

## Area:

3,750 ha at full supply level

## Altitude:

Information not available

## Overview:

This is a large, ancient irrigation tank built by King Aggabodhi II who reigned from 604-614 AD. The catchment area of the tank is about 20,000 ha. The tank receives irrigation water diverted from the Mahaweli River. Kantale tank is an important storage tank and supports a thriving inland fishery. The bund was breached in 1986 and recently reconstructed. This tank has been identified as an IBA by BirdLife International.

## Physical features:

Kantale tank primarily acts as a storage tank and has a maximum depth of 9.8m. The salinity in the Kantale tank is said to be relatively low, perhaps due to the dilution resulting from diversion of Mahaweli water via Bowatenna. As such the pH is approximately 7.2. The Kantale Tank is situated in the dry zone. The area receives a mean annual rainfall of 1,500 – 2,000 mm. The mean annual temperature is about 28°C.

## Ecological features:

The surrounding landscape is characterised by natural vegetation types such as dry mixed evergreen forests and sparsely distributed scrublands and anthropogenic habitats such as paddy fields, chena and home gardens.

## Noteworthy fauna:

The freshwater fish are dominated by exotic species such as *Oreochromis mossambicus*. The indigenous fish fauna comprises of *Puntius* spp, *Channa* spp. Water birds include *Leptoptilos javanicus*, *Pelecanus philippensis*, *Anhinga melanogaster*, *Phalacrocorax niger* and *Haliaeetus leucogaster*. Large herds of *Elephas maximus* visit the tank regularly from the surrounding areas.

## Noteworthy flora:

*Chloroxylon swietenia*, *Drypetes sepiaria* and *Vitex altissima* are some of the noteworthy tree species that have been recorded from the adjacent forest areas.

## Land use:

The land surrounding the tank is used for timber and medicinal plant collection. In addition, many paddy fields that are irrigated by the tank can be observed in the vicinity. Fishing activities are also common within the tank.

**Possible changes in land use:**

Increased deforestation for the collection of timber.

**Hydrological and biophysical values:**

This is a main storage tank that stores and supplies irrigation water for the downstream areas of Kantale.

**Social and cultural values:**

This tank was built at the time of King Aggabodhi II who reigned from 604-614 AD to irrigate the surrounding areas. The main livelihood of the communities living downstream of the tank is paddy cultivation. They are dependent on the tank for the timely discharge of irrigation water with the cropping cycle. The tank is also valuable as it supports a tank fishery and provides water for irrigation activities in the surrounding areas.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

The tank is situated along the Kandy-Trincomalee main road. Tourists travelling to Trincomalee frequently stop at Kantale. The potential for nature-based tourism is also high because of its status as an IBA.

**Conservation measures taken:**

The surrounding area was declared a forest reserve (37,479.3 ha) by the Forest Department in 1902.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Cattle grazing and encroachment of the wetland area causes habitat modification and degradation while excessive timber logging destroys the surrounding forest areas.

**Land tenure:**

The tank is state owned; surrounding areas are partly state and partly privately owned.

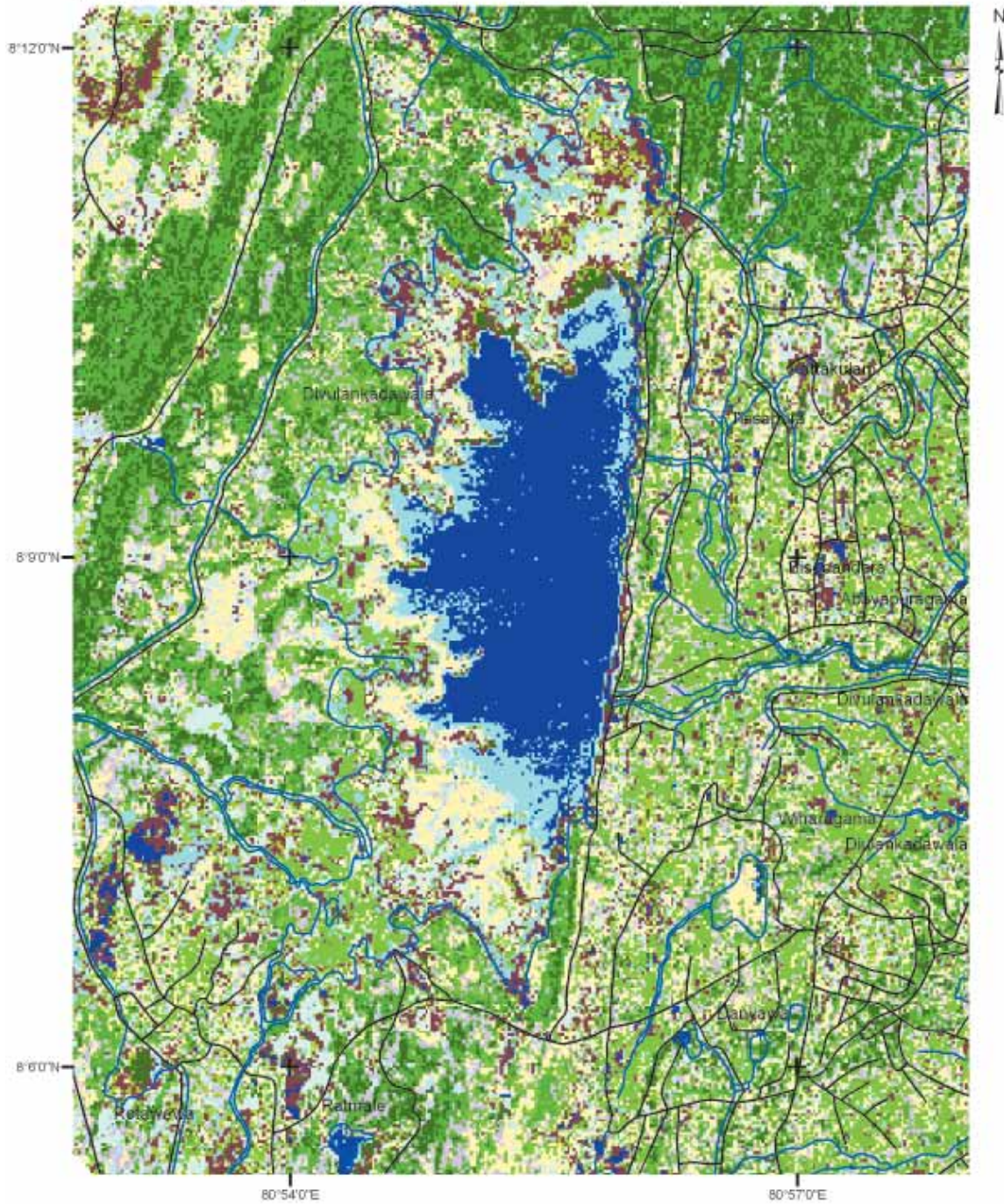
**Management authority and jurisdiction:**

Kantale DS is the local management authority. The surrounding forest area is under the jurisdiction of the Forest Department.

**References:**

Bandaragoda (2006); BirdLife International (2005); IUCN and the World Conservation Monitoring Centre (1997); Kotagama (1989); Silva (2003)















# Kaudulla Tank



0 0.5 1 2 Kilometers

## Legend

### Land Cover

	Water (deep)		Natural vegetation with significant water
	Water (shallow)		Natural vegetation (low dense)
	Marshy and		Natural vegetation (moderate dense)
	Paddy land		Natural vegetation (high dense)
	Homegardens		Exposed soil
	Agricultural fragments		Minor road
	Grassland		Waterways

Source: Landsat ETM+ (06 Sep 2001)  
Ground Truthing - Nov 2005  
(Datum WGS 84, Projection UTM)

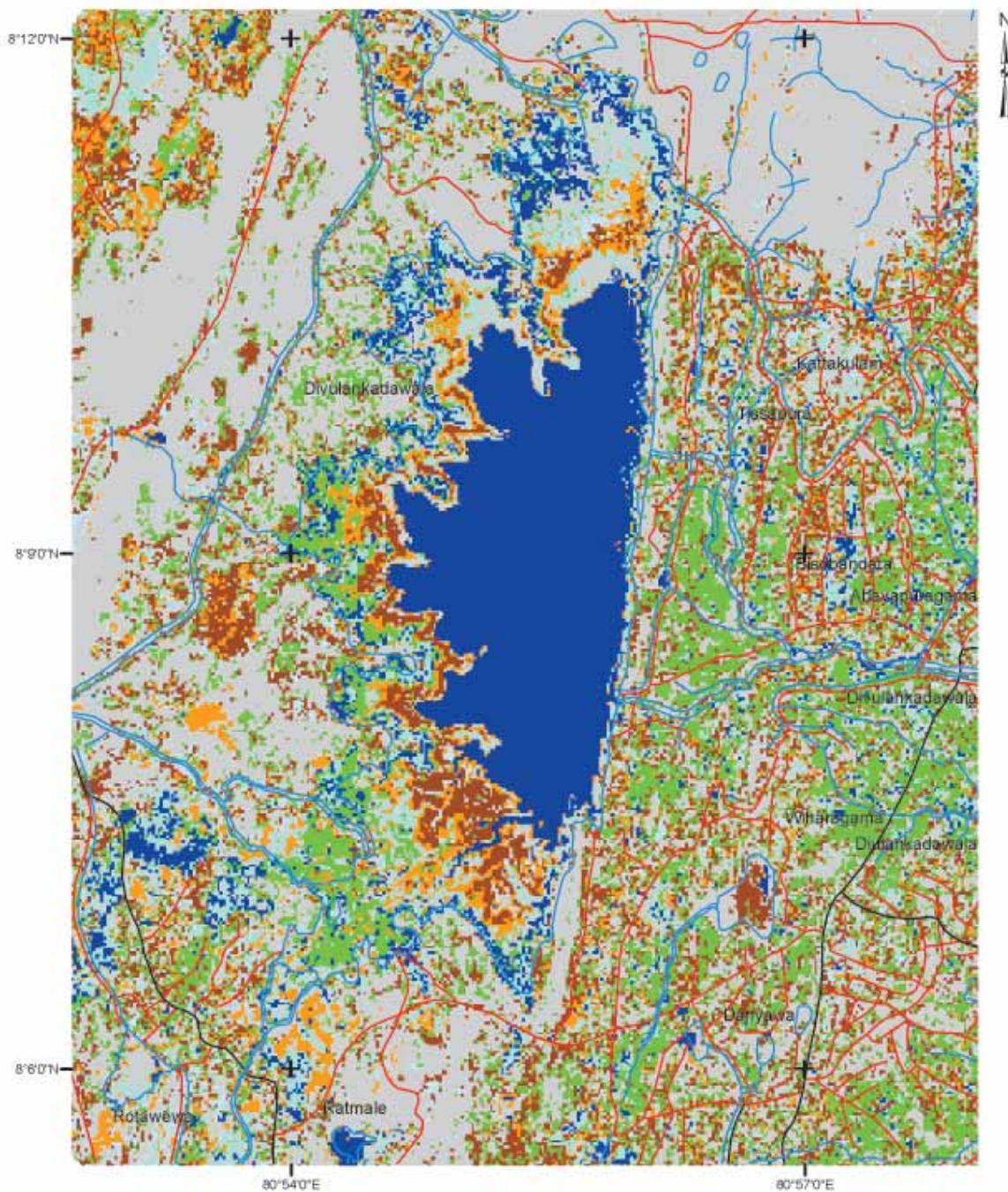


Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Kaudulla Tank

## Wetlands based on Ramsar Classification



### Legend



#### Class Name

- |   |   |   |                |
|---|---|---|----------------|
|  | Permanent Fresh water lakes                       |  | Irrigated Land |
|  | Seasonal/ Intermittent fresh water lakes          |  | Non-wetlands   |
|  | Seasonal/ Intermittent fresh water marshes/ pools |  | Minor road     |
|  | Fresh water, tree-dominated wetlands              |  | Waterways      |
|  | Shrub-dominated wetlands                          |   |                |

Source: Landsat ETM+ (06 Sep 2001)  
 Ground Truthing - Nov 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Kaudulla Tank

## Location:

8° 12' 0 N and 80° 52' 30 E to 8° 6' 0 N and 80° 58 30 E; 906411 N and 485314 E to 895353 N and 496328 E; approximately 190km from Colombo, in the Polonnaruwa District, of the North-central Province.

## Area:

The tank area is 6,675 ha.

## Altitude:

Information not available

## Overview:

Kaudulla is an ancient irrigation tank constructed in the 3<sup>rd</sup> century AD during the reign of King Mahasen. The tank was subsequently abandoned, but it was restored in 1959 by the Irrigation Department. It is now a part of system D of the Mahaweli Network and receives water through the Elahera anicut. The tank and its surroundings were declared as the Kaudulla National Park in 2002. The National Park supports a large bird population and together with Minneriya and Giritale has been identified as an IBA by BirdLife International.

## Physical features:

The tank has a gross catchment area of 97 sq. miles. Gal Oya and Aluth Oya are the two main streams feeding the reservoir, while floodwaters from the Minneriya tank are also discharged to Kaudulla. The water in the reservoir is known to have a pH of 7.23-8.56. Kaudulla is located in the dry zone of Sri Lanka and is influenced by the northeast monsoon from October to February. It receives an annual rainfall of 1,500 – 2,000 mm, and has a mean annual temperature of 28°C.

## Ecological features:

The area surrounding the tank consists of tropical dry mixed evergreen forests, abandoned chena cultivations, and grasslands. The phytoplankton community in the tank is dominated by the blue green algae *Microcystis sp.* and the filamentous diatom *Melosira sp.* 24 species of mammals, 25 species of reptiles, 26 species of fish, and 160 species of birds have been recorded from the National Park.

## Noteworthy fauna:

The freshwater fish in the tank is dominated by the exotic *Oreochromis mossambicus*. Among the amphibians, *Rana gracilis* is endemic. Noteworthy reptiles include the freshwater turtles *Lissemys punctata* and *Melanochelys trijuga*. Large water birds include *Pelecanus philippensis* and *Leptoptilos javanicus*. The tank caters to the water requirements of wild animals in the Park, including a large herd of *Elephas maximus*.

## Noteworthy flora:

Trees such as *Manilkara hexandra*, *Chloroxylon swietenia* and *Vitex altissima*, are some of the predominant species occurring in the forests bordering the tank. Some areas are dominated by shrubs such as *Randia*

*dumetorum* and *Calotropis gigantea* and exotic grasses such as *Imperata cylindrica* and *Panicum maximum*.

**Land use:**

The water body is used for fisheries activities while surrounding areas are either set aside for wildlife conservation or used for agriculture.

**Possible changes in land use:**

Expansion of chena cultivation into the tank catchment area.

**Hydrological and biophysical values:**

The reservoir provides water for irrigation of agricultural lands in surrounding areas. Additionally, it acts as a flood detention mechanism during the rainy season and as such two-thirds of the Kaudulla National Park is inundated for several months of the year.

**Social and cultural values:**

The reservoir was built by the sister of King Mahasen, who built the neighbouring Minneriya reservoir. It supports subsistence-fishing activities of local communities and provides water for agriculture.

**Scientific research and monitoring:**

A water management study was carried out within the Kaudulla irrigation system in 1980.

**Conservation education:**

The DWC has conducted awareness programmes through the electronic media.

**Recreation and tourism:**

The park is visited by wildlife enthusiasts to view birds and elephants. Locals operate catamaran rides to view wildlife and a private safari camp is located at the park border. However, there is a lack of visitor facilities such as bungalows within the park.

**Conservation measures taken:**

The tank and surrounding areas were declared as a National Park under the FFPO in 2002. In 2004, the Kaudulla-Minneriya Jungle Corridor was declared a National Reserve to link Kaudulla with the Minneriya National Park. In 1997 the Forest Department conducted a reforestation programme that created a 50 acre teak forest.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Cattle grazing causes habitat modification and degradation while the spread of invasive alien species such as *Lantana camara* is also causing serious problems to wildlife habitats around the tank.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

The National Park is under the authority of the DWC, while the reservoir and irrigation system is maintained by the Irrigation Department.

**References:**

BirdLife International (2005); DWLC (2004); Gunasekera (1997); Silva (2003); University of Sterling/  
University of Peradeniya (1998)

# Koggala Lagoon

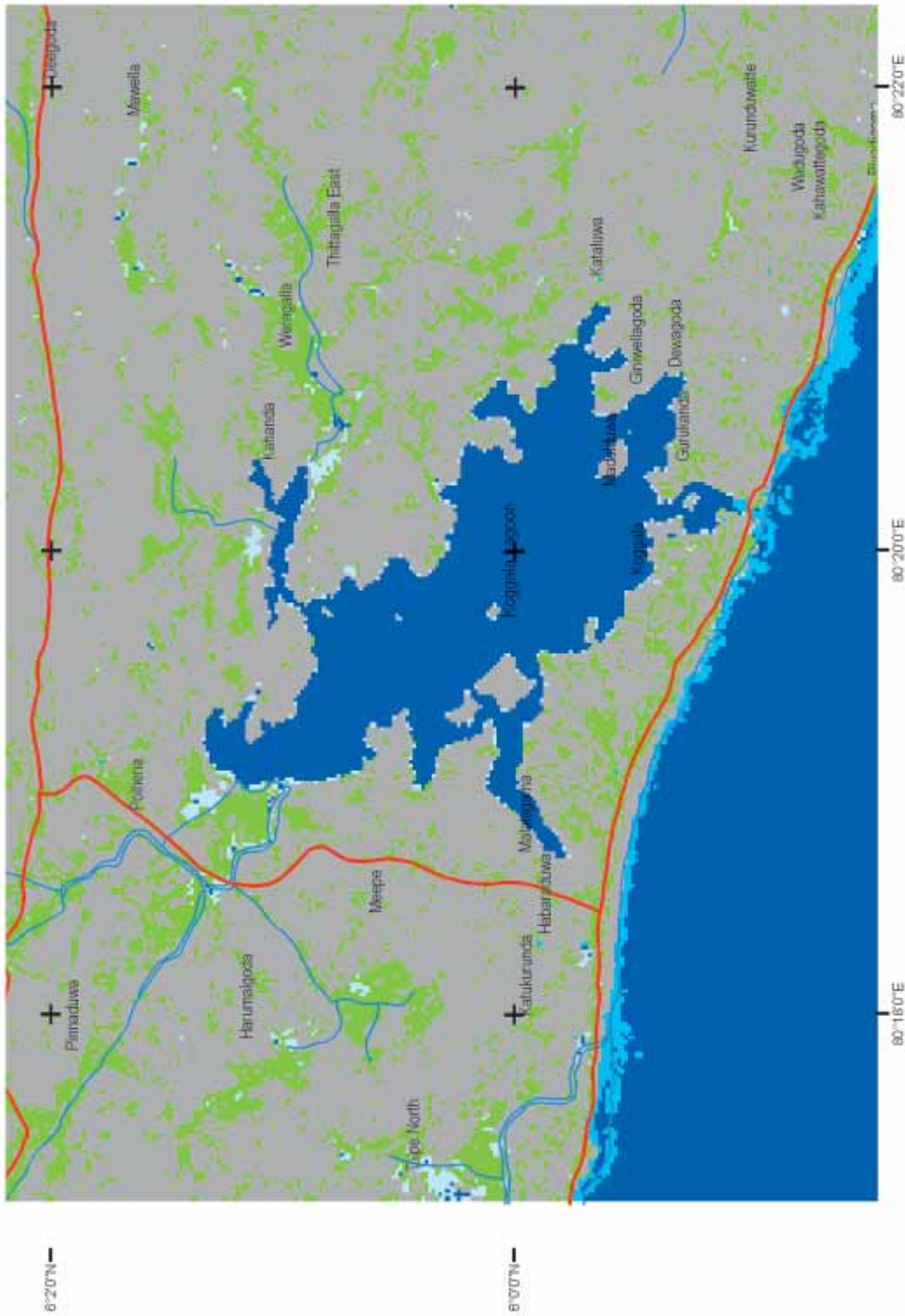


Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - 2005-12-23  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006





# Koggala Lagoon Wetlands based on Ramsar Classification



**Legend**

Class Name	Symbol
Coastal freshwater lagoons	Dark Blue
Permanent shallow marine waters	Light Blue
Seasonal/Intermittent freshwater marshes	Pale Blue
Irrigated land	Green
Non-wetlands	Grey
Main road	Red Line
Waterways	Blue Line

Source: Landsat ETM+ 14th March 2001  
Ground Truthing - 2005/12/23-24  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/PIEMA/CEA/2006



# Koggala Lagoon

## Location:

6° 20' 0 N and 80° 17' 0 E to 5° 58' 0 N and 80° 22' 0 E; 700107 N and 420734 E to 659560 N and 429904 E; about 130 km south of Colombo in the Galle District, of the Southern Province.

## Area:

727 ha

## Altitude:

Information not available

## Overview:

There are 14 islets of varying sizes, forested with mangroves and terrestrial shrubs, within the lagoon. The largest islet is located in the southeast corner of the lagoon near Gurukande Temple. A number of waterways are connected to the Koggala lagoon although its main freshwater source is the Koggala Oya. An increase in salinity levels and water logging has caused large extents of paddy lands around the lagoon to be abandoned. This reduction in potable water sources poses a considerable problem to the local communities.

## Physical features:

The Koggala lagoon has a relatively deeper basin and larger surface area with respect to other coastal water bodies in the southern coast. Its volume is  $127 \times 10^6 \text{ m}^3$  and it has a depth range of 1.00m to 3.7m. The lagoon is essentially a rain fed coastal lake. A perennial stream, which drains the northwest portion of the watershed, empties into the lagoon via the village called Godawatte. The main geological form of the area is garnet biotite gneiss of Precambrian origin. The predominant soil types in the area are red yellow podzolic soils with soft or hard lateritic sub soils, which are characteristic of the southwest of the country. The deposition and sedimentation of alluvial and marine deposits can be observed in some areas of the lagoon. Prior to the removal of the natural sand bar at the mouth of the lagoon the salinity fluctuations ranged from 3 % to 15 %. However, once constructions to permanently open the lagoon mouth were introduced, the salinity of the lagoon increased causing an alteration in the species of fish recorded. Since most fish species that were traditionally found in the lagoon were adapted to a fresh water environment, these increased salinity levels have caused a decline in the fish stocks. Koggala is located in the wet zone on the southern coast of Sri Lanka and therefore experiences a mean annual rainfall of between 2,000 to 2,500mm with the heaviest rainfall in the months of May (300 mm) and October (340 mm). It receives rain during the southwest monsoon and during the first and second monsoon periods. The temperature in the area ranges between 15°C and 28°C.

## Ecological features:

Fringing mangrove and scrubland form the main natural vegetation around the lagoon and its islands. Managed vegetation types around the lagoon include home gardens, paddy fields and plantations (rubber, coconut). The islands consist of mangrove as well as non-mangrove plant species. The salinity of the lagoon has increased considerably since 1992, subsequent to the removal of the sand bar across the mouth of the lagoon, which has led to a gradual change in the species composition of mangrove vegetation. *Sonneratia caseolaris*, which was a common mangrove species in the lagoon, has decreased considerably

over the past decade. The increase in salinity has also led to a change in the species composition of aquatic fauna in the lagoon.

#### **Noteworthy fauna:**

This site is important for prawn fisheries (*Metapenaeus dobsoni*, *Penaeus indicus* and *Macrobrachium rosenbergii*). Among the fish present in the lagoon *Clarias brachysoma* is endemic. Aquatic reptiles in the lagoon include *Varanus salvator*, *Crocodylus porosus*, *C. palustris*, *Lissemys punctata*, and *Melanochelys trijuga*. The Python (*Python molurus*) also occurs in islands covered with dense mangroves. The Koggala beach is a popular nesting area for all five species of marine turtles that visit Sri Lanka. The wetland ecosystem serves as breeding and foraging grounds for herons (*Ardeola grayii*, *Nycticorax nycticorax*) egrets (*Mesophoyx intermedia*, *Egretta garzetta*), waterfowl (*Dendrocygna javanica*), kingfishers (*Alcedo atthis*, *Halcyon capensis*) and terns (*Sterna* spp.) that feed on the aquatic organisms. Rare mammals in the area include *Lutra lutra*, and *Prionailurus viverrinus*.

#### **Noteworthy flora:**

The dominant fringing mangrove is *Rhizophora mucronata* while other species found in the area include *R. apiculata*, *Bruguiera sexangula*, *Sonneratia caseolaris*, *Acanthus illicifolius*, *Acrosticum aurium*, *Avicennia officinalis*, *A. marina*, *Aegicerus comiculatum*, *Excoecaria agallocha*, *Nypa fruticans* and *Dolichandrone spatheacia*. The lagoon banks are covered with *Typha angustifolia*, *Phragmites australis* and *Cyperus* spp. The endemic terrestrial plant species include *Mangifera zeylanica*, *Artocarpus nobilis* and *Horsfieldia iryaghedhi*.

#### **Land use:**

The wetland and its surrounding areas are mainly used for fisheries, tourism and agriculture (that uses water from the inflow area of the lagoon). Prawn fishing is undertaken at a large scale in the areas close to the lagoon mouth while a small-scale subsistence fishery is also known to be in place. The mangroves are used for house construction, agriculture and firewood. Animal husbandry is also an economic activity in this area. A few patches of coconut plantations are scattered mainly towards the seaward boundary and a fairly large area in the north-eastern part of the watershed bordering the lagoon has been cultivated with cinnamon. The infrastructure development in the watershed is minimal, except for the Free Trade Processing Zone (FTPZ) and establishment of a few tourist hotels along the beach.

#### **Possible changes in land use:**

Rapid tourism development activities around this area could lead to construction of tourism related infrastructure in the islands and areas bordering the lagoon.

#### **Hydrological and biophysical values:**

After the natural sand barrier at the river mouth was removed in 1992 the Southern Provincial Council built a groyne system to avoid sand deposition in the lagoon. However construction of the groyne resulted in the lagoon mouth being permanently open which in turn led to many environmental problems around the lagoon environment. As such in order to control the salinity level that was affecting the paddy cultivation areas, three anicuts and one bund (3km) were constructed by the Irrigation Department.

#### **Social and cultural values:**

There are a number of sites of historical and cultural value (including temples) in the area. One of the islets, Madol Duwa, belongs to the family of Sri Lanka's renowned writer, Martin Wickramasinghe.

**Scientific research and monitoring:**

NARA carried out a study on 'the effects of saltwater intrusion' in 2006. Ruhuna University and the Institute of Fundamental Studies have, in the past, carried out water quality studies. A laboratory located within the Koggala Trade Processing Zone routinely monitors the quality of the effluents released through the sea outfall.

**Conservation education:**

Information not available

**Recreation and tourism:**

Lagoon tours and bird watching trips are conducted particularly to the small islets within the lagoon. Approximately 50-200 local tourists visit per day (mostly on the weekends) including school children, particularly to visit the island Madol Duwa. From December to April this site supports approximately 50-100 foreign tourists per day. There is one hotel on an island and a further four hotels in the vicinity. Sri Lankan air taxi, a domestic service of the Sri Lankan airlines operates seaplane tours to this lagoon.

**Conservation measures taken:**

The CEA prepared a wetland site report/conservation management plan for Koggala lagoon in 1995. The reef and surrounding coastal area has been included in the Habaraduwa SAM plan by the CCD to initiate participatory community based management. The CCD has built coast protection structures. Some of the families in the islands grow mangroves around the island to protect it from erosion. This is a proposed EPA under the NEA of the CEA.

**Conservation measures proposed:**

Conservation and management recommendations have been listed in the SAM Plan for the area produced by the CCD and the conservation management plan produced by the CEA.

**Disturbances and threats:**

The permanent opening of the lagoon mouth by removing the sandbar in 1992 caused a series of problems due to the influx of salt water, which resulted in an increase in the salinity levels of the lagoon and surrounding areas. Some of the problems included the increased sandiness of the lagoon bed due to the influx brought in at high tide, the abandoning of paddy lands, decline in fish productivity in the lagoon and the destruction of some mangrove species particularly *Sonneratia caseolaris*. Additionally, the high salinity of the lagoon water makes it unsuitable for human consumption and other domestic activities. Fishing practices are also unregulated and thus lead to overexploitation of the valuable resources. The growth of invasive plant species within the lagoon (i.e. *Salvinia molesta*) has led to a decrease in other species naturally found in the area. The ease with which foreigners are allowed to purchase land has led to large scale clearing of mangroves for construction purposes. Mangroves have also been destroyed due to the discharge of effluents into the lagoon. Unauthorised filling and encroachment of the lagoon boundary and land erosion leading to sedimentation in the lagoon are further threats to the wetland area. The landing of seaplanes in the lagoon is known to affect the bird populations, and cause erosion of the lagoon banks due to the large waves created during landings. Madol Duwa is threatened by irresponsible waste disposal by tourists. Need urgent actions to mitigate existing threats.



**Land tenure:**

The lagoon is state owned, while some of the islands are privately owned.

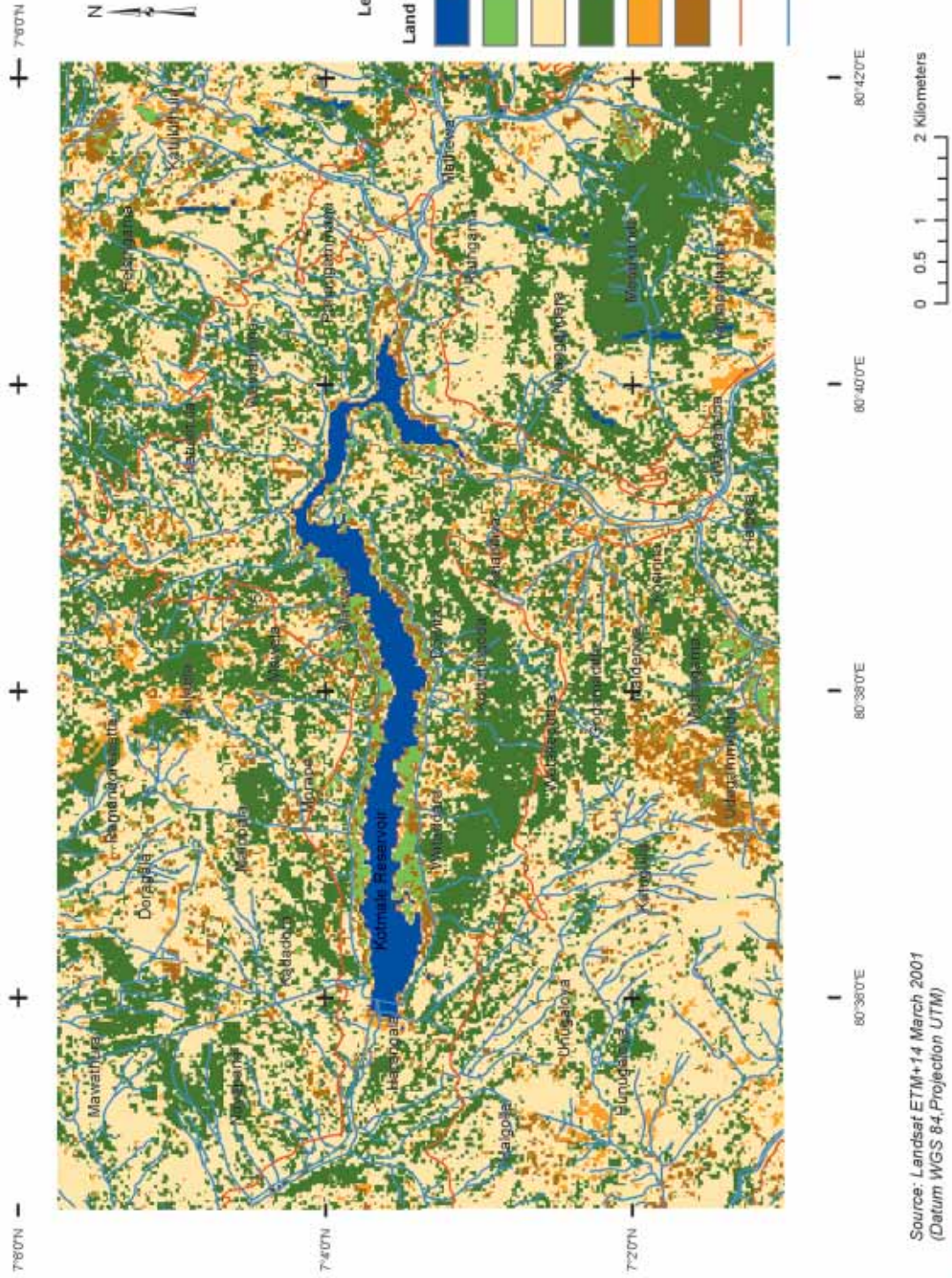
**Management authority and jurisdiction:**

The CCD has legal jurisdiction over the lagoon under the CCA.

**References:**

CCD (2005a); CCD (2006b); CEA/ARCADIS Euroconsult (1995d); Silva (1996)

# Kotmale Reservoir

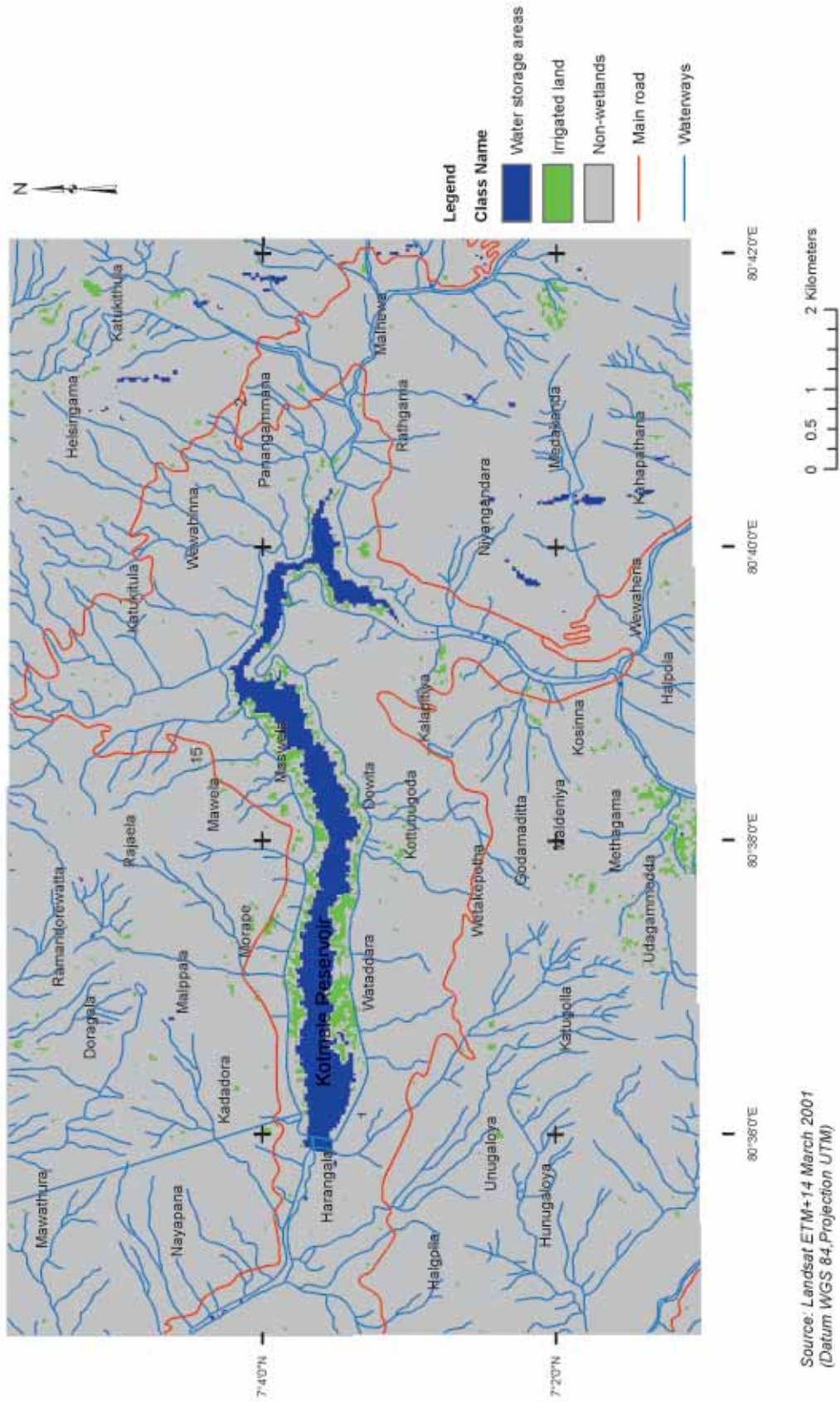


Source: Landsat ETM+ 14 March 2001  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA

# Kotmale Reservoir Wetland based on Ramsar classification



Source: Landsat ETM+14 March 2001  
(Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&S/PIEMA/CEA



# Kotmale Reservoir

## Location:

7° 55' 0 N and 80° 35' 0 E to 7° 10' 0 N and 80° 42' 0 E; 875108 N and 454074 E to 792184 N and 466876 E; lies between the Kandy and Nuwara Eliya Districts in the Central Province.

## Area:

Surface area of the water body 6,500 ha (6.5 km<sup>2</sup>)

## Altitude:

703 m at msl.

## Overview:

Kotmale reservoir is the uppermost impoundment of the Mahaweli River, which was constructed in 1985 under the Accelerated Mahaweli Development Programme for hydropower generation. An 87 m high rock-filled dam was built across the Kotmala Oya, which is a main tributary of the Mahaweli, at Kadadora, enabling the regulation of a large proportion of the recorded mean annual flow of the Oya. As an additional benefit, the reservoir increases the amount of irrigation water available at Polgolla and also stabilizes the water supply to the entire reservoir system of the Mahaweli River. During low water periods, the reservoir becomes eutrophic due to the inflow of a large amount of nutrients from its catchment, which comprises mainly of tea plantations.

## Physical features:

The catchment of the reservoir falls within the upcountry wet zone and receives the highest rainfall during the southwest monsoons from May to September. However, large seasonal variations in rainfall can occur and this changed rainfall pattern strongly influences the inflow regime into the impoundment, as there are no lakes or swamps in the catchment to retain the excess water. The gross storage up to full reservoir level is  $174 \times 10^6 \text{ m}^3$  and the length of the reservoir is 6.8 km. It has a maximum depth of 90 m near the dam, while the mean depth is 26.8 m. The surface temperature of the reservoir water varies between 23 – 30.2°C. Several waterfalls are located in the upper reaches of the reservoir.

## Ecological features:

The environs in the reservoir area can be divided into several ecological units with profound differences in physical and biological conditions: the aquatic environment of the reservoir (including connected streams); the shores/riparian zone; the home gardens and paddy fields of the valley slopes; remnant patches of humid lower and upper montane forests, tea plantations; montane grass lands (patanas) and patches of riverine forest. The slopes along the rim of the reservoir are entirely used for home gardens and rice cultivation. Extensive areas of grassland can be found on the highest hilltops, especially to the north of the reservoir. A dense lower and upper montane forest is present on both sides of the reservoir, which is an important refuge for mammals and birds. About 50% of the catchment is covered by very large tea plantations, which occur at elevations between 1,000–1,500m. The plankton of the reservoir consists of 43 species of phytoplankton, which is dominated by *Chlorophyceae* and *Staurastrum* species. The Cyanobacteria, *Microcystis aeruginosa* is abundant in the upper reaches of the reservoir during periods of low water. The zooplankton community is dominated by rotifers such as *Brachionus* species. More than 12 species of fish have been recorded from the reservoir.



**Noteworthy fauna:**

Important food fish species in the reservoir include three species of exotics (*Oreochromis mossambicus*, *Oreochromis niloticus* and *Cyprinus carpio*) and natives such as *Tor khudree*. Among the aquatic herpetofauna, the endemic *Lankanectus corrugata* inhabits the streams around the reservoir. The birds are dominated by egrets (*Egretta garzetta*), herons (*Ardeola grayii*) and kingfishers (*Alcedo atthis*, *Halcyon smyrnensis*), while rare raptors include *Elanus caeruleus*. Among the mammals, *Lutra lutra* and *Prionailurus viverrinus* inhabit the surrounding environs. The reservoir riparian areas and associated streams harbour several endemic crab species (*Perbrinkia* spp. and *Ceylonthelphusa* spp.).

**Noteworthy flora:**

Some common plant species associated with patches of riverine forests around the reservoir include *Artocarpus nobilis*, *Bambusa vulgaris*, *Bhesa zeylanica*, *Caryota urens*, *Celtis cinnamomoides*, *Entada pusaetha*, *Ficus nervosa*, *Ficus racemosa*, *Freycinetia pycnophylla*, *Mangifera zeylanica*, *Nephrolepis hirsulata*, *Ochlandra stridula*, *Pagiantha dichotoma*, *Pandanus kaida*, *Panicum gardneri*, *Phragmites karka* and *Phyllanthus indicus*. A highly threatened aquatic plant, *Zeylanidium* aff. *lichenoides* (Family Podostemaceae), was recently discovered in one of the streams located in the upstream area of the reservoir. The spray zone of waterfalls in the upstream areas harbour herbaceous species mostly growing on rocky substratum, such as *Hymenophyllum denticulatum*, *Impatiens* spp., *Sonerila* spp., *Angiopteris fraxinea*, *Asplenium indicum*, *Chirita walkeri* and *Lindsaea trapiziformis*.

**Land use:**

The reservoir water is mainly used for hydropower generation. Limited amount of fishing activities also take place. Tea plantations, home gardens and paddy lands are the major land use in the vicinity of the reservoir.

**Possible changes in land use:**

The construction of the Upper Kotmale hydropower reservoir will lead to land use changes within the catchment of the reservoir, which in turn may affect the amount of water inflowing to the reservoir.

**Hydrological and biophysical values:**

Provides water for hydropower generation, irrigation activities and prevents flooding during the rainy seasons.

**Social and cultural values:**

During the 6<sup>th</sup> Century BC, Kotmale formed an integral part of the mountainous Malaya region. The Sinhala Kings judiciously left the area under forest cover to sustain the rainfall, vital for the rice cultivations in the valleys below. During the period of British rule, the area was cleared initially for coffee and then later for tea plantations.

**Scientific research and monitoring:**

Since 1987, the MASL has conducted limnological studies of the reservoir with the assistance of the University of Sri Jayewardenapura. Several post-graduate and undergraduate research programmes have been conducted on the biophysical aspects of the reservoir.

**Conservation education:**

A reservoir viewing site and a visitor centre is located in the vicinity.

**Recreation and tourism:**

Not well developed, mainly due to the security restrictions at the reservoir. Large numbers of local visitors (mainly school children) visit the site.

**Conservation measures taken:**

The uppermost catchment of the Kotmala Oya lies within Horton Plains, which was declared as a National Reserve in December 1969 and elevated to the status of National Park in March 1988 under the provisions of the FFPO. The MASL regularly undertakes maintenance of reservoir structures to ensure that it remains in good condition.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Eutrophication of reservoir water due to inflow of nutrients from the tea estates has resulted in frequent algal blooms. Poor management of the estates causes moderate to severe soil erosion, leading to the siltation of the reservoir.

**Land tenure:**

The reservoir is State owned. Tea plantations are both state and privately owned. Home gardens are privately owned.

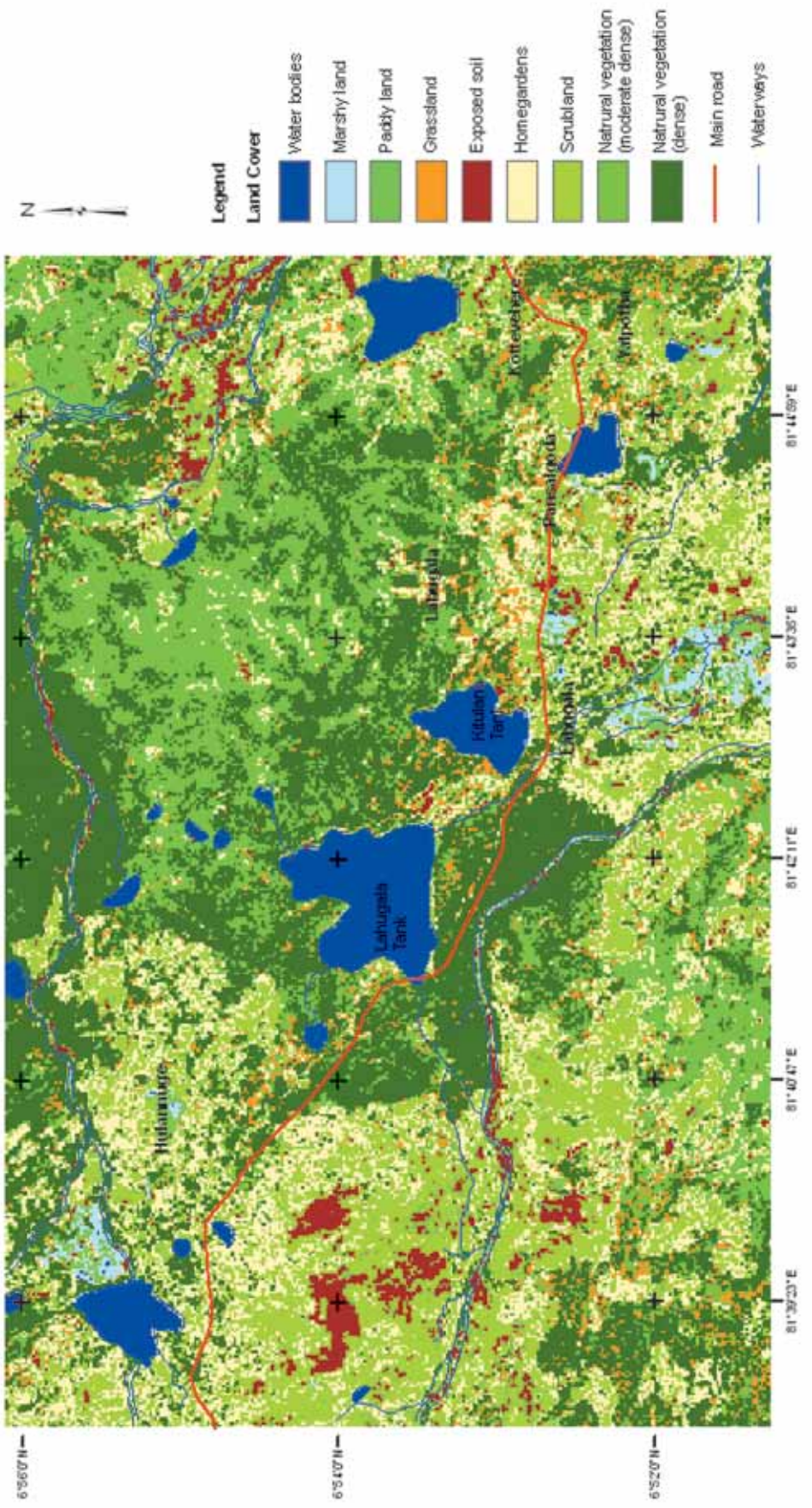
**Management authority and jurisdiction:**

The MASL maintains the reservoir. The uppermost catchment of the Kotmala Oya lies within the Horton Plains National Park which comes under the jurisdiction of the DWC.

**References:**

Chandrananda (1995); Johansson (1988); Perera (1998); Piyasiri (1995)

# Lahugala and Kithulana Tanks

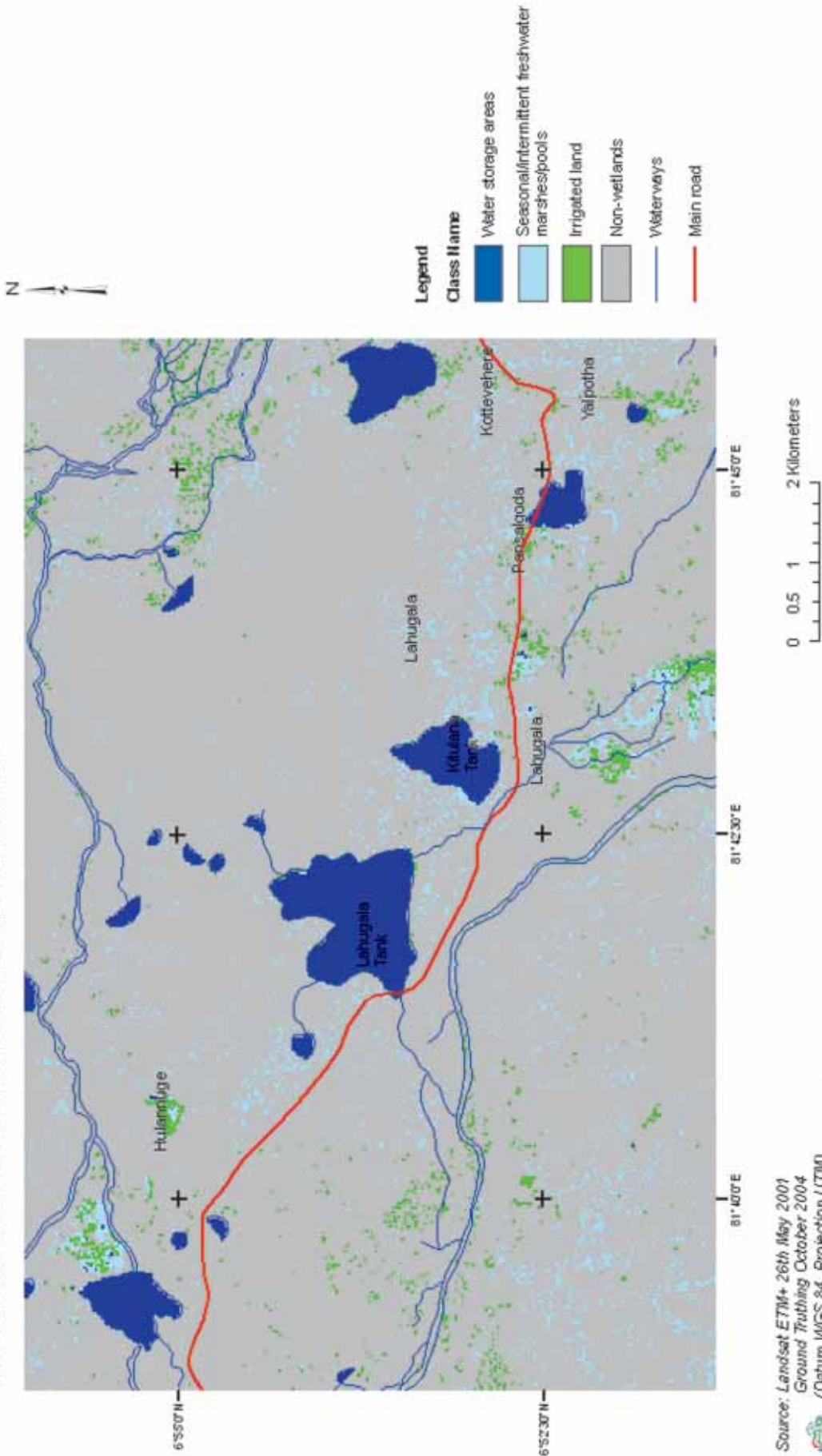


Source: Landsat ETM+ 26th May 2001  
 Ground Truthing October 2004  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/EIMA/CEA/2006





# Lahugala and Kithulana Tanks Wetlands based on Ramsar Classification



Source: Landsat ETM+, 26th May 2001  
Ground Truthing October 2004  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/PEIMA/CEA/2006



# Lahugala and Kitulana Tanks

## Location:

06° 56' 0 N and 80° 39' 0 E to 6° 51' 0 N and 81° 46' 0 E; 766428 N and 571805 E to 757235 N and 584708 E; 12 km southwest of Pottuvil in the Ampara District of the Eastern Province.

## Area:

Approximately 400 ha.

## Altitude:

Near sea level.

## Overview:

Lahugala-Kitulana National Park is one of the smallest parks in the country. Lahugala and Kitulana, small water storage reservoirs along with a third called Sengamuwa are located about 7km inland from the coast within the Heda Oya basin.

## Physical features:

Tropical monsoonal climate with an average annual rainfall of approximately 1,650mm.

## Ecological features:

These closely clustered tanks are surrounded by dry zone forest. The park has a flat terrain with occasional outcrops. Although the park is small in extent it provides an important grazing area for a large number of elephants that annually move to this area from outside to feed on a tall reedy grass, Beru (*Sacciopelsis interrupta*), that covers the tank extensively. Herds of over 150 elephants are a common sight from July to August.

## Noteworthy fauna:

Among the freshwater fish in the tank, *Clarias brachysoma* is endemic. Endemic amphibians around the tank include *Bufo athukoralei*, while aquatic reptiles include the freshwater turtles *Melanochelys trijuga* and *Lissemys punctata*. Large water birds that visit the tank include *Pelecanus philippensis*, *Leptoptilos javanicus*, *Anastomus oscitans* and *Ciconia episcopus*. Large herds of *Elephas maximus* visit the tank regularly to feed on the lush vegetation.

## Noteworthy flora:

The dry zone forest that surrounds the tanks is made up of species such as *Hemicyclia sepieria* and *Manilkara hexandra*. The dominant grass species *Sacciopelsis interrupta* is a major food source of the elephant.

## Land use:

The Park is uninhabited but there is a small settlement on the boundary. Villagers engage in paddy cultivation and fisheries activities. The Pottuvil to Moneragala trunk road runs through the southeastern sector of the park.

**Possible changes in land use:**

Information not available

**Hydrological and biophysical values:**

Information not available

**Social and cultural values:**

The historic site of Magulmahavihara, which was built in remembrance of the marriage between King Kavantissa and Princess Viharamaha Devi, is located close to the National Park.

**Scientific research and monitoring:**

Research on elephant ecology was carried out in 1967-1969. A project titled 'Saving Elephants by Helping People: Mitigating human-elephant conflicts along the southern boundary of the Lahugala-Kitulana National Park for the long-term conservation of the Sri Lankan elephant (*Elephas maximus maximus*)' was initiated in 2003, through funding from the US Fish and Wildlife Asian Elephant Conservation Fund.

**Conservation education:**

Information not available

**Recreation and tourism:**

The park was closed due to security reasons until 2000. The current civil unrest could possibly lead to its closure again.

**Conservation measures taken:**

The tanks are located within the Lahugala-Kitulana National Park (1,554 ha), which was declared under the FFPO in October 1980. The area was initially protected as a Sanctuary in July 1966. In 2005, a 15km solar-powered electric fence was erected by the DWC in four villages situated along the southern boundary of the Lahugala-Kitulana National Park to prevent raiding by wild elephants.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Amongst the threats that affect the surrounding habitats, cattle grazing is the most prominent. Additionally people from the surrounding villages engage in illegal activities such as timber felling and poaching.

**Land tenure:**

The tanks and surrounding area are state owned.

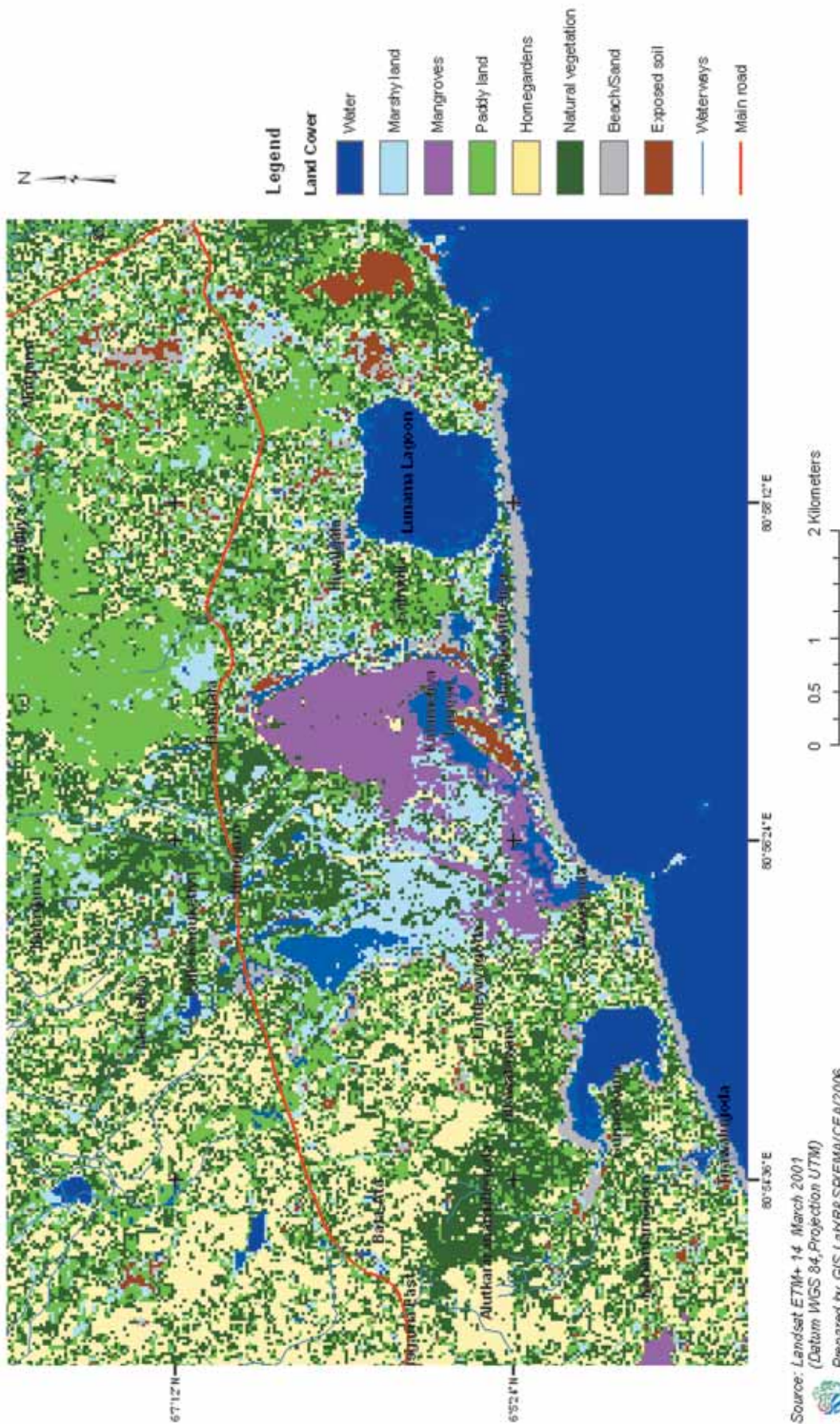
**Management authority and jurisdiction:**

DWC

**References:**

Kotagama (1989)

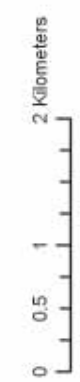
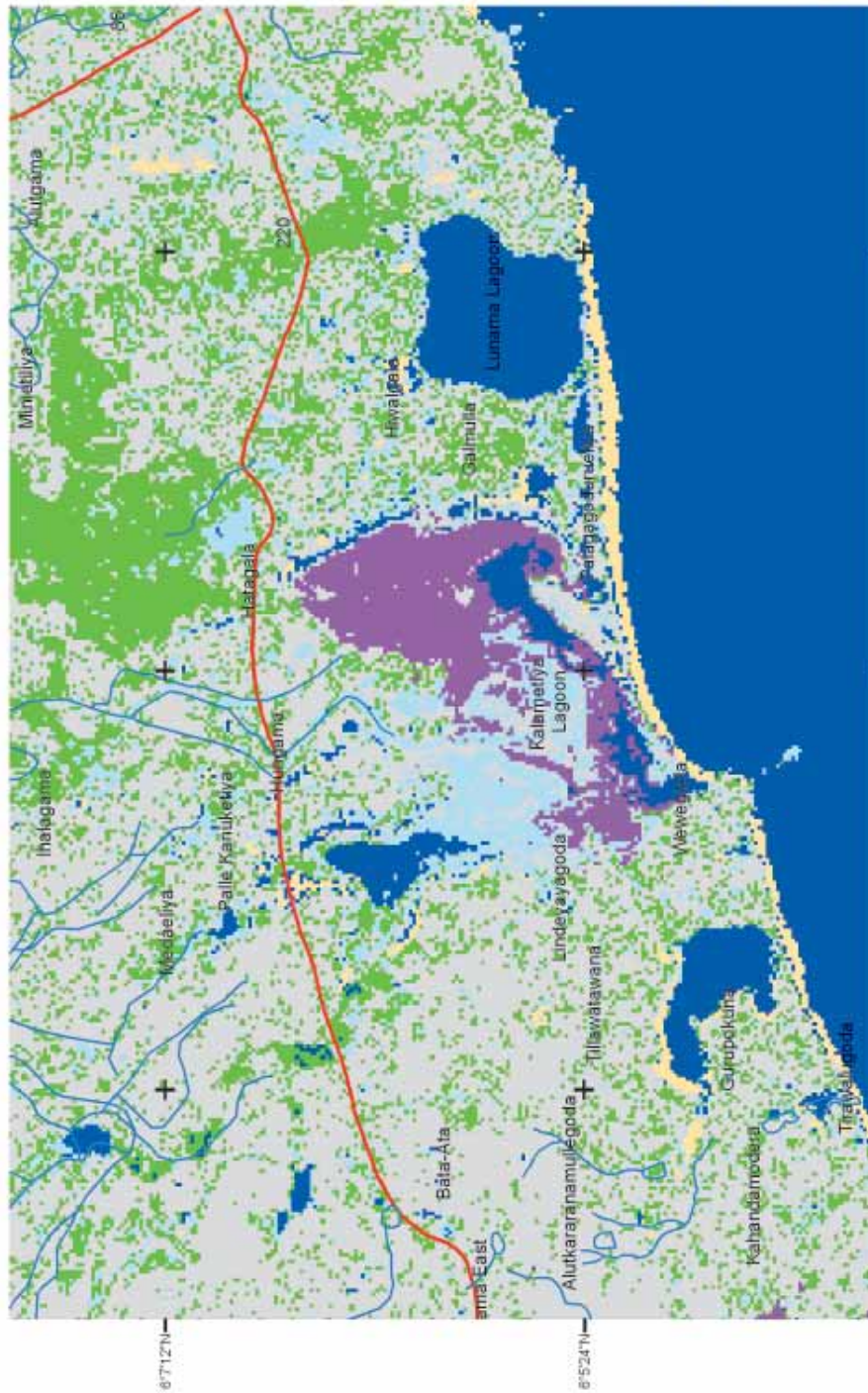
# Lunama-Kalametiya Lagoons



Source: Landsat ETM+ 14, March 2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/SPEM/CEA/2006



# Lunama-Kalametiya Lagoons Wetlands based on Ramsar Classification



Source: Landsat ETM+ 14 March 2001  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Lunama-Kalametiya Lagoons

## Location:

6° 8' 0 N and 80° 54' 0 E to 6° 5' 0 N and 80° 59' 0 E; 677945 N and 488936 E to 672416 N and 498156 E; about 200 km from Colombo, along the south-eastern coast in the Hambantota District, of the Southern Province of Sri Lanka.

## Area:

Lunama (192 ha) and Kalametiya lagoons (606 ha)

## Altitude:

Sea level to 20 m

## Overview:

The Lunama–Kalametiya wetlands are two brackish water lagoon systems harbouring rich biodiversity including a wide variety of habitats and species. This complex is also an important wintering site for a large number of waterfowl. Although 700 ha have been designated as a wildlife sanctuary, the water management of the wetland is entirely agriculture oriented, rather than for biodiversity conservation.

## Physical features:

The underlying Precambrian formations are predominantly sedimentary rocks and quartz. The main mineral resource is shell deposits that extend over a 1.5-3 km wide sub surface band along the coast. The Kalametiya lagoon opens to the sea through a narrow man-made outlet and is connected to Lunama through a shallow, 2 km man-made channel. These two shallow lagoons, with a mean depth of less than 1 m, are fed by the Kachchigal Ara, and are surrounded by fringes of marsh and mangrove vegetation. During the Indian Ocean Tsunami of 2004, the Lunama-Kalametiya sanctuary and adjoining villages were well protected by a broad, mature and stabilised sand dune that runs parallel to the coastline. Lagoon water levels used to be regulated by semi-natural breaching of a sand bar, but since the construction of the artificial sea outlet, there is an almost year round outflow into the sea. As the area is situated in the dry zone of Sri Lanka, it receives an annual rainfall of 1,000 – 1,250 mm. It experiences two distinct dry spells, in February and July – August. The mean air temperature is around 27°C. Relative humidity is in the range of 75 – 80% for most part of the year.

## Ecological features:

The inland and near-shore wetland habitats associated with the two lagoons include mangrove, reed beds, salt marsh, coral reef, sand stone reef, seashore vegetation, and seasonal ponds. The lagoons are surrounded by sand dunes, scrublands, grasslands, coconut plantations, home gardens, rice fields and chena lands. The mangroves around the Kalametiya lagoon, which consisted of a mixture of species about two decades ago, has converted into a *Sonneratia* dominant stand owing to the drainage of irrigation water and sedimentation. Patches of scrublands located around the lagoons are dominated by thorny species such as *Flueggea leucopyrus* and *Dicrostachys cinerea*. A total of 209 plant species have been recorded from the above habitat types, which include 12 climbers, 113 herbs, 39 shrubs and 54 tree species. Two hundred and eighty three species of vertebrates were recorded which comprise of 35 fish, 13 amphibians, 43 reptiles, 168 birds and 24 species of mammals. About 75 species of butterflies have also been recorded.

**Noteworthy fauna:**

Out of the 283 species of vertebrates, 14 species are endemic (3 fish, 4 reptiles, 5 birds, and 2 mammals) and 17 species are nationally threatened (2 fish, 7 reptiles, 5 birds and 3 mammals). Among the fish species present in the lagoon, *Esomus thermoicos*, *Clarias brachysoma* and *Puntius singhala* are endemic. Aquatic reptiles include *Crocodylus palustris*, *Lissemys punctata* and the endemic serpent *Xenochrophis asperrimus*, while *Python molurus* inhabits the mangrove areas. Among the birds recorded, 46 are winter migrants. Rare and/or locally declining wetland bird species include *Esacus recurvirostris*, *Vanellus malabaricus*, *Phalacrocorax carbo*, *Pelecanus philippensis* and *Porzana fusca*. Three species of globally endangered marine turtles (*Chelonia mydas*, *Lepidochelys olivacea* and *Dermochelys coriacea*) nest on the beaches of the sanctuary. The mammals present in the surrounding mangroves include two endemic species (*Macaca sinica* and *Moschiola meminna*) and three rare and locally declining carnivores (*Prionailurus viverrinus*, *P. rubiginosus* and *Lutra lutra*).

**Noteworthy flora:**

Endemic plants present around the lagoons include *Vernonia zeylanica*, *Cassine glauca*, and *Memecylon sylvaticum*. The mangrove bordering the Kalametiya lagoon is dominated by *Sonneratia caseolaris*, while those in Lunama are dominated by *Excoecaria agallocha*. The frequently inundated areas of the lagoon consist of salt marsh communities, dominated by salt-tolerant species such as *Halosarcia indica*. The reedbeds adjoining the lagoons are dominated by the exotic Cattail (*Typha angustifolia*).

**Land use:**

Fisheries, shell mining, chena and paddy cultivation and livestock production are the major land use activities. Additionally, the surroundings are used for human settlements.

**Possible changes in land use:**

Encroachment of human settlements into the sanctuary area and expansion of the agricultural lands may result in increased use of land area for agriculture and housing. Changes in the hydrology may lead to the decrease of fisheries livelihoods in the lagoon. Already this has resulted in a decline in lagoon fishing by around 60%. Many poor fishermen in Tuduwa DS, have been forced to seek alternative livelihoods in the form of labour, rearing and selling chickens, and mining for shells as lagoon fishing now only makes up about 25% of their income. Furthermore, when the children of these households reach working age they often seek employment in towns and cities, often in factories, rather than entering traditional fishing due to the decreased benefits.

**Hydrological and biophysical values:**

Sand dune habitats shielded the wetland from the recent tsunami disaster; however, the tsunami waves were funnelled into the Kalametiya lagoon through the man-made opening to the sea. This site is important for flood control and nutrient retention.

**Social and cultural values:**

The lagoons have been important for sustaining livelihoods and providing numerous goods and services for the local community. Although the importance of the lagoons to the livelihood of the local population has declined considerably, many people still rely on them to supplement their income and to meet nutritional needs, if not for their main livelihood activity.

**Scientific research and monitoring:**

Several ornithological and turtle surveys have been conducted including a joint survey by the IWRB and the Ceylon Bird Club in 1995. IUCN conducted a biodiversity survey in the latter part of 2002 to determine the current status of biodiversity in and around the lagoon area.

**Conservation education:**

Some awareness raising for local communities was carried out by IUCN as part of a GEF funded management project in the area. Several other education activities are being carried out or are being planned as part of the ADB funded CRMP activities being undertaken by the CCD.

**Recreation and tourism:**

A visitor centre is currently being established under the CRMP. Ornithologists regularly visit the wetland.

**Conservation measures taken:**

Recognizing the importance of the wetland's biodiversity, this site was declared a Sanctuary under the FFPO in 1984. In 1995, the CEA prepared a site report and a conservation management plan while the Forest Department in collaboration with IUCN prepared a mangrove management plan. IUCN prepared a biodiversity status profile of the site in 2005. Presently, the ADB funded CRMP and GEF funded RUK projects have initiated several activities within the area. The Kalametiya Community Development Foundation has been established to carry out SAM activities under the present CRMP.

**Conservation measures proposed:**

Major recommendations proposed by IUCN and the CRMP include the declaration of the wetland as a Ramsar site; expansion of the sanctuary area to include the Ussangoda scrubland, grassland, beach and near-shore marine habitats such as coral reefs, provision of necessary resources for regular monitoring, demarcation of sanctuary boundaries, zoning of the sanctuary; issuing of permits to regularise illegal shell mining, preparation of a catchment development plan, de-siltation of the lagoon, restocking of the lagoon with fingerlings and creating self-employment opportunities.

**Disturbances and threats:**

The salinity of the Kalametiya lagoon has decreased due to the unsustainable development activities carried out in the catchment of the Kachchigal Ara. This problem was aggravated with the construction of a canal through the lagoon, which has in turn caused a decrease in the originally well-established commercial fishery to an insignificant low subsistence fishery. Drainage of irrigation water has lowered the salinity of the lagoon water, which in turn has aggravated the spread of invasive alien plants such as *Typha angustifolia*, *Salvinia molesta* and *Eichhornia crassipes*. Other invasives such as *Prosopis juliflora* and *Opuntia dillennii* have also become established around the lagoons. Additionally, eutrophication of lagoon water due to increased agrochemicals has led to the spread of aquatic weeds and the occurrence of fresh water microphytes. Silt accumulation has filled up 40% of the Kalametiya lagoon within the last 15 years. Oxygen depletion in the water body is another reason for the depletion of the fishery resources in the lagoon. The December 2004 tsunami destroyed about 5% of the mangrove cover and increased the salinity levels of the lagoon water. Seawater entering the lagoon during inflow stopped when a canal was constructed through the sandbar to keep the lagoon open throughout the year and thereby prevent frequent inundations of paddy lands located at the northern and eastern edges of the lagoon. This has resulted in serious degradation of the ecosystem, leading to severe resource depletion due to, among others, desalination. Deforestation for human settlements, chena cultivation, and shell mining are other threats to

the sanctuary. Funnelling of seawater from the lagoon outlet and artificial canal during the tsunami damaged approximately 10% of the *Sonneratia* dominant mangrove tree line bordering the lagoon. Need urgent actions to mitigate existing threats.

**Land tenure:**

Lagoons are owned by the state, but private lands can also be found within the sanctuary.

**Management authority and jurisdiction:**

DWC

**References:**

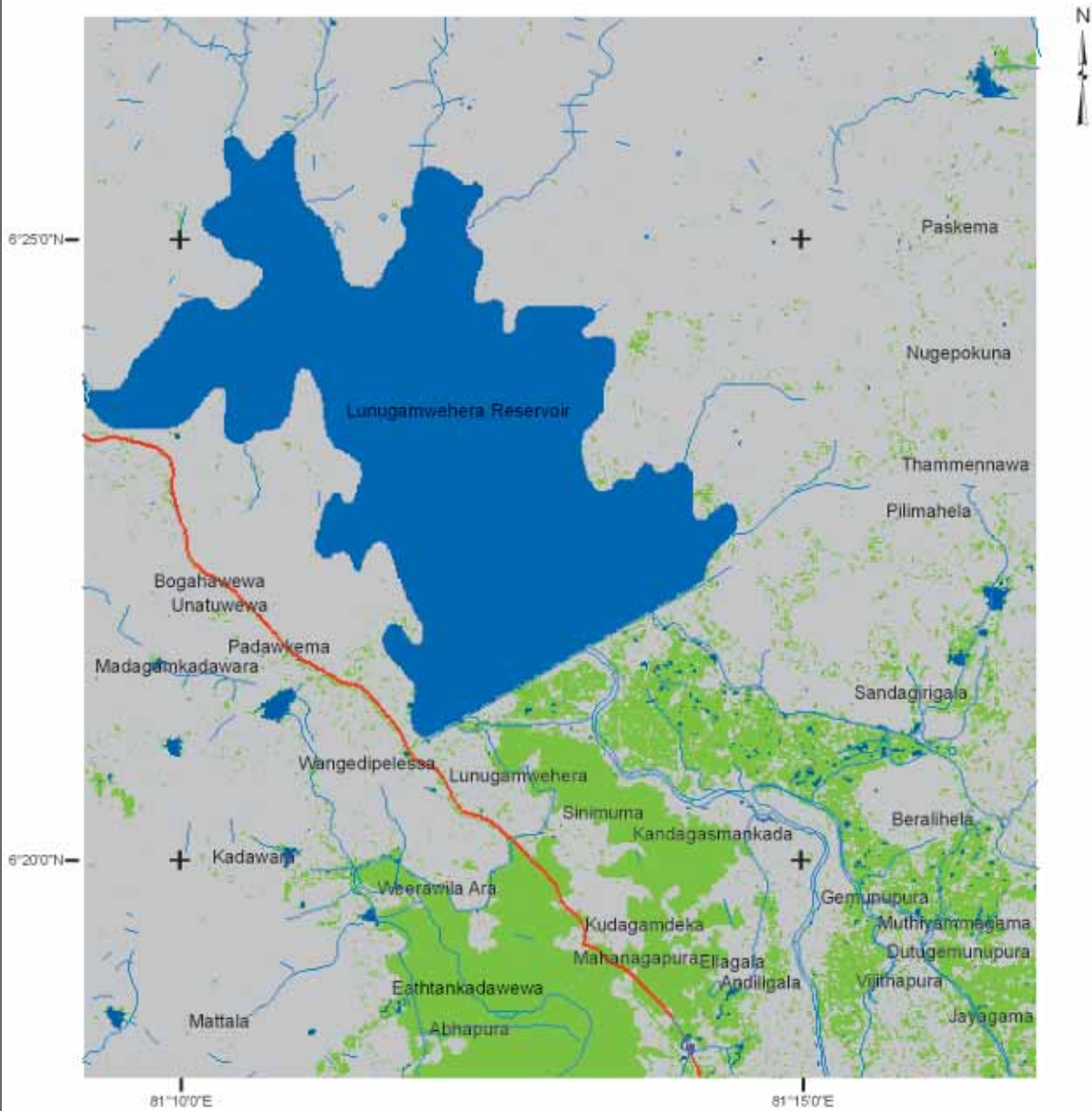
CCD (2006c); CEA/ARCADIS Euroconsult (1995e); CEA/ARCADIS Euroconsult (1999); Clemett et al. (2004); Ekanayake et al. (2005); IUCN (2003c)





# Lunugamvehera Reservoir

## Wetlands based on Ramsar Classification



0 1 2 4 Kilometers

### Legend

#### Class Name

- Water storage areas
- Irrigated land
- Non-wetlands
- Waterways
- Main road

Source: Landsat ETM+ 28th September 2000  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Lunugamvehera Reservoir

## Location:

6° 27' 0 N and 81° 9' 0 E to 6° 19' 0 N and 81° 15' 0 E; 712951 N and 516586 E to 698216 N and 527651 E; about 260 km from Colombo in the Moneragala District of the Uva Province and Hambantota District of the Southern Province.

## Area:

7,438 ha at full supply level

## Altitude:

Approximately 91m

## Overview:

Lunugamvehera is a multi-purpose reservoir, which was constructed in 1987 by damming the Kirindi Oya under the Kirindi Oya Irrigation and Settlement Project (KOISP). The 198 MCM capacity water body provides irrigation facilities to 5,400 ha of lands serviced by the old Ellegala systems, in the southeastern dry zone of Sri Lanka. Five downstream reservoirs (Debera Wewa, Tissa Wewa, Yoda Wewa, Pannegamuwa and Wirawila reservoir) receive about 30 percent of their inflow from this reservoir. Reservoir associated fisheries play an important role in the livelihoods of the local community. The reservoir and its catchment falls within the Lunugamvehera National Park, which is rich in biodiversity and an important habitat for a large number of water birds as well as elephants.

## Physical features:

The reservoir lies within an agroecological region which is part of the dry zone low country and represents a semi-arid tropical environment. The mean annual rainfall is around 970 mm and of this amount 67% occurs in the Maha season from October to February. The annual average temperature is 30°C. Evaporation exceeds precipitation in all months except November and December. As the annual potential evaporation is about twice the rainfall and strong dry westerly winds during the June-September period bring in cyclic atmospheric salts, there is potential for significant accretion of salts in the region.

## Ecological features:

Within the reservoir environs, the vegetation includes different stages of forest succession along with scrub/grassland mosaics. The shifting cultivation has caused degradation of the forest communities to open thorny scrub and grassland communities. The dense forest, which is dry mixed evergreen, is dominated by *Dryptes sepiaria*, *Manilkara hexandra*, *Schleichera oleosa*, *Lannea coromandelia* etc. The dominant grassland species include *Chloris montana*, *Eragrostis spp.*, *Ischaemum spp.*, *Cynodon dactylon*, etc. Teak and Eucalyptus plantations are also found within the National Park. The vertebrate fauna documented from these habitats include 21 fish, 12 amphibians, 33 reptiles, 184 birds and 43 mammals.

## Noteworthy fauna:

The freshwater fish in the reservoir is dominated by the introduced Tilapia (*Oreochromis spp.*). Among the amphibians, *Bufo atukoralei* and *Rana gracilis* are endemic. Aquatic reptiles include a population of *Crocodylus palustris*. The reservoir is home to several large water birds (i.e. *Ardea cinerea*, *Threskiornis*



*melanocephalus*, *Anastomus oscitans*, *Mycteria leucocephala*, *Pelecanus philippensis*), and functions as an important source of water for wildlife in the National Park, including large herds of *Elephas maximus*.

**Noteworthy flora:**

Tree species such as *Dryptes sepiaria* and *Manilkara hexandra* found in the dry-mixed evergreen forest bordering the reservoir are important timber species.

**Land use:**

The main water usage is for irrigated agriculture, which consists mainly of paddy cultivations. Farmers also grow other field crops such as chilli, onion, groundnut and banana, when there is insufficient water for paddy cultivation. Home gardens with fruit trees and other permanent vegetation (especially in the old settlement areas) can also be observed. Cattle and buffalo rearing is also a prominent activity. Fisheries are common in the shallow areas of the reservoir and mainly when the reservoir water level is low. Treated reservoir water is also used for domestic consumption.

**Possible changes in land use:**

Up to now, municipal and industrial uses have not been major competitors for water use as the area is quite far from the major urban centers. However, there are plans to build an oil refinery on the coast, which would require a large amount of water from the Kirindi Oya irrigation scheme. This may change the agricultural activities from paddy cultivation to other field crops, with less demand for water.

**Hydrological and biophysical values:**

The reservoir stores and releases water to irrigate 4,200 ha of land under the old Ellagala system and 850 ha of land under the Bandagiriya irrigation system. The drainage is important to maintain the water levels of the five tanks in the downstream area and the wetland characteristics of Bundala National Park

**Social and cultural values:**

Information not available

**Scientific research and monitoring:**

Information not available

**Conservation education:**

The Veheragala irrigation project conducts programmes on environmental protection on a regular basis.

**Recreation and tourism:**

Despite the presence of significant elephant and water bird populations, this park does not attract many tourists due to the presence of more popular parks such as Yala in the vicinity. Additionally, the park does not have visitor facilities at present. However, some people do come to see the reservoir.

**Conservation measures taken:**

An area of 23,498 ha was declared as a National Park in 1995, including the reservoir and its catchment, with the objective of protecting both the wildlife and the reservoir. The park serves as a link between the Yala Protected area complex and Udawalawe National Park and facilitates the ranging of elephants to and



from areas such as Haldummula and Koslanda. Additionally, in 2005 the reservoir was declared a FMA under FARA.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Salinity intrusion and conflicts between farmers and herdsmen over limited land due to increasing crop damage by elephants are cited as the main threats. Timber felling and poaching also occurs to an extent. Spread of invasive alien plant species such as *Lantana camara* is a growing concern.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

Reservoir: Irrigation Department

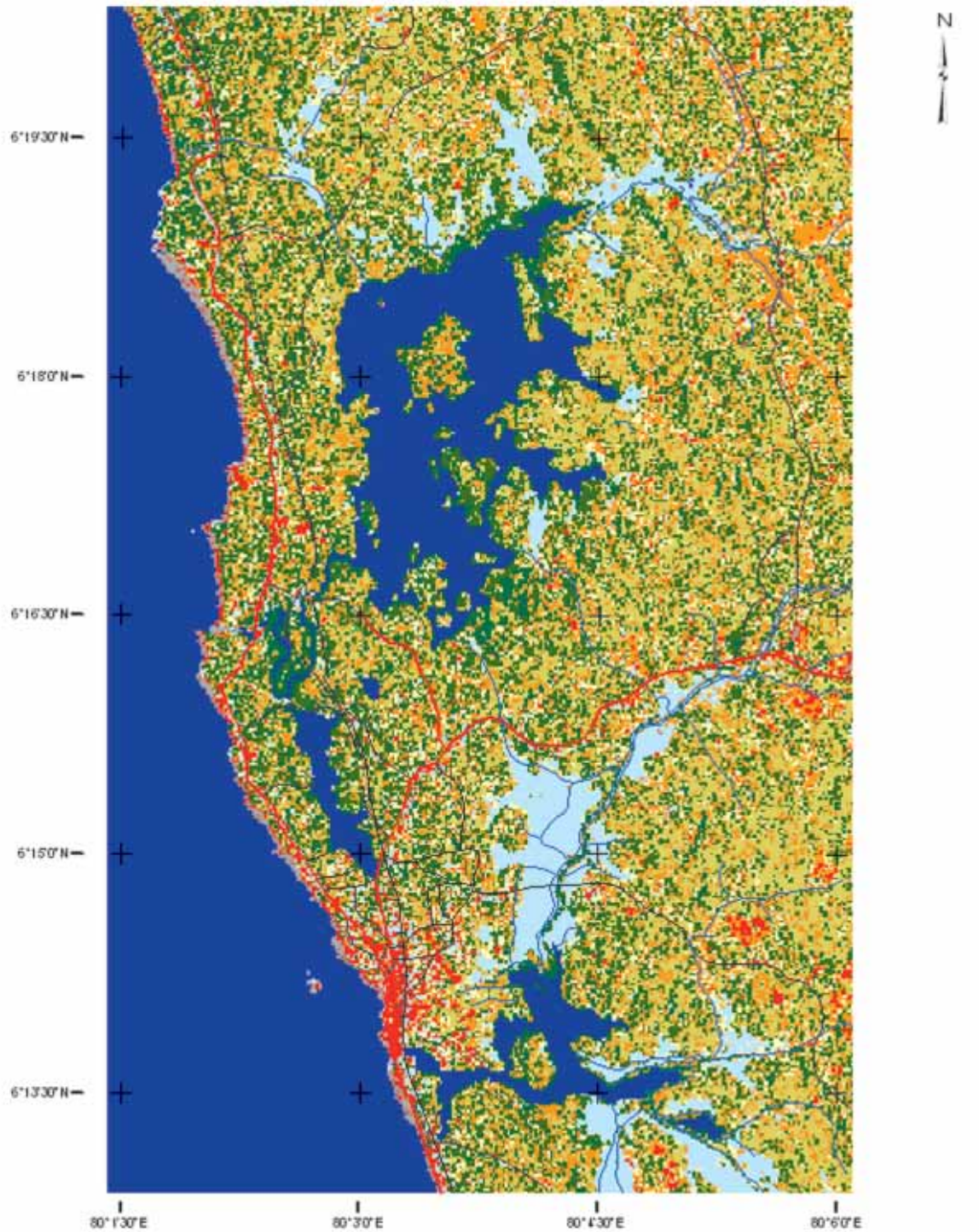
Fisheries activities within the area: DFAR

Surrounding environs within the national park: DWC

**References:**

Bakker M (2000); DWC (2004); Matsuno et al. (2000); Renwik (2001)

# Maduganga Estuary



### Land Cover

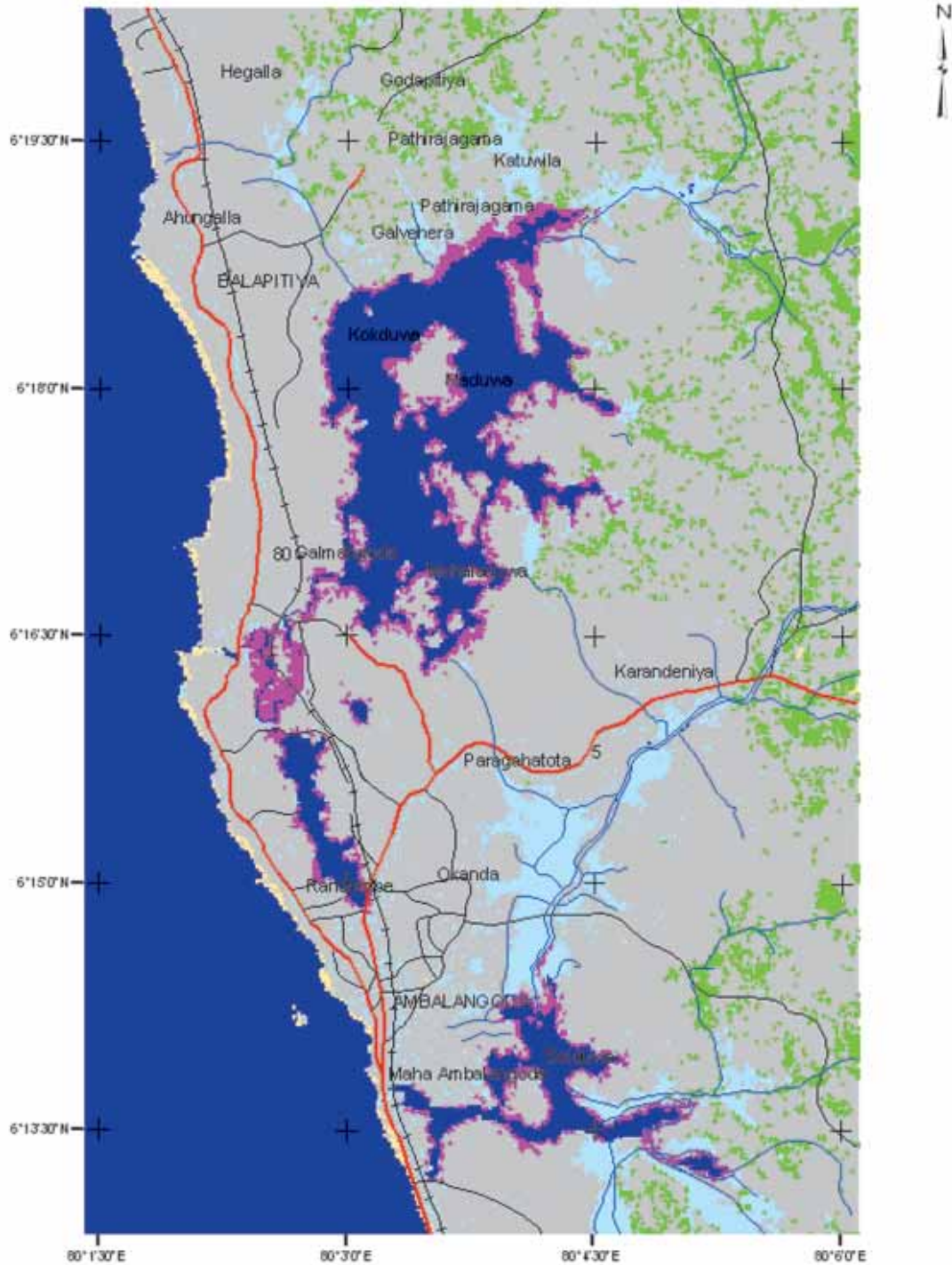
- Water
- Marshy land
- Paddy land
- Mangroves
- Cinnamon
- Coconut and Cinnamon
- Natural vegetation (moderate dense)

### Legend

- Homegardens
- Beach/Sand
- Built up area
- Main road
- Minor road
- Railway line
- Waterways

Source: Landsat ETM+ 14th March 2001  
 Ground Truthing - August 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/PIEMA/CEA/2006

# Maduganga Estuary Wetlands based on Ramsar Classification



0 0.5 1 2 Kilometers

Class Name		Legend	
	Permanent river/streams/creeks		Non-wetlands
	Permanent fresh water marshes		Main road
	Intertidal forested wetlands		Minor road
	Irrigated land		Railway line
	Sand, shingle or pebble shores		Waterways

Source: Landsat ETM+ 14th March 2001  
Ground Truthing - August 2005  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/EMA/CEA/2006



# Maduganga Estuary

## Location:

6° 19' 0 N and 80° 1' 0 E to 6° 12' 0 N and 80° 6' 0 E; 698313 N and 391234 E to 685398 N and 400430 E; 88 km south of Colombo and 35km north of Galle in the Galle District, of the Southern Province.

## Area:

915 ha (The total surface area of the 15 islands is 145 ha and the total area of water surface is 770 ha)

## Altitude:

0 – 377 m (The water body of Maduganga is less than 1 m above MSL. The highest location of the catchment is 377 m above MSL at a location called Hippan Kanda).

## Overview:

Maduganga is a relatively unspoilt estuary with a dense growth of mangrove vegetation harbouring high biodiversity. The area was declared a Ramsar site in 2003.

## Physical features:

Maduganga is located in the southwestern region of Sri Lanka where the southwestern group of crystalline rocks, which is one of the upper Paleozoic rock formations, predominates. Bog and half bog soils dominate this area. A total of 15 islands within the estuary are surrounded by water throughout the year, with Ma Duwa, Mirala Duwa and Dik Duwa forming the large islands. The Maduganga basin is situated in the wet zone of the country which experiences high rainfall during the northwest monsoon (average rainfall is 2,217 mm annually and subject to flooding). The mean monthly temperature is on average 27.2°C. Maduganga is generally shallow, with a maximum depth of 2.5 m in most places (the deepest point is 3 m and the shallowest is 1.25 m). Tidal influence is small with a maximum of 10 cm. The temperature of the surface water is within the range of 30.1-33.7°C. The pH range in Maduganga is between 6.95 and 8.98. The level of salinity depends on the tides, inflow of freshwater via different streams and whether the lagoon mouth is open or closed. Near the mouth of the estuary, the salinity levels vary between 6.7 – 20.8 ppt and gradually decrease with distance from the mouth. The estuary is connected to the sea by a narrow canal and the mouth of the estuary is often blocked by a naturally formed sand bar. It receives water from three major streams; Boralessa Ela, Heen Ela and Magala Ela.

## Ecological features:

The estuarine area comprises of 10 different wetland vegetation types including mangroves, mangrove scrub, mangrove mixed swamps, bank scrubs, tall shrub swamps, palm swamps, tall sedge brackish marshes, dwarf sedge brackish marshes, gramineous bogs and lentic macrophytes. These vegetation types have contributed to a rich biodiversity, with 303 plant species belonging to 95 families. Mangroves (*Rhizophora-Bruguiera-Sonneratia* community) and mangrove mixed swamps (*Rhizophora-Dolichandrone-Hibiscus* community) are the most abundant (125 ha) vegetation types. The abundance of mangrove species such as *Bruguiera sexangula*, *B. gymnorhiza* and *Sonneratia caseolaris* is higher towards the northern reaches of the estuary, where salinity is lower. Conversely, *Xylocarpus granatum* and *Lumnitzera littorea* are abundant in the southern reaches, closer to the mouth of the estuary, where the salinity is higher. This mixed vegetation makes Maduganga an ideal ecotone for a variety of bird species, including aquatic and terrestrial forms. 111 species of birds, of which 10% are winter migrants have been recorded



from the area. Due to the lack of shorelines and mudflats, there is a low presence of waders. In total, 248 vertebrate species have been recorded, which include 70 species of fish, 12 amphibians, 31 reptiles, 111 bird species (13 winter migrants) and 24 mammal species. Of the invertebrates, 50 species of butterflies and 25 species of molluscs (14 terrestrial and 11 brackish water) have also been recorded.

#### **Noteworthy fauna:**

Of the 248 species of vertebrates, 20 species are endemic (2 fish, 3 amphibians, 7 reptiles, 6 birds and 2 mammals) and 30 are nationally threatened (2 fish, 4 amphibians, 11 reptiles, 7 birds, and 6 mammals). About one third (23 species) of the fish species in Maduganga consist of typical brackish water forms such as *Ambassis* spp., *Leiognathus* spp., *Monodactylus argenteus*, *Therapon jabua*, *Periophthalmus koelreuteri* and *Chanos chanos*. The endemic fish include *Puntius singhala* and *Clarias brachysoma*. Among the amphibians, *Bufo atukoralei*, *Rana gracilis* and *Polypedates cruciger* are endemic. The Water monitor (*Varanus salvator*) is the most common aquatic reptile, while the other aquatic reptiles include *Crocodylus porosus*, *C. palustris*, *Lissemys punctata*, *Melanochelys trijuga*, *Achrochordus granulatus* and the endemic *Xenochrophis asperimus*. The python (*Python molurus*) is also present on islands covered with dense mangroves. About 35% of the bird species recorded are those associated with wetland ecosystems, such as herons, egrets, cormorants, teals, waders and kingfishers. The area supports a large population of Little green heron (*Butorides striatus*). Rare mammals in the area include *Lutra lutra*, *Prionailurus viverrinus* and *Axis porcinus*. The most common molluscs in mangrove habitats include *Telescopium telescopium*, *Cerithedia cingulata*, and *Nerita polita*. The most common crustacean species recorded in the Maduganga estuary include the Mud Crab (*Scylla serrata*), Grapsid Crabs (*Chiromantes* spp.), the Mud Lobster (*Thalassinia anomala*) and the White Prawn (*Penaeus indicus*).

#### **Noteworthy flora:**

According to studies, Maduganga has perhaps one of the last remaining tracts of pristine mangrove forest in both the biogeographic regions to which it belongs (south-western wet coastal zone) as well as in Sri Lanka in general. It harbours a small population of a very rare, threatened mangrove species, *Lumnitzera littorea*. The most abundant mangrove species is *Rhizophora apiculata*. It also harbours 19 endemic species, and 8 that are nationally threatened. A rare orchid (*Vanilla walkerae*) can be found in one of the islands. The islands also harbour non-mangrove endemic woody species such as *Mesua ferrea*, *Dillenia retusa*, *Chionanthus albidiflorus* and *Cleistanthus pallidus*.

#### **Land use:**

Fishing (estuarine and sea), agriculture, forestry, and tourism related activities. Small scale coconut retting can be found in a few places around the estuary. Kraal fishery is a traditional fishing practice associated with the estuary. The main agricultural crops around the estuary are paddy, coconut, cinnamon, pepper, fruit trees and vegetables. Cinnamon has also been cultivated in some of the islands. Only few families are engaged in animal husbandry. Coir is a major industry in the area.

#### **Possible changes in land use:**

Some of the islands have been identified for tourism development activities, which would include the construction of tourism related infrastructure. This could result in the clearance of mangrove and other natural vegetation in such islands.

#### **Hydrological and biophysical values:**

Maduganga has an important role in flood control. Its hydrology is influenced by the presence of a sandbar at the mouth and the amount of rainfall it receives. When the lagoon mouth is fully closed, heavy rainfall

causes flooding and subsequent problems for inhabitants. Due to frequent flooding and high saline conditions, only the paddy fields in the upper reaches are cultivated and 304 ha of land have been abandoned. A number of natural waterways are connected to the estuarine system and their flow through rates have been controlled by the construction of regulators and bunds. The wetland also plays an important role in nutrient retention. Since large amounts of fertilizers are used in cinnamon plantations, run-off causes nutrients to enter the estuary, preventing groundwater pollution.

#### **Social and cultural values:**

Several old Buddhist temples are found within the Maduganga environs. The most prominent historical monument in the Maduganga area is the temple at Kothduwa Island with its sacred Bo tree. According to the Bodhiwansha, a historical chronicle of ancient Sri Lanka, this Bo tree is one of the 32 buds that sprang from the Sri Maha Bodhi in Anuradhapura, and was planted during the reign of King Pandith Parakramabahu II. According to Lanka Deepa Warnana, another historical chronicle, the Sacred Tooth Relic had been kept here for protection from the Portuguese during the period of King Weediya Bandara. There is also a mosque at Welithara (Jumma Masjid), which is known to be over 400 years old at which an annual religious festival is held.

#### **Scientific research and monitoring:**

A study is being conducted on the hydrology of the lagoon to prepare a model on water circulation patterns within the Maduganga. In 2000, IUCN undertook a systematic survey to document the status of biodiversity in this wetland.

#### **Conservation education:**

Under the ADB funded CRMP, several awareness and educational campaigns were conducted. A visitor centre to educate tourists was constructed through the CRMP, which will be managed by the local community.

#### **Recreation and tourism:**

Maduganga has a high potential for nature-based tourism development, due to its scenic and biodiversity value. In 2002 the CTB declared this area as a tourist development area. At present there are about 10 small-scale hotels operating with boat tours being the main recreation activity. Local as well as foreign tourists frequently visit this site in motorboats, to experience the scenic beauty and biodiversity of this site.

#### **Conservation measures taken:**

The DWC declared this site and its surroundings (2,300 ha) a sanctuary in July 2006. The area has been recognized as a priority wetland for conservation, with two conservation management plans being developed during the last two decades by the CEA and the Forest Department. In 2003 the area was declared a Ramsar site. A SAM Plan is being prepared under the ADB funded CRMP.

#### **Conservation measures proposed:**

Recommendations for management have been listed in the SAM Plan produced by the CCD through the CRMP. Additionally, this site is a proposed EPA under the NEA of the CEA.

**Disturbances and threats:**

The clearing of mangroves to establish large areas of cinnamon plantations and the extensive use of fertilizers is threatening the quality of lagoon water. The groynes constructed in the 1970s cause frequent flooding and prevent water exchange with the sea. The irrigation channels and structures do not function properly nor are they maintained. Invasive alien species such as *Najas marina* and *Annona glabra* not only replace native species but also hinder navigation within the lagoon. Discharge of sewage and garbage (including sawdust) is on the increase at Maduganga. The high-powered (20-25 horse power diesel engines), motorized boats operating in the lagoon also contribute to the deterioration of habitats. River bank erosion occurs as a result of sand mining, which disrupts the water currents in the lower reaches of Maduganga.

**Land tenure:**

The 15 islands in the Maduganga estuary are privately owned. Most of the surrounding land is also privately owned.

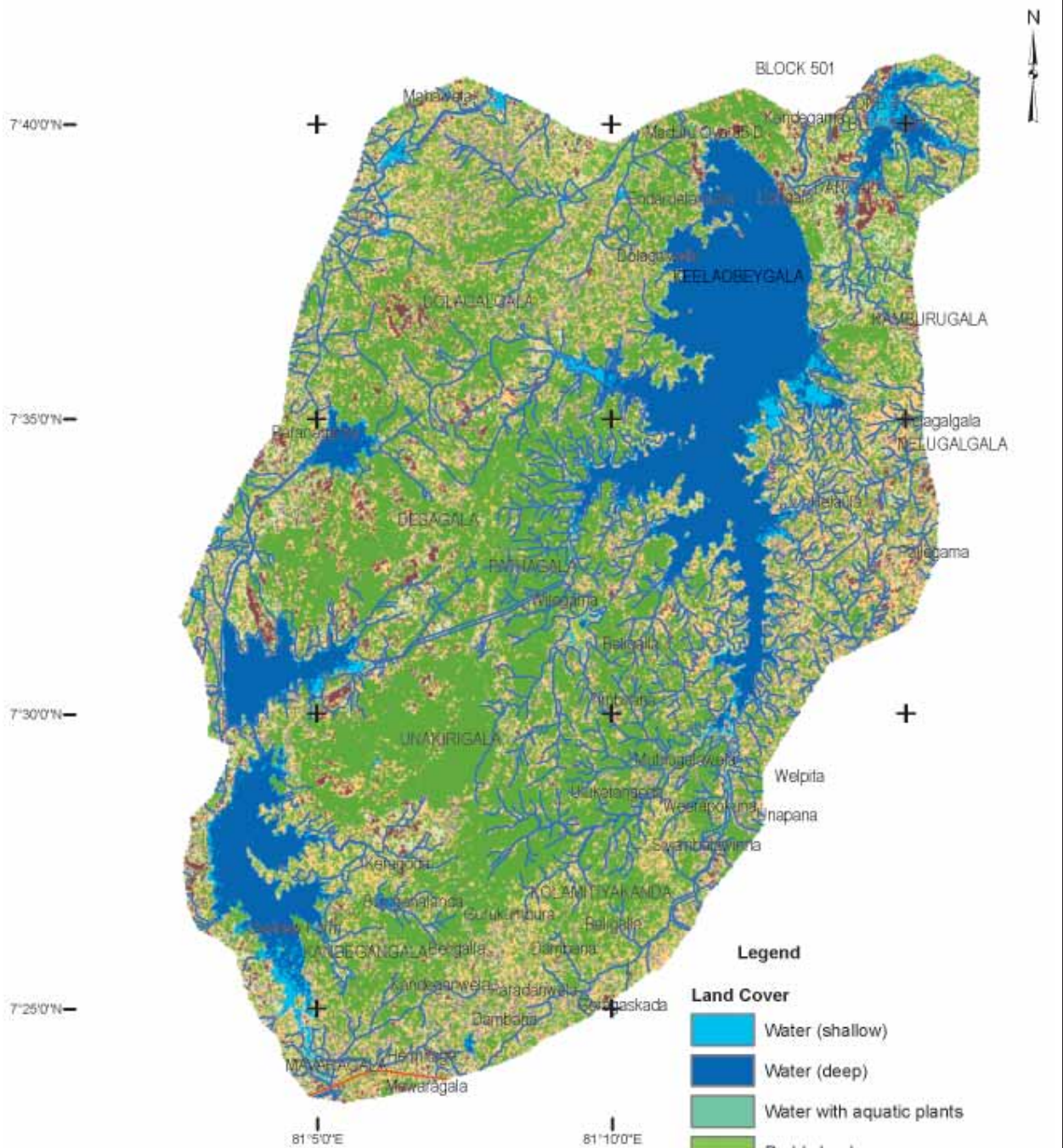
**Management authority and jurisdiction:**

There are several agencies, which have management authority of different aspects of the Maduganga. The most important ones are: DWC (wildlife): Forest Department (forests); Irrigation Department (maintenance of irrigation structures); CCD (preparation and the implementation of the SAM plan).

**References:**

Bambaradeniya et al. (2002b); CCD (2006d); CEA/ARCADIS Euroconsult (1997b); IUCN Sri Lanka (2000); [www.ramsar.org](http://www.ramsar.org); Sri Lanka Tourist Board (2002);

# Reservoirs of Maduru Oya National Park



**Legend**

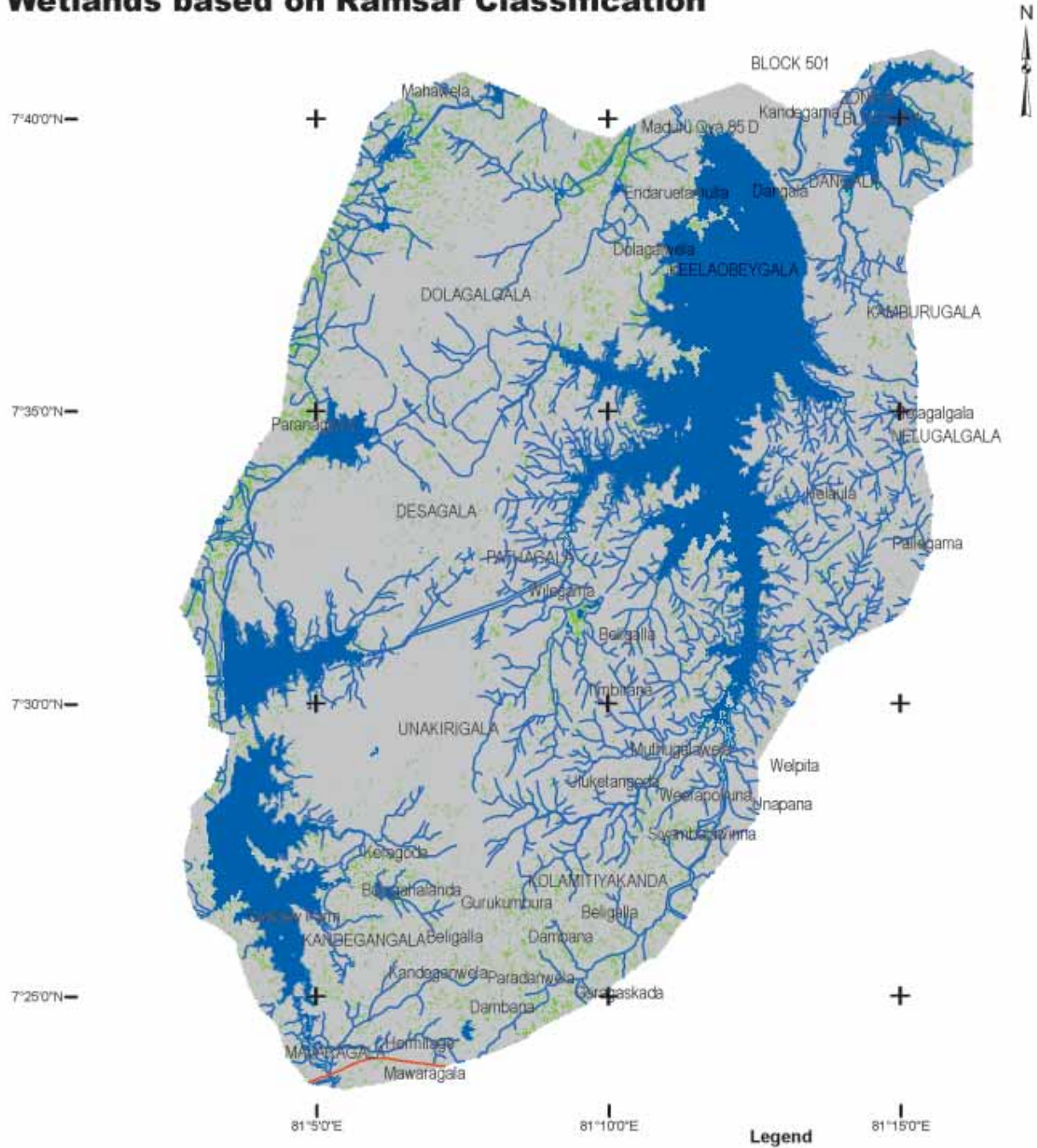
**Land Cover**

- Water (shallow)
- Water (deep)
- Water with aquatic plants
- Paddy land
- Agricultural fragments
- Natural vegetation (low dense)
- Natural vegetation (moderate dense)
- Natural vegetation (high dense)
- Mud flats or bare soil
- Main road
- Waterways

Source: Landsat ETM+ (14 Feb 2001)  
 Ground Truthing - Aug 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Reservoirs of Maduru Oya National Park Wetlands based on Ramsar Classification



Source: Landsat ETM+ (14 Feb 2001)  
 Ground Truthing - Aug 2005  
 ( Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Reservoirs of Maduru Oya National Park

## Location:

7° 40' 0 N and 81° 0' 0 E to 7° 25' 0 N and 81° 15' 0 E; 847448 N and 500000 E to 819818 N and 527588 E; spanning the Districts of Ampara, Badulla and Polonnaruwa in the Eastern, Uva and North-central Provinces.

## Area:

The park is 58,850 ha in extent of which the wetlands constitute around 10,000 ha.

## Altitude:

The major portion of the park lies between 30 – 150 m, while the maximum altitude is 685 m.

## Overview:

The wetlands within Maduru Oya National Park constitute the immediate catchments of five reservoirs developed under the Accelerated Mahaweli Development Programme. The water bodies include the Maduru Oya (6,100 ha), Ulhitiya (2,270), Ratkinda (1,100 ha), Kadupaharaella (700 ha), and Henanigala (800 ha) reservoirs and tributaries of the Mahaweli and Maduru Oya river systems. The park provides a refuge for elephants and a large number of water birds. Fishing with permits is allowed in the reservoirs. The area is scattered with archaeologically significant sites.

## Physical features:

The dominant topographic feature of the area is the 8 km long stretch of rocky mountains in the southwest of the park. The geological regime comprises alluvium deposits and Miocene limestone. Red earth that is relatively fertile but easily eroded, is the predominant soil type. Lying within the dry zone of the country, the climatic conditions are largely influenced by the northeast monsoon, which lasts from October to February. The mean annual rainfall is 1,650 mm and the mean annual temperature is about 27°C. Overall, the annual evapotranspiration rates normally exceed precipitation levels.

## Ecological features:

The surrounding area consists of scrubland and tropical dry mixed evergreen forest growing between the prominent rock outcrops. Characteristic floral species include *Drypetes sepiaria*, *Chloroxylon switenia*, *Manilkara hexandra* and *Pterospermum canescens*. To the west and north of the park is the Mahaweli development area (System B) where paddy cultivation and homesteads are prominent. To the east of the park there is a teak plantation and scrub jungle.

## Noteworthy fauna:

The freshwater fish in the reservoirs are dominated by exotic species such as *Oreochromis mossambicus* and *Osphronemus goramy*. Aquatic reptiles associated with the reservoirs include *Crocodylus palustris*, *Melanochelys trijuga* and *Lissemys punctata*. The reservoirs harbour several species of water birds, including large flocks of cormorants (*Phalacrocorax* spp.), *Anhinga melanogaster*, *Pelecanus philippensis*, *Anastomus oscitans*, *Mycteria leucocephala*, *Threskiornis melanocephalus* and *Platalea leucorodia*. The mammals that frequently visit the reservoirs include *Elephas maximus*, *Canis aureus*, *Prionailurus viverrinus*, *Lutra lutra*, *Cervus axis* and *Sus scrofa*.

**Noteworthy flora:**

*Vatica obscura* (rare and endemic) is the only species of the Dipterocarpaceae to occur in the dry zone and is found in restricted locations on the banks of the Maduru Oya. Other woody species around the reservoirs include *Drypetes seperia*, *Chloroxylon sweitenia*, *Manilkara hexandra*, *Diospyros ebenum*, *Trema orientale*, *Zizyphus oenoplea*, *Pterospermum canescens*, *Feronia limonia*, *Cassia fistula*, *Dimorphocalyx glabellus*, *Vitex altissima* and *Sterculia foetida*.

**Land use:**

The land is mainly used for biodiversity and catchment conservation, while some areas have been encroached by people to establish chena cultivation areas. Fishing, which is under license from the DFAR is carried out in the reservoirs. Local people also collect medicinal plants and herbs from within the park area.

**Possible changes in land use:**

Increased deforestation by chena cultivators and encroachment of the wetland area by local villagers are possible along with an increase in fishing effort.

**Hydrological and biophysical values:**

The reservoirs play an important role in storing water during the dry seasons and in irrigating large areas of agricultural land and are also useful for flood prevention during the rainy seasons.

**Social and cultural values:**

Ruins found at Henanigala, Kudawila, Gurukumbura, Ulukentangoda, Werapokuna and several other places include ancient Buddhist shrines, temples, dagobas, statues and hermitages from different eras in Sri Lanka's history. An ancient sluice more than 9 centuries old has been found on the old breached earthen bund of the Maduru Oya, while early Brahmin inscriptions from the 1<sup>st</sup> to the 3<sup>rd</sup> centuries have been discovered at Kandegamakanda. A community of Veddas, the adivasi people of Sri Lanka, live within the park boundary in Henanigala.

**Scientific research and monitoring:**

The Open University of Sri Lanka and the Eastern University have conducted studies on the biodiversity of the National Park. Accommodation and research facilities are available at Kandegawila.

**Conservation education:**

A wildlife museum and visitor centre is located at the park entrance.

**Recreation and tourism:**

The park is popular among nature lovers, especially for viewing elephants and birds. Visitor accommodation in the form of two circuit bungalows, a dormitory and a campsite are available within the park.

**Conservation measures taken:**

In 1983, 51,468 ha of land acquired from the crown lands through the Mahaweli Authority Act was declared as a National Park under the FFPO. In 1985 the park area was extended to 58,850 ha, in order to provide additional habitat for wildlife and to ensure protection of important catchment areas. In the same year, a

draft management plan was prepared under the USAID funded Mahaweli Environment Project and subsequently revised in 1987.

**Conservation measures proposed:**

Linking the Maduru Oya National Park with the Gal Oya National Park via the Nilgala jungle corridor has been proposed to provide a more continuous habitat for wildlife.

**Disturbances and threats:**

Large areas of forest within the park have been exploited for chena cultivation, and much of the park now consists of secondary growth and open grassland. Encroachment of the wetland area, poaching and illegal timber felling are serious problems within the park. The park has also been invaded by the alien species *Lantana camara*, while the Maduru Oya reservoir has been infested with the exotic floating weed *Salvinia molesta*.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

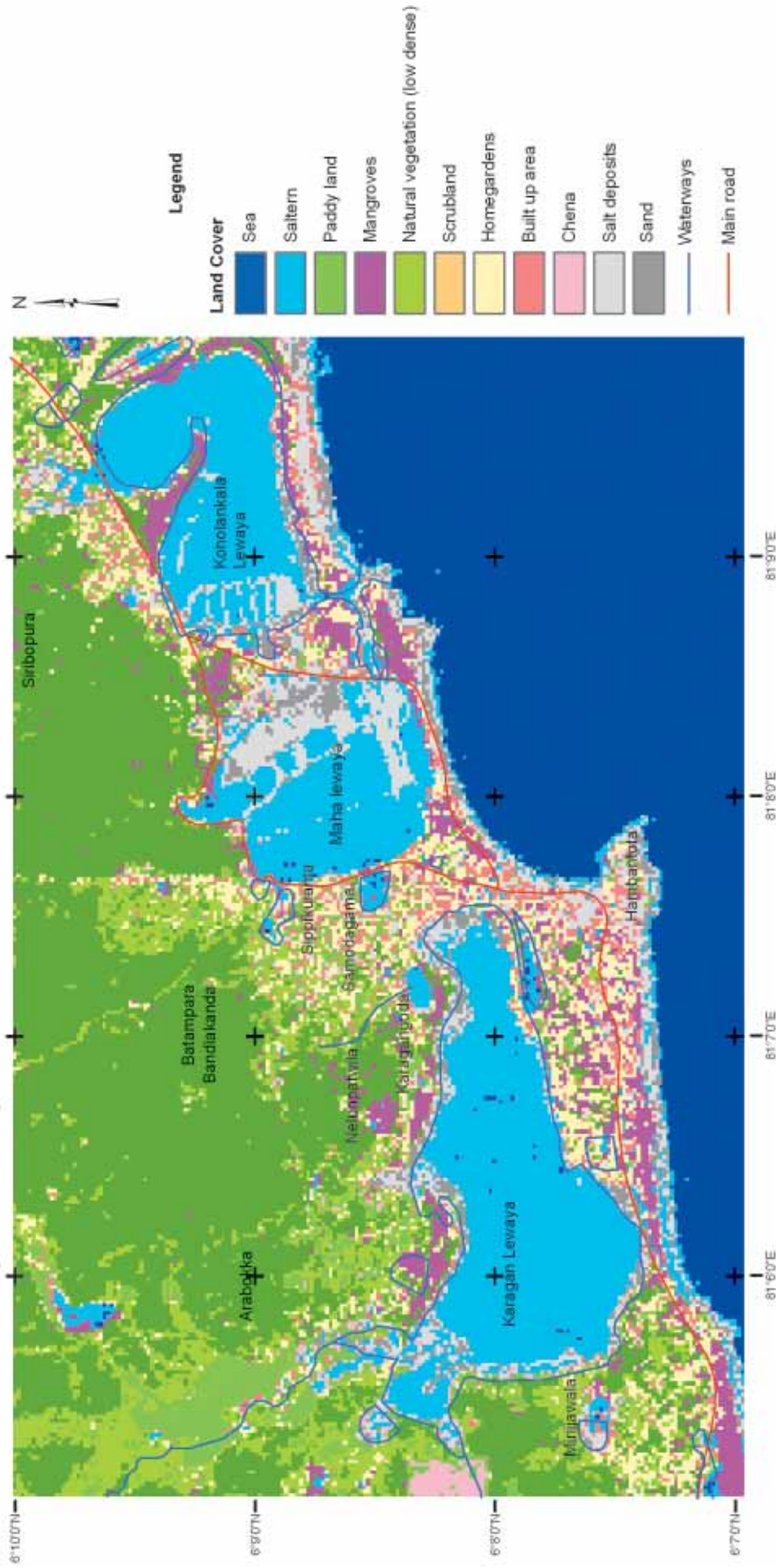
The National Park is under the jurisdiction of the DWC, while the reservoirs and irrigation canals are managed by the MASL.

**References:**

DWC (2004); Kotagama et al. (1989); MEP/DWLC (1987)

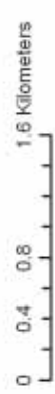


# Maha & Karagan Lewaya



**Legend**

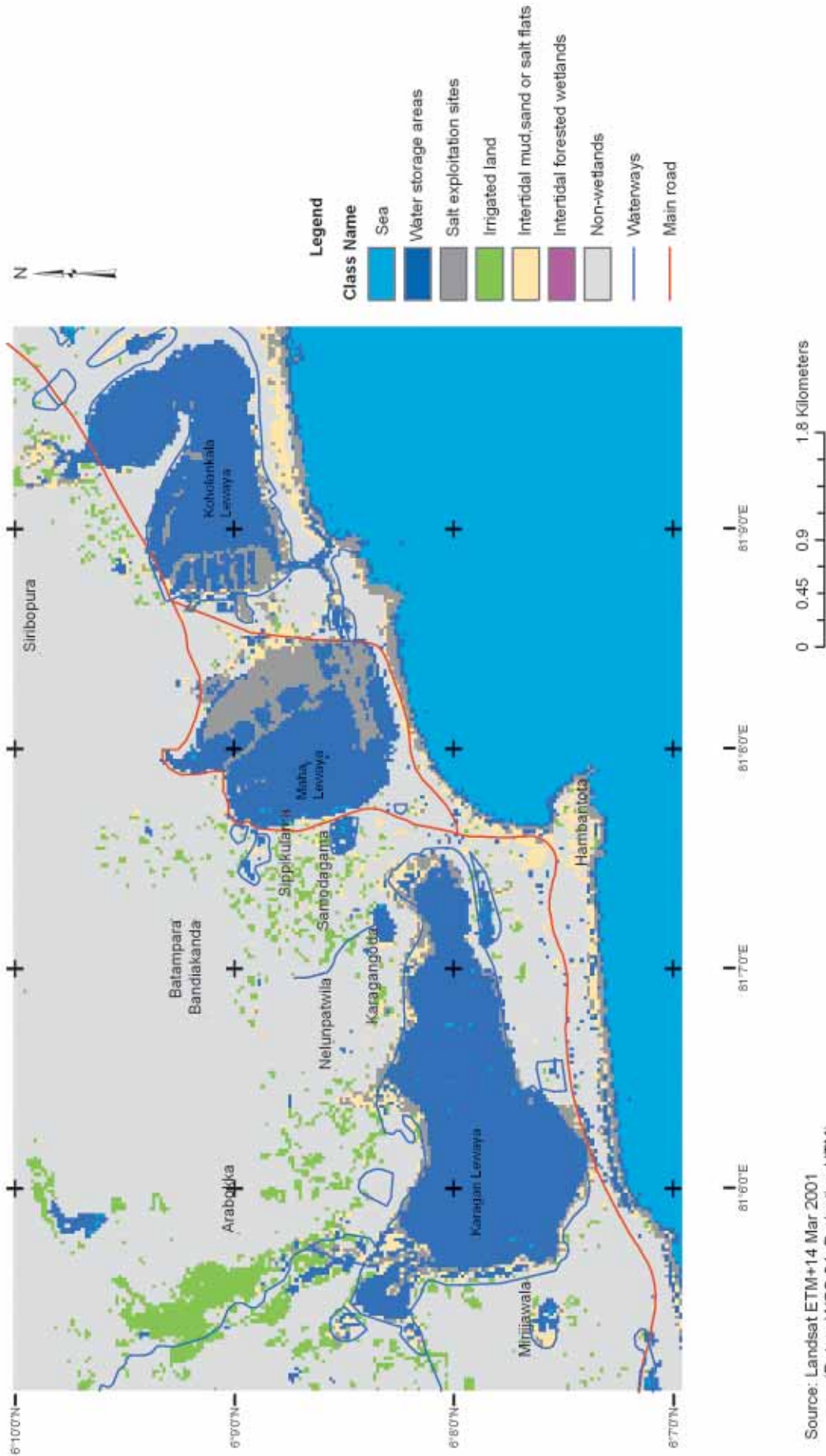
Land Cover	Color
Sea	Dark Blue
Saltern	Light Blue
Paddy land	Light Green
Mangroves	Purple
Natural vegetation (low dense)	Light Green
Scrubland	Orange
Homegardens	Yellow
Built up area	Red
Chena	Pink
Salt deposits	Light Grey
Sand	Dark Grey
Waterways	Blue line
Main road	Red line



Source: Landsat ETM+14 Mar 2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Maha & Karagan Lewaya Wetlands based on Ramsar Classification



# Maha and Karagan Lewaya

## Location:

6° 10' 0 N and 81° 7' 0 E to 6° 7' 0 N and 81° 50' 0 E; 681630 N and 512907 E to 676173 N and 592208 E; near Hambantota town in the Hambantota District, of the Southern Province.

## Area:

1,160 ha (Maha Lewaya = 260 ha; Karagan Lewaya = 900 ha)

## Altitude:

From 60 m in the northeast (catchment) to 1.5 m below sea level at the bottom of the lagoon.

## Overview:

Maha Lewaya and Karagan Lewaya are naturally formed hyper-saline shallow lagoons, which serve as important refuges for migratory water birds. Karagan Lewaya is separated from the sea by the main Colombo-Hambantota road and by sand dunes, with the only connection to the sea being man-made flood control channels. The water levels of the lagoon fluctuate depending on rainfall and the water received from the cascading tank systems in its catchment area. Maha Lewaya has been developed for salt production. This area is also very important as a corridor for elephant populations that generally move between Bundala, Lunugamvehera and Udawalawe National Parks and Madunagala forest reserve.

## Physical features:

The lagoon is about 3.5 km long and 1-2 km wide. The maximum water area in the lagoon is about 3.2 km<sup>2</sup>, but is subject to high seasonal variations. In the rainy season floods can occur, while in the dry season the lagoon can dry up completely. Surface inflow to the lagoon comes from two sources: irrigated water released from two downstream reservoirs of Karagan Oya tank cascade system, and direct runoff from the catchment. The Karagan Lewaya was created by the deposition of sediments between the eroded inland peneplain and a barrier of coastal rock outcrops, a process that likely started in the Miocene. The narrow outlet to the sea became permanently blocked in the early 1970s. The two wetlands are located in one of the driest regions of the country and experience mean annual precipitation of 1,035 mm. The main wet season is from October to December (Northeast monsoon). Average daily temperatures range from 26°C in December to 28°C in May. Wind speed is generally high (4-6 m/sec) resulting in high and constant evaporation rates throughout the year.

## Ecological features:

A sand dune of approximately 15 m height and 100 to 200 m width is situated in the western part of the Karagan Lewaya. Two types of vegetation are distinguishable: predominantly thorn scrub forests of the catchment and salt-tolerant vegetation of the lagoon (exclusively phytoplankton). Being a shallow wetland surrounded by mudflats, it serves as an excellent habitat for wading birds, particularly migratory birds. Karagan Lewaya acts as an alternative feeding ground for the migratory birds that come to the wetlands within Bundala National Park every year.

**Noteworthy fauna:**

Many species of resident and migratory water birds use these two shallow lagoons as feeding sites. These include cormorants (*Phalacrocorax niger*, *P. fuscicollis*), large water birds (*Ardea cinerea*, *Threskiornis melanocephalus*, *Anastomus oscitans*, *Pelecanus philippensis*), medium sized waders (*Tringa* spp.) and small waders (*Charadrius* spp.). Flocks of the Greater Flamingo (*Phoenicopterus ruber*) also visit these wetlands occasionally.

**Noteworthy flora:**

The phytoplankton in both lagoons is dominated by blue-green algae such as *Microcystis*, *Nostoc* and *Oscillatoria*.

**Land use:**

Shell mining is practised on a limited scale in times of low water levels, while salt extraction is carried out at Maha Lewaya. Shifting cultivation, cattle grazing and paddy cultivation are also carried out.

**Possible changes in land use:**

Although at present there is no connection with the lagoon and the Uda Walawe irrigation scheme (UWIS), the lagoon is likely to receive high quantities of drainage flow containing agro-chemicals from the proposed extension of the UWIS. This in turn can reduce the salinity levels of the wetland and adversely affect the present ecological status of the lagoon. This may change the lagoon characteristics from being seasonally hyper-saline to a freshwater wetland. Additionally, further development of saltpans for salt production is also possible and can threaten the status of the wetland. The Karagan lagoon has also been identified for the development of a port in the Hambantota District, which could completely alter the lagoon.

**Hydrological and biophysical values:**

Flood control (since 1970, the lagoon has had no connection to the sea, with the exception of temporarily built channels through the sandbar for the drainage of excess water). The wetland also acts as a nutrient trap for irrigated water.

**Social and cultural values:**

Salt production at Maha Lewaya provides employment for some of the local people and surrounding areas have been traditionally used for free range cattle.

**Scientific research and monitoring:**

IWMI has undertaken scientific studies on the impacts of irrigation on the hydrology of the lagoon. The CBC regularly conducts ornithological surveys in this area.

**Conservation education:**

Conservation education is carried out in nearby Bundala National Park.

**Recreation and tourism:**

This is a popular site with bird-watchers that come to observe the migratory birds, particularly the flamingos during their migratory season.



**Conservation measures taken:**

A wetland site report and conservation management plan was prepared in 1994 by the CEA under the Wetland Conservation Project. Although Karagan lagoon was declared as a sanctuary, it was degazetted in 2004.

**Conservation measures proposed:**

A number of conservation measures were recommended in the management plan prepared by the CEA in 1994. To date, many of the recommendations have not been implemented and it is therefore necessary to initiate management activities prior to further degradation of the wetland.

**Disturbances and threats:**

Degradation of the forests in the catchment area (shifting cultivation, fuel food collection, cattle grazing etc.) is a major threat while excessive shell mining and salt extraction is also problematic. The spread of *Prosopis juliflora* and *Opuntia dillennii* around the tidal flats in Karagan lagoon has resulted in the loss of habitats for wading birds. Poaching is also extensive in this area. The current threats in the Karagan lagoon would be further aggravated by the proposed port development project. Need urgent actions to mitigate existing threats.

**Land tenure:**

Maha lewaya is state land that has been leased to the National Salt Corporation. Karagan lewaya is state owned. Surrounding areas are partly state owned and partly privately owned.

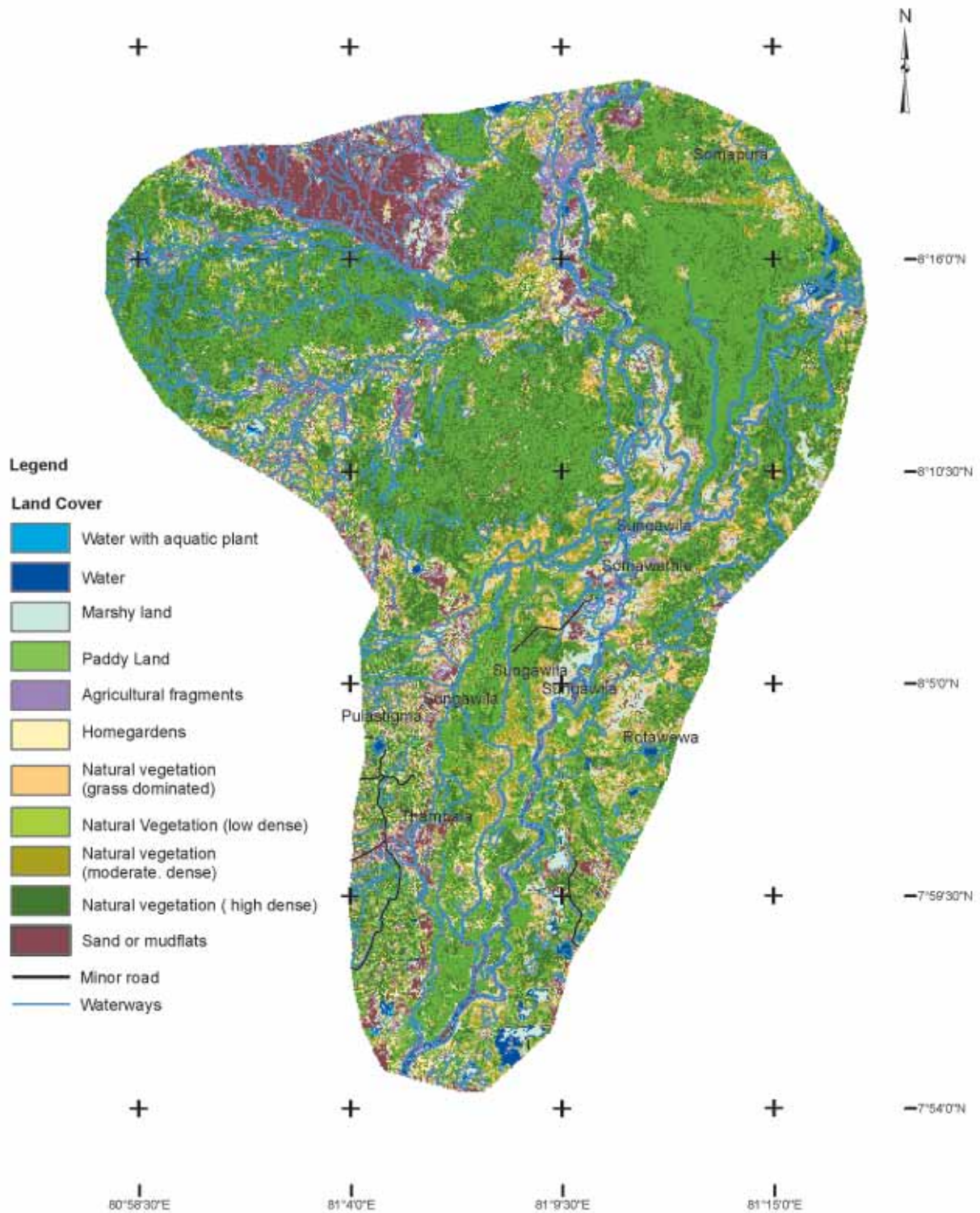
**Management authority and jurisdiction:**

Maha Lewaya is under the jurisdiction of the National Salt Corporation while other state owned lands are under the authority of the local government and Divisional Secretariat.

**References:**

CEA/ARCADIS Euroconsult (1999); IUCN (2003b); Stanzel et al. (2002)

# Mahaweli Flood Plains National Park



Source: Landsat ETM+ (06 Sep 2001)  
 Ground Truthing - 16 Sep 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by: GIS Lab/R&SP/EMA/CEA/2006





# Mahaweli Flood Plains National Park

## Location:

8° 21' 30 N and 80° 58' 0 E to 7° 54' 0 N and 81° 15' 0 E; 922991 N and 496330 E to 873251 N and 527557 E; along the Mahaweli River from its mouth near Trincomalee to Polonnaruwa, in the Trincomalee District and Polonnaruwa District, of the Eastern and North-central Provinces respectively.

## Area:

50,000 ha

## Altitude:

Sea level to 50 m

## Overview:

The Mahaweli Ganga floodplain is an extensive system of wetlands composed of river channels, riverine marshes, villus, mangroves, lagoons, and tidal creeks associated with the Mahaweli Ganga, Sri Lanka's longest river. The presence of elephants, rich plant diversity and a large number of aquatic birds including 75 migratory species led to the area being accorded protected status through three National Parks. The flood plains also serve as a migratory corridor between the dry and wet season feeding grounds of a large elephant population.

## Physical features:

The alluvial plain associated with the Mahaweli Ganga begins a few kilometres upstream and the deltaic plain commences with the first distributary, the Kandakadu Aru, with the combined flow entering the sea near Verugal, on the east coast. Around 38 villus have been recorded from the floodplains. Most of them have direct or indirect connections with the river or its tributaries with water flowing into the villus when the river water is high, and the reverse taking place when the water level falls in the river. The area belongs to the low country dry zone and the climate is largely influenced by the northeast monsoon from October to February, which is followed by a dry season lasting from May to September. Average temperature is around 27°C, and annual rainfall is around 1,650 mm, with relative humidity varying from 60 - 90% depending on the rainfall patterns. The area is subjected to strong seasonal windy periods.

## Ecological features:

The floodplains of the Mahaweli River are composed of various ecological zones consisting of river channels, riverine marshes, villus, seasonally flooded grasslands and swamp forests. The flood plain in general and the associated villus in particular, have a high diversity of both microscopic and larger plant forms. Two hundred and thirty one plant species were recorded at Handapan and Bendiya villus and swamp forests, which is the largest villu (796 ha) within the Mahaweli Ganga floodplain. The distribution of the larger vegetation in the villus tends to show a characteristic pattern closely related to the hydro-period and the depth of flooding. The aquatic vegetation consists of floating plants (*Salvinia molesta*, *Trapa bispinosa*, *Pistia stratiotes* and *Azolla pinnata*), submerged plants, grasses and emergent plants (*Aponogeton crispus*, *A. natans* and *Nymphoides* spp.). On the margins of villus, where wet conditions are brief and the depth of flooding is slight, creeping grasses such as *Cynodon dactylon* are common. The mangroves of the Mahaweli floodplain area are less diverse than those in other parts of the country and the major species recorded are *Rhizophora mucronata*, *Avicennia marina*, *Acanthus ilicifolius*, *Lumnitzera racemosa*, *Aegiceras corniculatum* and *Scyphiphora hydrophyllacea*. *Sonneratia apetala* exists in small numbers near the mouth



of the Mahaweli River. Mangrove associates such as *Acrostichum aureum* and *Hibiscus tiliaceus* occur along the inner margins of the mangroves within the transition zone of the riverine forest. Halophytes such as *Achrocnemum indicum* and *Suaeda monoica* have been recorded on the fringes of infrequently flooded hypersaline flats. Around 75 migratory bird species spend the winter months in the marshes of the floodplain.

#### **Noteworthy fauna:**

The freshwater fish are dominated by exotic forms (i.e. *Oreochromis* spp., *Osphronemus gourami*), while endemics such as *Esomus thermoicos*, *Garra ceylonensis* and *Schistura notostigma* have also been recorded. Common aquatic reptiles include *Melanochelys trijuga*, *Lissemys punctata*, *Crocodylus palustris*, and *Varanus salvator*. A variety of water birds inhabit the floodplains, including rare ones such as *Leptoptilus javanicus*. Among the mammals, large herds of *Elephas maximus* visit the flood plains to feed on the lush vegetation, while other mammals such as *Lutra lutra*, *Prionailurus viverrinus*, *Moschiola meminna*, *Cervus unicolor* and *Panthera pardus* have also been recorded in the floodplains.

#### **Noteworthy flora:**

The villus in the floodplain are surrounded by tall dense dry zone forest dominated by *Manilkara hexandra*, *Chloroxylon sweitenia*, and *Terminalia arjuna* species. Prominent grass species include *Panicum repens*, *Hygroryza aristata* and *Crachiaria mutica*. Threatened aquatic plants in the floodplains include *Aponogeton jacobsenii* and *A. natans*.

#### **Land use:**

The wetland and its surroundings are mainly used for paddy cultivation, clay mining for brick making, livestock breeding and grazing, cane harvesting, and vegetable and tobacco cultivation. Extensive sand mining also occurs in the Mahaweli Ganga.

#### **Possible changes in land use:**

Proposals for increased water diversion and impoundment schemes for irrigation and hydropower within the upstream areas will result in less water flow to the flood plains, which in turn will affect their hydrological, ecological and resource use patterns.

#### **Hydrological and biophysical values:**

The flood plains are important for flood detention during the wet season. This nutrient rich highly productive environment also provides a habitat for a large number of plants and animals. The flood plain also acts as a sediment and nutrient trap and reduces the input of sediments and nutrients into near-shore marine waters at the river mouth.

#### **Social and cultural values:**

The areas adjacent to the floodplains have largely been developed by the MASL under the Accelerated Mahaweli Development Programme (Mahaweli systems B and C). The vast majority of the families are settled in high grounds, which are protected from the seasonal floodings and are mainly occupied in farming. A number of ancient irrigation networks are present in the area rendering this site culturally significant.

#### **Scientific research and monitoring:**

The Water Resources Board has carried out investigations for tapping groundwater in the lower reaches of the flood plains and deltaic areas.

**Conservation education:**

A visitor information centre is located within the Wasgamuwa National Park.

**Recreation and tourism:**

Areas within Somawathiya National Park and Flood Plains National Park are currently not open to visitors. However, Wasgamuwa National Park is popular among tourists for its large elephant population.

**Conservation measures taken:**

Much of the flood plains are included within the Flood Plain National Park, declared in 1984 covering an area of 17,350 ha of the upper flood plain, and the Somawathiya National Park, declared in 1986 and covering an area of 33,765 ha of upper deltaic plain. These two national parks along with Wasgamuwa National Park (33,765 ha), to the southwest and the Tirikonamadu Nature Reserve (25,032 ha) to the northeast, form a contiguous system of protected areas. Around 30 villus are included within these protected areas which provide an important habitat for migratory elephants. The MASL has constructed an electric fence to minimize human-elephant conflict. In 1995 the CEA developed a wetland site report and conservation management plan for the Handapan and Bendiya Villus.

**Conservation measures proposed:**

Expansion of the protected area to include the lower deltaic plain and extensive mangroves at the river mouth and linking all these National Parks together to form a single protected area for the elephants have been proposed.

**Disturbances and threats:**

Due to further diversion and impoundments in the upstream areas of the Mahaweli Ganga, the water flow has decreased and one third of the villus are already drying up. This has also facilitated the spread of invasive alien plants such as *Eichhornia crassipes*, *Xanthium indicum* and *Salvinia molesta*, which has affected native grasses and other aquatic plants, resulting in the loss of food plants for native herbivores. Un-authorized tobacco cultivation along the riverbanks, the establishment of brick kilns have degraded natural habitats. Many areas of the floodplains have also been encroached upon by local communities. The abandoned clay pits weaken the riverbank and contribute to the threat of malaria by providing breeding grounds for mosquitoes. Need urgent actions to mitigate existing threats.

**Land tenure:**

The protected areas and the Mahaweli area are state owned while the human settlements are privately owned.

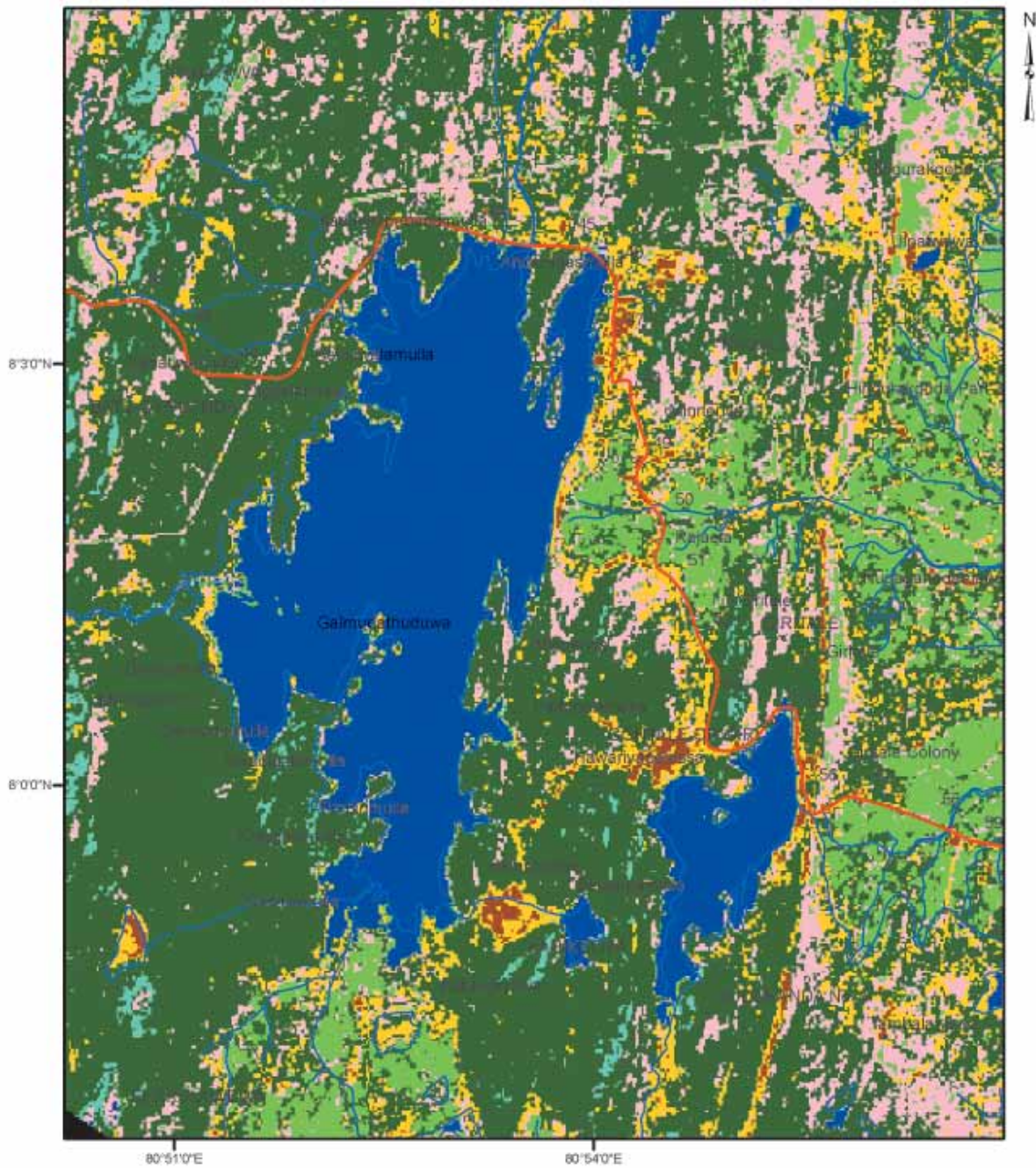
**Management authority and jurisdiction:**

The protected areas are under the jurisdiction of the DWC while the remaining areas under the Mahaweli Development Programme are under the management of the MASL.

**References:**











CEA/ARCADIS Euroconsult (1995b); Ekanayake and Ranawana (2001); IUCN (1990); Jayawardena (2005); Kotagama (1989)

# Minneriya Reservoir



## Legend

### Land Cover

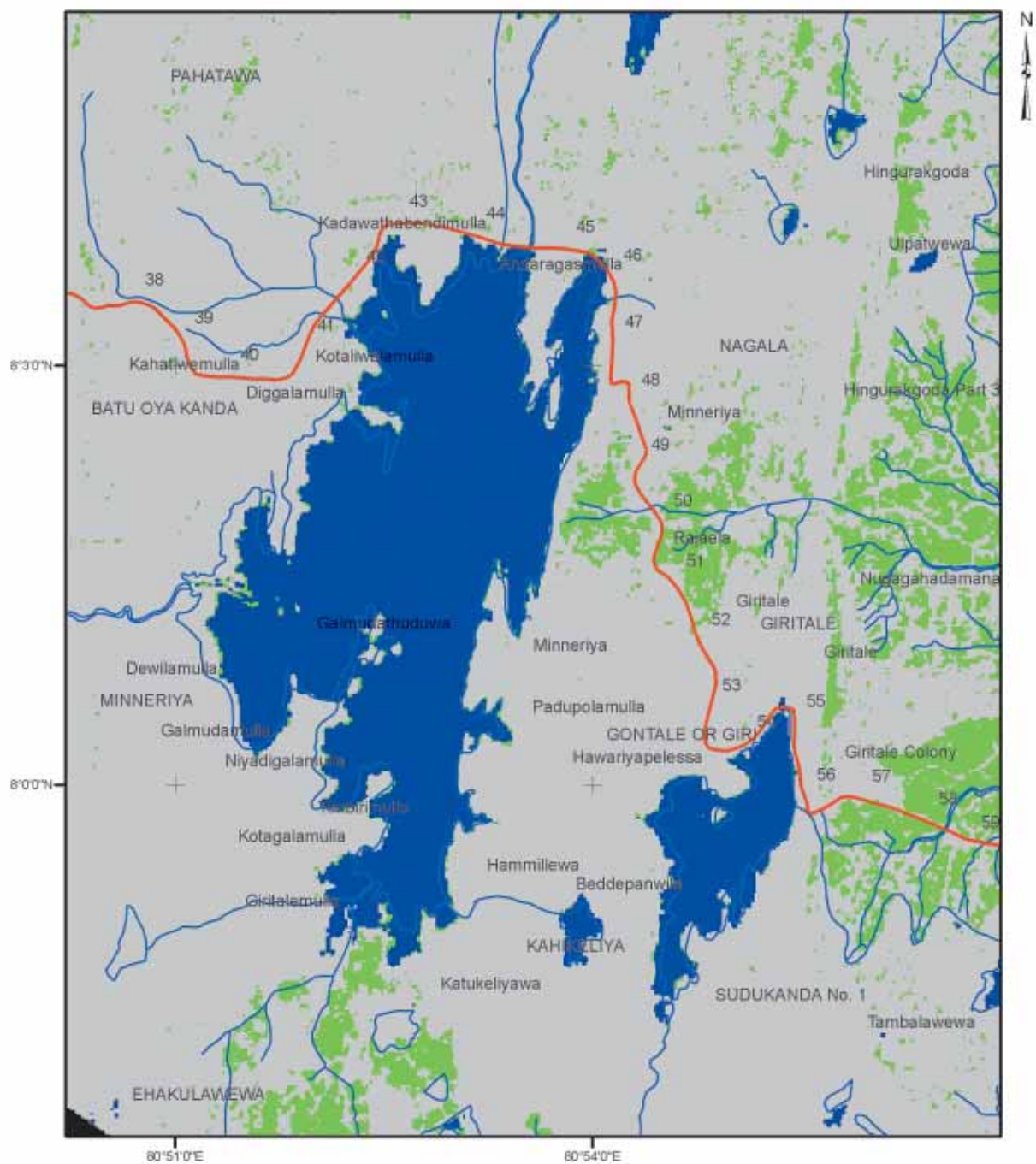
- |  |  |
|--|--|
|  Water                              |  Grassland                  |
|  Natural vegetation (high moisture) |  Natural vegetation         |
|  Paddy land                         |  Barren land (exposed soil) |
|  Agricultural fragments             |  Main road                  |
|  Homegardens                        |  Waterways                  |

Source: Landsat ETM+ ( 06 Sep 2001)  
 Ground Truthing - Sep 2005 by CEA  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Minneriya Reservoir

## Wetlands based on Ramsar Classification



0 1 2 4 Kilometers

### Legend

#### Class Name

- Water storage areas
- Irrigated land
- Non-wetlands
- Main road
- Waterways

Source: Landsat ETM+ ( 06 Sep 2001)  
 Ground Truthing - Sep 2005 by CEA  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Minneriya Reservoir

## Location:

8° 5' 0 N and 80° 51' 7 E to 7° 57' 0 N and 80° 57' 0 E; 893514 N and 483473 N and 878771 N and 494489 E; approximately 20km northwest of Polonnaruwa in the Polonnaruwa District, of the North-central Province.

## Area:

2,550 ha.

## Altitude:

c. 100m

## Overview:

The Minneriya reservoir is a man-made, non-tidal water retention reservoir, built primarily for irrigation purposes. The reservoir falls within the the Mahaweli River Basin, and is of historical importance, having been built in the third century AD with a catchment area of 24,000 ha. The reservoir and surrounding areas have been declared a National Park. Birdlife International has identified Minneriya as an IBA due to its populations of globally threatened bird species.

## Physical features:

The reservoir has a maximum depth of 10.7m, and the average pH of the water is 7.5. The conductivity value of this reservoir suggests that it is relatively nutrient poor, and this is probably due to the high flushing rate resulting from the feeding of two major down-stream reservoirs (Kantale and Kaudulla), as well as demand for irrigation water supply. The main source of water for the reservoir is from a diversion of the Amban Ganga, along the Elahara Channel. The Minneriya reservoir is located in the dry zone and experiences an average rainfall of 1,500-2,000mm. The wet season is during the northeast monsoon between October and January, while the May to August period is considered the dry season.

## Ecological features:

The Minneriya Reservoir is located within Minneriya National Park (8,889 ha). The park comprises low-forested hills that feed the third century reservoir and more recent Giritale reservoir. The vegetation in the area is composed of dry zone forest, scrublands and grasslands. During the dry season, grass along the reservoir edges attracts large numbers of elephants. The reservoir itself is an important water source for large herds of elephants that frequent the park and surrounding forest areas. It is also an important habitat for numerous water birds.

## Noteworthy fauna:

The freshwater fish are dominated by exotic forms (i.e. *Oreochromis* spp., *Tilapia rendali*, *Ctenopharyngodon idella*, *Labeo rohita*, *Aristichthys nobilis*, *Osphronemus goramy*). Aquatic reptiles in the tank include *Lissemys punctata* and *Crocodylus palustris*. Large water birds include *Leptoptilos javanicus*, *Mycteria leucocephala* and *Pelecanus philippensis*. The tank contributes to the sustenance of a large herd of *Elephas maximus* in the park.

**Noteworthy flora:**

The surrounding habitat is dominated by *Terminalia arjuna*, *Manilkara hexandra*, *Azadirachta indica*, *Ficus religiosa* and *Bauhinia racemosa*.

**Land use:**

Small-scale fisheries are carried out within the reservoir. The wetland areas and surrounding grasslands and forests are also used for livestock grazing, timber collection and chena cultivation. Paddy cultivation is also carried out in the vicinity and is aided by irrigation water from the reservoir, while sedimented clays found in the area are used for manufacturing bricks.

**Possible changes in land use:**

Conversion of land for paddy and chena cultivation is possible due to increased demand for agricultural land. Encroachment of National Park by home gardens, houses and shops is also possible, along with an increase in fishing effort.

**Hydrological and biophysical values:**

The most important hydrological factor of the reservoir, which influences both fisheries productivity and wildlife conservation, is the pattern of change in reservoir water levels. Additionally, it provides a source of water to the surrounding paddy fields.

**Social and cultural values:**

This reservoir is of historical importance as it was originally constructed by King Mahasen in the third century AD. The Irrigation Department has constructed a shrine room onsite to honour the work of this historically important King.

**Scientific research and monitoring:**

The reservoir and surrounding areas have been studied by several universities. The ADB funded PAM project carried out by the DWC is also conducting several studies. Minneriya National Park also functions as the DWC training centre.

**Conservation education:**

There is a visitor centre at the entrance of the National Park, which provides educational information, and awareness programmes are being conducted under the PAM project.

**Recreation and tourism:**

The National Park is a huge visitor attraction mostly because of the large elephant herd that visits the reservoir all year round but more so during the dry season.

**Conservation measures taken:**

In 1993, the CEA produced a wetland site report and conservation management plan for the reservoir. Minneriya reservoir is located within the Minneriya National Park, which was first accorded protected status as a Sanctuary in 1938, and subsequently upgraded to a National Park in 1997 under the FFPO. It is also part of the Minneriya-Giritale Nature Reserve, which was declared in 4 blocks between 1988 and 1997. Currently, the Forest Department is conducting some reforestation projects in the area.

**Conservation measures proposed:**

The conservation management plan produced by the CEA proposes a number of conservation measures, which include habitat restoration, removal of livestock from the park area and development of tourism facilities.

**Disturbances and threats:**

The main threat to the reservoir area is the clearing of vegetation for firewood, which causes environmental imbalance and can eventually result in lowering of the water table and soil erosion in the catchment area. Pollution in densely populated bathing areas, encroachment and illegal agricultural activities, overfishing, and poaching are additional anthropogenic threats. The invasive species *Lantana camara* appears to be spreading throughout the park

**Land tenure:**

State owned

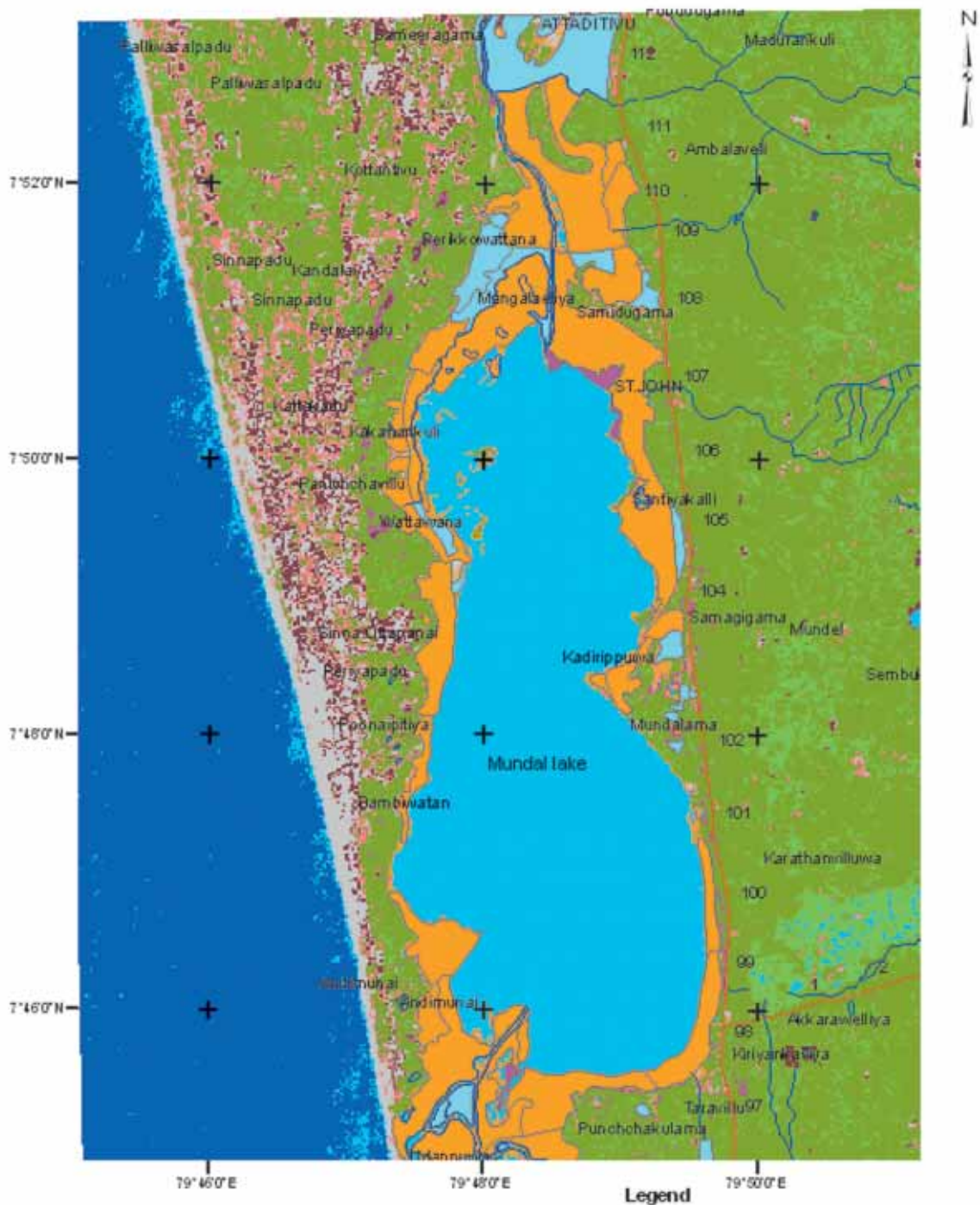
**Management authority and jurisdiction:**

DWC

**References:**

BirdLife International (2005); CEA/ARCADIS Euroconsult (1993b); Petr (1985); Somasunderam (2003);

# Mundel Lake



0 0.30.6 1.2 Kilometers

Source: Landsat ETM+ 15 Dec 2000  
Ground Truthing - Dec 2005  
(Datum WGS84, Projection UTM)



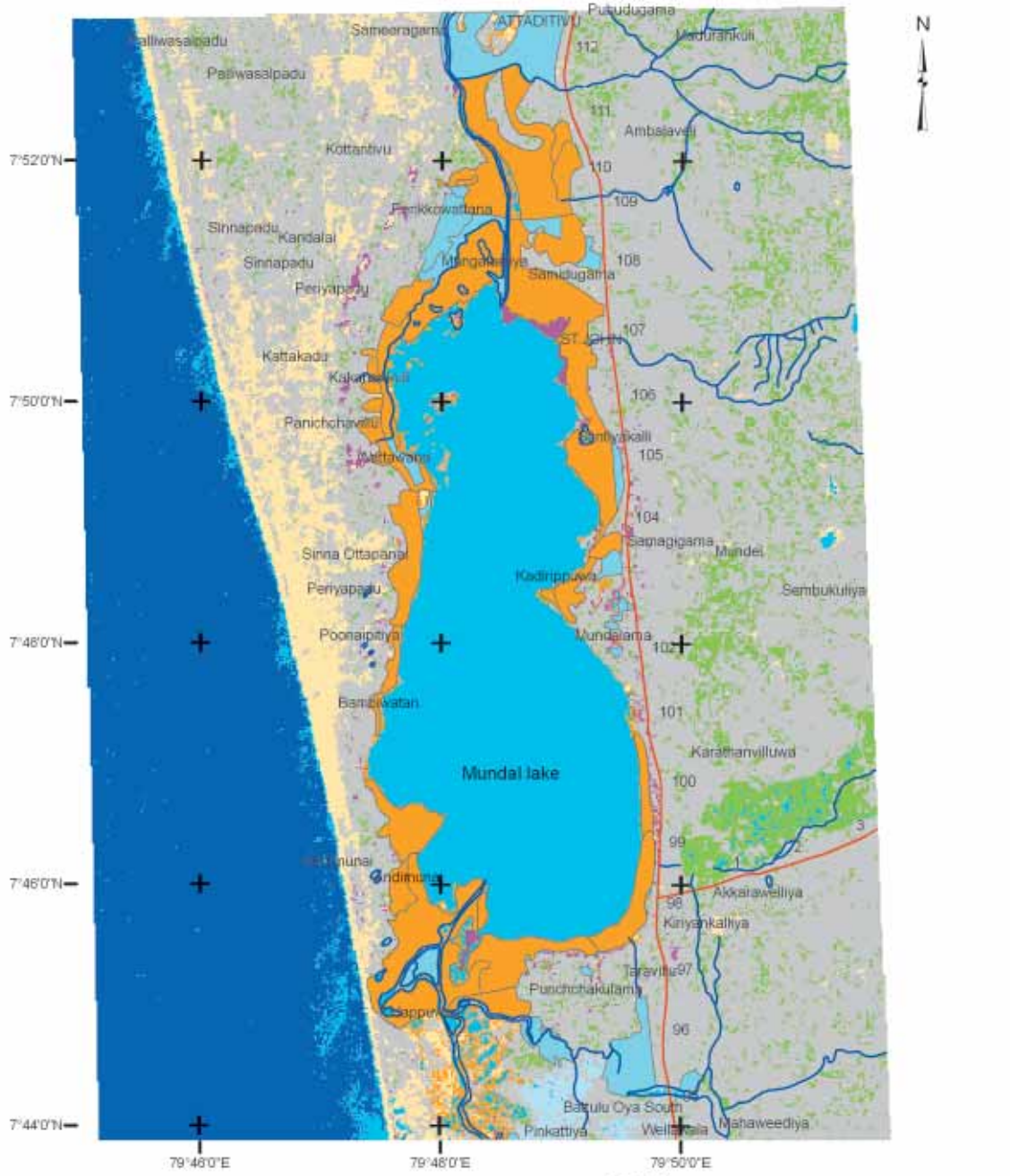
Prepared by GIS Lab/R&S/PEMA/CEA/2006

## Legend

Land Cover			
	Water		Built up area
	Marshy land		Exposed Soil
	Mangroves		Beach/Sand
	Paddy land		Main road
	Prawn farms		Waterways
	Coconut		













# Mundel Lake Wetlands based on Ramsar Classification



0 0.450.9 1.8 Kilometers

### Legend

- |   |                                    |   |              |
|---|------------------------------------|---|--------------|
|  | Sea                                |  | Non-wetlands |
|  | Coastal brackish/saline lagoons    |  | Waterways    |
|  | Intertidal forested wetlands       |  | Main road    |
|  | Permanent freshwater marshes/pools |   |              |
|  | Irrigated land                     |   |              |
|  | Aquaculture ponds                  |   |              |
|  | Sand, shingle or pebble shores     |   |              |

Source: Landsat ETM+ 15 Dec 2000  
Ground Truthing - Dec 2005  
(Datum WGS84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA

# Mundel Lake

## Location:

7° 53' 0 N and 79° 45' 0 E to 7° 45' 0 N and 79° 51' 0 E; 871606 N and 362202 E to 856832 N and 373187 E; 20 km south of Puttalam, in the Puttalam District, of the North-western Province.

## Area:

3,100 ha. It is approximately 12 km long and 1.3 km wide.

## Altitude:

Sea level

## Overview:

The Mundel 'Lake' is actually a shallow brackish water lagoon fringed by mud flats, salt marshes and remnants of mangrove stands which is connected with the Puttalam estuary at the northern end through the Dutch canal. The lagoon is completely cut off from the sea by a narrow sandbar at Udappuwa and the high salinity level of the wetland is maintained due to high evaporation and low rainfall in the area. Aquaculture farms are the most conspicuous developments around the lake while a small-scale subsistence fishery can also be found. The wetland is an important feeding ground for migratory birds. The Mundel Lake and its environs are disturbed as a result of injudicious utilization of resources beyond sustainable limits.

## Physical features:

The area falls within the dry zone of Sri Lanka and therefore experiences two rainy and two dry periods per year. The first rainy season extends from April-June and while the second period occurs between October and November: the transition periods between the prevailing Southwest monsoon (June-October) and the Northeast monsoon (December-February). Average annual rainfall is 1,000-1,500 mm while, monthly rainfall is around 120 mm and the temperature is uniform at around 30.4 –33.6°C. The lagoon is very shallow with an average depth of 0.75 m. Salinity is variable between 3ppt and 65 ppt depending on evaporation rates and rainfall. There is some indication that the lagoon in this location used to be larger, however, the current extent of the lagoon has been reduced due to the beach extending inwards to the lagoon.

## Ecological features:

The lagoon and its environs consist of a straight coastline with wide beaches, berms and sand dunes. Old raised dune ridges, mud flats, salt marshes and degraded mangroves border the eastern margin of the wetland. The sand dunes from Deduru Oya mouth northwards consist of a series of medium sized dunes 10-15 m in height, which are active and migratory. Close to the coast, the dunes are covered by creeping vegetation such as *Spinifex littoreus* and *Ipomoea pescaprae*. According to 1992 estimates, around 262.04 ha of mangroves are present in the Mundel lagoon, but it has diminished due to accelerated growth of aquaculture farming. A survey in 1987 by NARA recorded nine mangrove species, four mangrove associated species and five salt marsh species. Mangrove associates and adjacent mudflats are highly rich in invertebrates and fishes, and are important for water birds. Around 30 species of finfish have been recorded from the lake. The surrounding salt marshes and tidal waterways are subjected to daily tidal fluctuations.

**Noteworthy fauna:**

Six finfish species dominate the catches (*Nematolosa nasus* 42%, *Arius* sp. 30%, *Jobnius carouna* 7%, *Lates calcarifer* 4%, *Terapon* sp. 3.7%, and *Mugil* sp. 3.3%). The dominant birds include cormorants (*Phalacrocorax niger*, *P. fuscicollis*) and egrets (*Mesophoyx intermedia*, *Egretta garzetta*), while migratory water birds include waterfowl such as *Anas querquedula* and waders such as *Tringa stagnatilis* and *T. nebularia*. The threatened mammal *Lutra lutra* has also been recorded from the site.

**Noteworthy flora:**

The common mangrove species include *Avicennia officinalis*, *Lumnitzera racemosa*, *Excoecaria agallocha* and *Clerodendrone inerme*. The salt marsh vegetation includes *Sueda maritima* and *Salicornia brachiata*.

**Land use:**

The wetland is mainly used for fisheries and prawn farming. A 1992 survey estimated the land use area by the aquaculture industry to be approximately 350 ha. Agriculture, animal husbandry and livestock farming is common in the surrounding areas. Coconut is the main crop of the area with around 15–20% of families earning extra income from the preparation of cadjans from coconut leaves. These families use the lagoon for retting the leaves.

**Possible changes in land use:**

Mangrove restoration activities initiated by local CBOs and NGOs in degraded sites could lead to the recovery of mangrove vegetation. Natural regeneration of mangrove is also evident around some of the abandoned shrimp ponds.

**Hydrological and biophysical values:**

During heavy rains, flood control in the area happens through the physical breaching of the Udappuwa sand bar. Water circulation between the Puttalam estuary and Mundel lagoon is determined by rainfall. During rainy seasons, the water level in the Mundel lagoon is higher and therefore water flows towards the Puttalam estuary. During the drier months, water flows from the estuary to the lagoon. The water of this lagoon is used for aquaculture purposes in the nearby shrimp farms.

**Social and cultural values:**

40-50% of the families in the surrounding villages are engaged in lagoon fisheries, which is the main source of income for the local communities. While some of the fishermen sell their catch fresh to the whole-sellers on the beach, others prepare dry fish for sale. Livestock farming is done on a small-scale near the lagoon and only around 3-5 % of the families rear chicken, cattle and pigs.

**Scientific research and monitoring:**

NARA has conducted several studies on the effects of shrimp culture on the lagoon.

**Conservation education:**

Several CBOs, NGOs and government institutions (i.e. NARA) have carried out awareness raising activities related to the Mundel lagoon and its threats.

**Recreation and tourism:**

Tourism used to be centred around the large number of migratory birds that used to visit the area. However, destruction of the mangrove stands has led to a decrease in the migratory bird populations visiting the area.

**Conservation measures taken:**

A small fishery organisation located in the area has started to restore the mangrove ecosystem.

**Conservation measures proposed:**

The wetland site report and conservation management plan produced by the CEA recommend actions for the conservation of this site.

**Disturbances and threats:**

Aquaculture and fisheries development and the lack of enforcement of rules and regulations are the major threats to the area. Vast areas of mangrove have been cleared for the establishment of aquaculture ponds. The use of dragnets has damaged the benthic organisms and sea grass beds. The application of non-sustainable fishing techniques such as fish kraals across the Dutch Canal not only obstructs water flow but also impedes recruitment of fish and shrimp from the sea. Construction of shrimp farms in lagoon mud flats as well as water retention areas has increased the incidence of floods in the area. From 1990-2000 almost 90% of the fringing vegetation of the lagoon and its environs had been cleared to construct aquaculture ponds. Release of untreated water from shrimp farms reduces the salinity levels and degrades the water quality of the lagoon, which in turn reduces its fishery potential. Increased sedimentation of the lagoon has affected the rainwater retention capacity of the wetland. Reduction of environmentally sensitive areas has caused a reduction in biodiversity. Migratory bird populations visiting the area have reduced by 48% between 1998-99 compared to 1992-93 due to the large-scale destruction of mangrove stands. The fish diversity has reduced from 19 species caught in 1991 to 14 species in 2000. Need urgent actions to mitigate existing threats.

**Land tenure:**

The lagoon and the corridor are state-owned while some of the surrounding lands are privately owned.

**Management authority and jurisdiction:**

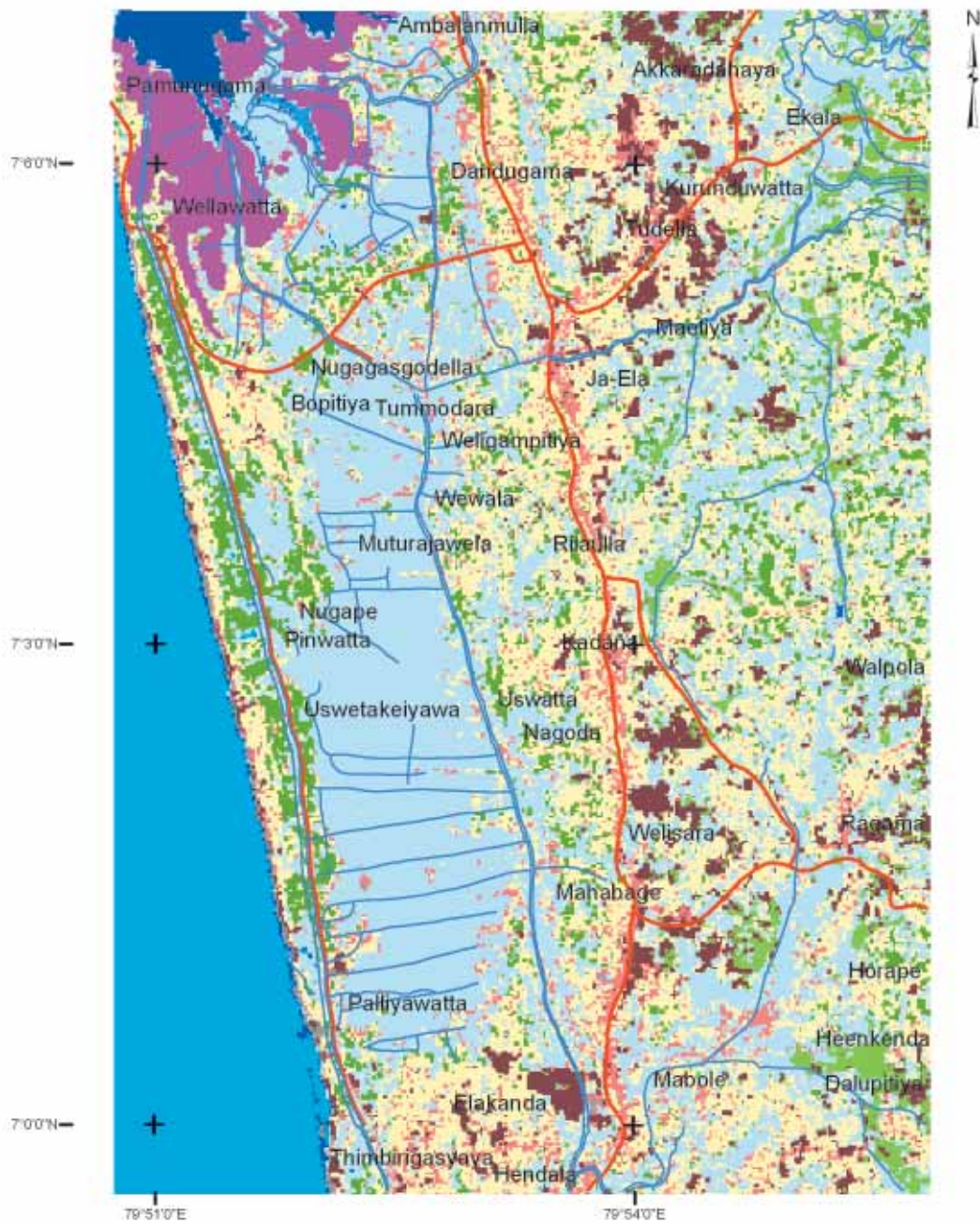
Settlement areas come under the purview of the GA.

**References:**

BirdLife International (2005); CEA/ARCADIS Euroconsult (1994e); Corea and Jayasinghe (2002); Dayaratne et al. (1997); Katupotha (2002).



# Muthurajawela Marshes



## Legend

0 0.5 1 2 Kilometers

### Land Cover

- |   |                |   |                                     |
|---|----------------|---|-------------------------------------|
|  | Sea            |  | Natural vegetation with homesteads  |
|  | Brackish water |  | Built up area                       |
|  | Water bodies   |  | Natural vegetation (moderate dense) |
|  | Beach/Sand     |  | Exposed soil                        |
|  | Mangroves      |  | Waterways                           |
|  | Marshy land    |  | Main road                           |
|  | Paddy land     |   |                                     |

Source: Landsat ETM+ 13th March 1992  
Ground Truthing - 7th August 2005  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Muthurajawela Marshes

## Wetlands based on Ramsar Classification



### Legend

Class Name	
	Sea
	Coastal brackish/saline lagoons
	Water storage areas
	Intertidal forested wetlands
	Permanent freshwater marshes/pools
	Irrigated land
	Sand, shingle or pebble shores
	Non-wetlands
	Waterways
	Main road

Source: Landsat ETM+ 13th March 1992  
 Ground Truthing - 7th August 2005  
 (Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Muthurajawela Marshes

## Location:

7° 7' 0 N and 79° 51' 0 E to 7° 0' 0 N and 79° 56' 0 E; 786804 N and 373005 E to 773883 N and 382179 E; 10 km North of Colombo in the Gampaha District, of the Western Province.

## Area:

2,569.2 ha (Sanctuary and buffer zone)

## Altitude:

Sea level

## Overview:

Muthurajawela is the largest saline peat bog in Sri Lanka, and together with the Negombo estuary forms an integrated coastal wetland ecosystem spanning 6,232 ha. Estimated economic value of the wetland is around Rs 726.5 million per year and the benefits mainly come in the form of flood attenuation and wastewater treatment. The marsh supports livelihood activities such as fishing and to a lesser extent agriculture. The location of Muthurajawela in a rapidly developing and highly populated urban area makes it an extremely valuable, yet vulnerable ecosystem.

## Physical features:

The marsh is located within the low country wet zone and is influenced by the southwest monsoon. The highest rainfall is received during the inter-monsoon periods in April and May, and in October and November, with an annual rainfall between 2,000 – 2,500 mm. Average annual temperature is around 27° C. The soil is a uniform, potentially acidic sulphate, and the land is poorly drained with a peaty substrate which is saturated for almost the whole year. The marsh receives water from the Kelani river and the Dandugam oya stream.

## Ecological features:

The marsh plant community is unstable and represents one of the final stages of succession towards dry land formation. High-levels of human disturbance have lead to significant change in the composition of dominant plant species over the last ten years, which in turn had an effect on the faunal composition. One hundred and ninety four species of flora belonging to 66 families are distributed over seven major vegetation communities (marsh, lentic, reed swamp, short grassland, shrub land, stream bank and mangrove swamp). The shrub land harbours the highest number of species (115), while the mangrove forest and stream bank/ riparian type consist of the lowest (23). The vertebrate fauna includes 40 species of fish (4 endemic and nationally threatened), 14 species of amphibians, 31 species of reptiles, 102 species of birds (including one endemic and 19 winter migrants), and 22 species of mammals.

## Noteworthy fauna:

Out of the 209 species of vertebrate fauna documented, 17 (9%) are endemic, while 26 (12%) are nationally threatened. The endemic fish species include *Puntius singala*, *Esomus thermoicos*, *Channa orientalis*, *Clarias brachysoma* and *Aplocheilus dayi*. Among the amphibians, *Bufo atukoralei*, *Lankanectes corrugate*, *Rana gracilis* and *Polypedates cruciger* are endemic to Sri Lanka. Among the reptiles, *Varanus salvator* is

the most common, while rare species include *Crocodylus porosus* and *Achrochordus granulatus*. Rare birds in Muthurajawela include *Porzana fusca* and *Rostratula benghalensis*, while the migratory Marsh Harrier (*Circus aeruginosus*) is fairly common in the southern part of the marsh. Rare mammals in the marsh include *Lutra lutra*, *Prionailurus viverrinus* and the primate *Loris tardigradus*. The most common odonates include *Neurothemis tulia* and *Rhyothemis variegata*. The giant freshwater prawn (*Macrobrachium* spp.) also inhabits the marsh.

#### **Noteworthy flora:**

Within the recorded flora, one endemic (*Phoenix zeylanica*), and three nationally threatened (*Aponogeton natans*, *Nypa fruticans*, *Caesalpinia crista*) species occur in the marsh. The mangrove in the northern border of the marsh is dominated by *Avicennia marina* and *Rhizophora mucronata*. The lentic flora in open water bodies is dominated by *Nymphaea stellata* and *Eleocharis dulcis*. The riparian vegetation includes *Pandanus tectorius*, *Cerbera manghas* and *Syzygium caryophyllatum*. The reedbeds consist of *Phragmites karka*.

#### **Land use:**

Historically, the marshes were used for paddy cultivation but cultivation was abandoned due to salt-water intrusion. Starting from the 15<sup>th</sup> century, the marsh system has been altered, and a variety of canals, drains, bunds, sluices and culverts present evidence of various attempts to manage water flow, combat flooding and prevent salt-water intrusion, in addition to the development of the waterways for transportation of goods. An estimated 700 households live in settlements within the marsh, with the majority of houses being temporary structures. A resettlement village founded in 1994 in the southern part of the marsh comprises of around 240 families. Agricultural activities are limited due to poor soil conditions, but around 90 ha are planted with coconut, bananas and vegetables.

#### **Possible changes in land use:**

Since the 1970s land filling and reclamation of the marsh for industry, infrastructure and human settlements has accelerated. Over half of the marsh population are squatters and about three quarters of landholdings are unauthorised. Recently the marsh was segmented due to the construction of the Colombo-Katunayake highway.

#### **Hydrological and biophysical values:**

Muthurajawela receives and retains high loads of domestic and industrial wastes and sediment from both surrounding and upstream areas. Wetland plants facilitate sediment deposition, before water enters Negombo lagoon. The plants also act as a filter for through-flowing waters, and assist in the removal of nutrients and toxic substances. During the rainy season the wetland acts as a retention area for run-off from surrounding higher grounds and floodwaters from Dadugam Oya, Kalu Oya and Kelani Ganga. The maximum water storage capacity of the marsh is 11 million cubic meters, with a maximum discharge of 12.5 cubic meters per second and a retention period of more than 10 days. By maintaining surface, near surface and possibly groundwater levels, the marsh also plays a major role in the local freshwater supply. These functions are particularly important for local households, as many depend on shallow-dug wells. The overall economic value of the wetland has been estimated to be around Rs 726.5 million per year.

#### **Social and cultural values:**

Around 5,000 people live in or directly adjacent to Muthurajawela marsh, although the majority are engaged in low-paying manual labour activities. A few traditional fishing families are involved in small-scale commercial and subsistence fisheries in the canals, the Dandugam Oya and marsh-lagoon transition zone.



The canals running through the wetland were developed and used for transportation of goods during the Dutch period.

#### **Scientific research and monitoring:**

The wetland was studied thoroughly under the Dutch funded Wetland Conservation Project executed by the CEA in 1993. IUCN has also conducted biodiversity surveys and an economic valuation of the wetland.

#### **Conservation education:**

The marsh provides a field laboratory for diverse studies at both school and university level. Sri Lankan universities as well as several foreign universities have conducted graduate and post-graduate level studies at this site. A visitor centre was set up by the CEA in 1996 and is now managed and operated by the Muthurajawela and Negombo Lagoon Development Foundation.

#### **Recreation and tourism:**

Local and foreign tourists regularly visit the wetland for sight-seeing and bird watching. In 1996 a visitor centre, "The Marsh" was established by the CEA under the Wetland Conservation Project. With attractions such as boat rides, a model fishing village, a restaurant, shop and meeting facilities, it became popular amongst school children and tourists. It was closed down in mid 2001 due to the construction of the Colombo-Katunayake highway and a temporary centre was set up near the Hamilton Canal. A new permanent visitor centre was established in 2003.

#### **Conservation measures taken:**

In 1989 as a result of growing concern about the degradation of the ecosystem, the government froze all public and private sector developments within the marsh until the preparation of a master plan for sustainable resource use. In 1991, the Greater Colombo Economic Commission prepared the Master Plan for the Muthurajawela marsh and Negombo Lagoon wetland complex, which included a land use strategy based on the wetland being divided into zones for conservation, industrial development, and residential development. A detailed plan for the conservation zone was prepared following approval from the government in 1992. In 1996, 1,284.45 ha of the northern section of Muthurajawela were declared a Sanctuary under the FFPO. In 2004, a buffer zone (the area between the conservation zone and mixed urban zone) of 285.4 ha was protected as an EPA under the NEA. This was the first site to be declared an EPA under this act.

#### **Conservation measures proposed:**

A biodiversity status profile prepared by IUCN, and the conservation management plan prepared by the CEA have made several recommendations for conservation. These include upgrading the northern part of the Sanctuary to a higher protected area category, clarification and documentation of the legal status of land ownership, restoration of degraded habitats, initiation of programmes to manage the spread of invasive alien species, and rehabilitation of the canal network to ensure adequate water seepage to keep the peaty soils moist.

#### **Disturbances and threats:**

Illegal reclamation of land for housing, dumping of garbage, chemical pollution and eutrophication (due to agricultural fertilizers and pesticides, residue from illegal breweries) are major threats to the wetland. Direct exploitation of natural resources such as poaching and cutting of trees and reeds are also major issues. The spread of invasive alien plant species such as *Annona glabra*, *Eichhornia crassipes*, *Pistia stratiotes*

and *Salvinia molesta* has affected the native plant communities in the wetland. Unmanaged domesticated animals (buffalo, cattle, pigs, goats, dogs and cats) pose a serious threat to native flora and fauna. Need urgent actions to mitigate existing threats.

**Land tenure:**

The sanctuary area is state owned while the surrounding lands are either owned by the church, or privately owned.

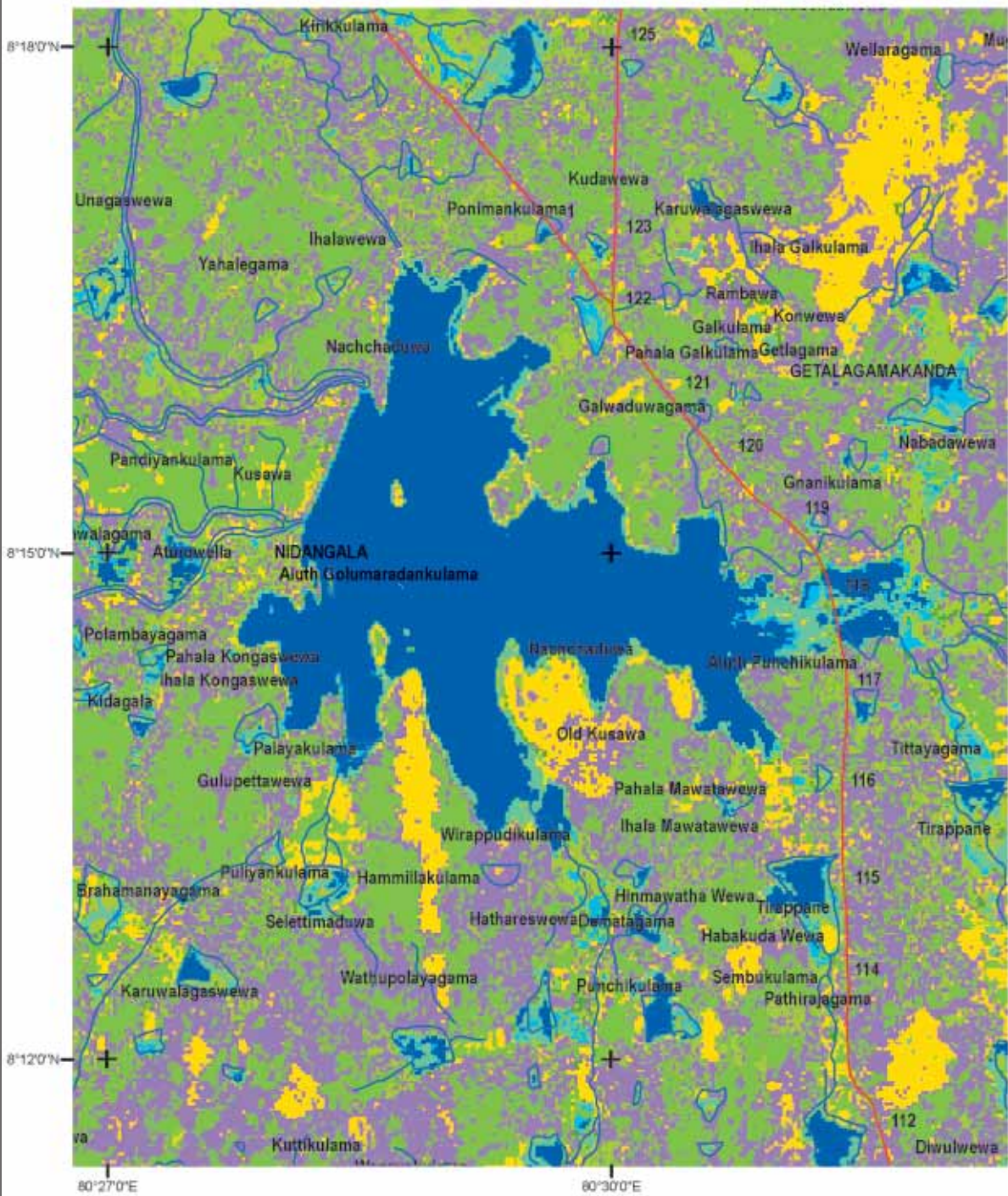
**Management authority and jurisdiction:**

DWC

**References:**












Bambaradeniya et al. (2002c); CEA/ARCADIS Euroconsult (1994f); CEA/ARCADIS Euroconsult (2003); Emerton and Kekulandala (2002); The Government of Sri Lanka (1996)

# Nachchaduwa Tank



## Legend

### Land Cover

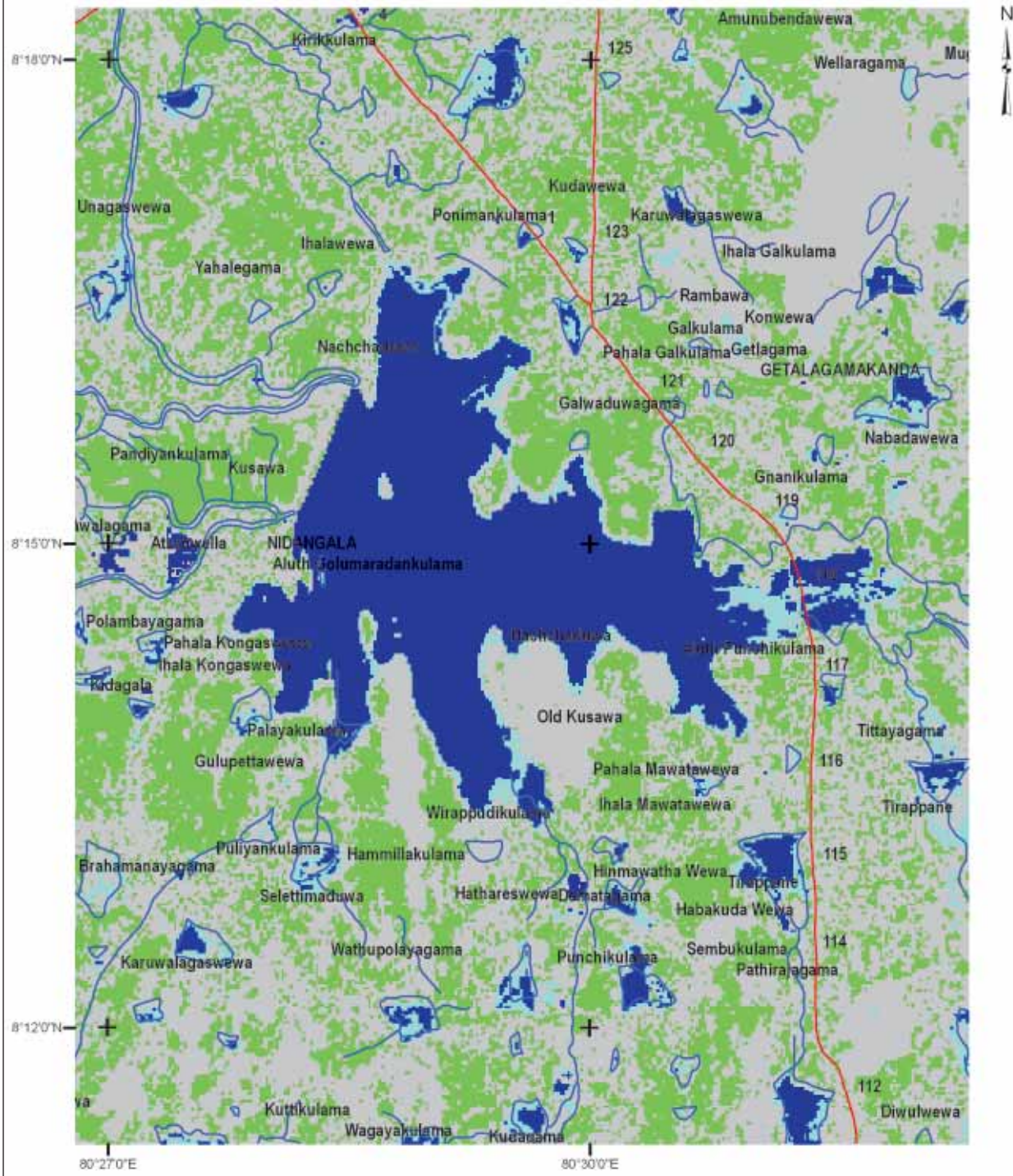
- |   |                          |   |                                     |
|---|--------------------------|---|-------------------------------------|
|  | Water with aquatic plant |  | Grassland                           |
|  | Water (shallow)          |  | Natural vegetation (low dense)      |
|  | Water (deep)             |  | Natural vegetation (moderate dense) |
|  | Paddy land               |  | Main road                           |
|  | Agricultural fragments   |  | Waterways                           |
|  | Homegardens              |   |                                     |

0 0.45 0.9 1.8 Kilometers

Source: Landsat ETM+ (14 March 2001)  
 Ground Truthing - 2005 August  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/VCEA/2006



# Nachchaduwa Tank Wetlands based on Ramsar Classification



### Legend

Class Name	
	Irrigated land
	Non-wetlands
	Seasonal Intermittant fresh water marshes/pools
	Water storage area (tanks)
	Main road
	Waterways

Source: Landsat ETM+ (14 March 2001)  
Ground Truthing - 2005 August  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Nachchaduwa Tank

## Location:

8° 18' 0 N and 80° 27' 0 E to 8° 17' 0 N and 80° 32' 0 E; 917506 N and 439435 E to 915651 N and 448609 E; about 10 km southeast of Anuradhapura town in the Anuradhapura District, of the North-central Province.

## Area:

1,780 ha at full supply level

## Altitude:

Around 100 m above sea level (asl) while the highest point in the area, the Ritigala hills are 572 m asl.

## Overview:

Nachchaduwa is a recently rehabilitated ancient irrigation tank. It is situated in the upper regions of the Malwatu Oya basin and forms a part of the cascading tank system of the Mahaweli scheme. The conservation significance of the wetland stems not only from its support to wildlife but also from the multiple uses it provides in the form of irrigated agriculture, domestic usage and fisheries. The tank catchment forms a part of the Ritigala Strict Nature Reserve, which is notably high in floral and faunal diversity.

## Physical features:

The tank is moderately deep (7.62 m asl at bund) and is surrounded by an undulating plain (at about 100 – 350 m asl) with isolated hillocks. The Malwatu Oya feeds the Nachchaduwa tank, which has three sluices to control its water levels. The main sluice is located near the southern end of the bund and releases water mainly to Tissa Wewa. The other two sluices release water to Nuwara Wewa. The tank has a storage capacity of 55.68 million m<sup>3</sup>. The reservoir and its catchment lie within the dry zone and receive an annual rainfall of 1,219 mm, mainly through the northeast monsoon. Mean monthly temperature is 27.9°C and the mean monthly relative humidity varies from a low of 60% (March) to 90% (December/January).

## Ecological features:

The landscape surrounding Nachchaduwa was part of the ancient Anuradhapura kingdom and has been influenced by human activities for centuries. Few patches of natural forests remain in the southern boundary of the tank. The aquatic vegetation in the tank consists of phytoplankton and rooted vegetation, while certain parts of the tank and its borders, which are seasonally inundated, are important feeding and breeding habitat for birds. Four types of terrestrial vegetation (dry mixed evergreen, riverine, scrub land and home gardens) are present in the area. A total of 105 plant species have been recorded. 65 bird species have been documented in the area of which 18 can be considered aquatic. This reservoir contributes to water quality regulation through the retention of pollutants and sediments.

## Noteworthy fauna:

The freshwater fishes in this tank are dominated by exotics such as *Oreochromis mossambicus*, *Labeo rohita* and *Ctenopharyngodon idella*. Indigenous species such as *Channa striata* are commercially important. Other indigenous fish species in the tank mainly comprise of *Puntius* spp, and *Rasbora* spp. Noteworthy reptiles include *Crocodylus palustris*, *Geochelone elegans*, *Lissemys punctata* and *Melanochelys trijuga*. The tank also serves as important habitat for water birds, where *Pelecanus*

*philippensis*, *Anhinga melanogaster* and *Haliaeetus leucogaster* are among the noteworthy birds associated with the tank. Mammals such as *Canis aureus*, *Lutra lutra*, *Elephas maximus* and *Prionailurus viverrinus* are among the noteworthy mammals.

**Noteworthy flora:**

At least five species of endemic plants, *Anisophyllea cinnamomoides*, *Diospyros ebenoides*, *Vernonia zeylanica* and *Willughbela cirrhifera* have been recorded from the adjacent forests of the Nachchaduwa tank. Additionally, species such as *Diospyrus malabaricus* and *Terminalia arjuna* have also been noted in these habitats.

**Land use:**

The local communities collect fish and shrimp from the tank. Paddy and chena cultivations and brick-making activities are common in the surrounding areas.

**Possible changes in land use:**

Information not available

**Hydrological and biophysical values:**

This tank acts as a store of water that is released according to the downstream irrigation requirements.

**Social and cultural values:**

The majority of the workforce in the immediate vicinity are self-employed and engage in the seasonal cultivation of paddy and chena, which are dependent upon the rainfall patterns. Due to the shortage of water, agricultural expansion is hindered. A small segment of the population depends on the tank fishery for their livelihood. Several important archaeological remains including an ancient diversion weir have been discovered from the vicinity. The Aruvil Aru, which is the second largest river in Sri Lanka, was one of the earliest sites of human settlement in the country. Settlements in the region can be traced back to pre-historic times. The exact time frame of the construction of Nachchaduwa is unknown, but the reservoir was possibly already in existence in the early part of the first millennium A.D.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

The catchment area of the tank, Ritigala, is being promoted as a nature-based tourism destination.

**Conservation measures taken:**

A portion of the catchment of the reservoir, Ritigala hill, has been declared as a Strict Nature Reserve under the FFPO. Community-based forestry management projects have been practiced in the area. The CEA published a wetland site report in 1994 under the Wetland Conservation Project. The Forest Department has been involved with teak planting in the surrounding areas. Under the ADB funded PAM

Project, management measures for Ritigala will be implemented aiming to enhance its status as a Strict Nature Reserve.

**Conservation measures proposed:**

The wetland site report produced by the CEA suggests a number of conservation measures.

**Disturbances and threats:**

Rapid destruction of the wetland and surrounding forests for chena cultivation, illegal timber extraction and the expansion of human settlements are major problems in this area. Tortoise hunting by villages for food and indiscriminate killing of snakes mainly due to wrong identification is a major threat to their survival in the tank area. Invasive alien plant species such as *Eichhornia crassipes* also pose a threat to native aquatic plants in the tank.

**Land tenure:**

The tank and the Strict Nature Reserve are state owned, while the homesteads and paddy fields are privately owned.

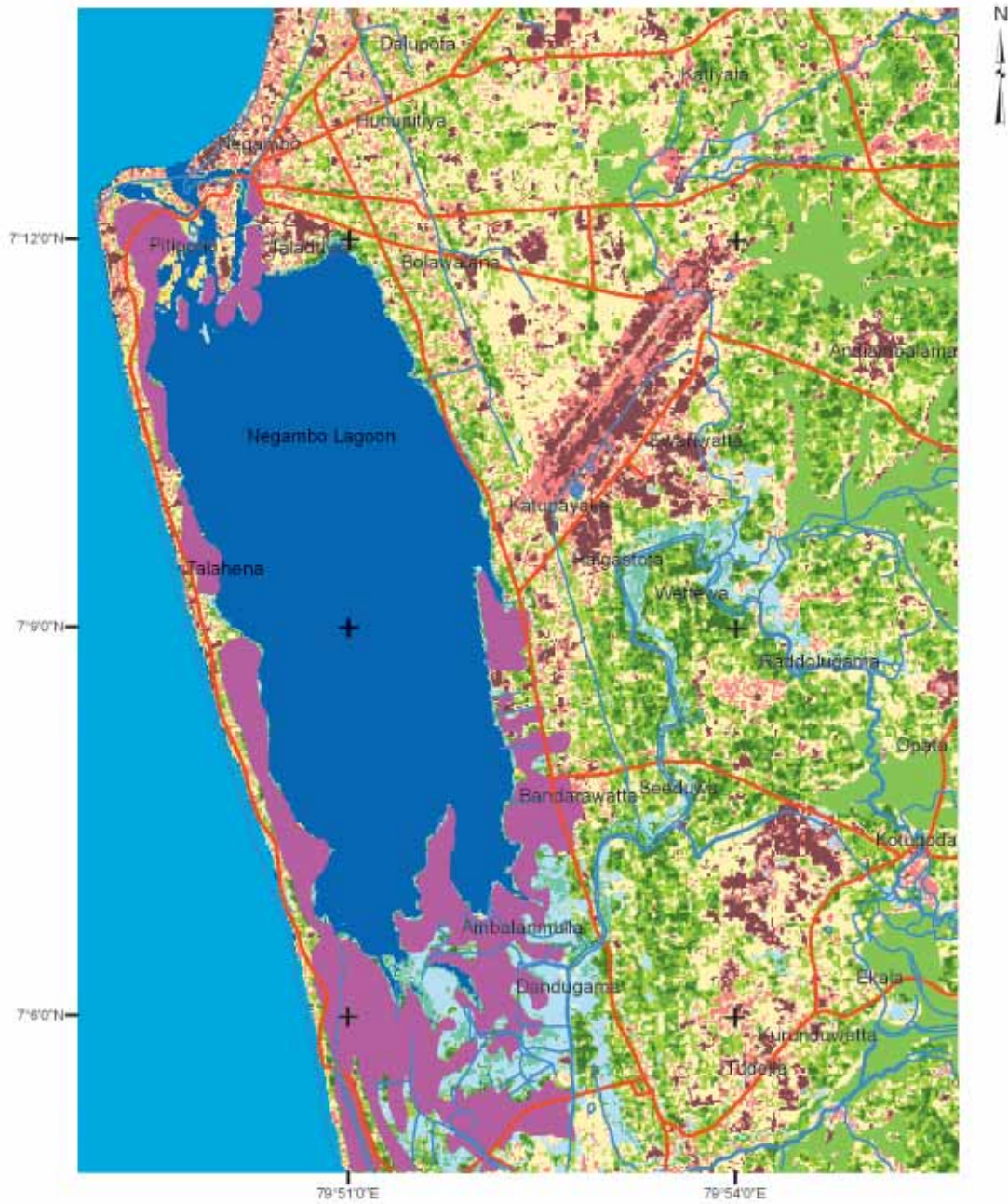
**Management authority and jurisdiction:**

Divisional Secretariat Division at Thirappane is responsible for all matters related to land tenure and distribution and five government departments (Irrigation, Agriculture, Forest, Wildlife, Archaeology) play important roles with respect to land management and resource use.

**References:**

CEA/ARCADIS Euroconsult (1994g); CEA/ARCADIS Euroconsult (1999)
















# Negombo Estuary



0 1 2 4 Kilometers

## Legend

### Land Cover

	Sea		Homegardens
	Lagoon		Natural vegetation (low dense)
	Sand		Natural vegetation (moderate dense)
	Mangroves		Natural vegetation (dense)
	Marshy land		Exposed soil
	Water with water grasses		Main road
	Paddy land		Waterways
	Built up area		

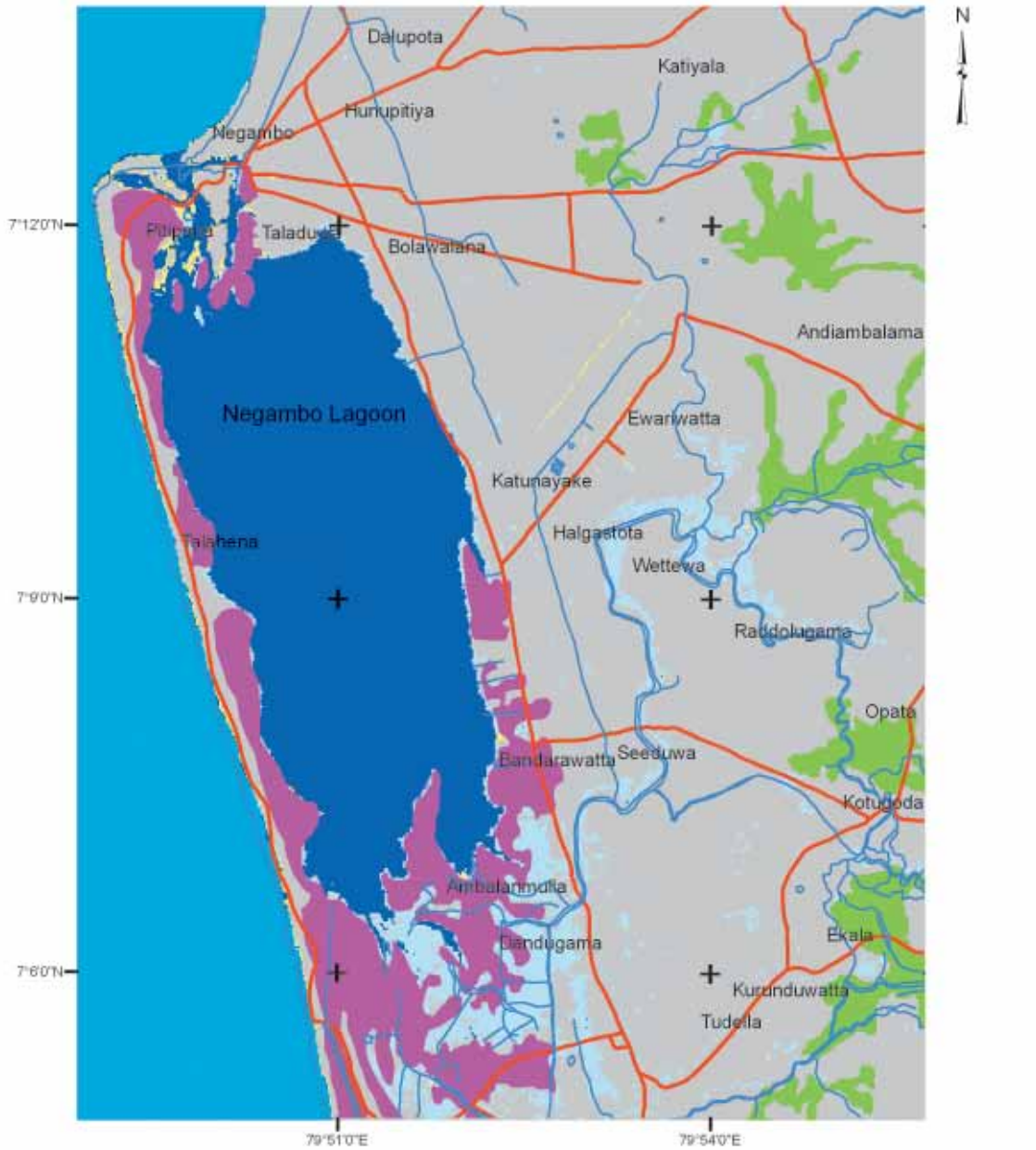
Source: Landsat ETM+ 13th March 1992  
Ground Truthing - 8th March 2006  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Negombo Estuary Wetlands based on Ramsar Classification



0 1.25 2.5 5 Kilometers

### Legend

#### Class Name

- |   |  |   |           |
|---|--|---|-----------|
|  | Sea  |  | Waterways |
|  | Coastal brackish/saline lagoons                  |  | Main road |
|  | Sand, shingle or pebble shores                   |   |           |
|  | Mangroves  |   |           |
|  | Permanent saline/brackish/alkaline marshes/pools |   |           |
|  | Irrigated land                                   |   |           |
|  | Non-wetlands                                     |   |           |

Source: Landsat ETM+ 13th March 1992  
Ground Truthing - 8th March 2006  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Negombo Estuary

## Location:

7° 12' 0 N and 79° 50' 0 E to 7° 6' 0 N and 79° 55' 0 E; 796023 N and 371187 E to 784943 N and 380363 E; along the western coast in the Gampaha District, of the Western Province.

## Area:

The extent of the estuary is 3,502 ha.

## Altitude:

Sea level

## Overview:

Negombo estuary is a very productive shallow coastal body of water, receiving fresh water from the Attanagalu Oya drainage basin via Dandugam Oya and Ja-Ela and connected with the sea by a single narrow opening. There are 13 islands within the inter-tidal channel segments of the estuary of which four are inhabited. The estuary is multi-functional but is threatened by accelerated and haphazard infrastructure development. It is interconnected with the Muthurajawela marsh.

## Physical features:

The estuary is approximately 12.5 km in length and 0.6 to 3.6 km wide. It has a mean depth of 0.65 m and a surface area of 35 km<sup>2</sup>. The tidal amplitude in the estuary is on average less than 20 cm. Seasonal fluctuations in water level are around 30 cm and are higher than the tidal fluctuations. The area is affected by two periods of heavy rains occurring in April/May and in October/November, immediately preceding and following the Southwest monsoons. Daily maximum rainfall can be as high as 340 mm. Salinity ranges from 1 to 40 ppt and the pH from 5.8 to 8.8. The average daily temperature is 27°C and relative humidity is approximately 80%.

## Ecological features:

Apart from the phytoplankton, the estuarine vegetation can be divided into two main types, namely, fringing types (mangroves and reeds) and submerged types (sea grasses and filamentous green algae). The low tidal variations have confined the mangroves to a narrow band of about 10m. Excessive reed beds mainly consisting of *Phragmites karka* exist along the southern border of the estuary, where the salinity is low and the mangrove vegetation has depleted. The submerged sea grasses constitute critical nursery habitat for the fish and crustaceans.

## Noteworthy fauna:

Four penaeid shrimp species (*Penaeus indicus*, *P. monodon*, *P. semisculcatus* and *Metapenaeus dobsoni*), and two crab species (*Scylla serrata* and *Portunus pelagiucs*) are of high economic value.

## Noteworthy flora:

The filamentous green algae *Chaetomorpha* spp is an indicator of the presence of high levels of nutrients in the estuary. It forms a thick mat and smothers the sea grass beds, which die off due to a lack of sunlight.

The mangrove species observed on the islands include *Ceriops tagal* (most dominant species), *Avicennia marina*, *Lumnitzera racemosa*, *Bruguiera gymnorhiza*, *Rhizophora mucronata* and *Rhizophora apiculata*. The latter two species are highly valued in brush pile fisheries.

#### **Land use:**

The estuary is mainly used for estuarine and coastal fisheries, for the anchorage of fishing boats (mainly in the channel) and for conservation purposes (particularly the five mangrove islands). The surroundings are mainly used for human settlements and industries.

#### **Possible changes in land use:**

During the last 50 years nearly 800 ha of the estuary has been reclaimed by people for various activities. Unauthorized settlement expansion towards the intertidal sand shoals in the channel segment of the estuary has had serious impacts upon its hydrology. Haphazard development of piers and landing points for fishing boats has caused alterations in flow patterns and sedimentation.

#### **Hydrological and biophysical values:**

The volume of discharge varies seasonally with rainfall and regulates variations in salinity and nutrient flow to the sea. The dynamicity of the ecosystem is controlled by the tides and river flow. Twice daily tidal changes and biannual flushing by freshwater (through the flooding of Attanaglau Oya during the rainy seasons) takes place within the estuary. The relatively stable period in this wetland coincides with the winter migration of birds, and as a result the ecosystem serves as an important habitat for migratory birds within the wet zone of Sri Lanka.

#### **Social and cultural values:**

Fishing is the primary source of income for over 3,000 families in the 26 villages bordering the estuary. Unemployment and poverty have led to over-exploitation of resources.

#### **Scientific research and monitoring:**

The estuary is an important site for field research and numerous postgraduate and undergraduate studies have been carried out based upon the diverse ecological and socio-economic aspects of the wetland. A study on the fishing gear used in the Negombo estuary conducted in 2004 provides recommendations for the major fishing gear types and fishing practices such as trammel net fishing, cast net fishing, brushpile fishing, stake seine net fishing, gawana del fishery, gok-ren del fishery and crabtraps. It has also become a site for regular visitation by students from Dutch universities.

#### **Conservation education:**

Nearly 10 ha of mangrove area are used for educational purposes while research is conducted in Kadokele by NARA.

#### **Recreation and tourism:**

The scenic beauty of the estuary has attracted a large number of tourist resorts to the area and the hotel capacity has increased from 120 rooms in 1973 to 1,200 rooms in 1987. A boat trip on the estuary is one of the main attractions for tourists.

**Conservation measures taken:**

Negombo estuary was declared a FMA under FARA of 1996 and the Management Plan for the lagoon, which is now being implemented, was approved in 1998. The Negombo estuary management authority was gazetted under the Fisheries Act of 1996 to manage activities within the estuary area. Five mangrove islands (51.3 ha in extent) in Munnakkare area within the estuary were declared as conservation forests in September 2002 under the Forest Ordinance. In 1991, the Greater Colombo Economic Commission (now the Board of Investment) prepared the Master Plan for the Muthurajawela marsh Negombo estuary wetland complex, which was approved by the Government in 1992. In 1994 the CEA prepared a Conservation Management Plan for Negombo estuary and Muthurajawela marsh.

**Conservation measures proposed:**

The conservation management plan produced by the CEA in 1994 recommends certain conservation measures. Additionally, other management plans such as that by the Greater Economic Commission (Board of Investment) and the CCD also provide similar recommendations.

**Disturbances and threats:**

There is a continuing reduction in water depths in the narrow inlet/exit channel of the lagoon as a result of the sedimentation caused by unauthorised landfill and unplanned development along the water front and the upstream areas of the Attanagalu Oya. Since the early 1980s haphazard construction of piers and landing points for large sea going boats in the channel segment of the lagoon have caused alterations in the flow patterns and increased sedimentation. The reduction in the inlet/exit channel directly reduces the tidal exchange and flushing. This in turn decreases the lagoon water quality and causes more frequent algal blooms especially during the dry season. Additionally, there is increased oil pollution from fishing vessels, extensive fishing, felling of mangroves and encroachment of the wetland area. Urgent actions need to be taken to mitigate existing threats.

**Land tenure:**

State owned. There is also privately owned land in the islands.

**Management authority and jurisdiction:**

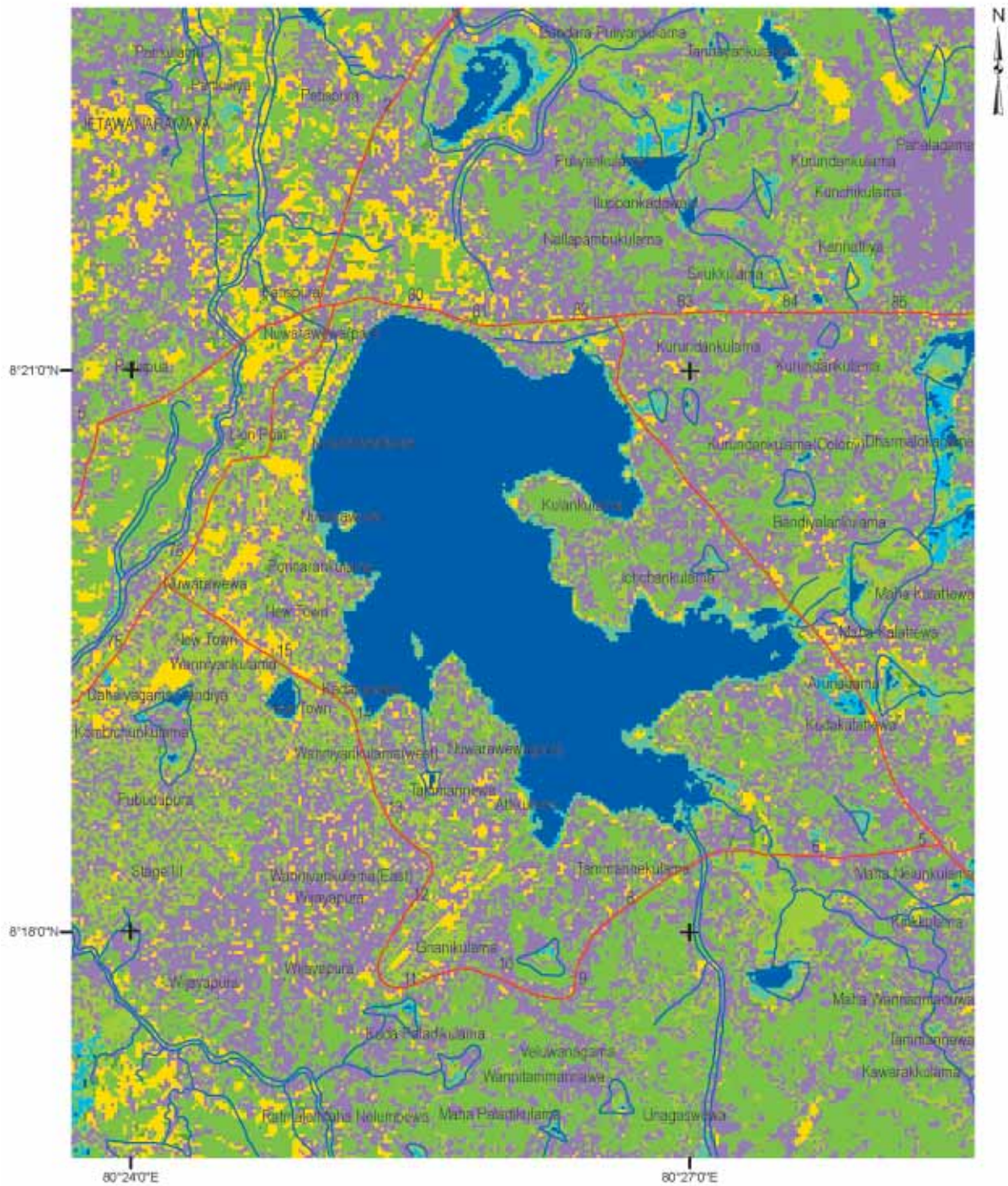
The estuary comes under the purview of the DFAR and the Negombo estuary Management Authority while the conservation forests are managed by the Forest Department.

**References:**

CCD (2005b); CEA/ARCADIS Euroconsult (1994f); IUCN (1996); Jayakody (2004); Kumara et al. (2003); Samarakoon and van Zon (1991)














# Nuwarawewa Tank




0 0.45 0.9 1.8 Kilometers

### Legend

#### Land Cover

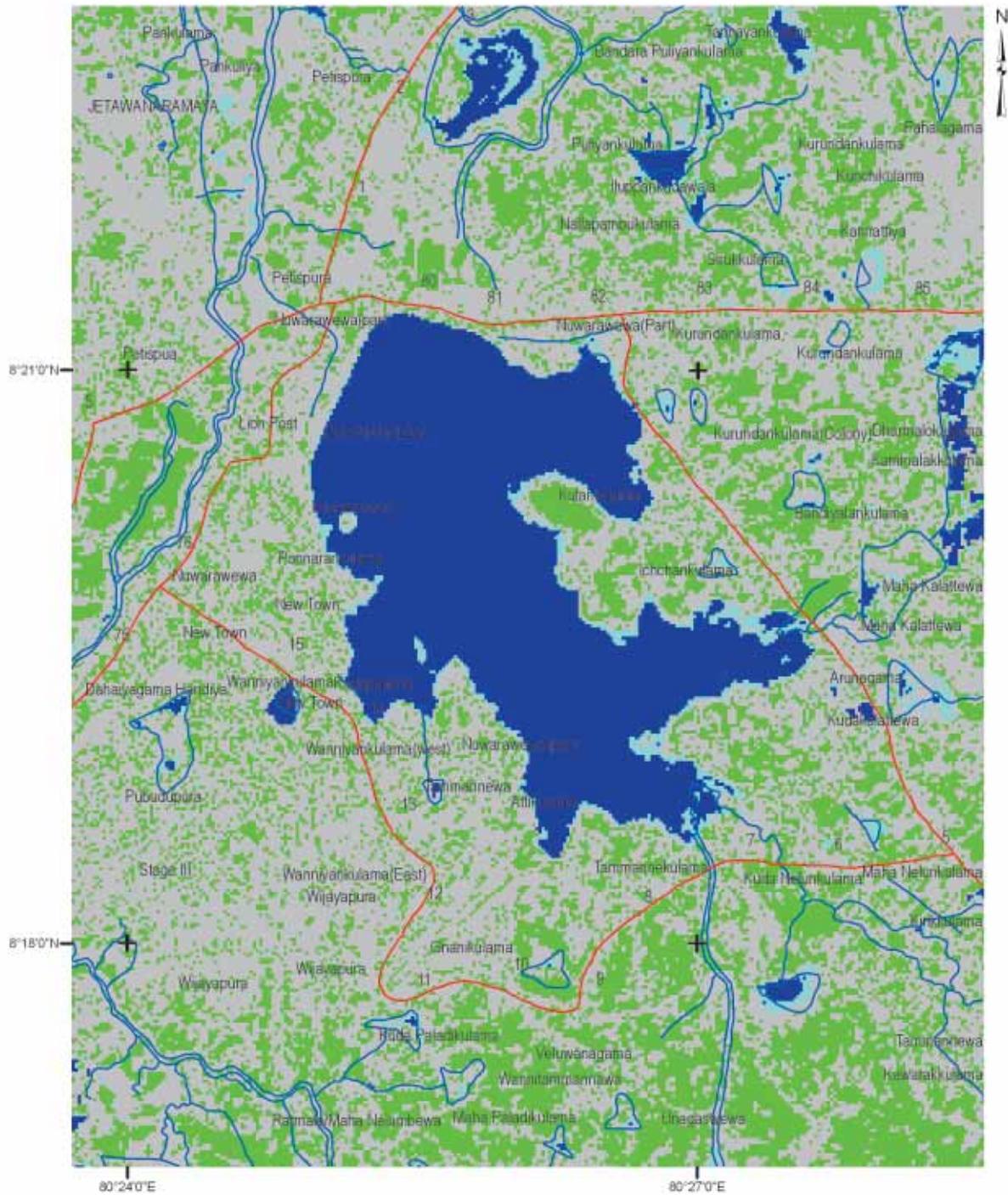
- |   |   |
|---|---|
|  Water with aquatic plants |  Grassland                           |
|  Water (shallow)           |  Natural vegetation (low dense)      |
|  Water (deep)              |  Natural vegetation (moderate dense) |
|  Paddy land                |  Main road                           |
|  Agricultural fragments    |  Waterways                           |
|  Homegardens               |   |

Source: Landsat ETM+ (14 March 2001)  
 Ground Truthing - 2005 August  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Nuwarawewa Tank

## Wetlands based on Ramsar Classification



### Legend

Class Name	
	Water storage areas
	Seasonal Intermittant fresh water marshes/pools
	Irrigated land
	Non-wetlands
	Main road
	Waterways

Source: Landsat ETM+ (14 March 2001)  
 Ground Truthing - 2005 August  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Nuwarawewa Tank

## Location:

8° 23' 0 N and 80° 24' 0 E to 80° 16' 30 N and 80° 28' 30; 926727 N and 433943 E to 913818 N and 441265 E; 206 km north-east of Colombo in the Anuradhapura District, of the North-central Province.

## Area:

1, 214 ha at full supply level

## Altitude:

100 m above sea level

## Overview:

Nuwarawewa is a large, ancient, freshwater reservoir that was constructed in the first century BC, and forms a part of an interconnected cascading system of tanks located in the Malwatu Oya catchment of the upper Aruvi Aru basin. The multipurpose reservoir is used mainly for irrigated paddy cultivation, though it also supplies water for domestic needs. The tank is located within the ancient city of Anuradhapura, which is an area of high archeological, historical and religious importance.

## Physical features:

The storage capacity of this reservoir is  $44.41 \times 10^6 \text{m}^3$  and it falls within the Malwatu Oya catchment within the dry zone of Sri Lanka. The area receives rainfall mainly during the northeast monsoon from September – November, with an average annual rainfall of 1,219 mm. Mean monthly temperature is around 27.9°C while the mean monthly relative humidity varies from 60% (March) to 80% (December). During the southwest monsoon period, strong dry winds constantly blow over the plains, making the area very dry. The soil of the areas consists of reddish-brown earths and low humic gley soils typical of the northern lowland region, with some alluvial soils found in the river valleys.

## Ecological features:

The natural vegetation can be subdivided into aquatic vegetation types associated with the tank, the river and the upland woodland vegetation. In upland areas there are extensive chena land and associated patches of scrubland in abandoned chena. In particular, the patches of chena to the east of Nuwarawewa may have some added value as a corridor for wildlife accessing the waters of the tank during the dry season. The only substantial areas of treed landscape are within the blocks of forest plantation (predominantly teak, with some Eucalyptus). The phytoplankton biomass is dominated by Cyanophyceae of which *Synedra* is the most common. Among the zooplankton, Rotifers are the most commonly recorded. 36 fish species, 5 amphibians (although older records indicate 17), 36 reptiles, 41 mammals and 152 bird species have been recorded from the area.

## Noteworthy fauna:

The freshwater fishes are dominated by exotic species such as *Oreochromis mossambicus* and *Labeo rohita*, which are commercially important. *Clarias brachysoma* and *Puntius singhala* are two noteworthy endemic species. The large, open water body is an ideal habitat for water birds such as *Pelecanus philippensis*, *Anhinga melanogaster*, *Phalacrocorax fuscicollis* and *Haliaeetus leucogaster*. The mammals

associated with the tank and its adjacent forest areas include *Macaca sinica*, *Paradoxurus zeylonensis*, *Lutra lutra*, *Herpestes vitticollis* and *Prionailurus viverrinus*.

**Noteworthy flora:**

In the dry mixed evergreen forests areas adjacent to the tank, general dry zone plant communities can be observed. The noteworthy flora include endemics such as *Canthium dicoccum*, *Ochna obtusata*, *Alangium salviifolium*, *Mixeomwulum minurum*, *Drypetes lanceolata*, *Mangifera zeylanica* and *Gymnosporia emarginata*.

**Land use:**

The water is mainly used for irrigated paddy cultivation and domestic purposes. Most of the land available in the tank vicinity is used for paddy cultivation, human settlements, and home gardens.

**Possible changes in land use:**

Information not available

**Hydrological and biophysical values:**

The reservoir receives water during the main rainy season. It is stored and released as necessary for agricultural purposes. The water in the reservoir is also important for the pipe water supply to the city of Anuradhapura and as a source of bathing water for pilgrims.

**Social and cultural values:**

There are three types of communities in the Nuwarawewa irrigation scheme: old villagers with old land, new settlers and middle class families settled in the area by the government. There are 700 families with entitlement to irrigated lands under the scheme. Anuradhapura is rich in history as it was the first metropolis of the country, and was founded by Anuradha in the sixth century BC. In ancient chronicles Nuwarawewa is referred to as Nagara Vapi (city reservoir), and was probably constructed by king Watta Gamini Abhaya in the first century BC.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

Anuradhapura and its environs to which Nuwarawewa belong are popular tourist destinations due to the rich cultural and historical value of the area. The Nuwarawewa Rest house is located on the banks of the reservoir.

**Conservation measures taken:**

In 1994, the CEA published a wetland site report and conservation management plan for the tanks in the Anuradhapura area, which included the Nuwarwewa tank.



**Conservation measures proposed:**

Conservation measures have been proposed in the conservation management plan produced by the CEA.

**Disturbances and threats:**

As the tank is located in a highly populated area, encroachment of the wetland is evident. Poor land use practices and maintenance of the canal system have led to sedimentation of the canals. The communities living in the vicinity are faced with problems such as land fragmentation, unemployment and issues related to the marketing of paddy. During the heavy rains the sewage tanks of hotels and guesthouses located near the tank overflow and cause water pollution. Additionally, bathing activities pollute the tank waters.

**Land tenure:**

State owned

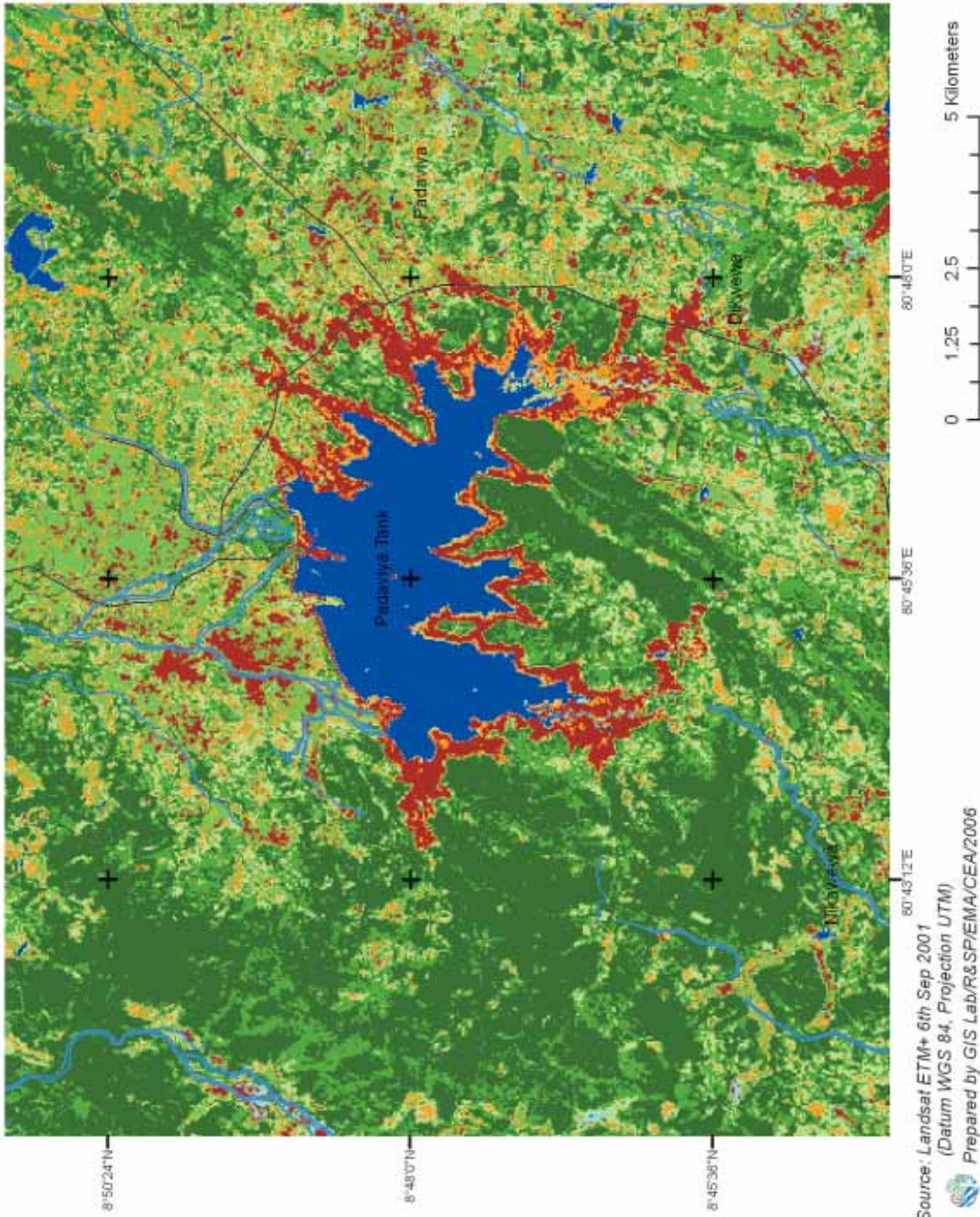
**Management authority and jurisdiction:**

Irrigation Department

**References:**

CEA/ARCADIS Euroconsult (1994b); Loeve et al. (2003)

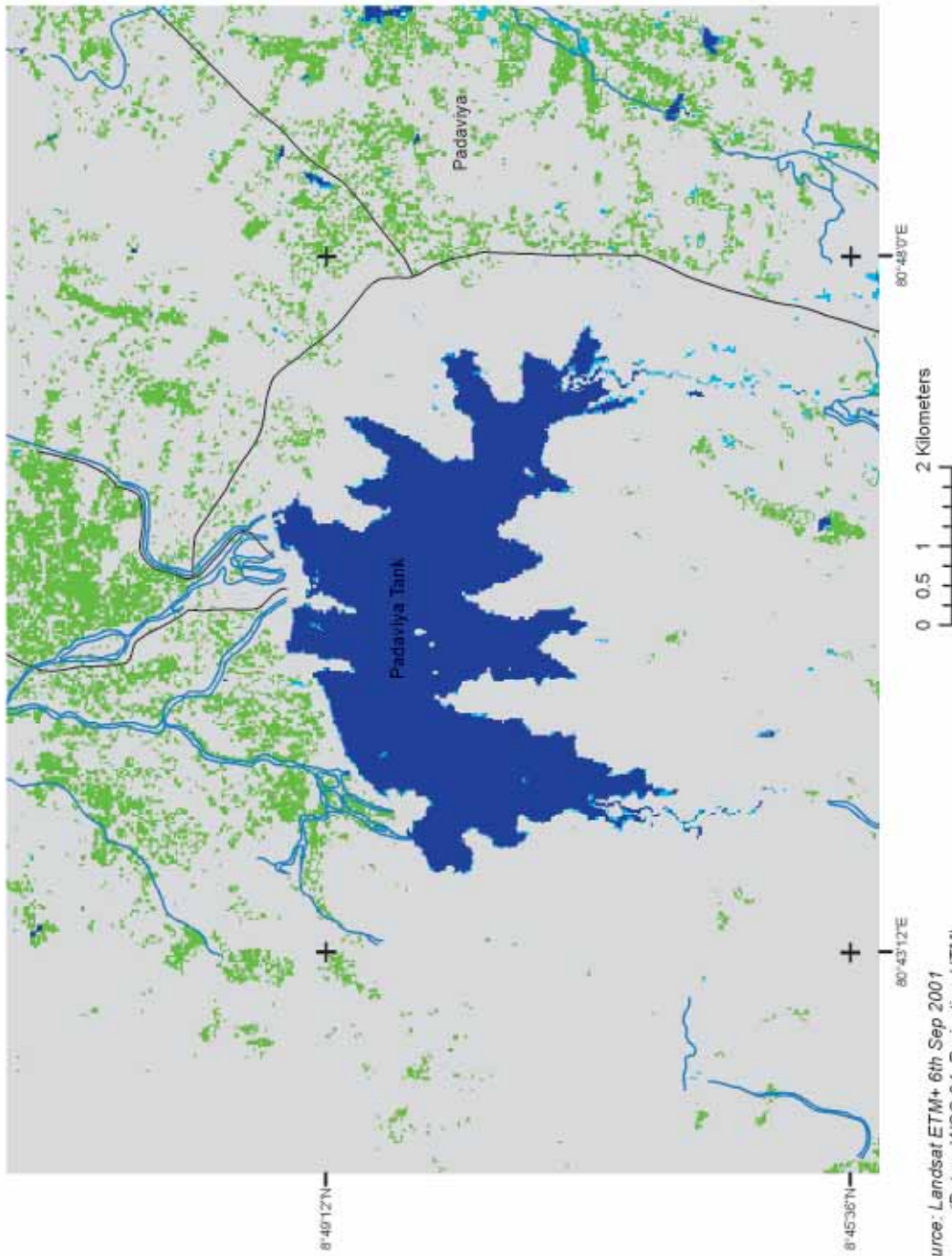
# Padaviya Tank



Source: Landsat ETM+ 6th Sep 2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Padaviya Tank Wetlands based on Ramsar Classification



Source: Landsat ETM+ 6th Sep 2001  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Padaviya Tank

## Location:

8° 52' 0 N and 80° 40' 0 E to 8° 38' 24 N and 80° 55' 0 E; 980128 N and 463348 E to 954316 N and 490831 E; between 30-35 km northeast of Kebethigollawa in the Anuradhapura District, of the North-central Province.

## Area:

2,347 ha

## Altitude:

Approximately 75 m

## Overview:

Padaviya is a recently restored irrigation tank with a maximum depth of 6.7m. The tank is bunded along its northern shore, and is fed by the Makunu and Mora Oyas (seasonal streams) entering in the south. The lake is permanent, but subject to wide seasonal fluctuations in water level with large portions drying out during the dry season. This area is considered an IBA by BirdLife International.

## Physical features:

This site is located in the dry zone of Sri Lanka, which receives a mean annual rainfall of 1,500 – 2,000 mm, and a mean annual temperature of 28°C. The pH of the tank is 7.5.

## Ecological features:

The aquatic vegetation consists of rooted and floating macrophytes. There are extensive grassland areas especially during the dry season when the water line recedes. These areas act as grazing areas for livestock. The natural vegetation around the tank comprises of disturbed dry mixed evergreen forests. There are extensive chena lands around the tank. *Tectona grandis* plantation patches can also be observed in certain areas.

## Noteworthy fauna:

The freshwater fish fauna of the Padaviya tank is dominated by exotic species (mainly *Oreochromis* spp.), while endemics such as *Puntius singhala* and *Clarias brachysoma* have been recorded in the past. Noteworthy reptiles include *Crocodylus palustris*, *Geochelone elegans*, *Lissemys punctata* and *Melanochelys trijuga*. The Padaviya tank, being a large water body is an ideal habitat for water birds; *Pelecanus philippensis*, *Ciconia episcopus*, *Leptoptilos javanicus* and *Mycteria leucocephala* are among the noteworthy species.

## Noteworthy flora:

Some noteworthy species that can be seen in the degraded dry zone forest areas adjacent to the tank are *Manilkara hexandra* and *Diospyros* spp. The riparian area of the tank consists of species such as *Terminalia arjuna* and *Memecylon* spp.



**Land use:**

The tank water is used for irrigation and domestic use while the surrounding area is mainly used for livestock management and paddy and chena cultivation.

**Possible changes in land use:**

Allocation of more land to irrigated agriculture and chena cultivation, which would in turn lead to the reduction of the existing natural vegetation.

**Hydrological and biophysical values:**

The tank is an important water storage facility. The human settlements located in the vicinity are dependent on water from this source.

**Social and cultural values:**

This tank was originally constructed by king Mahasen in the 3<sup>rd</sup> century AD and restored by King Parakramabahu in the 12<sup>th</sup> century AD to enable agricultural activities in the area. This tank also supports a small-scale fishing community and provides water for irrigation activities in the area.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

The YZA carried out environmental awareness on biodiversity conservation and capacity building programmes for school children in the Padaviya area in 2004.

**Recreation and tourism:**

Padaviya tank is a popular place for bird watchers especially during the migratory season.

**Conservation measures taken:**

In 1963, this area was declared a Sanctuary under the FFPO. In 2005, the tank area was declared a FMA under the FARA.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Over fishing, spread of invasive species such as *Lantana camara* and habitat degradation and modification caused by overgrazing. Allocation of more land around the tank for chena cultivation is a growing concern.

**Land tenure:**

The tank is state-owned while the surroundings are partly state-owned and partly privately owned.

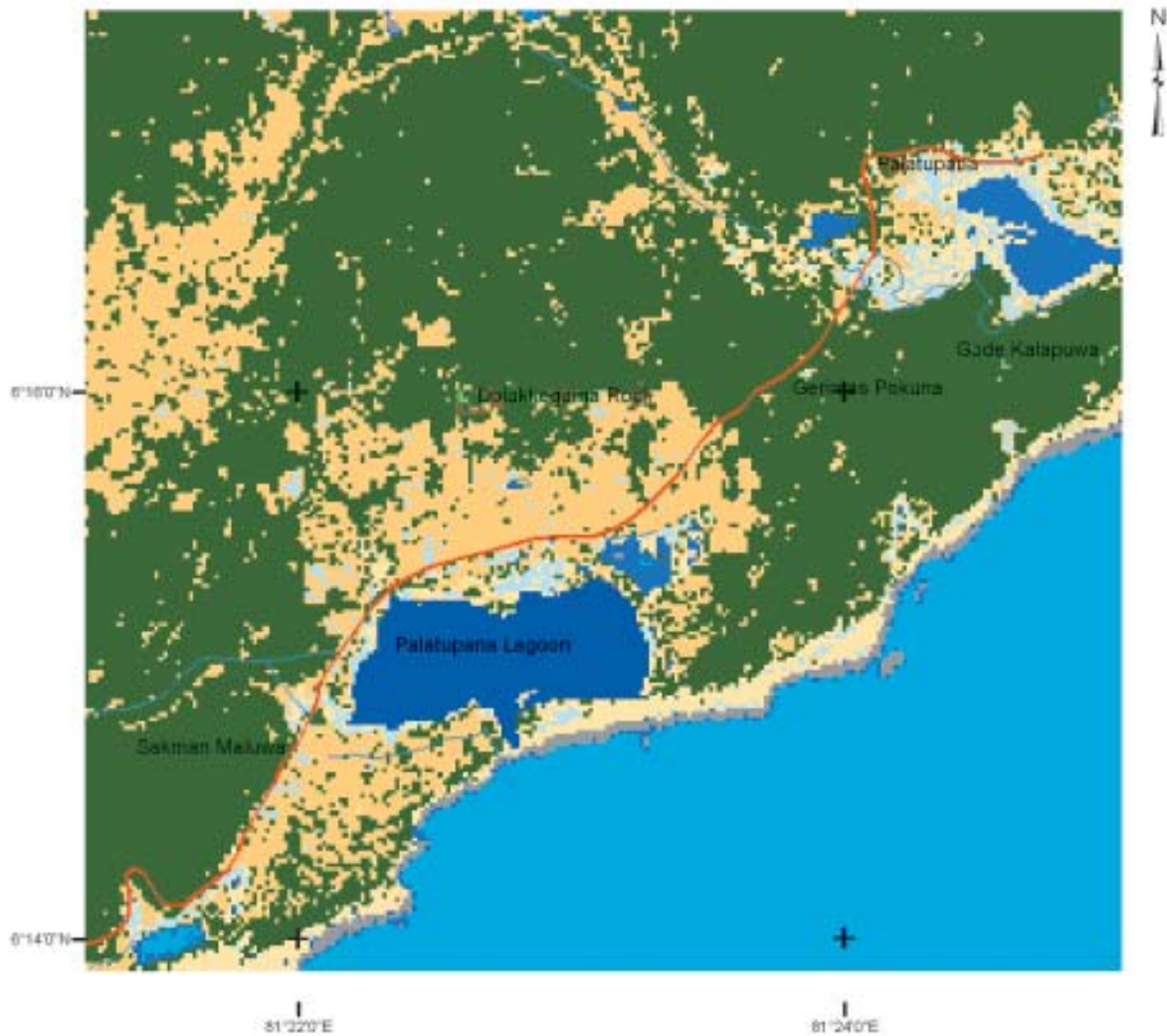
**Management authority and jurisdiction:**

The Sanctuary is under the purview of the DWC, while fisheries are managed by the DFAR

**References:**

BirdLife International (2005); Kotagama (1989)

# Palatupana Lagoon



0 0.5 1 2 Kilometers

## Legend

### Land Cover

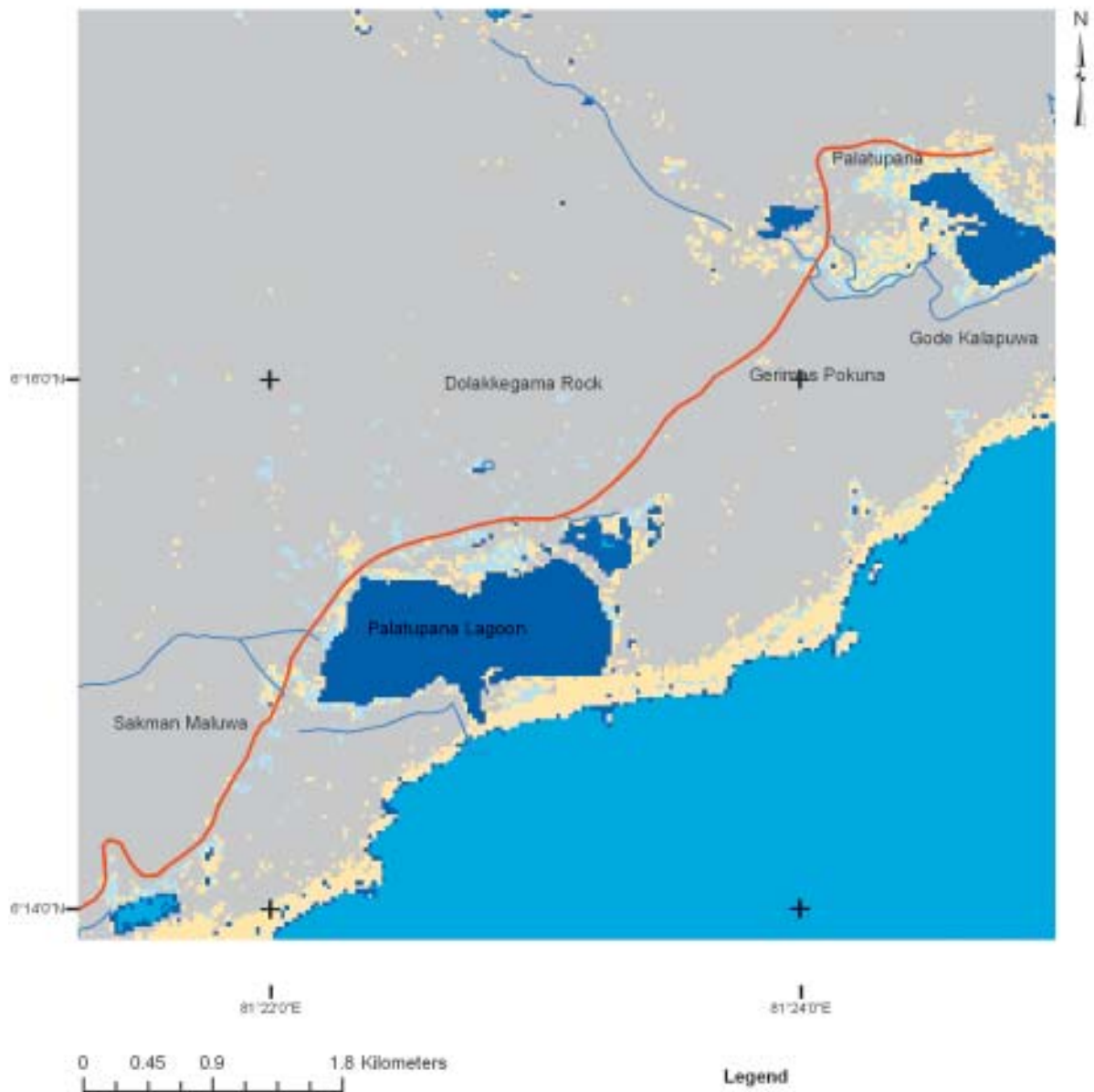
- |   |                   |   |                    |
|---|-------------------|---|--------------------|
|  | Sea               |  | Natural vegetation |
|  | Lagoon            |  | Main road          |
|  | Inland freshwater |  | Waterways          |
|  | Sand              |   |                    |
|  | Marshy land       |   |                    |
|  | Scrubland         |   |                    |

Source: Landsat ETM+ 28th September 2000  
Ground Truthing - Google Earth  
(Datum WGS 84, Projection UTM)




Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Palatupana Lagoon Wetlands based on Ramsar Classifications



### Class Name

- |   |  |   |           |
|---|--|---|-----------|
|  | Sea  |  | Waterways |
|  | Coastal brackish/saline lagoons                              |  | Main road |
|  | Water storage areas  |   |           |
|  | Intertidal mud, sand or salt flats                           |   |           |
|  | Seasonal/intermittent saline/brackish/alkaline marshes/pools |   |           |
|  | Non-wetlands   |   |           |

Source: Landsat ETM+ 28th September 2000  
 Ground Truthing - Google Earth  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Palatupana Lagoon

## Location:

6° 18' 0 N and 81° 21' 0 E to 6° 14' 0 N and 81° 25' 0 E; 696380 N and 538713 E to 689016 N and 546093 E; on the south coast between Kirinda and Yala National Park, in the Hambantota District, of the Southern Province.

## Area:

160 ha (which can increase up to 190ha during the rainy season) with a catchment area of 2,200 ha.

## Altitude:

0.5 – 1.0 m

## Overview:

A small shallow brackish to saline lagoon used mainly for salt production. Seawater enters mainly by seepage but also over the sand. It opens to the sea through a narrow dune ridge and is surrounded by low scrub woodland, chena plots and isolated rock outcrops. This saltern also serves as an important habitat for a large variety of waders, particularly during the migratory season.

## Physical features:

The lagoon has been created by deposition of sediments between the eroded inland peneplain and a barrier of coastal rock outcrops, a process likely to have initiated during the Miocene era. The lagoon is mainly fed by rain, run-off and a few perennial streams, usually leading to maximum water levels in the rainy season. In turn, the lagoon drains into the sea through a natural channel, approximately 50m wide and 500m in length, which is blocked at the seaward end by a wave-formed barrier dune. Located within the dry zone of the country the area receives an annual rainfall of 950 mm, mainly during the October - December period. The annual temperature is around 27°C, which can exceed 33°C during the drier months. In recent years, lagoon flood levels have been inadequate to breach the seaward sand barrier, and therefore the Lanka Salt Company pumps seawater in during the dry period. The salinity levels within the lagoon can increase up to 35 ppt during the drier months due to high evaporation rates and the restricted freshwater influx.

## Ecological features:

Several vegetation types are distinguishable in the lagoon and its environs particularly the salt-tolerant phytoplankton of the lagoon, the dune vegetation dominated by *Spinifex littoreus* and the chena influenced scrub forests with relatively undisturbed woodland. Due to the high salinity fluctuations, the open and shallow waters of the lagoon support no higher plant species. As such, the aquatic flora is dominated by phytoplankton such as *Anabaena*, *Merismopedia*, *Nostoc*, *Gomphosphaeria*, *Gloeotrichila* and *Oscillatoria* (Cyanophyceae), and diatoms such as *Navucula*, *Pinnularia* and *Tabellaria*. These planktonic organisms are scarce within the embanked seawater compartments of the Lanka salt company, but more abundant in the un-impounded, less saline areas of the lagoon. The vegetation in the immediate surroundings of the lagoon is turf dominated by *Cynodon dactylon*, *Cyperus rotundus* and *Fimbristylis spp*, all of which are in a heavily grazed state. Beyond the high water line, on the upland areas surrounding the lagoon, the vegetation is dominated by thorn-scrub communities, which are remnants of the original tropical thorn forests. 9 species of brackish to marine fish are present in varying degrees. 14 reptile species, 97 bird species and 13 mammals have been recorded.



**Noteworthy fauna:**

Many species of resident and migratory water birds use these two shallow lagoons as feeding sites. These include cormorants (*Phalacrocorax niger*, *P. fuscicollis*), large water birds (*Ardea cinerea*, *Threskiornis melanocephalus*, *Anastomus oscitans*, *Pelecanus philippensis*), medium sized waders (*Tringa* spp.) and small waders (*Charadrius* spp.). Flocks of the Greater Flamingo (*Phoenicopterus ruber*) also visit this lagoon occasionally. Three species of globally endangered marine turtles (*Dermochelys coriacea*, *Lepidochelys olivacea*, *Chelonia mydas*) visit the beach adjoining the lagoon for nesting. Locally declining reptiles such as *Geochelone elegans* and *Eryx conicus* inhabit the scrubland and sand dune habitats bordering the lagoon.

**Noteworthy flora:**

Phytoplankton species recorded in the lagoon include *Anabaena*, *Merismopedia*, *Nostoc*, *Gomphosphaeria*, *Gloeotrichila* and *Oscillatoria* (Cyanophyceae), and diatoms such as *Navucula*, *Pinnularia* and *Tabellaria*. The scrubland area around the lagoon is dominated by plant species such as *Acacia planifrons* and *Cassia auriculata*, and occasionally occurring species such as *Asystasia ganerica*, *Azadirachta indica* etc. The sand dunes and sandy seashore adjoining the lagoon support a sparse *Spinifex littoreus* dominated vegetation, with associated pioneering colonists such as *Launaea sarmentosa*, *Ipomeoa pescaprae* and *Hydrophylax maritima*.

**Land use:**

70% of the lagoon is used for salt production. There is an existing *Artemia* rearing programme established by the Lanka Salt Company. 51% of the catchment is covered with scrub vegetation and 34% with chena cultivation while 7% is under forest cover. Livestock grazing takes place in the area surrounding the lagoon. Fishing in the Lewaya is completely banned (imposed by the salt company) and agriculture is mostly in the form of chena cultivation. Vegetation around open areas (e.g. lagoon) indicates that grazing pressure is high and exploitation of the forest probably does occur. Salt production is in the order of 6-7,000 tonnes per annum, which is equivalent to about half the capacity of Bundala Lewaya and only 10% of what Maha Lewaya produces annually.

**Possible changes in land use:**

Further irrigation and human settlement expansions under the Kirindi Oya Irrigation Scheme (KOISP) will lead to degradation and depletion of the forest cover and deterioration of the water quality.

**Hydrological and biophysical values:**

Information not available

**Social and cultural values:**

With the exception of the staff of the Lanka Salt Company, no human settlements are found within the immediate surroundings of the lagoon. In the upland area, there are several human settlements established under the KOISP. Seasonal beach seine and lobster fisheries take place in the near shore area. The history of the area spans back to 504 B.C. and the only site of recorded historical significance within the vicinity of the wetland is the Nimalawa hermitage, which is reputed to have been established during the reign of King Kawanthissa.

**Scientific research and monitoring:**

The University of Kelaniya conducted research on generating electricity from salt water. In 1999 the fisheries corporation conducted a study on the aquatic species of the lagoon. In 2002 DWC-FOGSL-Jetwing Company conducted a bird-ringing project at the Palatupana saltern. The CBC has been conducting mid-winter water bird counts at the lagoon annually since 1991.

**Conservation education:**

Information not available

**Recreation and tourism:**

Around 10,000 local and foreign tourists visit the area annually for bird watching, especially during the migratory season. There are two bungalows in the wetland area. One belongs to Lanka Salt Ltd., which operates a staff bungalow on a commercial basis and therefore takes public bookings while the other belonging to the WNPS is operated as a guesthouse for its membership. The latter is situated in the fringing dune woodland area, east of the lagoon.

**Conservation measures taken:**

Part of the catchment falls within the boundaries of the Nimalawa Sanctuary, established in 1993. The lagoon has been accorded considerable protection by the Salt Company who strictly limits access to resources in the area. The WNPS initiated a turtle hatchery programme in 1978 to 1987. The programme was discontinued due to a decrease in turtle nesting. In 1994 the CEA produced a wetland site report and conservation management plan for this site.

**Conservation measures proposed:**

Certain measures have been proposed in the conservation management plan produced by the CEA.

**Disturbances and threats:**

Increasing the salt production of the Lewaya by heightening the saltpan bunds (which in turn would cause further loss to the lagoon's ecological significance), irrigation and settlement expansion of the KOISP scheme (further degradation of forest cover and wildlife habitats, and disturbance/poaching of wildlife), and establishment of a tourist resort (increased disturbance to vegetation and wildlife). Due to the large number of cattle, buffaloes and goats, the lagoon is contaminated with animal waste. The spread of the invasive alien *Prosopis juliflora* and *Opuntia dillennii* around the lagoon could pose problems in the future.

**Land tenure:**

The largest private landowner is Lanka Salt Ltd. (entire Lewaya basin). Generally state land apart from a few small privately owned plots.

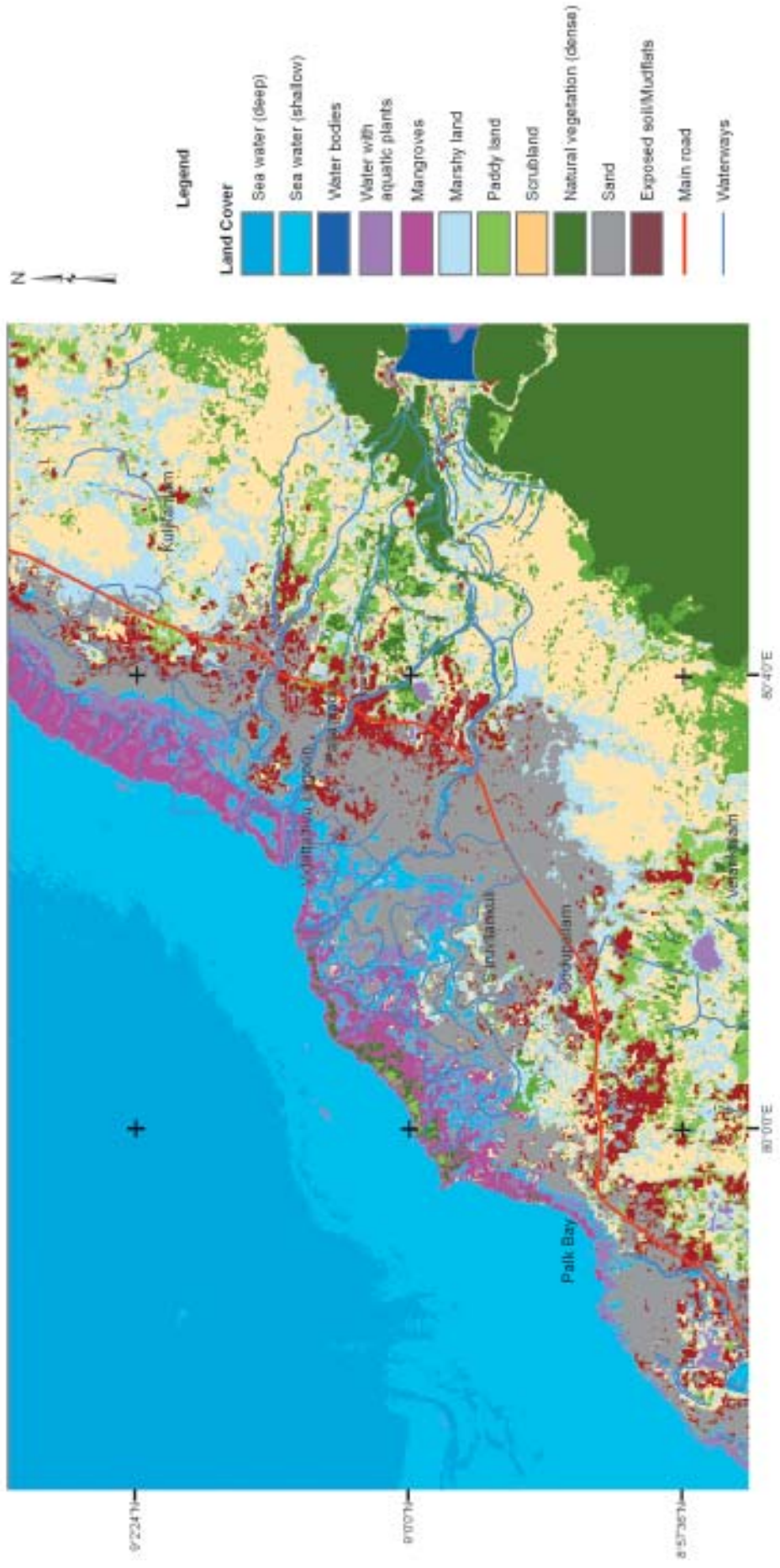
**Management authority and jurisdiction:**

The Nimalawa sanctuary area falls under the jurisdiction of the DWC.

**References:**

CEA/ARCADIS Euroconsult (1994h)

# Palk Bay-Vidattaitivu Lagoon



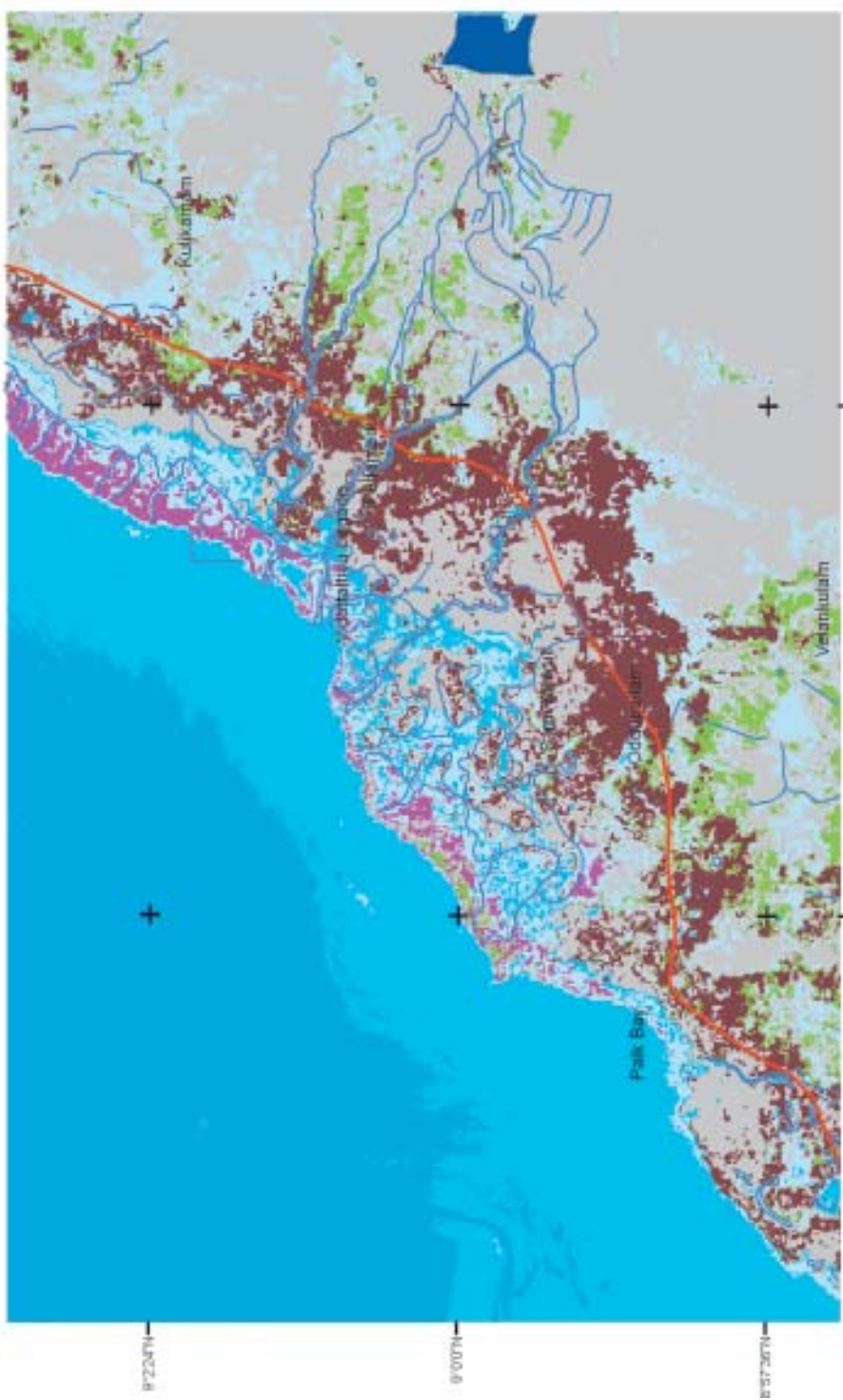
## Legend

- | Land Cover         |                            |
|--------------------|----------------------------|
| [Dark Blue Box]    | Sea water (deep)           |
| [Light Blue Box]   | Sea water (shallow)        |
| [Dark Purple Box]  | Water bodies               |
| [Light Purple Box] | Water with aquatic plants  |
| [Pink Box]         | Mangroves                  |
| [Light Blue Box]   | Marshy land                |
| [Light Green Box]  | Paddy land                 |
| [Yellow Box]       | Scrubland                  |
| [Dark Green Box]   | Natural vegetation (dense) |
| [Grey Box]         | Sand                       |
| [Dark Red Box]     | Exposed soil/Mudflats      |
| [Red Line]         | Main road                  |
| [Blue Line]        | Waterways                  |

Source: Landsat ETM+ 6th February 1988  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/RS/EM/CEA/2005



# Palk Bay-Vidattaitivu Lagoon Wetlands based on Ramsar Classification



**Legend**

Class Name	Color
Sea water (deep)	Dark Blue
Sea water (shallow)	Light Blue
Water storage areas	Dark Purple
Intertidal forested wetlands	Light Purple
Seasonal/intermittent saline/brackish/alkaline marshes/pools	Light Blue-Grey
Irrigated land	Green
Intertidal mud, sand or salt flats	Orange
Non-wetlands	Grey
Main road	Red
Waterways	Blue

0 1 2 4 Kilometers

Source: Landsat ETM+ 6th February 1988  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/RIS/SP/EMA/CEA/2006





# Palk Bay and Vidattaitivu Lagoon

## Location:

9° 0' 0 N and 79° 55' 0 E to 8° 58' 0 N and 80° 0' 0 E; 995028 N and 380920 E to 991316 N and 390071 E; north of Mannar up to Devils Point, in the Mannar and Jaffna Districts, of the Northern Province.

## Area:

Palk Bay and the adjoining Palk Strait consist of an area of around 1,700,000 ha while Vidattaitivu Lagoon consists of 1,300 ha.

## Altitude:

Sea level

## Overview:

Palk Bay is a semi-enclosed shallow water body that separates Sri Lanka from India and opens on the eastern side into the Bay of Bengal and the western side into the Gulf of Mannar. It is characterised by a number of coastal wetland habitats such as inter-tidal mudflats, sand banks and mangroves along its shores, extending into the shallow brackish water habitat of Vidattaitivu Lagoon.

## Physical features:

On the western side along the Gulf of Mannar, it is interrupted by Pamban Island and minor islands and sand bars of Adams Bridge between Pamban Island and Mannar Island. Palk Bay is deeper towards the eastern side with an average depth of 9.35m and a maximum depth of 13m while on the western side the average depth is only around 1m with a maximum depth of 7 m near the Pamban Pass. The Jaffna Lagoon opens into the north-western part of the Bay. Several small islands and sand cays are found around Devils Point. Salinity varies between 32.8 ppt to 29.4 ppt depending on water movement from the Bay of Bengal and Gulf of Mannar, and freshwater inflow from a few seasonal streams during the northeast monsoon from October to February. The shoreline of the Jaffna Peninsula is characterised by fossilized limestone rocks, while sand, mud and isolated rocks are found around Keerimalai and the islands, and the mainland south to Mannar. Palk Bay is situated in the low country dry semi- arid zone with annual rainfall between 500 – 775 mm. Average temperature is around 27° C.

## Ecological features:

Coastal areas around Palk Bay are characterized by shallow depths and generally turbid conditions, giving rise to numerous coastal wetlands. The coastline is dominated by mangroves and inter-tidal mud flats, while surrounding areas are dominated by dry scrub forests. Seagrass habitats are also known to exist within Palk Bay. The shallow depths and muddy substrate support prawns and small fish species such as leiognathids, engraulids and clupeids, while more open ocean species such as carangids, sphyraenids and scombrids are found towards Mannar Island. The famous Mannar pearl banks are also located within Palk Bay. Mangrove areas are important habitats for waterbirds.

**Noteworthy fauna:**

Commercial species belonging to the families Carangidae, Sphyraenidae and Scombridae are found towards the southern part towards Mannar. Commercially exploited pearl oysters, sea cucumbers and chanks are also found in abundance in the Bay.

**Noteworthy flora:**

Predominantly mangroves, with seagrasses in sub-tidal areas.

**Land use:**

Fisheries, particularly prawn fisheries and beach seines, as well as the collection of chanks and sea cucumbers are the major activities carried out in the area.

**Possible changes in land use:**

Fisheries are currently restricted due to the security situation and would increase if the security situation improves in the area. Shoreline vegetation such as mangroves is likely to be cleared for security reasons as well as for settlements and wood due to the large numbers of displaced people around Mannar.

**Hydrological and biophysical values:**

The semi-enclosed nature of the Bay results in fairly poor mixing of water and separates the Bay of Bengal and Gulf of Mannar as two distinct marine regions. The relatively low energy conditions and shallow depths facilitate sediment deposition resulting in the build up of numerous sand banks and cays.

**Social and cultural values:**

Traditional beach seine fisheries have been important livelihoods of coastal communities, particularly around Mannar. There are numerous sites of historical importance such as ancient ports and both Hindu and Buddhist temples.

**Scientific research and monitoring:**

Some studies have been undertaken by the Jaffna University and the DFAR prior to the conflict situation. NARA has undertaken some studies of the physical oceanography and biology of the area.

**Conservation education:**

Information not available

**Recreation and tourism:**

Information not available

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Extensive bottom trawling, particularly by Indian fishing vessels that enter into Sri Lankan waters is leading to extensive exploitation of fisheries resources and possible habitat degradation. Clearing of shoreline vegetation for security reasons is also carried out. The development of the Sethusamudram Ship Canal is also likely to impact the ocean circulation, physical conditions and biological cycles within the Palk Bay area.

**Land tenure:**

State owned

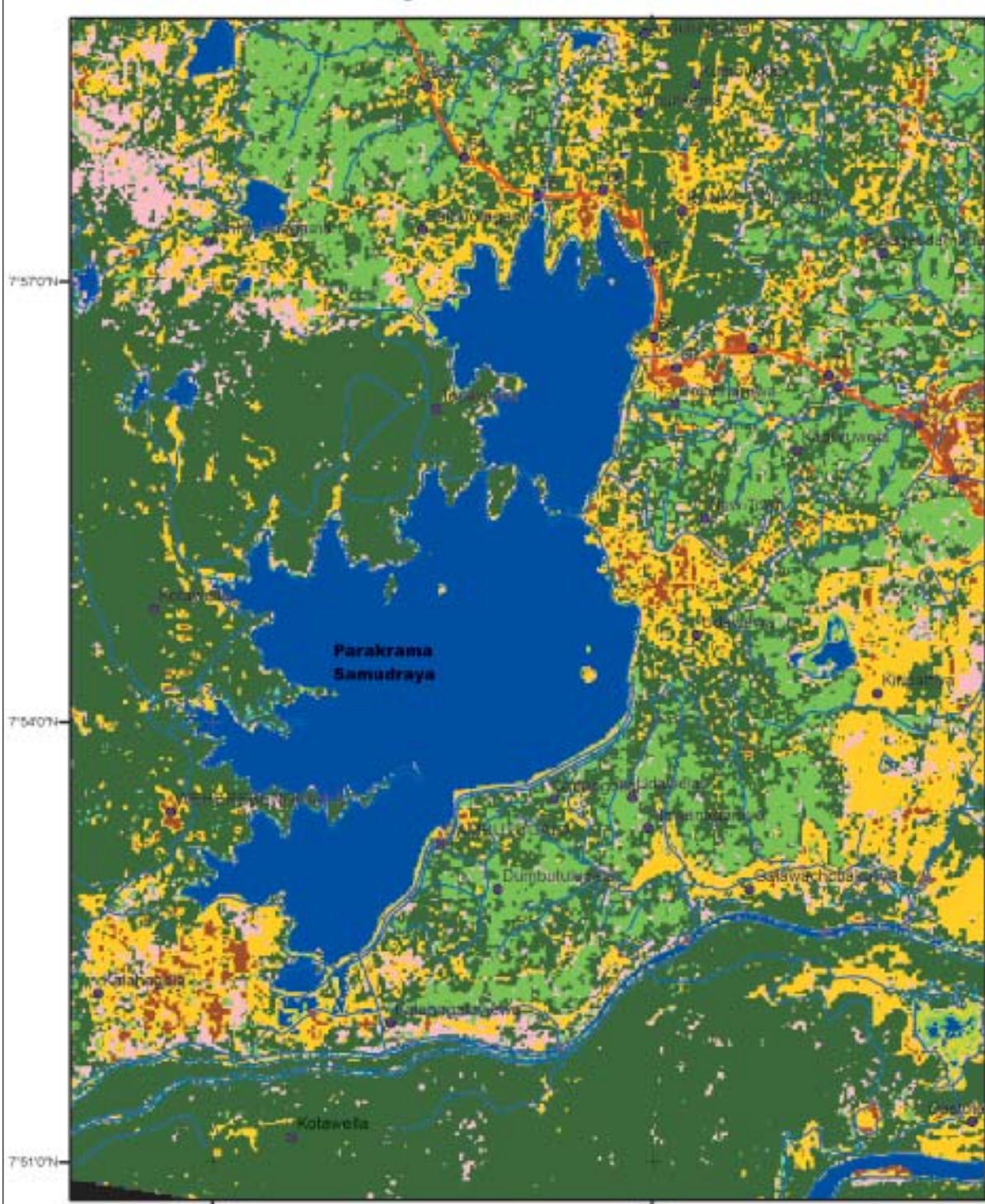
**Management authority and jurisdiction:**

DFAR for managing fisheries, and the CCD for management of the coastal zone.

**References:**

Bambaradeniya et al. (2005); Kotagama et al. (1989); Sivalingam (2005)

# Parakrama Samudraya



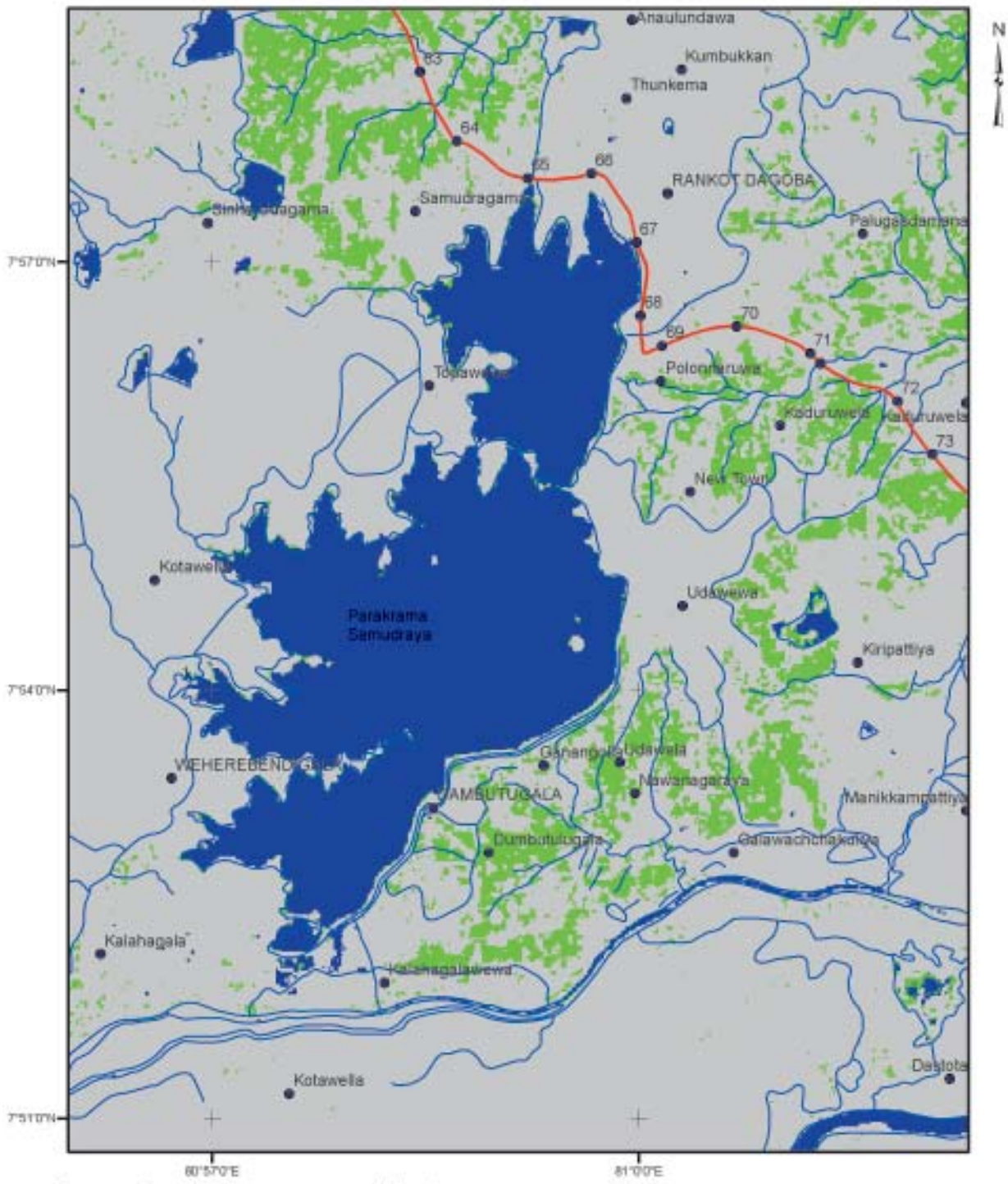
Source: Landsat ETM+ ( 06 Sep 2001)  
 Ground Truthing - Sep 2005 by CEA  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

**Legend**

Water	Grassland
Natural vegetation (high moisture)	Natural vegetation
Paddy land	Barren land (exposed soil)
Agricultural fragments	Main road
Homegardens	Waterways








# Parakrama Samudraya Wetlands based on Ramsar Classification



Source: Landsat ETM+ ( 06 Sep 2001)  
Ground Truthing - Sep 2005 by CEA  
Prepared by GIS Lab/R&SP/EMA/CEA/2006

**Legend**

**Class Name**

 Water storage areas	 Main road
 Irrigated land	 Waterways
 Non-wetlands	

# Parakrama Samudraya

## Location:

7° 59' 0 N and 80° 56' 0 E to 7° 51' 0 N and 81° 2' 30 E; 882456 N and 492653 E to 867715 N and 503675 E; 216 km east of Colombo in the Polonnaruwa District, of the North-central Province.

## Area:

6,275 ha at full supply level

## Altitude:

58.5 m above sea level

## Overview:

Parakrama Samudraya is an ancient, large, shallow, man-made impoundment created for irrigation purposes by King Parakrama Bahu the Great (1153 – 1186 AD) by damming the Amban Ganga. The present reservoir is a result of the three original reservoirs being connected. The reservoir is divided into three basins by chains of islands and even at high water levels these three basins maintain a distinct limnological identity. It has an extensive littoral fringe and large areas that are less than 1m in depth, which therefore provide important habitat for freshwater fishes.

## Physical features:

The reservoir has a catchment of 71.68 km<sup>2</sup>. The main water supply to it is through a channel from the Amban Ganga. The inflow is regulated at the anicut at Angammedilla. Average depth at maximum water level is 5 m while maximum depth is 12 m. The reservoir is situated in the dry zone of the country and the monthly mean temperature is around 29° C. The mean annual rainfall is around 1,850 mm with the maximum rainfall being recorded in December. The maximum monthly mean humidity is recorded in December (85%) and the lowest in August (70%).

## Ecological features:

The water level of the reservoir shows strong seasonal fluctuations and therefore the ecological character of the marginal habitats also changes continuously. During the dry season these areas are covered with terrestrial vegetation. During periods of low water level submerged macrophytes such as *Ceratophyllum* sp. can be observed in the reservoir. The phytoplankton assemblage (84 species) in the water body is characterized by green algae (30 species), blue-green algae (22 species), and diatoms and the abundance of species varies according to the amount of rainfall experienced. Biomass is dominated by *Melosira granulata*, *Anabaenopsis raciborskii* and *Mogeotia* sp. The zooplankton of Parakrama Samudraya is dominated by rotifers (32 species), while 19 species of Cladocera and 3 species of Cyclopoida, 2 species of Calanoida, and 1 species of Harpacticoida have also been recorded. About 23 fish species have been documented in the water body.

## Noteworthy fauna:

The fish fauna of the reservoir is dominated by exotic fish species; *Oreochromis mossambicus*, *Aristichthys nobilis*, *Cirrhinus cirrhosus* and *Labeo rohita* which are among the most commonly harvested food fish species. The indigenous fish comprise of *Puntius* spp, *Rasbora* spp, *Channa* spp., and *Clarias brachysoma*.

Aquatic reptiles include *Crocodylus palustris*, *Lissemys punctata* and *Melanochelys trijuga*. The reservoir being a large aquatic body is an ideal habitat for water birds, where large numbers of cormorants (*Phalacrocorax* spp.) are regularly encountered. Other noteworthy birds include *Haliaeetus leucogaster*, *Ichthyophaga ichthyaetus*, *Ceryle rudis* and *Dendrocygna javanica*. Large herds of *Elephas maximus*, *Axis axis* and small groups of *Sus scrofa* are among the noteworthy mammal species that can be seen in the vicinity of the reservoir.

#### **Noteworthy flora:**

*Manilkara hexandra*, *Schleichera oleosa*, *Azadirachta indica* and *Bauhinia racemosa* are among the common tree species in the dry mixed evergreen forest areas adjacent to the reservoir. Other tree species that can be seen around the tank are *Ficus religiosa*, *Ficus racemosa*, *Cassia fistula*, *Syzigium cummingi* and *Lepisanthus tetraphylla*.

#### **Land use:**

Commercial fisheries are active and are associated mainly with exotic tilapia species and small cyprinids. Collection of medicinal plants also occurs.

#### **Possible changes in land use:**

Logging and chena cultivation in the catchment area of the tank leads to the degradation of the forested areas.

#### **Hydrological and biophysical values:**

The inflow, outflow and storage capacity are strictly managed for irrigation needs. Water for human consumption is taken out of the tank.

#### **Social and cultural values:**

The reservoir is situated in the ancient city of Polonnaruwa, which was the medieval capital of Sri Lanka from the 11<sup>th</sup> century. The tank itself has a long history. The present reservoir is a result of connecting three original reservoirs. The oldest one, Topa Wewa, is at the northernmost part and was built around 386 AD. The middle part, Eramudu Wewa and the southern part, Dumbutulla Wewa were constructed during the reign of King Parakrama Bahu (1153 – 1186 AD) during which period the ancient irrigation system experienced its maximum development. Due to invasions, the Polonnaruwa kingdom was abandoned and the lakebed was subsequently covered with jungle. In 1945, the dam was reconstructed and the lake was filled once again.

#### **Scientific research and monitoring:**

From 1980-82 Prof. Fritz Scheimer in collaboration with several local universities undertook a comprehensive limnological study of the reservoir.

#### **Conservation education:**

Information not available

**Recreation and tourism:**

Parakrama Samudraya and its surroundings are popular destinations amongst the tourists due to its high historical and cultural value. Many tourists engage in bird watching activities around the tank while others hire boats and take excursions.

**Conservation measures taken:**

Part of the catchment of this reservoir is located within the recently declared (2006) Angammadilla National Park.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Illegal timber felling and poaching are major threats while illegal gem mining in the Amban Ganga area also occurs. The wetland area is being encroached by villagers. Fishermen using illegal nets and over fishing the tank pose a threat to the local fishery. The spread of invasive alien species such as *Lantana camara* is also problematic. Discharge of sewage and agrochemical residues have resulted in eutrophic condition, leading algal blooms.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

Irrigation Department

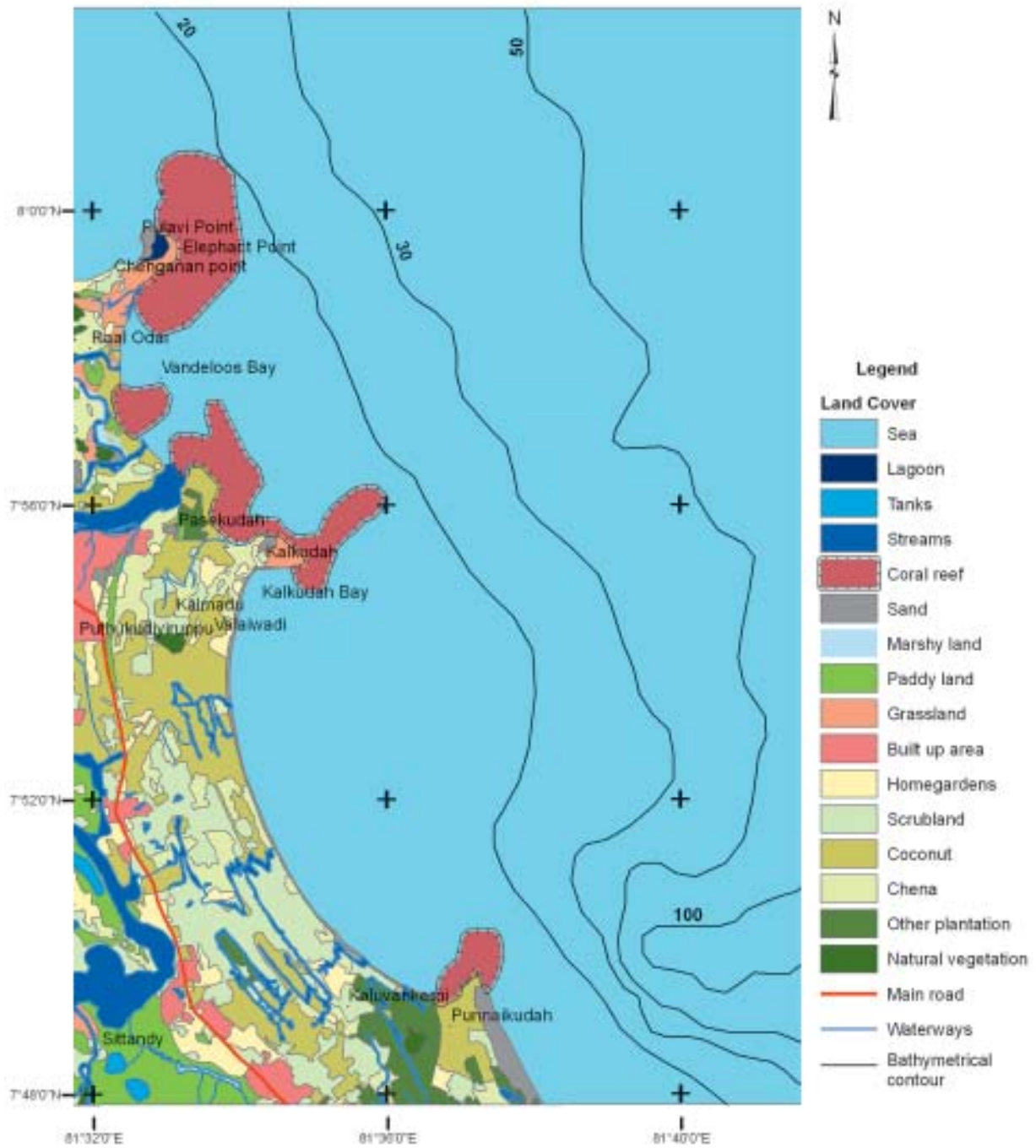
DFAR

**References:**

Amarasinghe et al. (2001); Moreau et al. (2001); Scheimer (1983)



# Passikudah-Kalkudah Reef



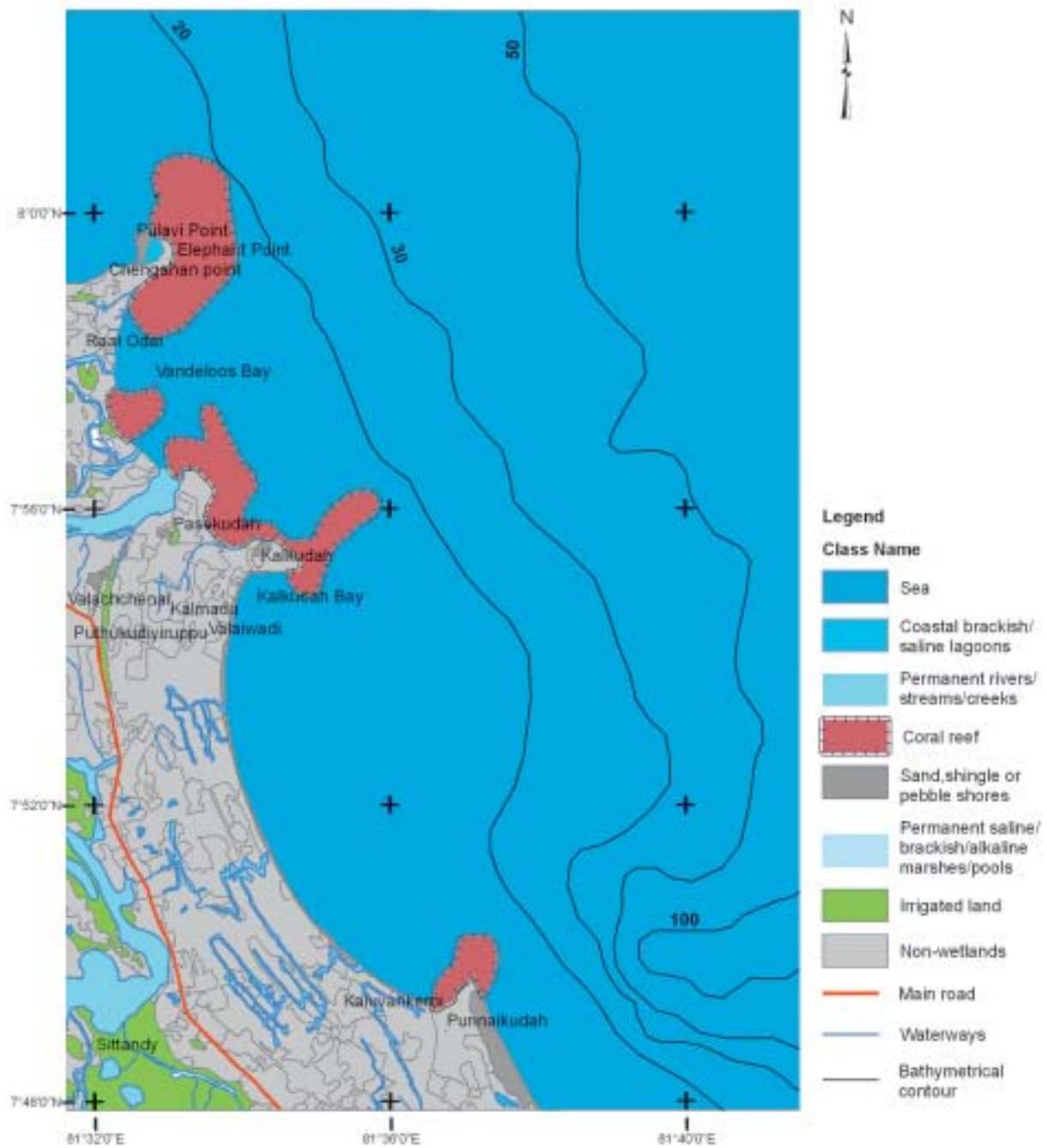
Source: 1:30,000 scale Admiralty chart No: 1583  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Passikudah-Kalkudah Reef

## Wetlands based on Ramsar Classification



Source: 1:30,000 scale Admiralty chart No: 1583  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&SP/EMA/CEA/2006

## Passikudah-Kalkudah Reef

### Location:

8° 0' 0 N and 81° 32' 0 E to 7° 84' 0 N and 81° 40' 0 E; 884336 N and 558774 E to 928581 N and 573394 E; about 28km north of Batticaloa town, in the Batticaloa District, of the Eastern Province.

### Area:

Exact reef area unknown

### Altitude:

Sea level to a depth of around 8m

### Overview:

Passikudah Bay contains a shallow fringing coral reef towards the outer bay with scattered coral communities within the bay, and is connected to similar reef systems further south towards Kalkudah. It is one of the best-known reef systems in the east and has been proposed as a Marine Sanctuary by NARA. Passikudah is very popular among visitors due to the calm clear waters which are ideal for swimming but is currently only rarely visited due to the volatile security situation in the area. Coral mining is a major threat to the reef and has degraded large areas of reef around Kalkudah.

### Physical features:

The reef is characterized by a shallow reef crest, inner reef lagoon and a steep outer reef slope. The inner reef lagoon has a depth of 0.5-2m while the outer reef slope extends seaward to a depth of around 8m. Coral growth is most extensive towards the north-western and south-eastern ends of the bay towards Natchivantivu and Kalkudah respectively. Branching, tabulate, massive and encrusting coral forms are common, with the healthiest corals being found along the outer reef slope. Numerous micro atolls made up of massive corals are found within the shallow sections of the reef lagoon. Passikudah is located in the dry zone with an annual rainfall ranging between 1,000 – 1,100 mm and average temperatures between 30.4°C – 33.6°C. The reef undergoes periods of high turbidity when southward moving near-shore currents bring freshwater from Valaichchenai lagoon located immediately north of the bay.

### Ecological features:

There are extensive coral stands within the reef lagoon although most corals are dead, possibly due to coral bleaching. The shallow sections towards the western end of the bay contain large areas of dead coral and algae. Distinct *Porites* micro atolls, that are subject to periodic exposure at low tide, are found in the shallow areas of the reef lagoon. The outer reef slope contains the most prolific coral growth dominated by branching and tabulate *Acropora*, *Echinopora lamellosa*, *Montipora* spp. and massive corals. The live coral cover in the shallow sections of the reef lagoon has been recorded to be around 15% although the coral cover on the reef slope is expected to be much higher. The reef fish community is dominated by damselfishes (Pomacentridae), surgeonfishes (Acanthuridae), parrotfishes (Scaridae) and wrasses (Labridae).

**Noteworthy fauna:**

The reef fish *Chlorurus rhakoura* which is endemic to Sri Lanka is commonly encountered on the reef, while a coral (*Porites desilveri*) is also restricted to Sri Lanka. Two species of globally threatened sea turtles (*Chelonia mydas* and *Lepidochelys olivacea*) visit the reef area.

**Noteworthy flora:**

Marine algae mainly *Sargassum* spp., *Ulva* spp. and *Caulerpa* spp. are found in abundance within the reef lagoon.

**Land use:**

Fisheries and ornamental fish collection are major activities, while illegal coral mining is carried out at Kalkudah. The area was popular for tourism in the 1970s and early 1980s but tourist activities are now almost non-existent due to the civil unrest.

**Possible changes in land use:**

The decline of tourism has probably increased pressure on the reef as communities are now more dependant on fishing and coral mining for income. Continued reef degradation could impact fisheries and lead to severe coastal erosion. This will also reduce the potential for tourism development in the future.

**Hydrological and biophysical values:**

The reef provides protection from rough seas and mitigates coastal erosion along the coastline. This fact is highlighted by the coastal erosion where coral mining has taken place. Passikudah reef is part of a series of a discontinuous fringing reef system along the east coast from Kalmunai to Trincomalee.

**Social and cultural values:**

Fishing has been a traditional activity for inhabitants of the area for many years. The calm conditions and clear waters that prevail within the inner reef lagoon make it ideal for swimming, and the beaches were popular among locals and foreign tourists. This resulted in the development of the tourism industry in the area prior to the start of the conflict.

**Scientific research and monitoring:**

Due to the conflict, no detailed studies have been carried out on the reef. Some rapid surveys have been conducted by NARA, and the Eastern University has also conducted some studies with the support of CORDIO.

**Conservation education:**

Information not available

**Recreation and tourism:**

Currently, there are no tourism activities in Passikudah. Although there were signs that the industry may re-start after the signing of the cease fire agreement in 2002, the 2004 tsunami and the recent outbreak of violence have prevented such developments.



**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

The Passikudah-Kalkudah reef system was proposed as a Marine Sanctuary by NARA in the 1980s. Kalkudah Bay and Passikudah Bay have been proposed as SAM sites by the CCD.

**Disturbances and threats:**

Extensive coral mining at Kalkudah is a major threat to the reef, and has already resulted in the destruction of large areas of the reef leading to severe coastal erosion. Solid waste pollution such as plastics, bottles and discarded fishing lines and nets, along with indiscriminate anchoring of boats are also threatening the reef and its associated biodiversity. Corals within the reef lagoon appear to have been affected by coral bleaching during the 1998 El Niño event. The reef was affected by the 2004 tsunami, and although initial ground observations indicate significant damage to corals, detailed assessments have not been conducted due to the security situation in the area.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

CCD for enforcement of coastal regulations and the DFAR for the implementation of fisheries regulations.

**References:**

Dharmaratnam and Kirupairajah (2001); Dharmaratnam and Ahmed (2005); Nishan Perera (personal communication)



# Periyakarachchi & Sinnakarachchi Lagoon Wetlands based on Ramsar Classification



Source: Landsat ETM+ (06 Sep 2001)  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Periyakarachchi and Sinnakarachchi Lagoons

## Location:

8° 49' 30 N and 81° 3' 0 E to 8° 45' 0 N and 81° 9' 0 E; 974584 N and 505498 E to 967216 N and 516498 E; 13-20km northwest of Trincomalee town in the Trincomalee District, of the Eastern Province.

## Area:

Periyakarachchi is 650 ha and Sinnakarachchi is 780 ha.

## Altitude:

Sea level

## Overview:

Periyakarachchi and Sinnakarachchi are shallow, brackish water coastal lagoons located along the north eastern coast near Trincomalee. The lagoons contain some mangrove swamps and sea grass beds, but are dominated by extensive inter-tidal mud flats, and are connected to the sea through a narrow canal. The lagoons are located close to numerous human settlements and are therefore heavily affected by pollution. The mouth of the Periyakarachchi lagoon has been identified as an IBA by BirdLife International.

## Physical features:

The lagoons are fairly shallow, with a maximum depth of approximately two metres, although many areas are much shallower and are exposed during low tide. Both lagoons are fed by several small streams and are seasonally tidal. The lagoons are located within the low country dry zone with a mean annual temperature of around 27°C, and annual rainfall of 1,000-1,250 mm, falling mainly during the northeast monsoon between October-February.

## Ecological features:

The lagoons are surrounded by natural habitats such as mangroves and scrublands, and managed habitats such as paddy fields and coconut plantations. Much of the natural habitat is in a degraded or semi-degraded state, while a large area of the Sinnakarachchi lagoon has been converted into saltpans.

## Noteworthy fauna:

Noteworthy fauna include two species of birds (*Phoenicopiterus ruber* and *Ephippiorhynchus asiaticus*). Large mammals such as *Elephas maximus* are also known to frequent the area.

## Noteworthy flora:

Information not available

## Land use:

Fishing for finfish and prawns, and salt production are the main land use activities in the lagoons. Shifting cultivation and permanent cultivation of rice and coconut is found in the surroundings.

## Possible changes in land use

Expansion of human settlements, especially for the construction of new houses for families displaced by the December 2004 Tsunami may lead to conversion of natural habitats and agricultural land into housing



settlements. Increases in population may also result in conversion of natural scrublands into agricultural land and coconut plantations. Development of aquaculture and expansion of saltpans is also a possibility.

**Hydrological and biophysical values:**

The lagoons are influenced by the tides and are therefore important in flushing nutrients from the wetland, and would play an important role in nutrient cycling. The lagoons are also useful for flood control during periods of heavy rain.

**Social and cultural values:**

Many families depend on the lagoons for livelihoods. Many fishermen involved in sea fishing take up lagoon fishing during the monsoon period. The lagoon is also used as an anchorage for fishing boats.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

Information not available

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

The lagoons have been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Pollution, particularly due to the indiscriminate disposal of solid waste such as plastics is a major issue in these lagoons. The location of new settlements of Tsunami displaced communities has increased pollution of the lagoons. The spread of invasive alien species such as *Lantana camara* and *Opuntia spp.* is also threatening native vegetation. Development of the lagoons for aquaculture and salt production, and siltation are seen as potential threats.

**Land tenure:**

The lagoons are state-owned while the surrounding areas are partly state-owned and partly privately owned.

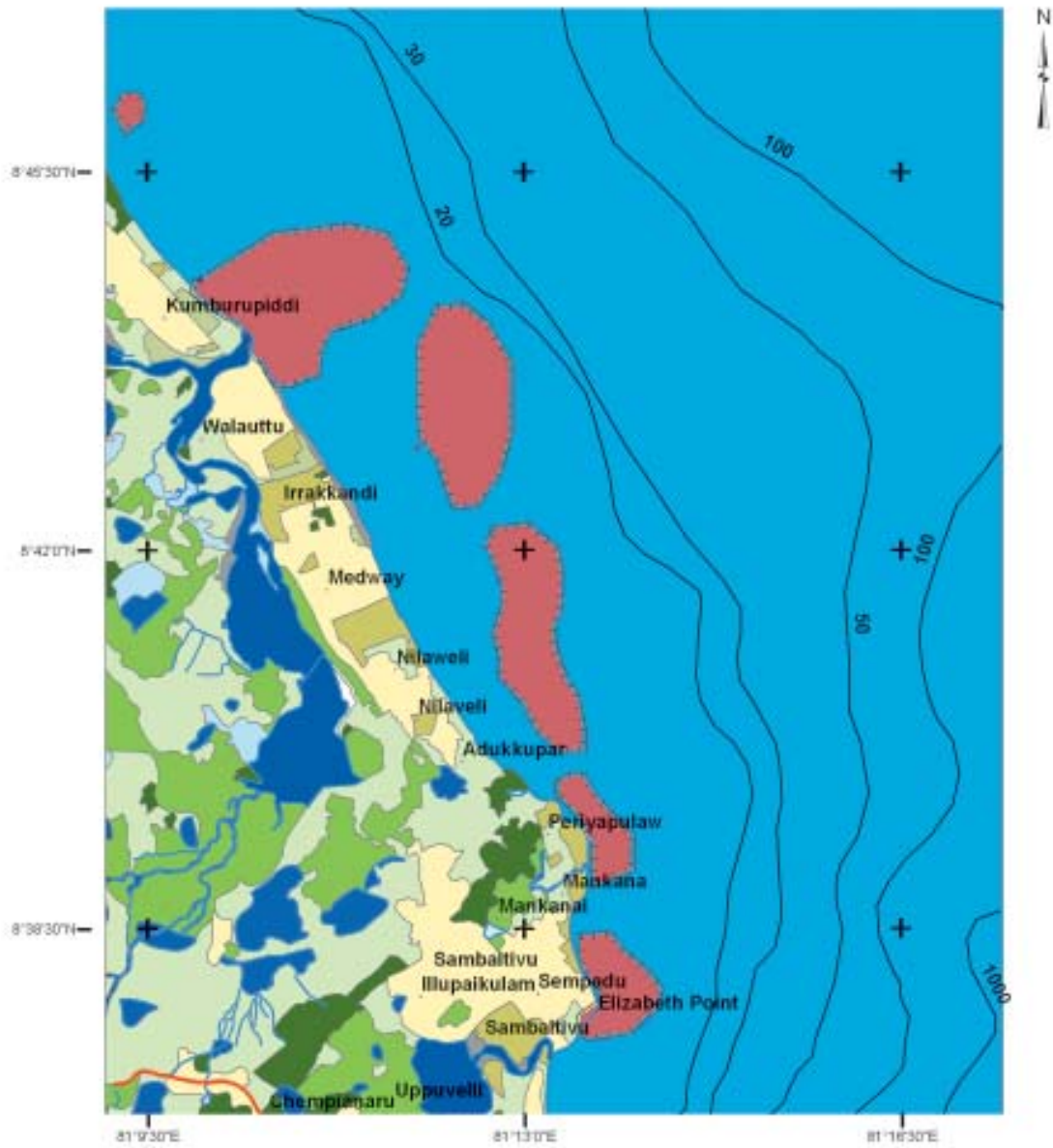
**Management authority and jurisdiction:**

Trincomalee DS

**References:**

Kotagama et al. (1989)

# Pigeon Island National Park



## Legend

0 1 2 4 Kilometers

### Land Cover

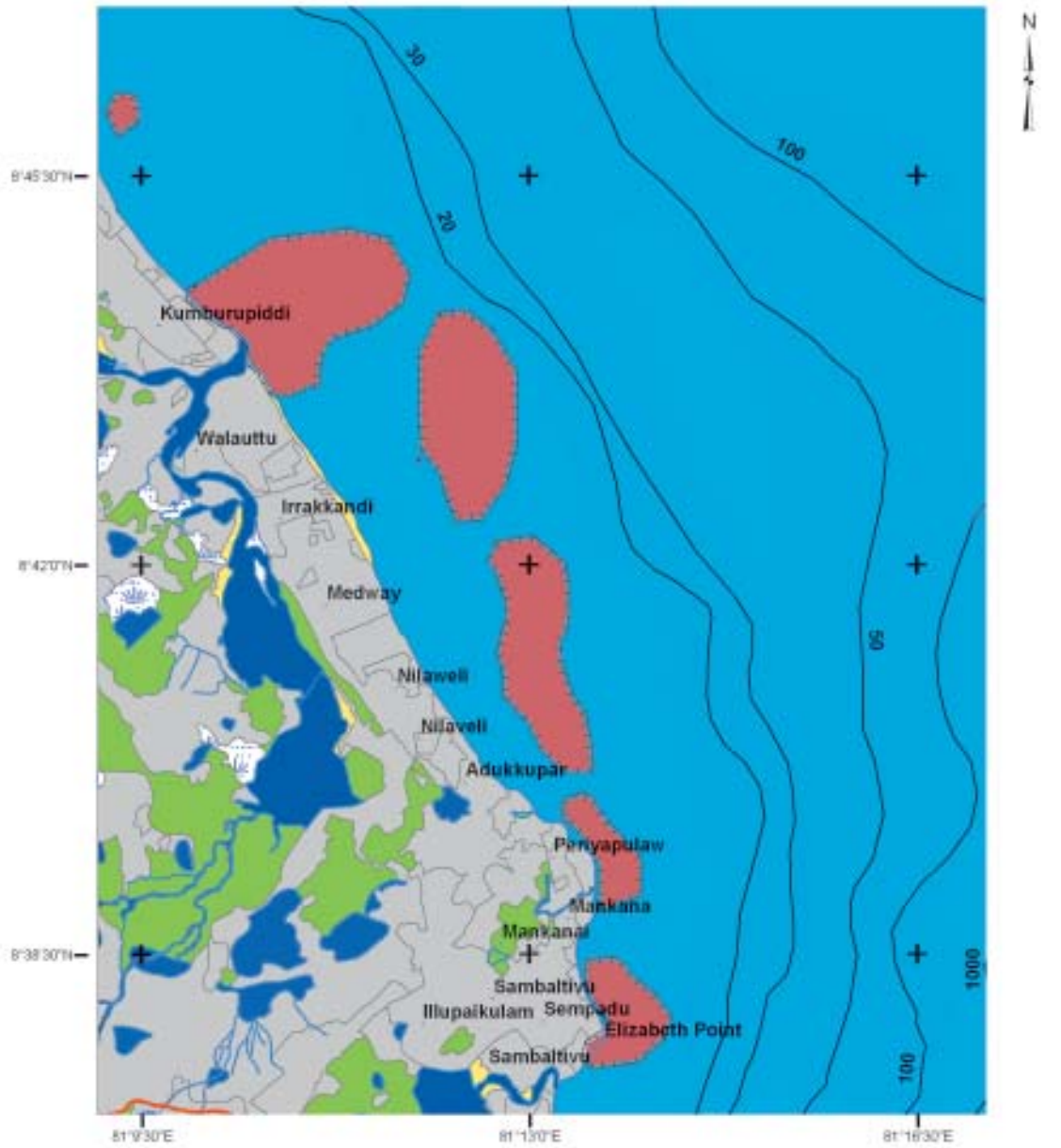
- |  |             |  |                            |
|--|-------------|--|----------------------------|
|  | Sea         |  | Homegardens                |
|  | Tanks       |  | Scrubland                  |
|  | Lagoon      |  | Coconut                    |
|  | Sand        |  | Other plantation           |
|  | Coral reef  |  | Natural vegetation (dense) |
|  | Saltern     |  | Main road                  |
|  | Marshy land |  | Waterways                  |
|  | Paddy land  |  | Bathymetrical contour      |

Source: 1:30000 scale Admiralty chart No: 1583  
 U.K. Hydrographic Office- August 1984  
 (Datum WGS 84, Projection-UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Pigeon Island National Park Wetlands based on Ramsar Classification



0 1 2 4 Kilometers

### Legend

#### Class Name

- |   |  |   |                       |
|---|--|---|-----------------------|
|  | Sea  |  | Main road             |
|  | Coastal brackish/saline lagoons                              |  | Waterways             |
|  | Water storage areas  |  | Bathymetrical contour |
|  | Coral reef   |   |                       |
|  | Intertidal mud, sand or salt flats                           |   |                       |
|  | Seasonal/intermittent saline/brackish/alkaline marshes/pools |   |                       |
|  | Irrigated land   |   |                       |
|  | Non-wetlands   |   |                       |

Source: 1:30000 scale Admiralty chart No: 1583  
U.K. Hydrographic Office- August 1984  
(Datum WGS 84, Projection-UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Pigeon Island National Park

## Location:

8° 45' 0 N and 81° 9' 0 E to 8° 36' 0 N and 81° 14' 0 E; 967216 N and 516498 E to 950638 N and 525674 E; off the coast of Nilaveli, in the Trincomalee District, of the Eastern Province.

## Area:

471.4 ha

## Altitude:

Sea level to a depth of around 15m

## Overview:

Pigeon Island National Park comprises of two small islands (Large and Small Pigeon Island) and several rocky islets located about 1 km offshore. Large Pigeon Island and some rocky islets contain fringing coral reefs while rocky habitats dominated by soft corals are present around Small Pigeon Island and surrounding areas. These coral reefs were some of the few that were not affected by the 1998 mass coral bleaching event. Therefore they contain extensive areas of healthy live coral and are some of the best remaining coral reefs in the country. Due to the security situation in the area the reefs were not extensively affected by human activities until recently. Since the 2002 ceasefire agreement, the Pigeon Island National Park has become a popular tourist destination, and increased visitation has led to habitat degradation. The reefs are being further threatened by destructive fishing practices.

## Physical features:

Large Pigeon Island has two small beaches on the southwestern and northern flanks of the island. The island is surrounded by a fringing coral reef which has developed on hard substrate, within a depth range of 1 to 6m. The main reef area is in front of the southwestern beach, and is about 200 m long and 100 m wide. Scattered coral communities interspaced by rocky habitats are found around the island up to a depth of 15m. Small Pigeon Island is surrounded by rocky reef habitats interspersed with old limestone reef structures and sandy patches. There are several rock outcrops about 300-500 m to the north, south and southeast of Large Pigeon Island. Coral Island is a small rocky outcrop located about 500m north of Pigeon Island, and another rocky outcrop is located about 300 m offshore. Fringing coral reefs have also developed on the northern and southern sides of Coral Island within a depth range of 1-6m. The National Park is located within the low country dry zone with a mean annual temperature of around 27° C and annual rainfall between 1,000-1,700 mm. Most rain is received during the northeast monsoon from October to February during which the reef area is subjected to strong winds and currents and rough seas.

## Ecological features:

The main Pigeon Island reef has a live hard coral cover of around 74% dominated by branching and tabular *Acropora* spp. with some foliose *Montipora* spp. The rocky habitats have a coral cover of around 25% dominated by the families Faviidae, Mussidae and Poritidae. Extensive areas of soft corals (mainly *Sinularia*, *Lobophyton* and *Sarcophyton* spp.) are also present. The reef around Coral Island has a live hard coral cover of around 71% dominated by branching *Acropora* while colonies of *Montipora*, *Porites*, *Galaxea*, *Favia*, *Favites*, *Platygyra* and *Leptoria* are also common. Over 100 species of corals and more than 300 species of reef fish have been identified from the Trincomalee area, and many of these species are found within the Pigeon Island National Park.



**Noteworthy fauna:**

The protected reef fish *Labroides bicolor* has also been recorded from the reef, while *Chlorurus rhakoura* which is restricted to Sri Lanka has also been recorded from the reef. The globally endangered *Cheilinus undulates* is also found in deeper areas of the reef. Juvenile and adult *Carcharhinus melanopterus* are commonly seen around the shallow coral areas. Three species of globally endangered marine turtles (*Eretmochelys imbricata*, *Chelonia mydas* and *Lepidochelys olivacea*) visit the reef. Several species of birds visit the islands, which are an important breeding habitat for the wild race of *Columba livia*.

**Noteworthy flora:**

Reef areas have extensive turf algae while the island is dominated by dry zone scrub vegetation.

**Land use:**

Fishing and ornamental fish collection is the main use of the coral reefs. Nilaveli is an important tourist area and the islands are also used for recreation purposes. The reefs are used as a site for SCUBA diving and snorkelling.

**Possible changes in land use:**

Physical damage to the reef as a result of destructive fishing and uncontrolled tourism could lead to severe reef degradation and loss of biodiversity and fish abundance. This could seriously impact fisheries dependant livelihoods, while the island will also lose its appeal as a tourist destination, particularly among recreational divers. The resumption of the conflict could also reduce fishing and tourism in the area.

**Hydrological and biophysical values:**

The reefs are part of an extensive system of marine habitats in the Trincomalee area, and are some of the best examples of small island fringing reefs in the country. They are also some of the few major coral reefs that escaped bleaching in 1998 and are therefore some of the few remaining reefs with high live coral cover. It is also possible that the reefs are an important source of coral larvae for other reefs in surrounding areas.

**Social and cultural values:**

Traditionally, local communities have been dependant on fishing as a source of income, and many traditional fishing techniques are still in use. These include the use of fish traps within reef areas, while beach seine nets are deployed along the mainland coast near Nilaveli. In recent times, the reefs and in particular the islands have become popular tourist attractions.

**Scientific research and monitoring:**

The coral reefs have been studied by NARA as part of a long-term monitoring programme supported by the GCRMN and CORDIO. The SLSAC has organised Reef Check surveys at Pigeon Island and Coral Island.

**Conservation education:**

Recreational dive operators and IUCN have carried out limited awareness activities.

**Recreation and tourism:**

Many hotels and guesthouses are present in the Nilaveli and Uppuveli area, and there has been a significant increase in visitors to Pigeon Island since the cease-fire agreement in 2002. Several SCUBA diving operators are based in nearby hotels and conduct dive trips to the National Park.

**Conservation measures taken:**

Large Pigeon Island and Small Pigeon Island were declared a sanctuary in 1963 for the purpose of protecting birds. In 2003 this was upgraded to the status of a National Park under the FFPO and the boundaries extended to include adjacent marine waters, resulting in a total protected area of 471.4 ha. Several beach and reef cleanups have been organised by local dive operators.

**Conservation measures proposed:**

Pigeon Island has been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Destructive fishing practices, particularly the use of dynamite is causing extreme damage to reefs in the area. Uncontrolled tourism has resulted in pollution, collection of corals and other marine organisms as souvenirs and physical damage to the reef from boat anchoring and reef walking. Extensive collection of ornamental species is also affecting populations of some fish species. The invasive *Acanthaster planci* is common in the area and may pose a threat if populations increase. An infestation of *Acanthaster planci* resulted in extensive coral mortality in the 1970's, although the reefs have since recovered.

**Land tenure:**

State owned

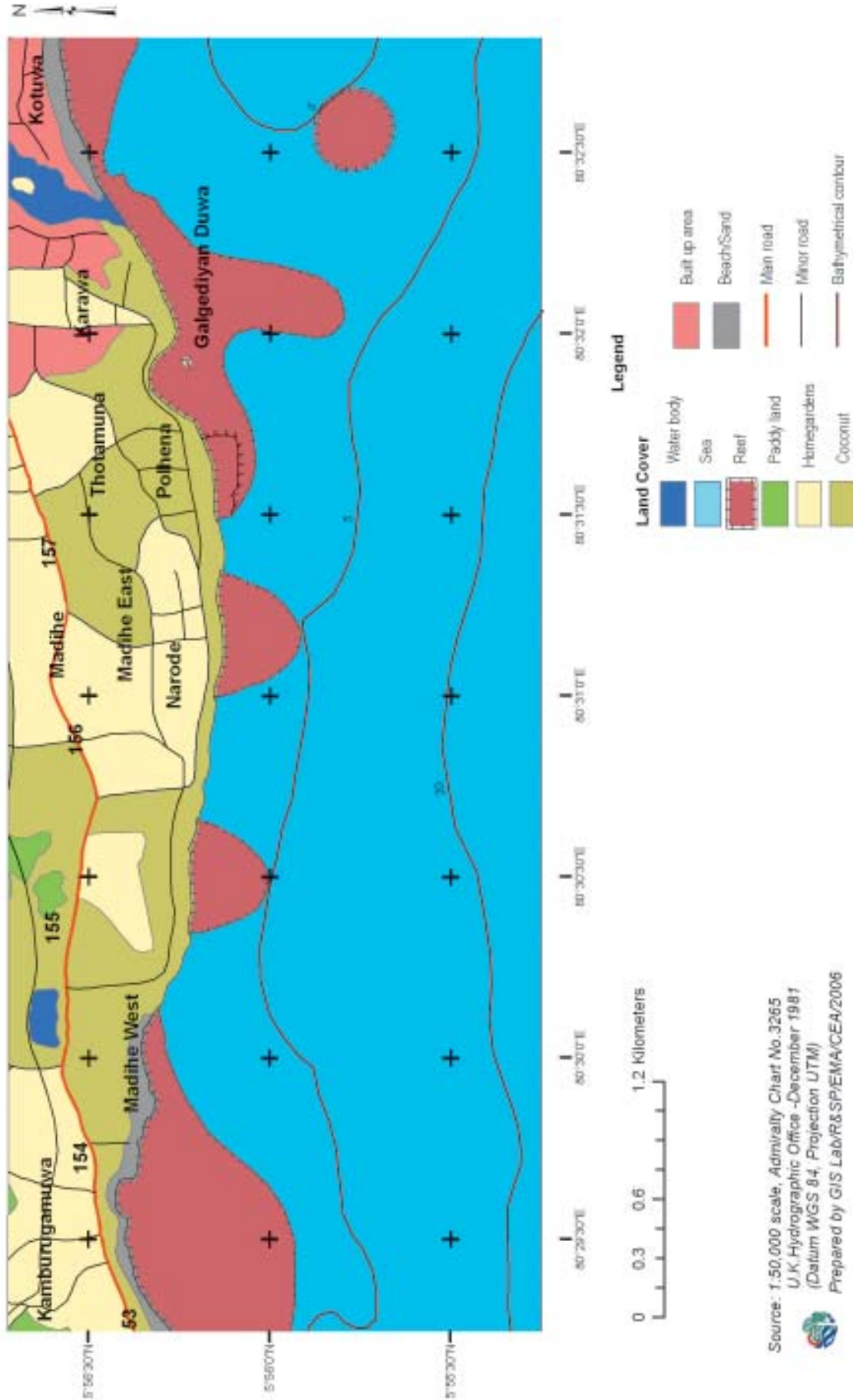
**Management authority and jurisdiction:**

DWC

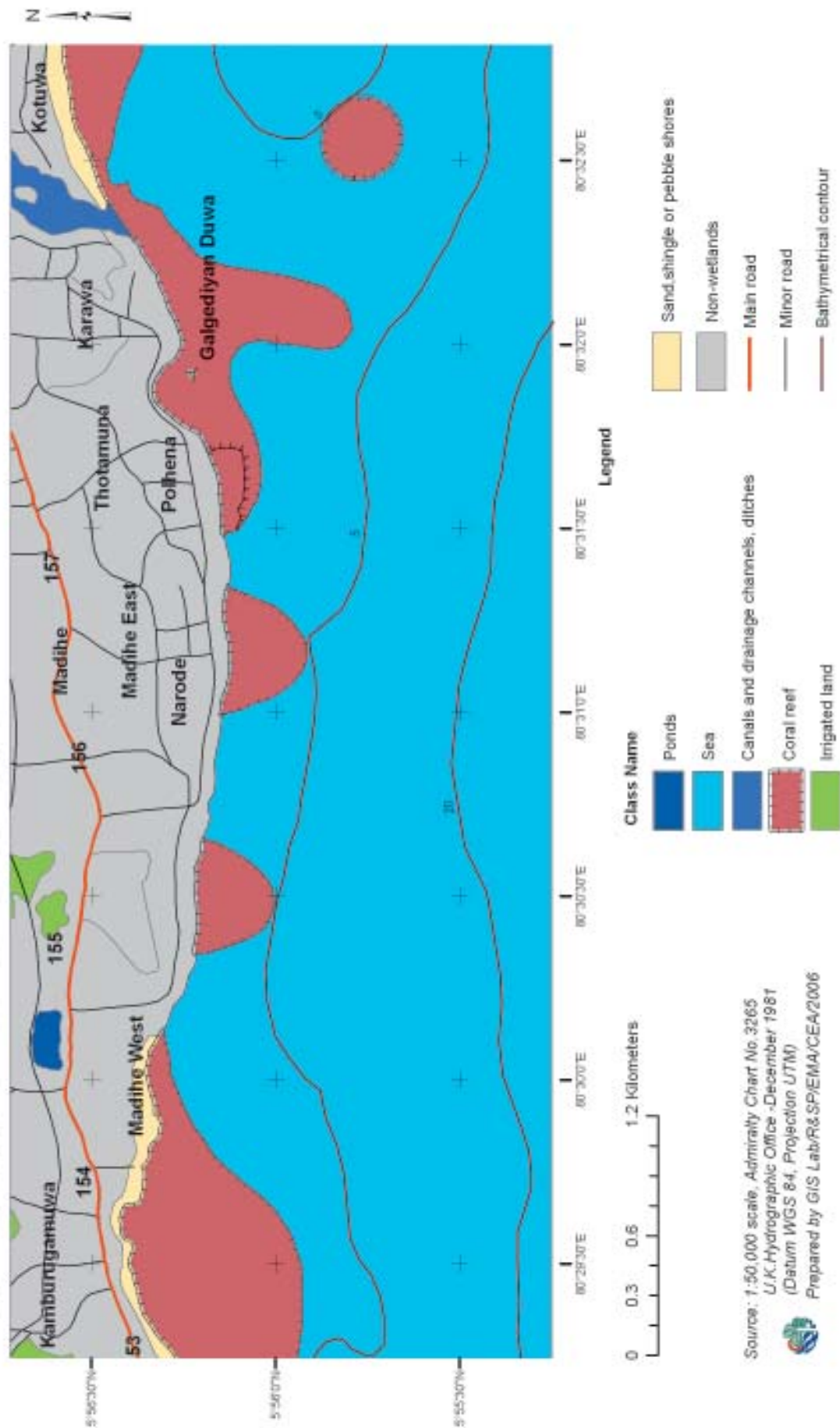
**References:**

IUCN (2002); Perera (2006); Rajasuriya (2005); Rajasuriya et al. (2005);

# Polhena Reef



# Polhena Reef Wetlands based on Ramsar Classification





# Polhena Reef

## Location:

5° 57' 0 N and 80° 29' 0 E to 5° 55' 0 N and 80° 32' 0 E; 657704 N and 442815 E to 654014 N and 448346 E; north of Matara town in the Matara District, of the Southern Province.

## Area:

Exact reef area unknown

## Altitude:

Sea level to a depth of 5m

## Overview:

Polhena is a shallow near-shore fringing coral reef located near Matara. The reef has been severely impacted by human activities as well as coral bleaching, and as a result, live coral cover is low. Small digitate and encrusting forms dominate coral communities. Major livelihood activities include the collection of ornamental fish. The reef area was declared as a FMA in 2001.

## Physical features:

The reef is characterised by a shallow reef crest and a shallow inner reef lagoon on the leeward side. The reef lagoon is shallow (ca. 1m) and much of this area is exposed during low tide. An outer reef slope composed of limestone rock and coral is found to a depth of around 5m on the seaward side of the reef crest. The outer reef and reef crest are exposed to rough hydrodynamic conditions during the southwest monsoon from May to October. Polhena is located in the wet zone with an annual rainfall of over 2,000mm and an average annual temperature of around 27°C.

## Ecological features:

Coral communities are dominated by colonies of *Pocillopora damicornis* and *Montipora* spp. Encrusting and sub-massive forms are also found. Extensive stands of branching *Acropora* were once present on the reef but have been destroyed by human activities and coral bleaching. Sea grass patches are also found within the reef lagoon. The fish community is dominated by small omnivorous and herbivorous species such as damselfishes (Pomacentridae), wrasses (Labridae) and surgeonfishes (Acanthuridae)

## Noteworthy fauna:

The coral species *Porites desilveri* is restricted to Sri Lanka. Among the reef fish, *Chlorurus rhakoura* and *Pomacentrus proteus* are also restricted to Sri Lanka. At least one species of endangered marine turtle (*Chelonia mydas*) is known to visit the reef.

## Noteworthy flora:

Seagrasses such as *Thalassia* sp. and *Halodule* sp.

## Land use:

Collection of ornamental fish species and artisanal fisheries are the most common activities being carried out on the reef. The reef lagoon is also popular for recreational activities such as swimming, reef walking and snorkelling.

**Possible changes in land use:**

Degradation of the reef may result in changes to the reef structure and fish community and seriously impact associated livelihoods such as ornamental fish collection through reduced fish catches.

**Hydrological and biophysical values:**

The reef provides protection from strong waves during the monsoon and is important for shoreline stabilisation. The outer side of the Polhena fringing reef and the Polhena rock reef situated around 300m further offshore are subject to rough hydrological conditions and are important in determining local current patterns and water movement.

**Social and cultural values:**

The reef has traditionally been an important site for artisanal fishing by the local community. In the last three to four decades, it has also become important for ornamental fish collection. The reef lagoon and beach are also important recreation areas for locals.

**Scientific research and monitoring:**

NARA has periodically carried out surveys of the reef. In addition, the University of Ruhuna has been involved in conducting numerous biophysical and socio-economic studies.

**Conservation education:**

Information not available

**Recreation and tourism:**

The site is popular among locals for swimming, snorkelling and reef walking. There is no major coral reef tourism at the site.

**Conservation measures taken:**

The reef area was declared as a FMA under the FARA in 2001 in order to regulate fisheries.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Reef walking has damaged much of the live coral within the reef. Nutrients from a nearby coconut husk retting operation have also contributed to the degradation of the reef, while coral bleaching resulted in extensive coral mortality in 1998. Unmanaged ornamental fish collection has affected populations of some reef fishes. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned

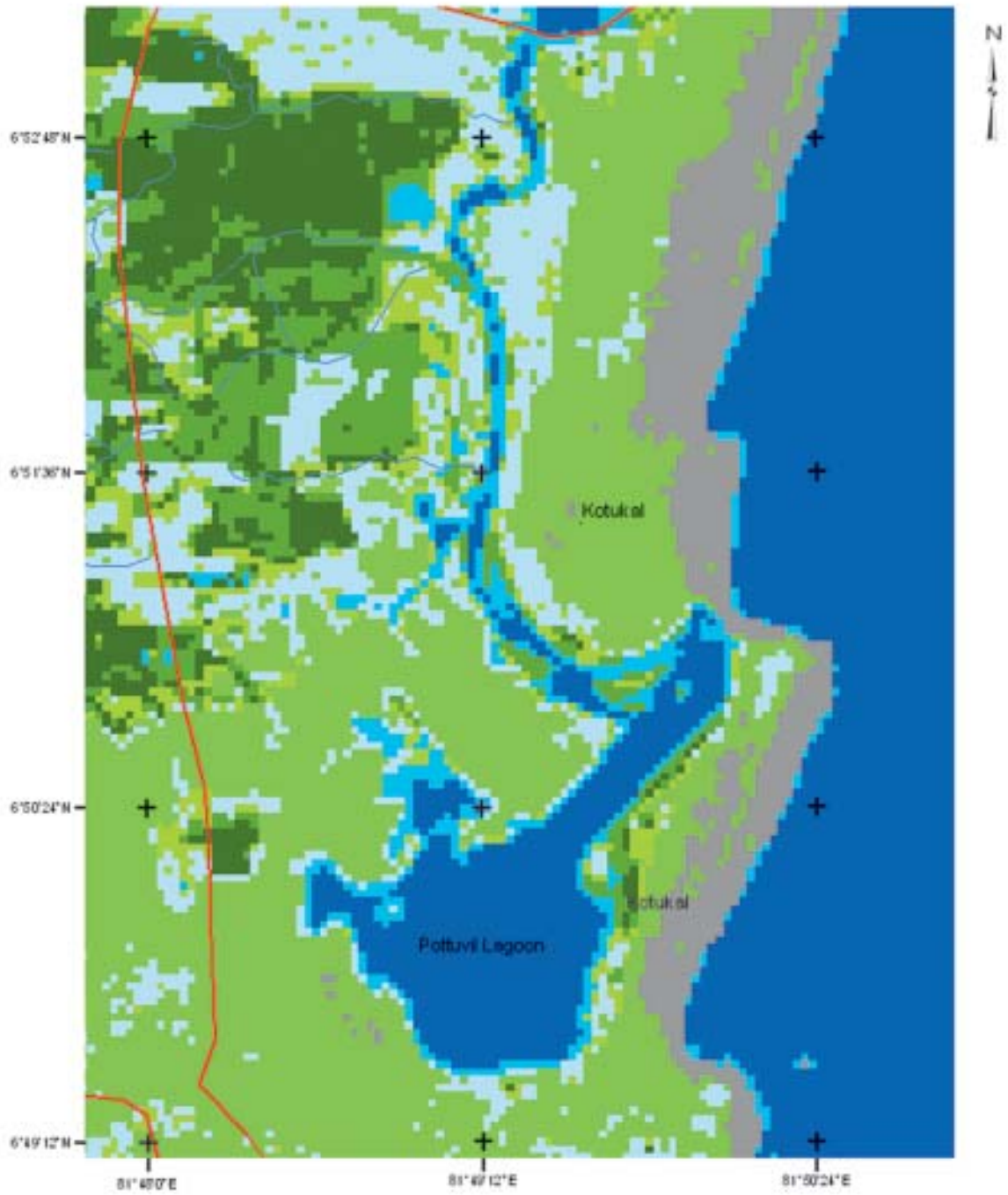
**Management authority and jurisdiction:**

DFAR











**References:**


NARA/CORDIO/IUCN/GCRMN/SLSAC (2005); Öhman et al. (1998); Nishan Perera (personal communication)

# Pottuvil Lagoon



## Legend

Land Cover	
	Water (deep)
	Water (shallow)
	Marshy land
	Sand
	Paddy land
	Natural vegetation (low dense)
	Natural vegetation (moderate dense)
	Natural vegetation (high dense)
	Main road
	Waterways

Source: Landsat ETM+ 26th July 2000  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/PEMA/CEA/2006

# Pottuvil Lagoon Wetlands based on Ramsar Classification



0 0.25 0.5 1 Kilometers

### Legend

#### Class Name

- Sea
- Coastal freshwater lagoons
- Water storage areas
- Seasonal/intermittent saline/brackish/alkaline marshes/pools
- Irrigated land

- Sand, shingle or pebble shores
- Non-wetlands
- Main road
- Waterways

Source: Landsat ETM+ 26th July 2000  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&S/REMA/CEA/2006



# Pottuvil Lagoon

## Location:

6° 57' 0 N and 81° 46' 15 E to 6° 50' 0 N and 81° 51' 30 E; 768290 N and 584691 E to 755407 N and 593920 E; 3km north of Arugam Bay in the Ampara District, of the Eastern Province.

## Area:

Information not available

## Altitude:

Sea level

## Overview:

Pottuvil lagoon is a brackish water coastal lagoon surrounded by sand dunes, salt marshes, mangroves, coconut plantations and home gardens. The lagoon is connected to the sea on its eastern side via a narrow channel. Freshwater input is from rainfall and several small streams, and the lagoon is seasonally tidal.

## Physical features:

The lagoon is located in the low country dry zone, where the mean annual temperature is 27.4°C and the annual rainfall varies between 700 – 1,700 mm. Most of the rain is received during the northeast monsoon between October-February, while the driest period is between May and September. Maximum depth of the lagoon is 2-3 m, while salinity varies seasonally and can be over 30 ppt at times. Winds are generally moderate, ranging from 7– 15 km per hour with stronger winds during the evening.

## Ecological features:

The area surrounding the lagoon is primarily composed of mangroves while a smaller percentage of land area is covered with coconut plantations, homesteads, sand dunes and grasslands. The lagoon is an important habitat for water birds including migratory species.

## Noteworthy fauna:

Two species of nationally threatened and globally vulnerable birds (*Leptoptilos javanicus* and *Pelecanus philippensis*) have been recorded from the lagoon.

## Noteworthy flora:

Mangrove species such as *Excoecaria agallocha*, *Rhizophora mucronata*, *Lumnitzera racemosa*, *Acanthus ilicifolius*, *Phoenix pusilla*, *Aegiceras corniculata*, *Bauhinia racemosa*, *Avicennia marina* and *Bruguiera* spp. are found around the lagoon.

## Land use:

The main use of the lagoon is for fisheries. Paddy cultivation is the major activity in areas surrounding the lagoon and the Ampara District is the largest rice-producing region of Sri Lanka. Additionally, there are many human settlements and coconut plantations in the vicinity. Tourism infrastructure is also found in nearby areas, and the lagoon is increasingly being used for eco-tourism.

**Possible changes in land use:**

Increased encroachment of the lagoon for housing and tourism infrastructure due to the increasing population and growing popularity of the area among tourists.

**Hydrological and biophysical values:**

The lagoon is important for flood control, and the adjoining sand dunes are important in coastal protection from storm surges and other natural disasters such as tsunamis.

**Social and cultural values:**

The lagoon sustains a small but important subsistence fishery and many people have been traditionally engaged in fisheries. More recently, ecotourism has become popular and provides income to locals. A 2000 year old temple, the Muhudhu Maha Viharaya is located nearby.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

The lagoon has recently become popular among tourists, and the Hidayapuram Fishermen's Cooperative Society runs a community-based ecotourism venture called the Pottuvil Lagoon Ecotour.

**Conservation measures taken:**

Attempts have been made to encourage community-based conservation through the Fisherman's Cooperative Societies. During the 2003-2004 period a mangrove nursery was established, managed and funded by the local Fisherman's Cooperative Societies in order to improve mangrove habitats around the lagoon, while local fishermen have also stopped the illegal shooting of birds in the lagoon. The fishery is also managed by the Pottuvil and Arugam Bay Fishermen's Association.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Pollution, land-filling and cattle grazing are the most prevalent threats causing habitat degradation and modification. Grazing by cattle in particular, causes damage to replanted mangrove seedlings. Additionally, the lagoon area was affected by the tsunami, which resulted in damage to mangroves and deposition of debris in the lagoon. Another prominent threat is the high rate of siltation, which may have increased after the tsunami. The invasive species *Pistia stratiotes* is found extensively in the area.

**Land tenure:**

The lagoon is state-owned while the surroundings are partly state owned and partly privately owned.

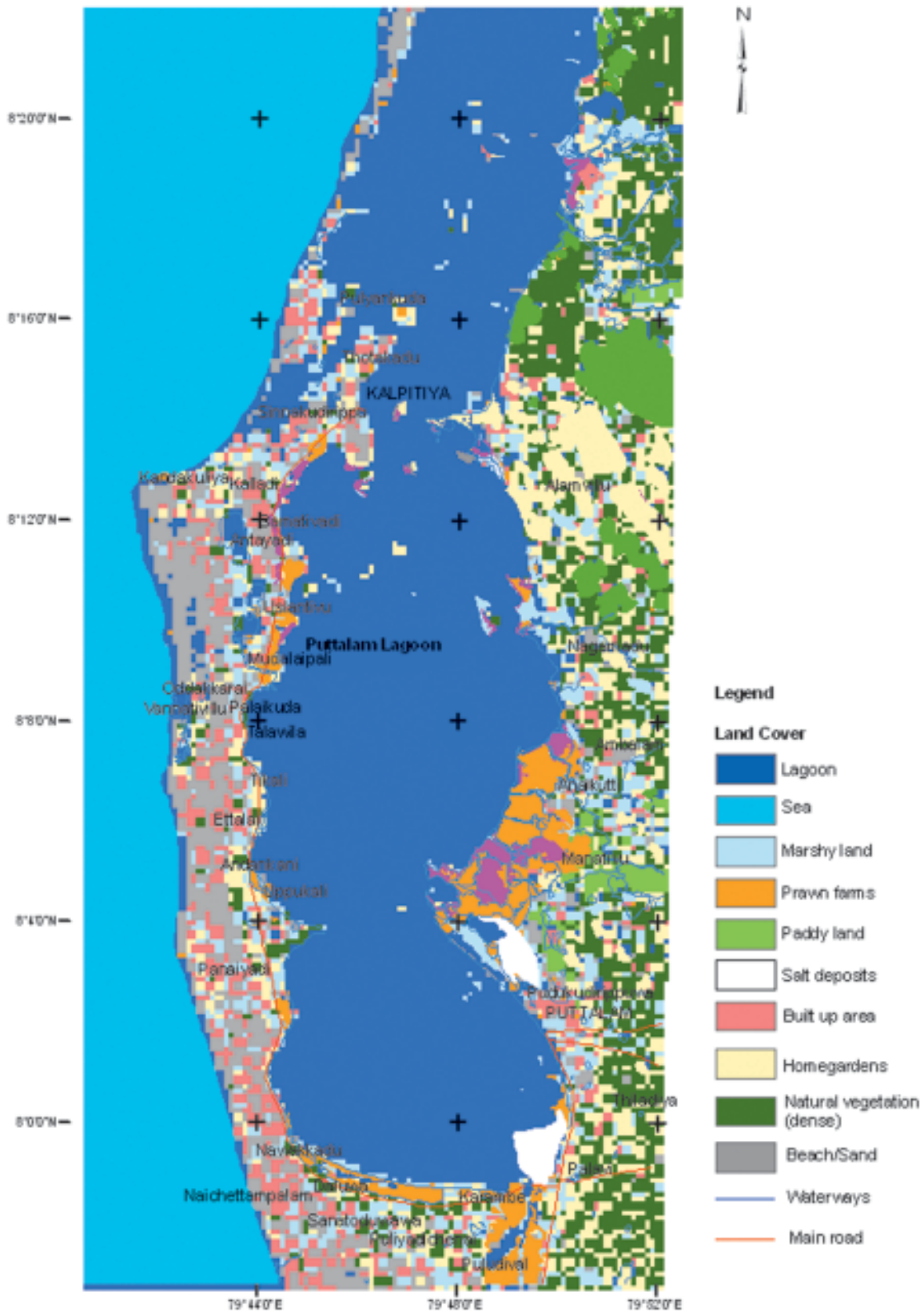
**Management authority and jurisdiction:**

This site is within the jurisdiction of the Pottuvil GN.

**References:**

IUCN (2005a); Kotagama (1989); Mallawatantri (2005)

# Puttalam Estuary



### Legend

#### Land Cover

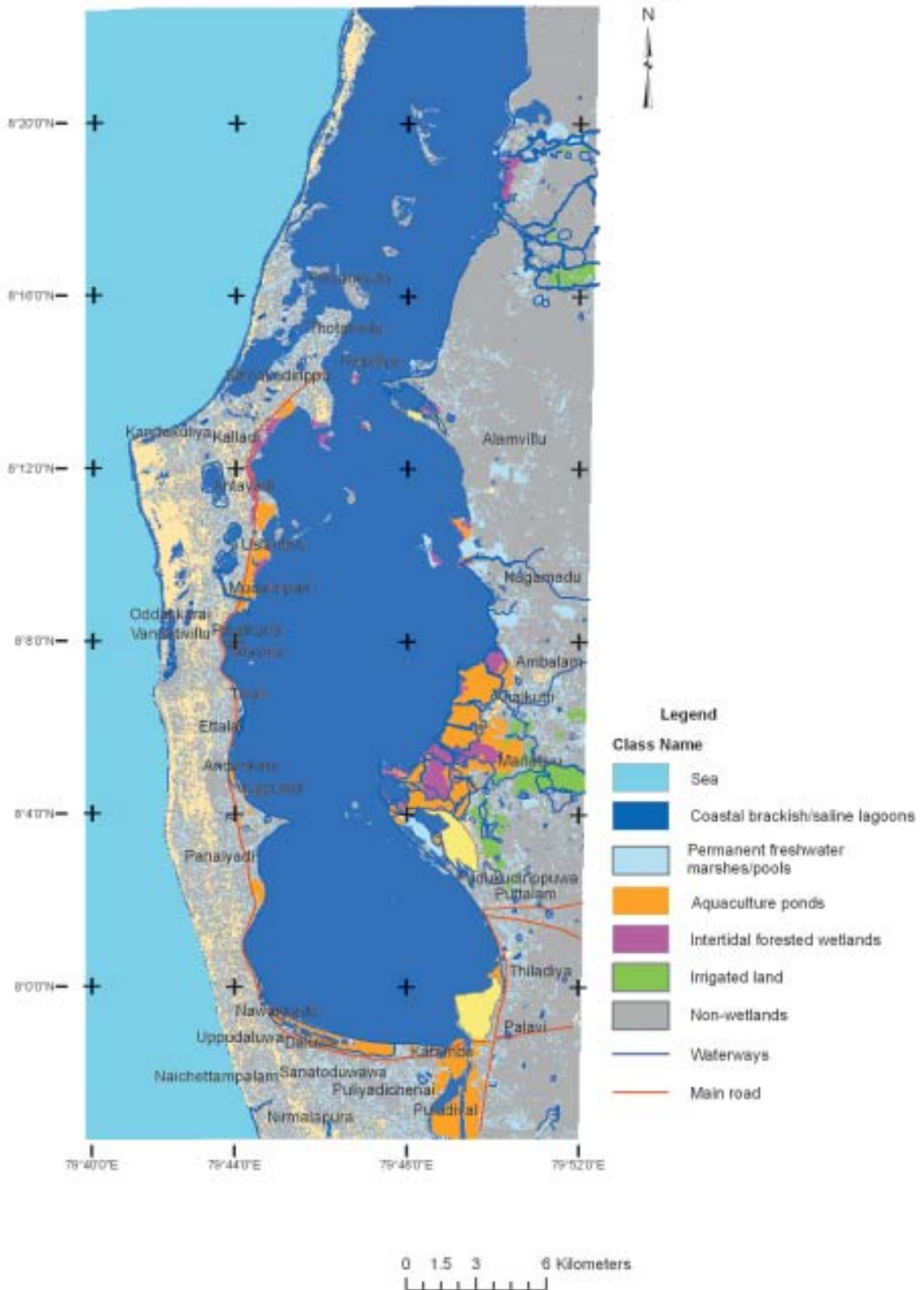
- Lagoon
- Sea
- Marshy land
- Prawn farms
- Paddy land
- Salt deposits
- Built up area
- Homegardens
- Natural vegetation (dense)
- Beach/Sand
- Waterways
- Main road

Source: Landsat ETM+ 15th December 2000  
 Ground Truthing - 06th December 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

0 1.5 3 6 Kilometers



# Puttalam Estuary Wetlands based on Ramsar Classification



Source: Landsat ETM+15 Dec 2000  
 Ground Truthing - 06/12/2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Puttalam Estuary

## Location:

8° 2' 0 N and 79° 40' 0 E to 8° 0' 0 N and 79° 52' 0 E; 888222 N and 353067 E to 884470 N and 375100 E; 120 km north of Colombo in the Puttalam District, of the North-western Province.

## Area:

The estuary is 36,426 ha while the surrounding mangroves and salt marshes cover an extent of about 600 ha and 700 ha respectively.

## Altitude:

Sea level

## Overview:

The estuary is the second largest in the country and is one of the most productive basin estuaries, being important for its finfish and shellfish fisheries. The shallow wetland is connected with the Mundel lagoon through the Dutch canal and opens out to the Indian Ocean at the northern end through the Dutch bay. The mangroves of the Kalpitiya peninsula border the Puttalam estuary on its western end. A number of islands (e.g. Erumathivu, Battalangunduva, Karativu) near the mouth of the lagoon are temporarily or permanently inhabited by fishermen. This area is very rich in biodiversity, as it contains a range of habitats including mudflats, mangroves, saltpans, salt marshes, sea grass beds and coral reefs.

## Physical features:

As the area lies within the dry zone of the country, the temperature varies between 30.4 – 33.6°C and the area experiences an average monthly rainfall of 120 mm. The highest rainfall occurs from November to December (225 mm) while the driest periods are characterised by as little as 25 mm of rainfall per month. The estuary is very shallow, with depths of 1.5-3 m, except in the deep channels, where depths of 4-5 m have been recorded. The average tidal period is 12 hours and 40 minutes, with a longer ebb period, and the average tidal range is about 0.25 m. The tidal patterns in the Puttalam estuary do not occur in rhythm with that of the Indian Ocean. Monsoon winds play a significant role in tidal movements, and the highest tidal ranges are recorded during the northeast monsoon. The salinity of the water body varies widely from 34ppt to 55ppt and it is exceptional amongst estuarine lagoons in that the salinity rarely decreases below 15 ppt, even during the rainy season. Average humidity in the area ranges from between 75.9% in the day time to 88% at night. The predominant soil type in Kalpitiya is sandy regosols. Due to its sandy character, the soil is very permeable, well-drained and aerated. Throughout the area the ground water is found at a depth of 2-5m but due to its high salinity it is not suitable for drinking purposes.

## Ecological features:

Several natural and man-made terrestrial and wetland habitats have been recorded from the estuary and its surrounding environs. The natural wetland ecosystems associated with the estuary include streams, mangroves, sea grass beds, mud/tidal flats, coral reefs, salt marsh, and seashore vegetation. These wetlands are surrounded by natural terrestrial vegetation (dry monsoon forests, and dry thorny scrublands), and human influenced habitats (coconut/banana/cashew cultivations, shrimp ponds, home gardens, and teak plantations). Fringing mangroves are predominantly found in the larger islands in Puttalam estuary and Dutch bay and in a few locations on the mainland (Pallivasalthurei, Tannikudah, Kuringipiti,

Mandalakudah, Kovilkudah, Keerimundel, Serakkuli and Karathivu areas). Small patches of over-washed mangroves, i.e. fringing mangroves located in small islands or patches of mud flats that get completely submerged during every high tide, occur around Kungimathottam area. Scrub mangroves can be found along the mainland shoreline towards more saline upper inter-tidal areas. Scattered and stunted *Avicennia marina* plants are characteristic of these mangrove ecosystems. A total of 14 exclusive or true mangrove plant species and 29 species of mangrove-associated species have been reported from Puttalam lagoon and Dutch bay. Salt marshes are closely associated with the mangroves in this dry climatic region. Extreme soil salinities that prevail in these inter-tidal soils have given rise to vegetation consisting of salt-tolerant herbaceous plants (halophytes), and five species have been recorded from these habitats. Eight species of sea grasses have been recorded from the sea grass beds associated with the estuary. The mudflats are sedimentary intertidal habitats created by mud deposition, particularly in sheltered areas of the estuary. Their sediment consists mostly of silts and clays with a high organic content. More than 50 species of fish, including fresh and salt-water forms have been recorded from the estuary. Among the other vertebrates, more than 100 species of birds have been recorded from the Puttalam estuary and its associated wetlands, dominated by water birds.

#### **Noteworthy fauna:**

Common food fish caught from the estuary include *Nematalosa nasus*, *Hilsa keeli*, *Mugil cephalus* and *Chanos chanos*. The cartilaginous fish recorded from the estuary includes sharks (i.e. *Chiloscyllium griseum*, *Carcharhinus* spp.) and rays (*Aetibatus narinari*, *Rhinoptera javenica*). Among marine mammals, *Sousa chinensis* and the globally endangered *Dugong dugon* are known to visit the estuary. Economically important prawn species (*Penaeus semisulcatus* and *P. indicus*), and crab (*Portunus pelagicus*) form a major component of the export market. Bivalves such as *Gafrarium tumidum*, *Marcia opima* and *M. biantina* are commercially important. The estuary harbours fairly large populations of migratory water birds, including terns (i.e. *Gelochelidon nilotica*, *Sterna hirundo*, *Thalasseus bengalensis*), waders (i.e. *Charadrius mongolus*, *Charadrius leschenaultii*, *Tringa tetanus*, *Calidris alba*), and locally declining large water birds such as *Pelecanus philippensis*. Among the noteworthy marine reptiles that inhabit and/or visit the estuary are sea snakes (*Enhydrina schistosa* and *Pelamis platurus*), and two species of globally endangered turtles (*Chelonia mydas* and *Lepidochelys olivacea*).

#### **Noteworthy flora:**

Among the mangrove species, the two major constituent species in this area are *Avicennia marina* and *Rhizophora mucronata*. Out of the mangrove species, *Scyphiphora hydrophyllaceae* is very rare and is present only on the western shore of the estuary. *Sonneratia alba*, *Aegiceras corniculata*, *Ceriops tagal*, *Bruguiera cylindrica*, *Excoecaria agallocha* and *Lumnitzera racemosa* are also commonly found in the area. Puttalam estuary has a well-developed sea grass community of which the two most common species are *Cymodocea rotundata* and *Enhalus acoroides*. Additionally, there are extensive growths of the edible seaweeds *Gracilaria edulis* and *G. verrucosa* which can be found mostly towards the Kalpitiya area but do not appear to be harvested commercially. Common plants in salt marshes include *Sueda* spp. and *Salicornia brachiata*.

#### **Land use:**

More than 2,000 fishing families utilize the estuary and the coastal waters for seasonal fisheries, which is the most important commercial activity in the area. Shrimp farming is another important economic activity in the estuary although around 50% of the farms in operation are actually illegal. Collection of seaweed and ornamental fish, and mangrove extraction also takes place. Mangroves are harvested for the manufacture of fishing gear, fishing boats, houses, charcoal and for firewood. The barks of some species such as *Rhizophora mucronata* are used for tannin production. The agricultural activities include cash crop

(coconut, cashew and vegetables) cultivation and subsistence farming. Around 20% of the land area is used for homesteads and agricultural crop cultivation (mainly coconut). Animal husbandry (cattle, goat, poultry and pigs) is also a popular activity.

#### **Possible changes in land use:**

At present, the government of Sri Lanka has identified this area as a tourism development zone, which could lead to reclamation and/or conversion of wetlands. Haphazard tourism development can be a threat to the wetlands and associated biodiversity. The islands in particular will be vulnerable to such tourism development activities.

#### **Hydrological and biophysical values:**

This estuary plays a role in flood control and acts as a source of water for the shrimp farms as well as the 'sink' for their waste effluents. The estuary is also important in driving the nutrient cycle and food chain in nearby coastal waters including the Bar Reef Marine Sanctuary.

#### **Social and cultural values:**

After the start of the civil unrest in the northern part of Sri Lanka, a large number of people migrated to the area as refugees (10% of the population in 2002). The socio-economic condition of many of the local communities in the area is relatively poor. The Church, Port and Fort located in the vicinity are of historical significance as they were constructed during the Dutch period. In the vicinity of Kandakuliya there is an ancient site called 'Gange' which is reported to have been occupied by the sister of Kuweni, the wife of King Vijaya, the first Sinhala King.

#### **Scientific research and monitoring:**

NARA has a regional research station at Kalpitiya which is used to conduct research on the lagoon. In 2003/2004, IUCN conducted two pilot projects on seaweed and mangrove growing in collaboration with NARA. As this site belongs to the Bar Reef area that was selected for SAM by the CCD, a comprehensive survey of the area was conducted during 2005.

#### **Conservation education:**

Information not available

#### **Recreation and tourism:**

Tourism in the area has been low due to the uneasy security situation in the country. However, following the cease fire agreement of 2002 the Government identified this area as a site for tourism development. Unfortunately, the recommencement of hostilities could hinder any such development in the near future. There is one guesthouse with three rooms in the Kalpitiya Peninsula, which does not cater to tourists and another guesthouse that was established in 2004.

#### **Conservation measures taken:**

The mangroves of the Kalpitiya Peninsula have been selected for SAM as a subcomponent of the Bar Reef area by the CCD. Of the mangrove areas around the estuary, one location (Kuringnampitiya North Forest Reserve) is a protected area of the forest department. Mangrove restoration activities have also been implemented by local CBOs and NGOs.



**Conservation measures proposed:**

IUCN has proposed a large marine and coastal Ramsar wetland site, including the northern part of the Puttalam estuary and its mangrove islands. The entire Puttalam estuary has also been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Clearance of natural habitats and reclamation of wetlands for housing, aquaculture and agricultural expansion have been major conservation issues for many years. The spread of invasive alien plants (*Opuntia dillenii* and *Prosopis juliflora*) is also seen as a threat to the existing habitats such as salt marshes. Conflicts between fishermen for limited fishery resources and landing sites, use of destructive fishing gears such as small mesh-monofilament gillnets, monofilament purse seine nets, encircling nets, push nets and pull nets has a negative impact on the fish stocks and sea grass beds. Poaching of turtles and incidental by catch related mortality of turtles, dolphins and sea snakes are also threatening these endangered species. Shrimp farms pose the largest threat to natural habitats in the area. Shrimp farming in the estuary commenced in 1984 and by 1992 approximately 44% of the mangroves on the eastern shore and 28% of the mangroves on the western shore had been destroyed. Such clearing has led to a decrease in the water bird populations due to habitat loss. Additionally, the discharge of nutrient-rich effluents from these farms pollutes the estuary resulting in eutrophication of the water body and pollution of ground water. Seaweed is collected for commercial purposes but due to the limited natural stocks and seasonal production there are constraints on maintaining a continuous supply to meet the demand. Heavy exploitation for export therefore will cause a decline in the stocks, possibly to unsustainable levels. Unauthorised construction around the lagoon is also a potential threat. Need urgent action to mitigate existing threats.

**Land tenure:**

The estuary is state-owned while there is some private ownership in the surrounding areas.

**Management authority and jurisdiction:**

This area is under the purview of the DS. The Kuringnampitiya North Forest Reserve is administered by the Forest Department.

**References:**

CCD (2006a); CEA/ARCADIS Euroconsult (1999); Dayaratne et al. (1997); IUCN (2003c); IUCN (2005b); Kotagama et al. (1989); Madduma Bandara (2002)

# Rekawa Lagoon



Source: Landsat ETM+ 14th March 2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Rekawa Lagoon Wetlands based on Ramsar Classification



Source: Landsat ETM+ 14th March 2001  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R/6.SP/EMA/CEA/2006

# Rekawa Lagoon

## Location:

6° 5' 24 N and 80° 45' 36 E to 6° 2' 48 N and 80° 52' 0 E; 672423 N and 472337 E to 666891 N and 485245 E; about 200 km south of Colombo, in the Hambantota District, of the Southern Province.

## Area:

250 ha

## Altitude:

Sea level

## Overview:

Despite being traditionally viewed and referred to as a lagoon, Rekawa is a shallow brackish water estuary, receiving freshwater from the Kirama Oya and connected to the sea via two outlets, one of which is natural in Kapuhenwela and the other a man made canal in Medilla. The presence of mangroves, along with coral reefs and five species of globally threatened marine turtles in nearby coastal waters gives high biological value to the lagoon and surrounding environment. Fisheries are the most important livelihood of the rural village community in the vicinity of the wetland. Lack of employment opportunities has lead to increased dependency on the lagoon resources.

## Physical features:

The metamorphic rocks in the Rekawa area are Precambrian in age and areas near the river are Miocene limestone, with alluvial soil beds. The coastal plain has been formed primarily through the erosion of crystalline rocks, and more recent sedimentary deposits. The wetland lies in the intermediate zone between the dry and wet climatic zones, with an average rainfall of about 2,000 mm per year. The average temperature ranges from 26.6 – 27.2° C. The area is subjected to strong winds (23 km /hr), especially from June to September. The winds and constant wave action on the shoreline have given rise to depositional sand dunes and leads to periodic closure of the lagoon mouth. The salinity in the lagoon basin varies between 0 – 10 ppt. The lagoon receives most of its water from the inland watershed draining the Kirama Oya, whose water is mainly used for irrigation through 19 anicuts, before reaching the lagoon. Rekawa Oya, which is a small stream, also provides water to the lagoon. Water from the wetland reaches the sea through a sand bar breach, located at the natural lagoon mouth, on the south western end of the lagoon.

## Ecological features:

Mangrove and scrub forest surround the lagoon, which is bound on the seaward side by a broad, sandy beach 10 km long. Landward of the lagoon is a large tract of paddy fields about 500 ha in extent, most of which have been abandoned. The mangrove cover has increased from 100 ha in 1984 to 200 ha in 1994 due to sedimentation, but the quality of mangroves has decreased. The mangrove communities around the lagoon include *Lumnitzera*, *Ceriops* and *Avicennia* dominated stands. The 2004 Indian Ocean tsunami had a major impact on the mangroves growing along the sides of the Kapuhenwela outlet and canal as a result of the tsunami wave being funnelled in through the estuary. The damage extended 500m inland from the estuary mouth as the narrow mangrove strip directly facing the wave was unable to withstand the force and was uprooted. No structural damage was seen in either coconut land or the mangroves surrounding the Rekawa lagoon. Towards the beach, littoral species such as *Bryophyllum pinnata* and *Cyperus rotundus*



can be found. The halophytes together with *Bacopa monniera* and *Ipomoea aquatica* are found close to water. 37 fish species, 9 crustacean species and 104 bird species (including 15 migrants) have been recorded from the lagoon environment. Off the northeastern side of the Rekawa headline there is a shallow fringing reef about 100- 150 m wide and 300 m long. Thirty-five species of stony corals and 138 species of reef and reef associated fish have been recorded from the reef. The sandy beach provides an ideal nesting site for five species of marine turtles.

#### **Noteworthy fauna:**

The common finfish in fish catches include *Anabas testudineus*, *Channa orientalis*, *Eetroplus suratensis*, *Hyporhamphus limbatus*, *Oreochromis* spp. and *Anchoviella* spp. Three species of economically important prawn are found in the lagoon, namely, *Penaeus indicus*, *Metapenaeus monoceros* and *Penaeus monodon*. The adjacent beaches also provide favourable nesting grounds for all five species of globally endangered marine turtles that visit Sri Lanka, although no recent records of *Eretmochelys imbricata* nests have been found. The most common nesting species is *Chelonia mydas*.

#### **Noteworthy flora:**

The mangrove communities are dominated by *Lumnitzera racemosa*, *Ceriops tagal* and *Avicennia officinalis*.

#### **Land use:**

Lagoon fishing is practiced by around 10% of the population while a much larger number is involved in sea fishing. Illegal sea coral mining also takes place. Human settlements and agriculture are the main terrestrial land uses in the lagoon vicinity.

#### **Possible changes in land use:**

The development of a causeway across the narrow section of the lagoon at Kapuhenwala has reduced the natural exchange of sea and lagoon water and increased the sedimentation. This has led to increased mangrove cover and decreased fishery potential which may impact on fisheries in the future. Establishment of a new settlement area in the northern border of the lagoon subsequent to the tsunami could lead to further sedimentation and clearance of mangrove areas as well. Coral mining has also led to severe erosion of the coastline at Rekawa.

#### **Hydrological and biophysical values:**

Manual breaching of the lagoon mouth during the rainy season controls flooding. Opening of the mouth is also important to the shrimp fishery, as the shrimp larvae enters the lagoon during this period.

#### **Social and cultural values:**

The lagoon area has nearly 5400 people comprising of 1200 families, out of which 50% are engaged in sea and lagoon fishing and the remainder in agriculture. However, due to the high salinity of the soil, most land in the Rekawa area cannot be used for paddy cultivation. Their incomes tend to be low by national standards and due to high levels of unemployment, the community depends on the lagoon for survival. The lagoon hosts a community of traditional fisher folk engaged in a seven month shrimp fishery using traditional non-mechanical boats, nets and various traps. This community has resisted the development of commercial prawn farming in the area.

**Scientific research and monitoring:**

NARA maintains a research station and regional office at Rekawa and conducts research on the lagoon fishery. The TCP, has established an education and research centre at Rekawa in 1994, and implemented several research programmes on turtles that visit the Rekawa beach for nesting.

**Conservation education:**

Since 1996, the TCP has been conducting community based marine turtle nest protection programmes employing previous nest poachers in the area. The DWC is also involved in similar activities.

**Recreation and tourism:**

The Rekawa area has potential for nature-based tourism, which has not yet been fully achieved. The TCP conducts nature based tourism programmes on the in-situ conservation of marine turtles in the adjoining beach area. Recently, the USAID funded SCOTIA selected Rekawa lagoon area to promote ecotourism.

**Conservation measures taken:**

A Coastal Environmental Profile of Rekawa lagoon was prepared in 1990 by the CCD which initiated the Rekawa SAM process under the CRMP in 1993, with a management plan being prepared in 1996. The Rekawa Lagoon Fishery Cooperative Society (RLFCS) has been organized and registered to carry out the management plan. Unfortunately, after the CRMP activities ended in the 1990s, the RLFCS ceased to operate. In 1999, the Rekawa lagoon fisheries management area regulations were gazetted under the FARA. In 2001, Rekawa Lagoon Fisheries Management was gazetted and in the same year it was rechristened as the Rekawa Lagoon Fisheries Management Authority. Reduction of destructive fishing practices was successful, especially with respect to fishing kraals and net size, largely as a result of the work of the RLMC through a GTZ funded project. The TCP has been operating in the area since the mid 1990s and has promoted in-situ turtle conservation together with DWC and NARA as well as introducing new livelihoods to women coral miners in the area. In 2000, the Survey Department demarcated the boundaries of the mangroves in this area, while NARA and local CBO's have carried out mangrove restoration activities around the lagoon over the past decade. The DWC has recently declared the Rekawa beach (4 km stretch) as a sanctuary, to conserve marine turtles.

**Conservation measures proposed:**

Several conservation measures have been proposed by the ADB funded CRMP and GEF funded RUK Project. These include the development of alternative livelihoods for lagoon resource users and the implementation of a zonation scheme and sustainable use plan for the mangrove resources, restoration of degraded mangrove stands, and restocking of the lagoon with shrimp.

**Disturbances and threats:**

Reduced freshwater flow due to the numerous irrigation schemes in the watersheds, reduced sea water flow and increased sedimentation due to construction of several causeways, particularly at Kapuhenwala have resulted in reduction of the lagoon area from 339 ha in 1983 to 250 ha in 1992. The use of drift nets have reduced the natural recruitment of shrimp and movement of fish, while degradation of lagoon water quality due to pesticides and insecticides used in agriculture and removal of mangrove for hotel construction have destroyed habitats and affected fisheries. The December 2004 tsunami destroyed a few mangrove stands near the lagoon mouth. The invasive alien *Opuntia dillennii* is found extensively and some plants got uprooted and transported to inland areas during the tsunami. The propagules have now started to colonise

new areas and could potentially pose a problem. The coral reef closer to the lagoon has been degraded due to illegal but extensive coral mining.

**Land tenure:**

The lagoon and its environs are state owned while home gardens and houses are situated on privately owned land.

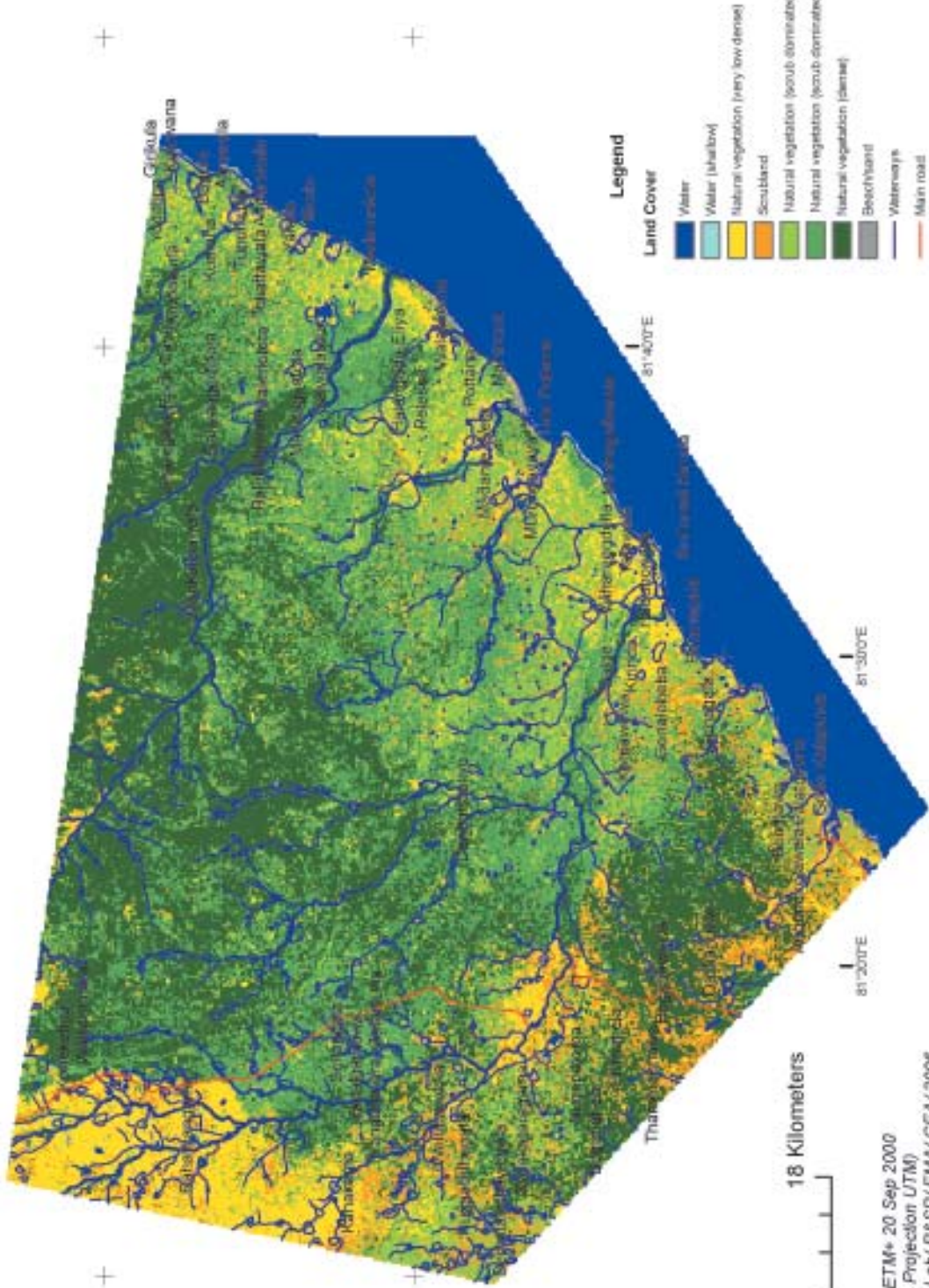
**Management authority and jurisdiction:**

The Tangalle DS has jurisdiction over the area. The Rekawa Lagoon Fishermen's Cooperative Society, a voluntary organization manages the lagoon fishery along with the Fisheries Department.

**References:**

Clemett et al. (2004); Ekaratne et al. (1998); Ganewatte et al. (1995); IUCN (2000); IUCN (2003d); Kapurusinghe (1998); Lowry et al. (1997); NARA (1997); Perera et al. (2004); Perera et al. (2005); Rekawa Special Area Management Coordinating Committee (1996); Southern Development Authority of Sri Lanka/ CCD (2000b)

# Ruhuna National Park and Yala East



### Legend

#### Land Cover

- Water
- Water (shallow)
- Natural vegetation (very low dense)
- Scrubland
- Natural vegetation (scrub dominated, low dense)
- Natural vegetation (scrub dominated, moderate dense)
- Natural vegetation (dense)
- Beachland
- Waterways
- Main road

0 4.5 9 18 Kilometers

Source: Landsat ETM+ 20 Sep 2000  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/ R&SP/EMA/CEA/ 2006







# Ruhuna National Park

## Location:

6° 40' 0 N and 81° 12' 0 E to 6° 16' 0 N and 81° 44' 0 E; 736905 N and 522106 E to 692739 N and 581119 E; in the south-eastern region of Sri Lanka extending over the Moneragala District of the Uva province and the Hambantota District, of the Southern province.

## Area:

The park area is 97, 881 ha (Block I – 14, 101 ha; Block II- 9,931 ha; Block III – 40, 775 ha; Block IV – 26, 418 ha; Block V – 6,656 ha)

## Altitude:

0 – 160 m

## Overview:

Ruhuna National Park (Block I to V) is one of the largest agglomerations of protected areas in Sri Lanka. It comprises of a complex of freshwater and brackish water wetlands including seasonal freshwater ponds, large and small abandoned tanks, waterholes, rivers and seasonal streams, coastal lagoons, estuaries, small patches of mangroves and marshes which are spread out within the park (mainly within Blocks I and II). The area is very rich in biodiversity and important for elephant and water bird conservation and as such is considered an IBA by BirdLife International. At present, the park is the most important destination for nature tourism in the country. Owing to the availability of water, and flat terrain, scrub vegetation and grassland, animals can be seen in large numbers in Block I.

## Physical features:

The geology of the area is composed almost entirely of metamorphic rocks belonging to the Pre-Cambrian age and can be categorized into two main series: Vijayan series, and the highland series. Out of the 6 soil types identified, reddish brown earths and low humic gley soils are prominent in the area. The area is situated in the lowest peneplain of the island, which stretches from Trincomalee to the Hambantota coastal plain. The land is a flat and gently undulating plain that stretches down to the coast with a height of less than 30 m but rises inland to 100 – 125 m above sea level. Situated in the dry semi-arid type of climate, the major rainy season is the northeast monsoon. The mean annual rainfall varies between 500 – 775 mm. The mean temperature range is between 26.38°C in January to 30° C in April. During the year the wind speed varies from 15 km/h during the northeast monsoon to 23 km/h during the southwest monsoons. Although, the availability of surface water appears to be a critical factor in the National Park during the dry season, water becomes abundantly available after the onset of the northeast monsoons. The surface water within the park is present in the form of streams, tanks, waterholes, rock pools, lagoons and bays. Many of the waterholes have originated at places with natural depressions. Rock pools of varying sizes hold water, often throughout the year, and provide an important source of water for elephants. The natural waterholes provide ideal habitats for many water birds, wild buffaloes etc. The largest concentration of such reservoirs are found within Block I followed by Block II. Amongst the largest tanks are the Yodha Wewa (480 ha) and Badu Wewa in close proximity to Block I.

There are a number of major and minor rivers and streams in the area that either originate in the highlands adjacent to the Hambantota District or from the central and Uva hills of the island and flow in a southeasterly direction. Kumbukkan Oya in the Northeast and Manik ganga and its tributaries in the west

flow through the Park providing a source of water to the animals even during the driest months of the year. The other important streams are Kurunda Ara, Nabadagas Ara, Katupila Ara, Karambe Ara, Wila Oya, Maheseelawa Oya and Buthawa Oya. These streams usually dry up during the dry season. These rivers and streams show very high fluctuations in the runoff between wet and dry seasons. For example, the Kumbukkan Oya carries seven times as much water to the sea in the rainy season than it does during the dry season. Mangrove vegetation is widespread in the estuaries of Manik Ganga and Kumbukkan Oya. Some of the important lagoons within the area are Buthuwa, Udapothana, Mahirawa, Etiliu and Udagajaba.

### **Ecological features:**

The multifarious ecosystems ranging from moist monsoon forest, dry monsoon forests, semi deciduous forests, thorn forests, grasslands, fresh water and marine wetlands, sandy beaches etc. are home to a large number of animals and plants. Of the Block I area, 62% of the land area is under forest cover (50% open forests, 35% scrub forest and 15% dense forests) while 26% of the area comprises mainly of rangelands of open park country (Pelessa grasslands) including some extensive grasslands. While the forests are mostly confined to around the Manik Ganga, the principal rangelands are distributed towards the coast. Tanks and water holes represent 1.2% of the land area while lagoons and mangroves represent 1.6% and the beach 2%. Chena land occupies 6%. In the Buthuwa lagoon, mangrove vegetation primarily comprises of *Rhizophora mucronata*. The other less abundant species are *Avicennia* sp. and *Aegiceras* sp.

In the Block II area, 42% is covered by forests, 32% by rangelands, and other habitats include natural water holes, lagoons, mangroves and beaches. The extensive Pitiya grasslands of Block II are mainly represented by Yala-wela, which was once a large expanse of fertile paddy land that was later abandoned. Mangroves in Block II with a total extent of 100 ha are mainly distributed around the Manik Ganga estuary. They are also found in the lagoon areas of Pilinnewa, Mahapothana, and Pahalapothona. The main mangrove species are *Rhizophora mucronata*, *Sonneratia caseolaris*, *Avicennia* spp and *Aegiceras corniculatum*.

Block III comprises of 85% forests and 15% rangelands, while in Block IV, 95% is forest, out of which 84% is dense forest while 10% is scrub. In Block V, 4,415 ha (out of 6,650 ha) is covered by forest while 1,500 ha comprises of rangelands. 68% is dense forest. Trees such as *Drypetes sepiaria*, and *Manilkara hexandra* form the principal component of the main canopy. The Pitiya grasslands are important grazing areas. The dominant grass in Pitiya is usually *Cynodon barbata*, but the grass *Zoysia matrella* becomes dominant closer to the beach. The vertebrate fauna recorded from the area include 31 fish, 14 amphibians, 30 reptiles, 151 bird species, and 32 mammal species.

### **Noteworthy fauna:**

Almost 90% of the fish population in the permanent reservoirs consist of the exotic food fish *Oreochromis mossambicus*. Among the other fish species, *Garra ceylonensis* and *Esomus thermoicos* are endemic. Breeding populations of two species of crocodiles (*Crocodylus palustris* and *C. porosus*) inhabit the wetlands of the park. The beach adjoining the National Park is a nesting ground for all five species of globally endangered marine turtle that visit Sri Lanka. At least 90 species of water birds inhabit the wetland habitats in the park, half of them being annual migrants. Common water birds include waterfowl (i.e. *Dendrocygna javanica*, *Anas querquedula*), cormorants (*Phalacrocorax niger*, *P. fuscicollis*), large water birds (*Ardea cinerea*, *Threskiornis melanocephalus*, *Platalea leucorodia*, *Anastomus oscitans*, *Mycteria leucocephala*), medium sized waders (*Tringa* spp.) and small waders (*Charadrius* spp.). Rare water birds include *Ephippiorhynchus asiaticus*, and *Leptoptilus javanicus*. The migrant *Pelecanus onocrotatus* has been observed in the lagoons with the resident *Pelecanus phillipensis*. The water holes cater to the water requirements of the wild animals within the park, including a large population of wild elephants (> 300).

**Noteworthy flora:**

A wild rice species (*Oryza* spp.) can be found in the seasonally inundated areas of Block II. Endemic plant species around the wetlands include *Argyreia populifolia*, *Calanus rivalis*, *Carmona oblongifolia*, *Casearia thwaitesii*, *Cordia oblongifolia*, *Derris parvifolia*, *Glenia unijunga*, *Glossocarpa scandens*, *Gymnea rotundatum* and *Sanseveria zeylanica*. Common medicinal plants include *Munronia pumila*, *Salacia reticulata*, and *Asparagas racemosus*.

**Land use:**

Within the National Park, the wetlands and their environs are protected for biodiversity conservation while Block I is also used for nature tourism. Illegal activities such as poaching, tree felling, chena cultivation and gem and sand mining have been observed within the Park. Permits are issued by the DWC to fishermen to fish around the coastal stretch of Patanangala from late September to early April. In the surrounding villages, people are involved in activities such as paddy and chena cultivation and animal rearing (mainly cattle and buffalo).

**Possible changes in land use:**

A main road planned across the park, linking Hambantota and Panama areas, could lead to clearance of vegetation along the pathway identified for the road.

**Hydrological and biophysical values:**

The wetlands provide an important water source for animals within the Park.

**Social and cultural values:**

A majority of the villagers around the park are farmers (rice and chena) that fall within the low-income category of the country and are dependent on the Samurdhi scheme. These villagers due to their circumstances are found to enter Block III and V to collect medicinal plants, fruits, food plants, rattan and bee's honey. Seasonal fisheries activities are undertaken along the Patanangala coastal stretch through a permit system.

The location of the National Park and its associated wetland clusters has great historical significance as it forms part of the Ruhuna Rata, which was the southern kingdom of the Sinhalese kings. The presence of a large number of ancient albeit dilapidated tanks provides evidence of a rich hydraulic and agricultural civilisation dating back to 5<sup>th</sup> century BC. According to the Mahavamsa, the great chronicle of Sri Lanka, the Kingdom of Ruhuna began to decline by the end of the 13<sup>th</sup> Century AD. During the colonial period that extended from the 16-20<sup>th</sup> Century, the area became a popular hunting ground. Historical and religious sites such as Kataragama, Sithulpahuwa and Magul Maha Vihara are found in the vicinity.

**Scientific research and monitoring:**

Limited research facilities are available within the National Park. However, under the GEF funded wildlife conservation project, several short-term biodiversity surveys were carried out between 1995-97. Extensive research on vegetation and large mammals was carried out by the Smithsonian Institute as far back as 1969. In 1978, a team of students from the Universities of Colombo and Aberdeen carried out a joint biological survey in the coastal zone of Block I. More recently, there was a project to establish a tamarind tree fence around the park in the Buttala area to prevent elephants from moving out of the park, an assessment of the impacts of the tsunami by the University of Colombo, and two studies on the human-elephant conflict and impacts of gem mining.

**Conservation education:**

There is a small museum inside the park.



**Recreation and tourism:**

The park is very popular amongst nature lovers and is the most visited park in Sri Lanka. In 2002 around 156,867 tourists, both local and foreign visited the park. Block I is the main area for visitors, with six wildlife bungalows managed by the DWC. There are 2 campsites each in Block II and III. The park is closed to visitors from 1<sup>st</sup> September to 15<sup>th</sup> October due to drought conditions. According to the Safari Jeep Owners Association, around 110 jeeps are registered with the association, which provides full-time employment to 144 people. While most tourists visit the park to enjoy the wildlife, some come for educational purposes such as to produce films etc.

**Conservation measures taken:**

Ruhuna National Park consists of five blocks. Block I of the park was established in 1938, having previously been a resident sportsmen's shooting reserve since 1900. Further blocks were established in subsequent years: Block II in 1954 (originally proclaimed as Yala Sanctuary in 1900), Block III in 1967, Block IV in 1969 and finally Block V in 1973. Yala east National Park, the Yala Strict Nature Reserve, and 3 Sanctuaries (Kataragama, Katagamuwa and Nimalawa) are continuous with the Ruhuna National Park. Management of grazing lands, conservation of small water ponds and eradication of invasive alien species are the activities that are currently being implemented by the DWC. A 40 km long electric fence was erected to prevent elephants moving out of the Park boundaries and into the nearby villages.

**Conservation measures proposed:**

The management plan developed under the GEF funded Protected Area Management and Wildlife Conservation (PAM-WC) project recommends the following conservation measures: zonation of the park into different areas (strict conservation, coastal conservation, intensive management, eco-development, tourism and cultural zone and administrative zone); rehabilitation of existing tanks and development of new ones to reduce pressure during the dry period; mitigation of genetic contamination of wild buffalo and development of ecotourism and alternative livelihoods for associated communities. Additionally, it is important to reduce visitor pressure on the park by restricting the number of visitors and vehicles permitted per day.

**Disturbances and threats:**

A large stand of *Sonneratia caseolaris* in the Manik Ganga estuary is faced with forest die back. Main conservation issues include poaching of animals; uncontrolled grazing by domesticated cattle and buffalo; illegal gem mining in the riverbeds; forest fires, which mainly spread from nearby chena land; uncontrolled tourism leading to noise and air pollution from the vehicles; cultivation of tobacco. Spread of invasive alien plant species such as *Lantana camara*, *Opuntia dillennii* and *Chromolaena odorata* pose threats to native species. The 2004 tsunami affected the coastal stretch, particularly in the Patanangala area.

**Land tenure:**

State owned

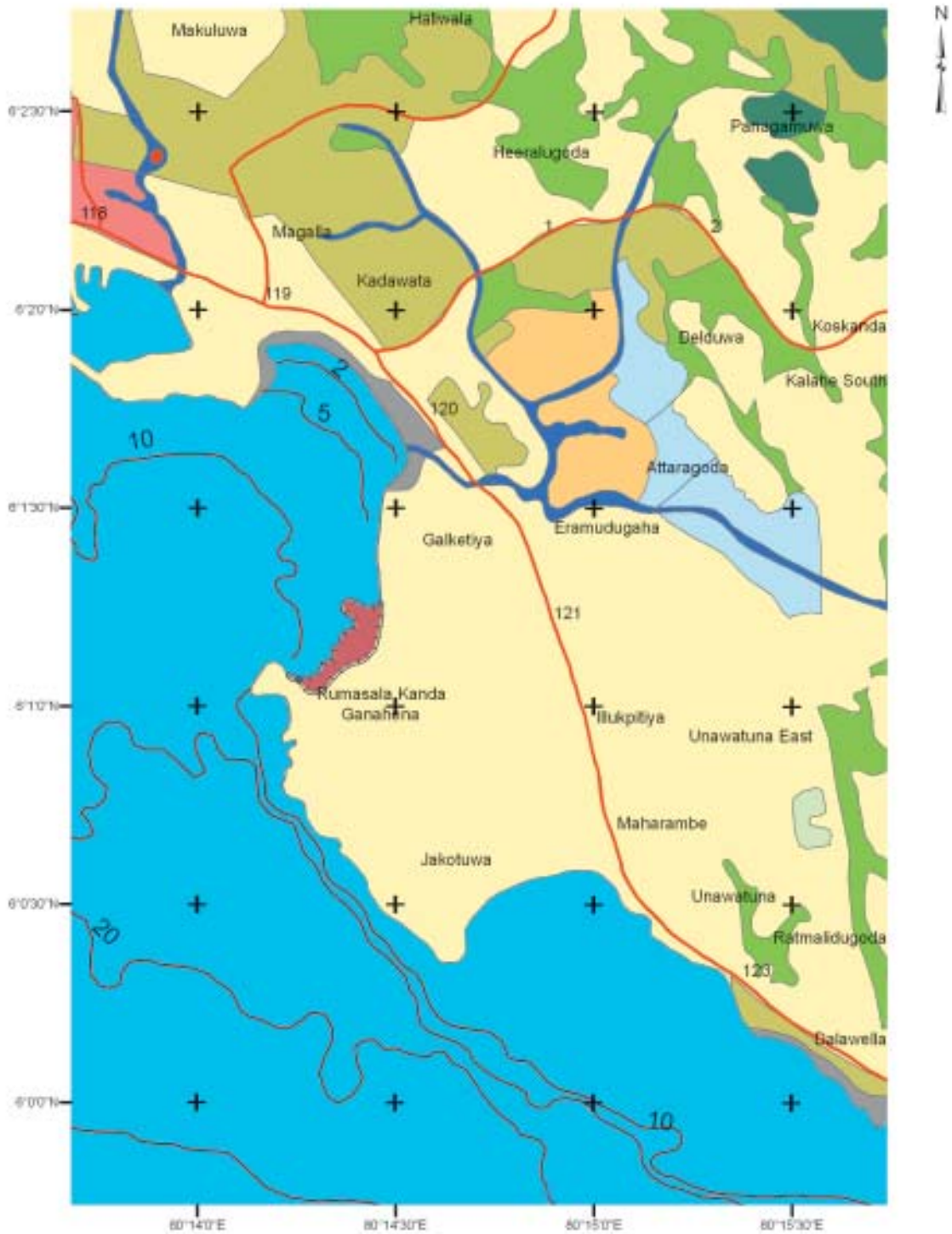
**Management authority and jurisdiction:**

DWC

**References:**

BirdLife International (2005); DWC (2004); Kotagama et al. (1989); Panwar and Wickramasinghe (1997)

# Rumassala Marine Sanctuary



0 0.25 0.5 1 Kilometers

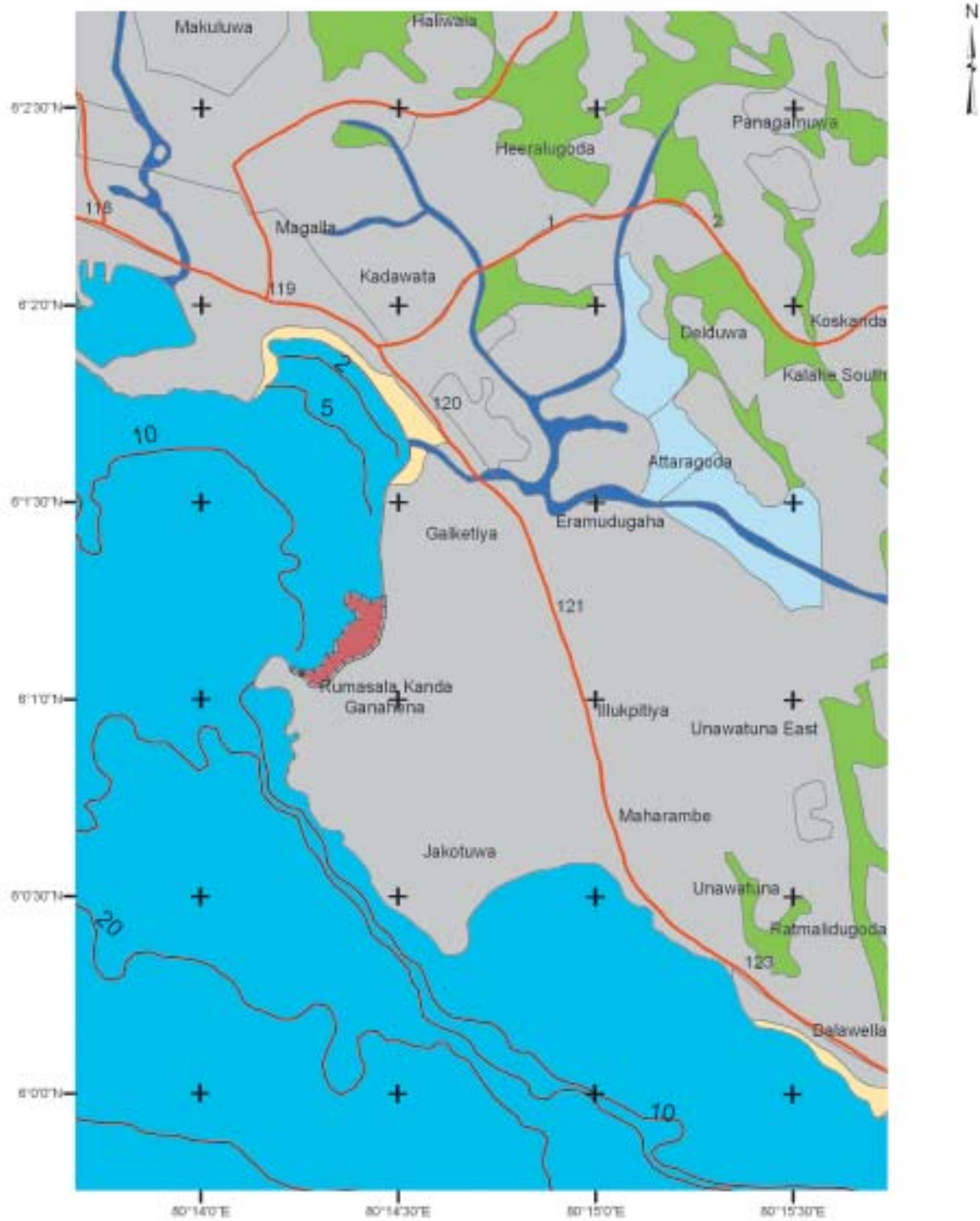
Land Cover		Legend	
	Sea		Grassland
	Stream line		Homegardens
	Marsh		Scrubland
	Coral reef		Coconut
	Paddy land		Rubber
	Sand		Built up area
	Waterways		Main road
	Bathymetrical contour		

Source: 1:30,000 scale Admiralty chart No. : 107  
U.K. Hydrographic Office, 2000-2001  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006










## Rumassala Marine Sanctuary Wetlands based on Ramsar Classification



0 0.25 0.5 1 Kilometers

### Legend

#### Class Name

- |   |  |
|---|--|
|  Sea                                   |  Irrigated land |
|  Permanent freshwater marshes/pools    |  Non-wetlands   |
|  Canals and drainage channels, ditches |  Waterways      |
|  Sand, shingle or pebble shores        |  Main road      |
|  Coral reefs                           |  |

Source: 1:30,000 scale Admiralty chart No. : 107  
U.K. Hydrographic Office, 2000-2001  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Rumassala Marine Sanctuary

## Location:

6° 2' 45 N and 80° 13' 45 E to 6° 0' 0 N and 80° 15' 45 E; 666949 N and 415156 E to 663261 N and 416996 E; in the southern end of Galle Bay, in the Galle District, of the Southern Province.

## Area:

1,707 ha

## Altitude:

Sea level to a depth of around 8m

## Overview:

The Rumassala Marine Sanctuary encompasses a small near-shore coral reef growing on hard substrate around the base of the Rumassala hill in the sheltered waters of Galle Bay. Despite its small size, the reef is known for its rich biodiversity and is an important habitat for many marine species. It is important for small-scale fisheries, collection of ornamental fish and tourism. The reef has been degraded by the use of dynamite for fishing and coral bleaching.

## Physical features:

The reef is sheltered from rough seas by a rocky headland, and unlike most fringing reefs along the southern coast, does not have a shallow reef crest and reef lagoon. Coral communities occur on old limestone and rock habitats along the seafloor. Coral patches varying in size from a few meters to over 30m across are located a few meters away from the shore, and extend around 200m towards the sea to a depth of around 8m. Some spur and groove formations are found in deeper areas. Shallower areas contain large stands of hard coral, while deeper areas contain rocky habitats with scattered colonies of hard and soft corals. Rumassala lies within the wet zone of Sri Lanka, which is characterized by an annual rainfall of over 2,000mm per year and average annual temperatures of around 27°C. The reef is influenced by the southwest monsoon from May to October, although wave energy is reduced due to its sheltered location. However, strong currents and freshwater input results in increased turbidity during this period. Sedimentation is relatively high due to poor water circulation as the reef is located within an enclosed bay.

## Ecological features:

The reef was dominated by branching and tabulate *Acropora* spp. with significant stands of *Montipora* spp. and *Porites rus*. However, much of the *Acropora* was destroyed during mass coral bleaching in 1998, which resulted in the mortality of most corals. The reef has now been re-colonized mostly by *Pocillopora damicornis* and *Porites rus*, and live coral cover is around 25%. Over 500 species of reef and reef-associated fish have been recorded from the reef. Major fish groups include damselfishes (Pomacentridae), wrasses (Labridae) and surgeonfishes (Acanthuridae).

## Noteworthy fauna:

The coral species *Porites desilveri* is restricted to Sri Lanka. Among the reef fish, *Chlorurus rhakoura* and *Pomacentrus proteus* are endemic to Sri Lanka, while *Cheilinus undulates* is globally endangered. The protected *Labroides bicolor* has been recorded at the site, while *Carcharhinus melanopterus* are



occasionally seen on the reef. Four species of globally endangered marine turtles (*Eretmochelys imbricata*, *Chelonia mydas*, *Lepidochelys olivacea* and *Dermochelys coriacea*) visit the reef.

**Noteworthy flora:**

Information not available

**Land use:**

Fishing and ornamental fish collection is carried out by the local communities. There is some tourism due to its proximity to the tourist areas of Unawatuna and Galle.

**Possible changes in land use:**

Use of dynamite for fishing has caused extensive damage to the reef structure and has reduced fish stocks. Continued reef degradation may have impacts on fisheries related livelihoods. The use of dynamite can also decrease tourist appeal for the reef.

**Hydrological and biophysical values:**

The reef is part of a larger system of coral reefs around the Rumassala headland, which includes the coral reefs at Unawatuna. There is high recruitment of larvae of many species, probably due to its location and prevailing current patterns.

**Social and cultural values:**

The Galle Bay area has a maritime heritage as a natural harbour, and was a major sea port during the periods of Portuguese, Dutch and British occupation in Sri Lanka. Rumassala which is located close to the main harbour area is therefore an important marine archaeological site, and the watering point on Rumassala hill was important during the colonial period. The reef supports a number of artisanal fishermen using traditional methods such as hook and line fishing. The reef and secluded beach is popular among locals for recreation and is visited by tourists from nearby areas.

**Scientific research and monitoring:**

The reef is being studied by NARA with support from the GCRMN and CORDIO. The Nature Conservation Group has also carried out extensive surveys of the coral reef.

**Conservation education:**

The Nature Conservation Group has undertaken numerous community education activities to promote conservation of the reef and encourage sustainable use of resources.

**Recreation and tourism:**

The beach area near the reef is a popular picnic and recreation area for locals. Tourists from Galle and Unawatuna also visit the area for snorkelling on the reef and use of the beach. SCUBA diving operators based in Unawatuna also conduct diving tours to the reef.

**Conservation measures taken:**

The reef area was declared as a Marine Sanctuary in 2003 under the FFPO. However, there is no implementation of regulations.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

Destructive fishing practices such as the use of dynamite and bottom set nets, and extensive collection of ornamental species is degrading the reef impacting on the biodiversity. Sedimentation can also lead to increased coral mortality and reduce recruitment. The 2004 Tsunami did not result in any significant mechanical damage to corals in Rumassala. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned

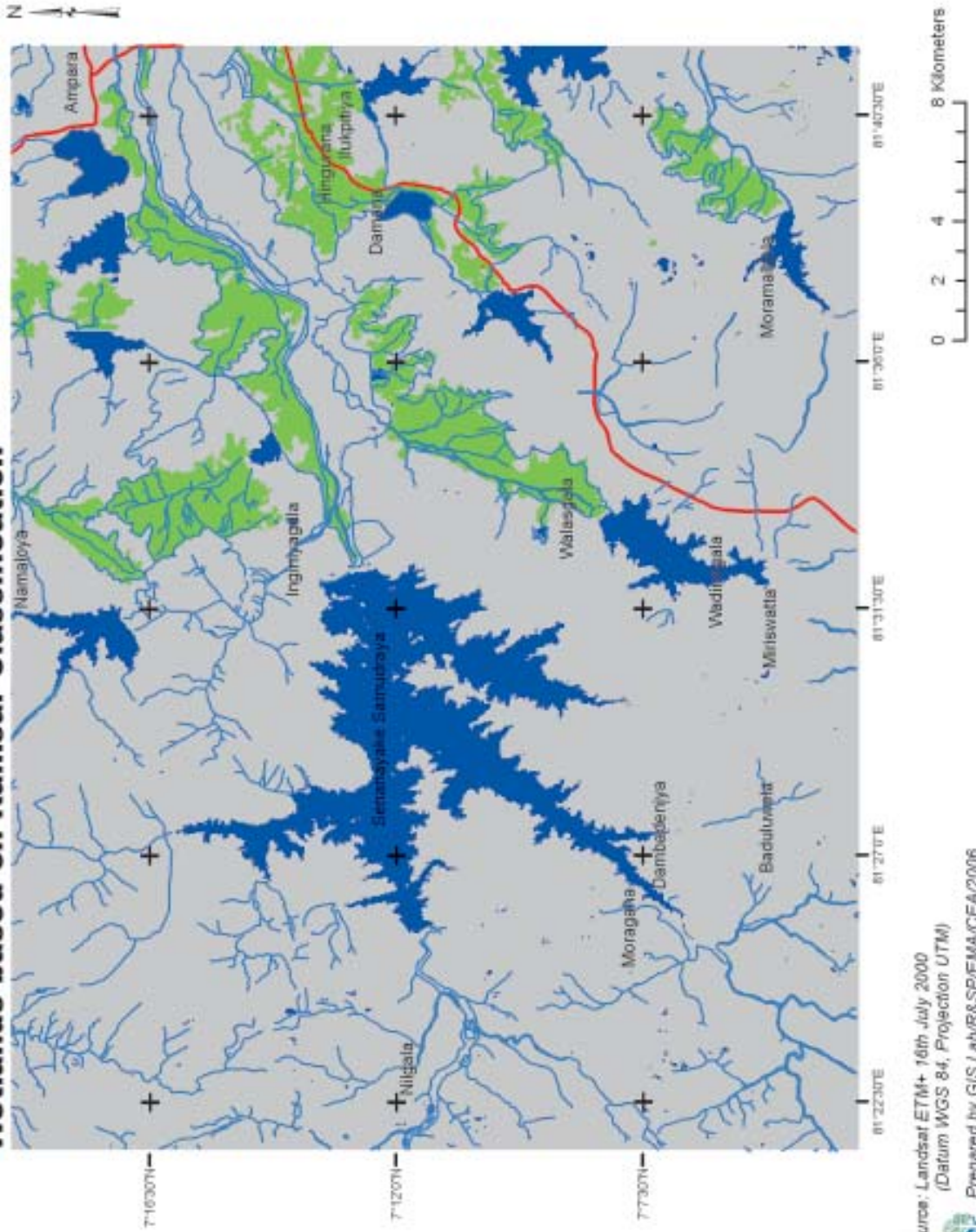
**Management authority and jurisdiction:**

DWC

**References:**

Karunaratne and Weerakkody (1998); NARA/CORDIO/IUCN/GCRMN/SLSAC (2005); Rajasuriya et al. (1995); Rajasuriya et al. (2006)

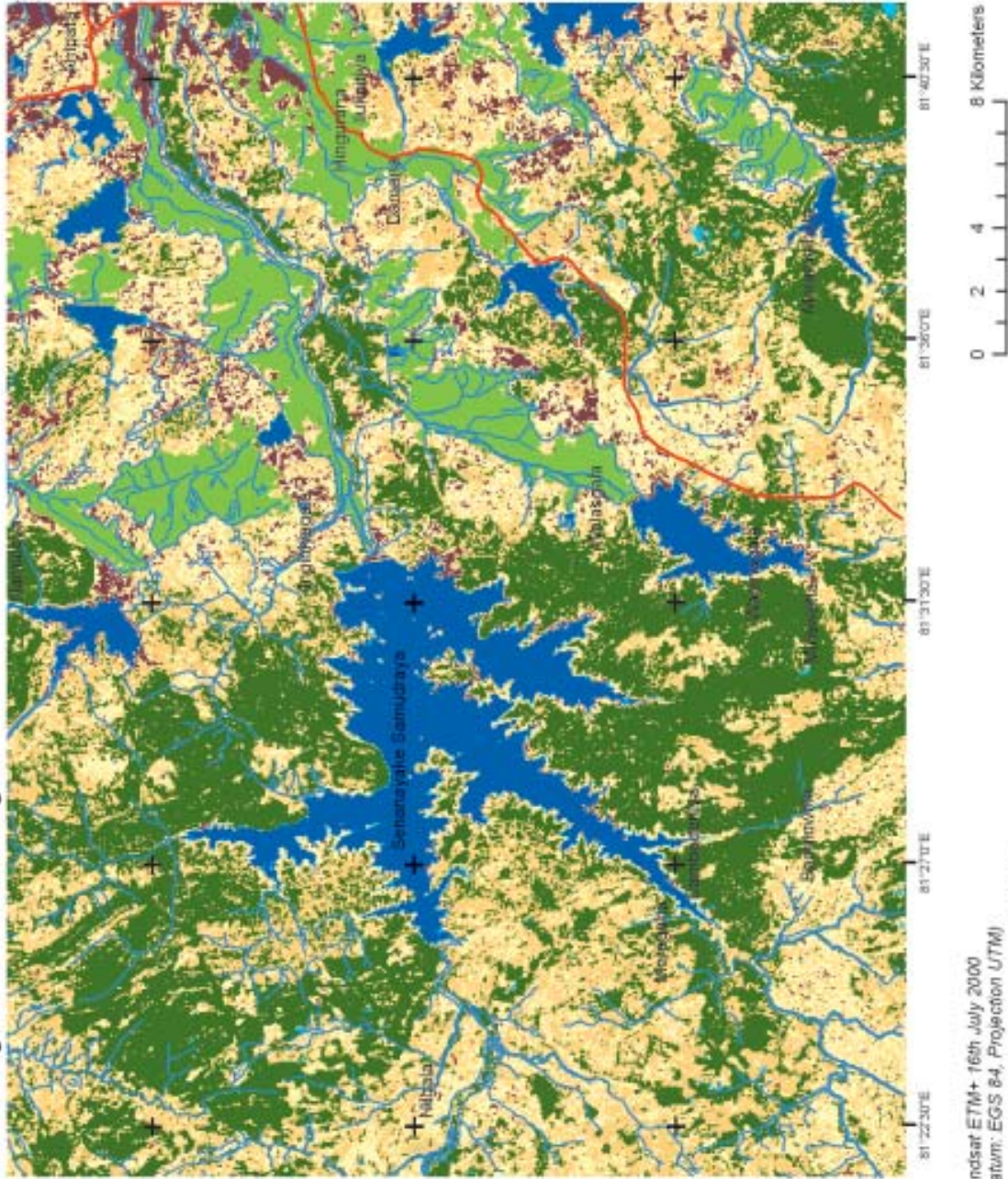
# Senanayake Samudraya Wetlands based on Ramsar Classification



Source: Landsat ETM+ 16th July 2000  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Senanayake Samudraya



Source: Landsat ETM+ 16th July 2000  
 (Datum: EGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Senanayake Samudraya

## Location:

7° 16' 0 N and 81° 22' 0 E to 7° 5' 0 N and 81° 40' 0 E; 803245 N and 540476 E to 783014 N and 573622 E; straddling the border of the Moneragala District of the Uva Province and the Ampara District, of the Eastern Province.

## Area:

7,770 ha at full supply level

## Altitude:

Approximately 80 m above sea level

## Overview:

This wetland is primarily a large water storage reservoir created in 1951 by damming the Gal Oya at Inginiyagala as part of the Gal Oya Development scheme to open up 162,000 ha of forest for agricultural and industrial purposes. The tank is an important inland fishery source. The reservoir and its surroundings have been declared a Sanctuary, while the Sanctuary itself and the catchment of the wetland lie within the Gal Oya National Park. The area is rich in biodiversity. Furthermore this is an important habitat for elephants and water birds. As such, Birdlife International has identified this site as an IBA.

## Physical features:

The reservoir has been classified as “deep, encompassing many valleys” as the wetland is a multi-fingered lake with 4 major basins and surrounded by hills. The reservoir is located in the Gal Oya basin, which covers an area of 179,200 ha. The catchment area of the reservoir alone covers about 100,000ha. The main river feeding the reservoir is the Gal Oya River. In addition to this, the reservoir is fed with water from seven main tributaries and 23 unnamed minor seasonal streams. The profusion of bays gives the reservoir an estimated shoreline of about 130 km at full supply level. The capacity of the reservoir is  $949 \times 10^6$  m<sup>3</sup> with a maximum depth of 33m and an average depth of 12m. The water level in the reservoir is subject to wide seasonal and annual fluctuations and is directly related to rainfall in the region. The lowest level recorded in the recent past was 28m below spill level in 1989; maximum depth in the reservoir at that time was 5m. The length of the dam is 1,093m with a crest at 83 m above sea level. The entire reservoir area is situated in the Vijayan series, a Precambrian formation prevailing in the eastern part of the country. The reservoir is situated in the dry zone of the eastern low country of Sri Lanka in the agro-ecological region DL<sub>2</sub>, which is defined as an area with a 75% expectancy of annual rainfall exceeding 900mm. Most rainfall is normally recorded in the period October-February; the period May-September is usually dry. Mean annual temperature is around 27.7 °C.

## Ecological features:

The reservoir's phytoplankton community is dominated by green algae such as *Mougeotia sp*, *Cosmarium singulum*, *C. reniformi*, *Staurastrum tetracerum* and *S. singulum*. Large stands of dead trees that were not removed before the impoundment can still be seen within the reservoir. Fringing areas of the reservoir other than those situated close to the dam are covered with grass, shrubs and forests such as dry evergreen mixed forest and savannah type grassland dominated by *Cymbopogon confertiflorus* and *Themeda* spp. The latter habitat is artificial and developed with logging in the bed of the reservoir. It is maintained by the regular inundation of the land.

**Noteworthy fauna:**

The reservoir has a rich diversity of freshwater fish, including native and exotic species. *Oreochromis mossambicus*, *Labeo rohita* and *Osphronemus goramy* are among the most common exotic species. *Amblypharygodon melettinus*, *Esomus thermoicos*, *Puntius singhala* and *Clarias brachysoma* are among the common indigenous species. This reservoir also serves as an ideal habitat for water birds, including migratory waterfowl during the migratory season. *Phalacrocorax fuscicollis*, *Pelecanus philippensis*, *Anhinga melanogaster*, *Ardea cinerea* and *Dendrocygna javanica* are among the common water birds in this reservoir. In addition raptors such as *Haliaeetus leucogaster* and *Ichthyophaga ichthyaetus* are regularly noted in this area. Aquatic reptiles such as *Crocodylus palustris*, *Melanochelys trijuga* and *Lissemys punctata* have been recorded in the reservoir. Large herbivores such as *Cervus axis*, *Cervus unicolor* and *Elephas maximus* can be seen in the grasslands fringing the reservoir.

**Noteworthy flora:**

The dry mixed evergreen forests adjacent to the reservoirs consist of noteworthy endemic species such as *Diospyros attenuata*, *Dialium ovoideum*, *Munronia pumila* and *Syzygium cumini*. Additionally, valuable medicinal plants such as *Phyllanthus emblica*, *Terminalia belerica*, *T. chebula* and *Pterocarpus marsupium* have also been recorded from the grasslands associated with the reservoir. Valuable timber species such as *Diospyros ebenum*, *Manilkara hexandra* and *Chloroxylon swietenia* are also found in the adjacent forest areas.

**Land use:**

Senanayake Samudraya is a source of water for irrigation, domestic use and fisheries activities. Under the Gal Oya Development Scheme, which began in 1949, the valley area around the park has been developed for agriculture. Paddy cultivation takes place both during the Yala and Maha seasons, and around 4,000 ha of the right bank is under sugarcane cultivation.

**Possible changes in land use:**

With the declaration of the reservoir as a FMA under FARA, more fingerlings will be introduced to the waterbody which in turn could lead to an increase in the number of fishermen using the resource. Logging and allocation of more land for agriculture would lead to the degradation of the catchment area of the reservoir.

**Hydrological and biophysical values:**

This reservoir is a valuable source of water for irrigation and it supports an important inland fishery.

**Social and cultural values:**

A thriving inland fishing industry associated with the reservoir supports the livelihood of the local communities. Senanayaka Samudraya was the largest and first reservoir to be built under the Gal Oya basin development scheme.

**Scientific research and monitoring:**

The National Park is mostly inaccessible, except by boat. A considerable amount of research has been carried out on the elephant population within the Gal Oya National Park. Additionally, NAQDA has conducted research activities including fish breeding within the tank.

**Conservation education:**

Information not available

**Recreation and tourism:**

There is a bungalow maintained by the DWC and a tourist hotel available at Inginiyagala for use by the general public.

**Conservation measures taken:**

The reservoir was declared as a Sanctuary in 1954. The catchment of the wetland lies within the Gal Oya National Park (25,900 ha), which was also established in the same year. The DWC enforces strict laws against bush meat consumption. The CEA developed a wetland site report and conservation action plan for this site in 1992. In 2005, the reservoir was declared a FMA under FARA, for the development of the inland fishery. The Irrigation Department has undertaken to rehabilitate the channels and the reservoir gates.

**Conservation measures proposed:**

The document prepared by the CEA recommends certain conservation measures.

**Disturbances and threats:**

Cattle grazing and plastic bag waste pollution were the most evident threats. Other threats include erosion and siltation of the reservoir due to the inadequate protection of the catchment area, the presence of extensive paddy cultivation areas and some poaching within the park. Food and medicinal plant collection and illegal timber felling from the surrounding forests and frequent fires in the surrounding savannah areas pose a major threat to the reservoir and its environs. Poor maintenance of reservoir gates and distribution channels has led to decreased water retention within the reservoir.

**Land tenure:**

The reservoir and surrounding areas are state-owned.

**Management authority and jurisdiction:**

The reservoir is managed by the Irrigation Department while the surrounding area is under the jurisdiction of the DWC. The inland fisheries are regulated by DFAR.

**References:**

Amarasinghe et al. (1998); CEA/ARCADIS Euroconsult (1993c); DWC (2004); Hettige et al. (2000); Kotagama et al. (1989)

# Tabbowa Reservoir



0 0.45 0.9 1.8 Kilometers

## Legend

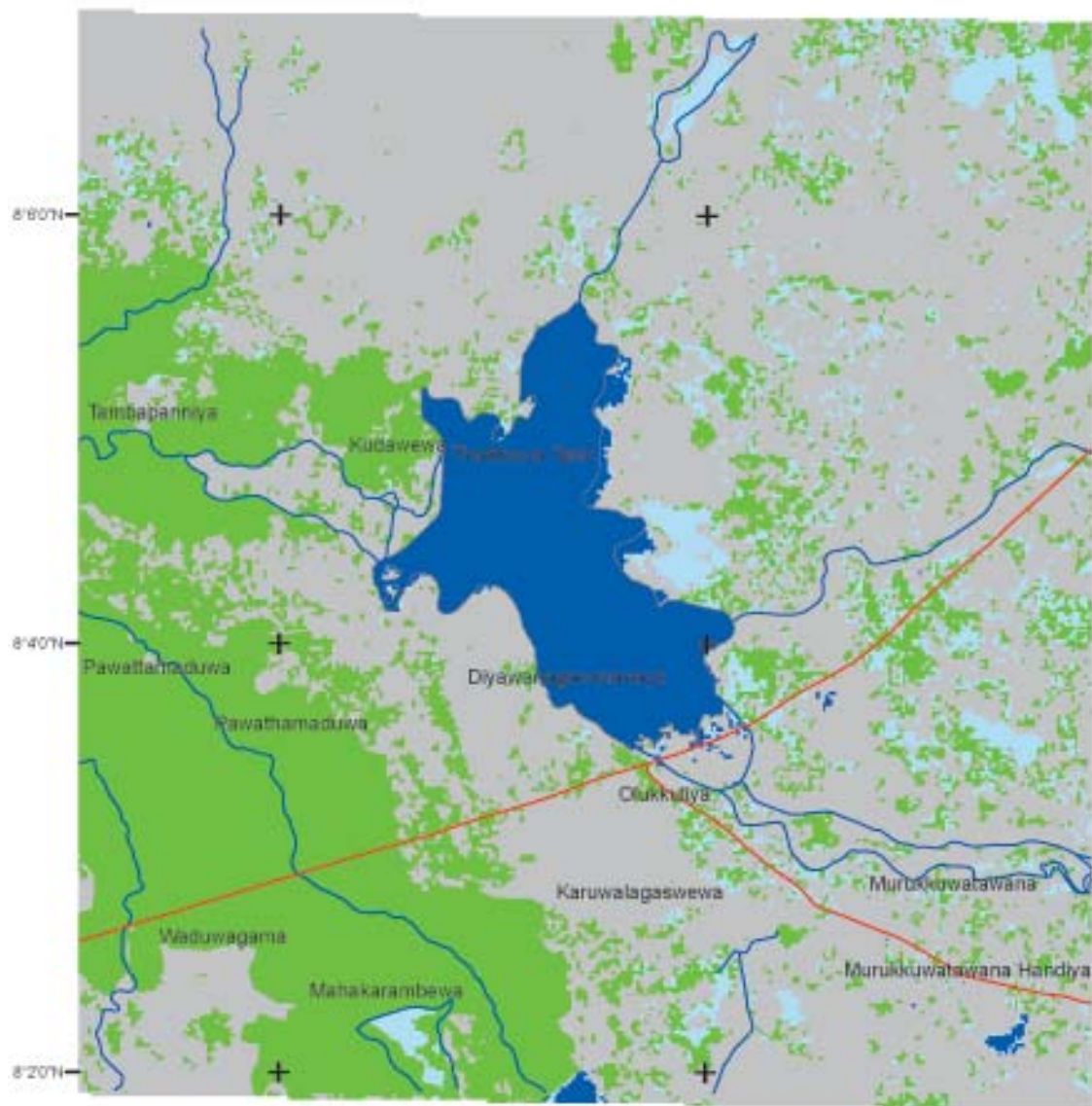
### Land Cover

- Water
- Water with aquatic plants
- Marshy land
- Paddy land
- Agricultural fragments with homestead
- Natural vegetation (low dense)
- Natural vegetation (high dense)
- Waterways
- Main road

Source: Landsat TM+06 Feb 1988  
 Ground Truthing - 2005 November  
 (Datum WGS84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Tabbowa Reservoir Wetlands based on Ramsar Classification



**Legend**

Class Name	Description
	Water storage areas
	Seasonal/intermittent freshwater marshes/pools
	Irrigated land
	Non-wetlands
	Waterways
	Main road

Source: Landsat TM+06 Feb 1988  
Ground Truthing - 2005 November  
(Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Tabbowa Reservoir

## Location:

8° 6' 0 N and 79° 55' 0 E to 8° 2' 0 N and 80° 0' 0 E; 895512 N and 380640 E to 888117 N and 389804 E; 15 km from the Puttalam estuary in the Puttalam District, of the North-western Province.

## Area:

591 ha at full supply level

## Altitude:

15 m above mean sea level

## Overview:

The Tabbowa reservoir is a medium sized, shallow water, ancient storage reservoir, constructed by damming the Nanneri Oya, a major tributary of the Mi Oya, for irrigation purposes. The reservoir was restored between 1913-1925 and then again in 1969. The wetland area has rich fossiliferous soils that are rare elsewhere in Sri Lanka. The tank and its environs are included within the Karuwalagaswewa Sanctuary, due to its importance as a habitat for elephants and water birds.

## Physical features:

The reservoir is located in the Mi Oya basin covering an area of 150,000 ha. The catchment area of the reservoir extends to about 39,000 ha and the main water inflow is from the Nanneri Oya, a major tributary of the Mi Oya, which discharges into the Puttalam lagoon. High water levels in the reservoir coincide with peak rainfall in the catchment area. The Jurassic sediments at Tabbowa (known as Tabbowa beds) from the relatively high ground around the Anuradhapura road are estimated to be 500 m in depth. The major soil types common to the area are Reddish-brown earths and Low Humic Gley and Alluvial types. The reservoir is situated in the dry zone of the western low country, where the mean annual rainfall is between 1,000 – 1,500 mm. The heaviest rains are experienced during the inter-monsoon months (April and October-November). Average annual relative humidity is 75% and varies between 73.5% in September to 87.5% in December. The annual average temperature is around 24°C while it can go up to 32°C in June.

## Ecological features:

The aquatic vegetation consists of phytoplankton and rooted and unrooted macrophytes, while the vegetation in the peripheral areas of the wetland, including its immediate catchment area comprises mainly of tropical dry/mixed evergreen forest, scrubland and grassland savannah communities. The dominant phytoplankton is the blue green algae, Myxophyceae, while the zooplankton community is dominated by small-sized rotifers. 65 macrophytes have been identified from the wetland and its environs. Grasses such as *Cynodon dactylon* and sedges dominate the submerged vegetation and the drawdown areas. Unrooted vegetation consists of *Naja marina* and *Lippa nodiflora*. On either side of the major inlet of the Nanneri Oya, *Carex filicine* is the dominant species while there is also a strand of trees and shrubs consisting of species such as *Acacia nilotica*. *Nymphoides indicum* and *Amaranthus sp.* can be found in flooded pools in the drawdown area around the reservoir. Tall trees and shrubs such as *Terminalia arjuna*, *Nauclea orientallis*, *Barringtonia ceylanica*, *Syzygium makull*, *Vitex leucoxylon* and *Caesalphia bonduce* occupy the periphery of the reservoir. About 65 species of plants have been recorded from the reservoir area. The abundance of gastropods, bivalves and chironomid larvae in the shallow areas might be a reason for high waterfowl

diversity in the wetland. 16 fish species, 57 birds, 13 reptiles and 12 mammals have been recorded from the area.

#### **Noteworthy fauna:**

The freshwater fish are dominated by exotic forms such as *Oreochromis* spp., and *Labeo rohita*. Among the freshwater fish, *Clarias brachysoma* is endemic. Noteworthy aquatic reptiles associated with the reservoir include *Crocodylus palustris* and serpents such as *Xenochrophis asperrimus* (endemic) and *Gerarda prevostianus*. The tank is an ideal feeding habitat of colony nesting large water birds such as *Pelecanus philippensis*, *Threskiornis melanocephalus*, *Platalea leucorodia*, *Anastomus oscitans* and *Mycteria leucocephala*. The reservoir functions as an important source of water for large mammals such as *Elephas maximus*, while locally declining mammals such as *Lutra lutra* and *Prionailurus viverrinus* have also been recorded in this area.

#### **Noteworthy flora:**

Economically valuable timber species around the reservoir include *Diospyros ebenum*, *Tectona grandis*, *Terminalia arjuna*, *Azadirachta indica* and *Manilkara hexandra*. A mixture of grasses and sedges thrive on the border areas of the reservoir.

#### **Land use:**

Wildlife conservation, tank-based subsistence fisheries, irrigated agriculture, homesteads and cattle grazing are the main land and wetland use activities in the area.

#### **Possible changes in land use:**

Extension of Inginimitiya Irrigation Project will increase the flow through rates to Tabbowa reservoir. Establishment of the proposed hotel complex on the southwestern part of the Tabbowa tank bed might also negatively impact on the reservoir. The spread of the invasive alien *Prosopis juliflora* could lead to the establishment of uniform stands of this species around the tank.

#### **Hydrological and biophysical values:**

The water that is stored during the rainy season is released during the Maha season according to the irrigation requirements downstream.

#### **Social and cultural values:**

Local reeds such as Hambupan (*Typha*), Thulhiriya and Gallaha (*Cyperus* spp.) are used in the production of handicrafts. The grasslands in the border areas of the reservoir are used by locals for feeding cattle and buffaloes. There are considerable traces of ancient settlements in the vicinity, which go back to the commencement of the Vijayan dynasty, 543 BC.

#### **Scientific research and monitoring:**

Research with respect to geology and fisheries have been conducted by the Kelaniya University, while studies into the avifauna of the reservoir have been carried out by the CBC. The DWC is monitoring elephant movements.

**Conservation education:**

Information not available

**Recreation and tourism:**

Limited, especially due to the non-availability of drinking water and accommodation facilities.

**Conservation measures taken:**

The CEA developed a wetland site report and conservation management plan in 1993. The tank and its environs are included within the Karuwalagaswewa Sanctuary (21, 933 ha), which was declared under the FFPO in 2002 to facilitate elephant migration. The reservoir was declared a FMA under the FARA in 2005. DWC undertakes habitat management within the area.

**Conservation measures proposed:**

The wetland site report and conservation management plan produced by the CEA provides details of proposed conservation measures.

**Disturbances and threats:**

Forest cover in the catchment has been reduced due to timber extraction and clearing for chena cultivation and homesteads. These activities have led to increased siltation of the tank. Reforestation of the area with exotic *Eucalyptus camaldulensis* has contributed to significant degradation of the vegetation cover in the area. Encroachment of the tank area for agriculture is evident. The spread of invasive alien *Prosopis juliflora* is a growing conservation issue.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

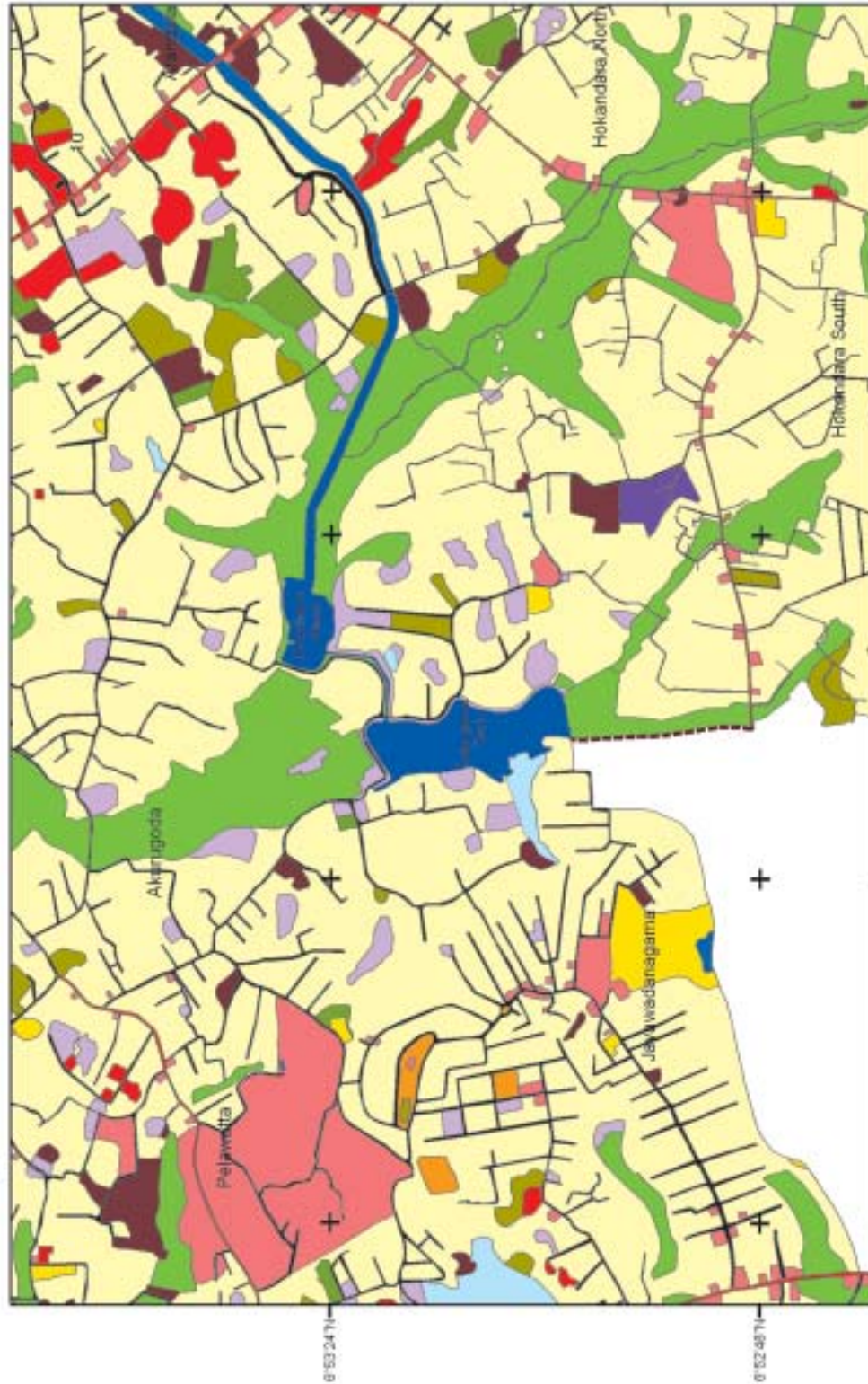
The Sanctuary is under the purview of the DWC while tank management is carried out by the Irrigation Department. Fisheries are managed by the Fisheries Department.

**References:**

CEA/ARCADIS Euroconsult (1993d); DWC (personal communication)



# Thalangama Tank

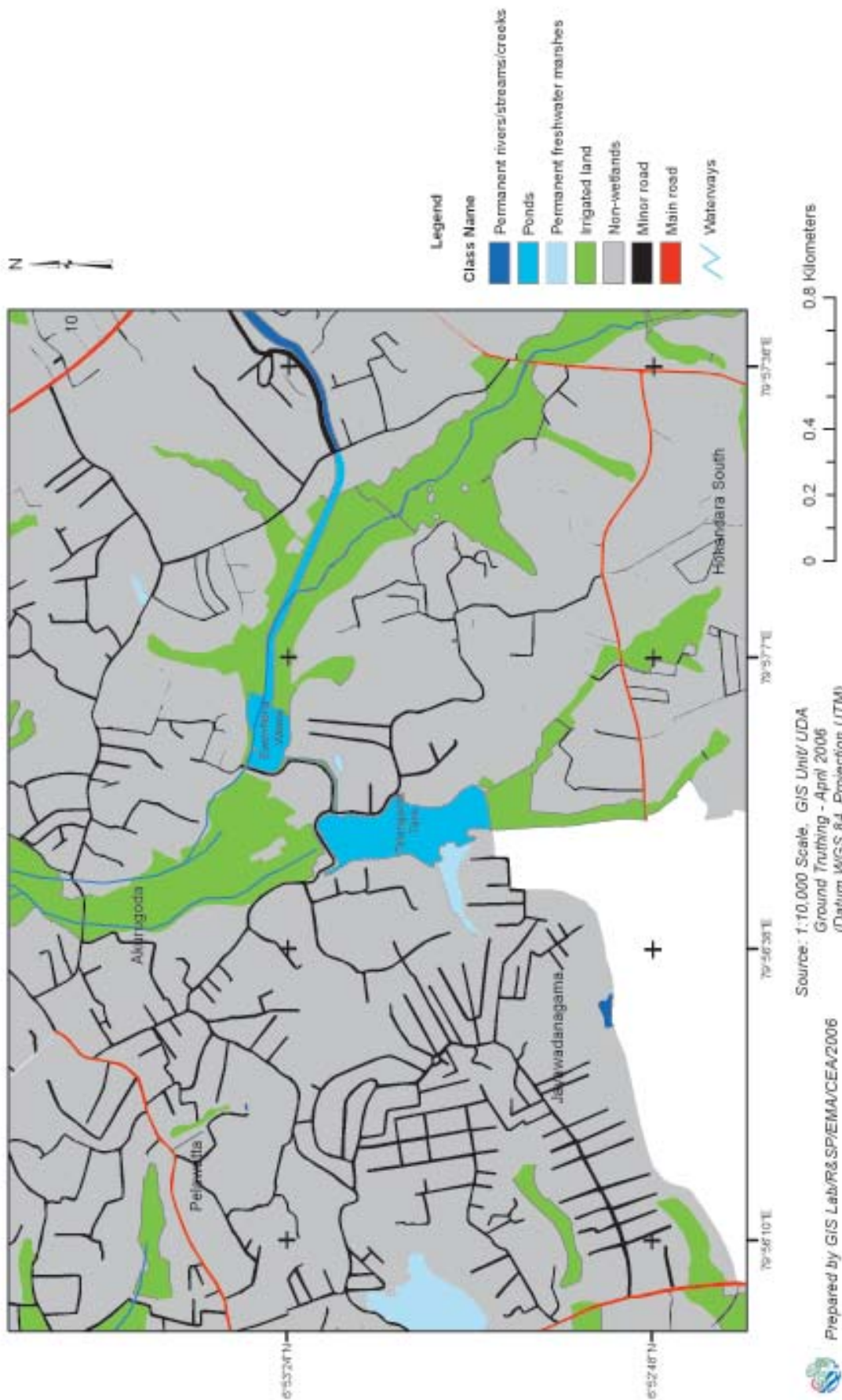


Source: 1:10,000 Scale, GIS Unit/UDA  
 Ground Truthing - April 2006  
 (Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&S/EMA/CEA/2006



# Thalangama Tank Wetlands based on Ramsar Classification



# Thalangama Tank

## Location:

6° 54' 30 N and 79° 55' 0 E to 6° 53' 0 N and 79° 58' 0 E; 762830 N and 380312 E to 760975 N and 385833 E; in the Colombo District, of the Western Province.

## Area:

The tank consists of an irrigation area of 95 acres and a non-irrigable area of 111 acres. The gross capacity of the tank is 50 Ac. Ft.

## Altitude:

Information not available

## Overview:

Thalangama Tank was built during the era of King Parakramabahu VI (1551-1547 AD) for paddy cultivation and is situated close to the ancient city of Kotte. The areas between Akurugoda and Thalangama north use the runoff water for paddy cultivation. The tank is an important habitat for water birds, functioning as an urban biodiversity refuge, as it is surrounded by densely populated human settlements of the Colombo District. The site is situated in the Madiwela catchment area within the Kelani river basin, which includes the Colombo flood detention area.

## Physical features:

The area is part of the Pre-cambrian southwestern group, and the geological formation of the coastal plain consists of gneisses and granite, predominantly of the Vijayan complex of the Pre-cambrian era. The soil is composed mainly of the Aruvi and Boralu series. Half-bog soils are found in the paddy area as well as the catchment area of the tank. The tank and its environs are situated within the Madiwela catchment area, which is influenced by 3 hydrological zones and is an important component for water drainage in the city of Colombo. The total catchment area is 33.34 sq. miles, and the upper reaches extend up to Pannipitiya and Kottawa. The gross capacity of the tank is 50 Ac. ft., and it has two spills, one of which is controlled by a steel gate. The tank is situated in the low country wet zone, with a mean annual rainfall between 2,000 – 2,500 mm, derived mainly from the Southwest monsoon. The area is characterized by high relative humidity and a hot climate with a mean annual temperature of 27.4°C fluctuating between 23.9 – 30°C and a relative humidity of 82%.

## Ecological features:

The Thalangama tank and its surrounding habitats serve as an important flood retention area. Major habitat types associated with the tank include seasonally flooded grassland/paddy fields (between ridge bund and Hokandara– Talawatugoda road), freshwater swamp forests (western boundary of the tank, dominated by *Annona glabra*, *Cerbera odollam* and *Pandanus odoratissima*), aquatic macrophytic vegetation (floating plants and rooted plants with floating leaves) like *Eichhornia crassipes* and *Nelumbo* sp. and *Annona glabra* and *Pandanus* spp. which occupy the tank edge, home scrublands dominated by species such as *Lantana* spp., *Macaranga peltata* and *Syzygium caryophyllatum*. Large trees like introduced *Alstonia* spp. are also found in abundance within home gardens along the tank margin. Forty-one plant species have been recorded in the area. 90 bird species (13 are migrants), 12 species of reptiles, 10 species of mammals and 15 freshwater fish species have also been recorded from the tank and its environs.



### **Noteworthy fauna**

Freshwater fish in the tank comprise of a mix of exotic and indigenous species. Among the native fish, *Puntius singhala*, *Etroplus maculatus* and *Esomus thermoicos* are among the noteworthy species that are found in the tank. The bird fauna of the tank is very significant when considering its small size. Locally declining aquatic birds include *Pelecanus philippensis* and *Rostratula benghalensis*. Noteworthy reptiles include *Lissemys punctata*, and *Xenochrophis piscator*, while remnant populations of the endemic primate *Trachypithecus vetulus*, and other rare mammals such as *Prionailurus viverrinus* and *Lutra lutra* have been recorded around the tank.

### **Noteworthy flora:**

The flora of this semi-urban area is highly modified, with many exotic species. The floating aquatic plants such as *Nelumbium* spp. and *Nymphaea* spp. form a prominent component of the aquatic plants in the tank.

### **Land use:**

The surroundings are used for human settlements, home gardens, paddy cultivation, and for livestock rearing while the wetland is used for small-scale fisheries.

### **Possible changes in land use:**

Catering for expanding human population needs through development of new housing schemes and other infrastructure is expected to affect the tank and its environs in the long term. New housing development and infrastructure development might impact the catchment area of the tank.

### **Hydrological and biophysical values:**

The Thalangama tank and its surrounding paddy fields are important for flood detention in the Greater Colombo area. In 1996, a diversion canal was built connecting the tank with the Kelani River under the storm water-draining project to prevent flooding in the vicinity of the parliament.

### **Social and cultural values:**

The Thalangama tank is a unique remnant of the historic past. The tank has been used for paddy cultivation for a long time, and historic evidence indicates that the surrounding area had been continuously and extensively cultivated. The northern boundary of the tank lies along the bund, which serves as a connecting road between Thalangama and Akurugoda.

### **Scientific research and monitoring:**

FOGSL has conducted several bird surveys in the area. Research work has also been carried out on hydrological aspects, monitoring of water flow and flood rates in the surrounding area under the Greater Colombo Flood Control and Environment Improvement Project.

### **Conservation education:**

Universities and an International School in the area use the site for educational purposes. Additionally, in 2005, IUCN conducted an education programme at this site on World Wetlands Day.



**Recreation and tourism:**

Private tour operators use the site as a part of their packaged bird watching tours for tourists. A luxury hotel is located within the tank vicinity.

**Conservation measures taken:**

In 2006, the Overseas School of Colombo in association with FOGSL organised a walk to raise funds for wetland protection, which ended at this site.

**Conservation measures proposed:**

This tank is a proposed EPA under the NEA of the CEA. Following the visit of the Minister of Environment and Natural Resources to this site in 2005, the Kaduwela DS has been instructed to implement projects to enhance the environmental standards around the tank area.

**Disturbances and threats:**

Due to rapid urbanisation of the area, the land value has increased significantly leading to excessive land filling and the reclamation of paddy lands for housing, despite the fact that this activity is illegal. The highly concentrated human population in the Jayawadanagama housing scheme has resulted in dumping of garbage and other solid waste within the tank environs and the release of wastewater in to the tank. Waste from a nearby poultry farm is also released to the tank causing deterioration in water quality. Poaching of water birds such as purple coots and painted storks as well as terrapins is affecting the biodiversity while the spread of invasive plant species such *Annona glabra*, *Eichhornia crassipes* and *Salvinia molesta* are also threatening the wetland.

**Land tenure:**

The surrounding area is mainly privately owned

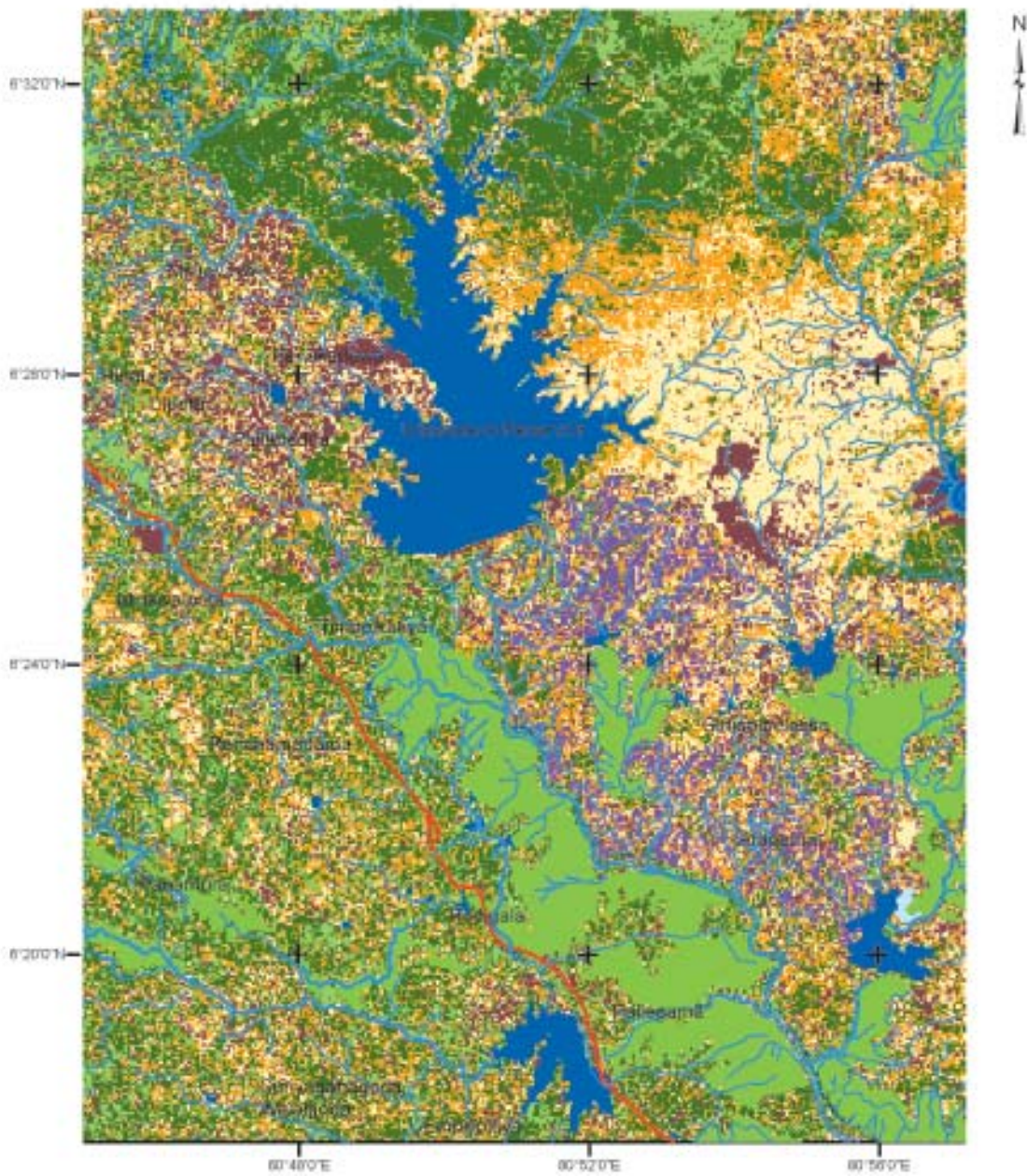
**Management authority and jurisdiction:**

The tank falls under the legal jurisdiction of the Irrigation Department, and the CEA.

**References:**

CEA/ARCADIS Euroconsult (1995a); FOGSL (2005); Rathnayake and Kotagama (2002)

# Udawalawe Reservoir



0 1.25 2.5 5 Kilometers

## Land Cover

-  Water body
-  Marshy land
-  Paddy land
-  Grassland
-  Scrubland
-  Sugar cane

## Legend

-  Natural vegetation (dense)
-  Natural vegetation (moderate dense)
-  Exposed soil
-  Waterways
-  Main road

Source: Landsat ETM+ 14th March 2001  
Ground Truthing May 2005, Google Earth  
(Datum WGS 84, Projection UTM)

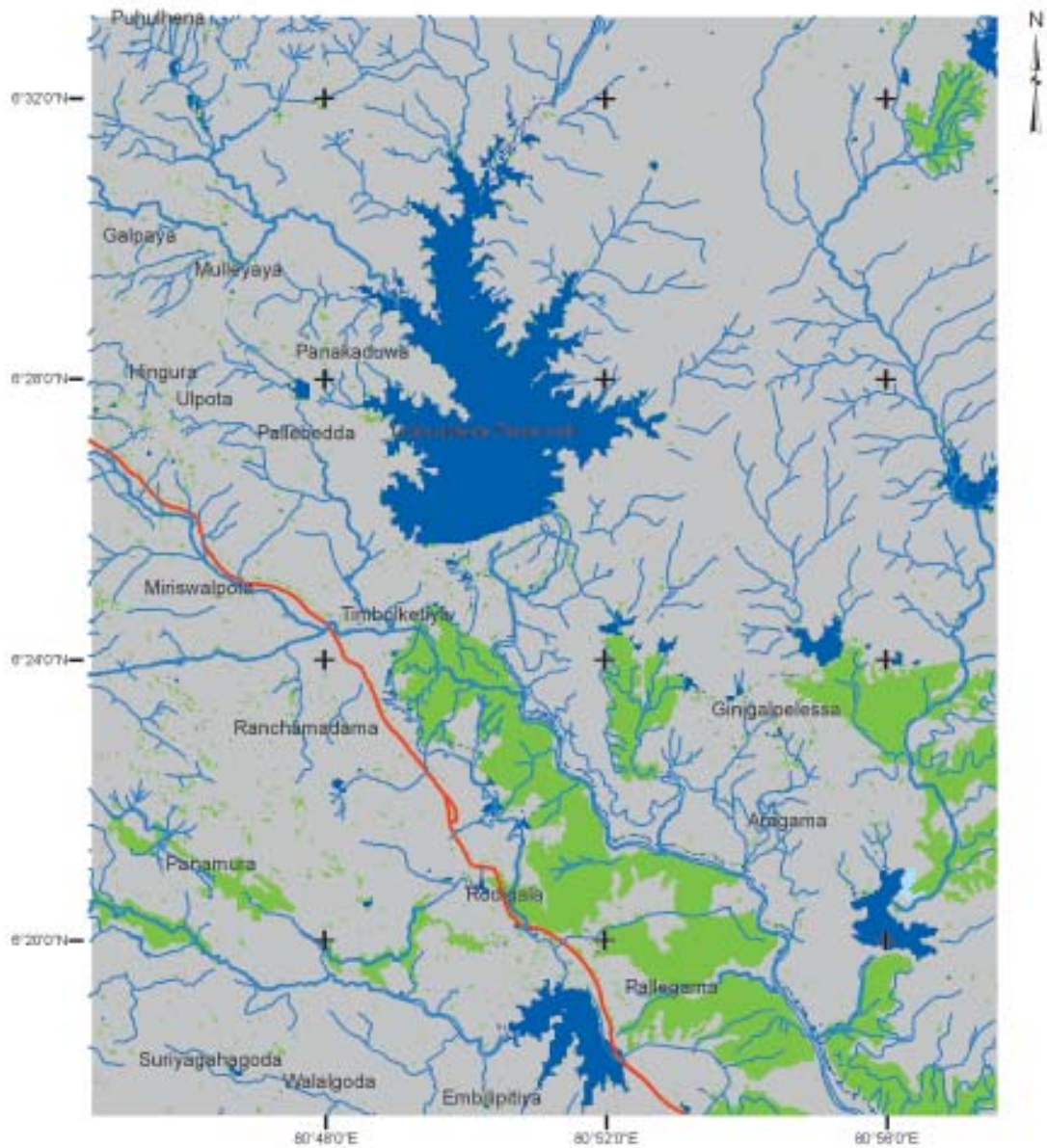


Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Udawalawe Reservoir

## Wetlands based on Ramsar Classification



0 1.5 3 6 Kilometers

### Legend

#### Class Name

- |   |  |   |           |
|---|--|---|-----------|
|  | Water storage areas                            |  | Waterways |
|  | Seasonal/intermittent freshwater marshes/pools |  | Main road |
|  | Irrigated land                                 |   |           |
|  | Non-wetlands                                   |   |           |

Source: Landsat ETM+ 14th March 2001  
Ground Truthing May 2005, Google Earth  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Udawalawe Reservoir

## Location:

6° 32' 0 N and 80° 46' 0 E to 6° 20' 0 N and 80° 56' 0 E; 722167 N and 474203 E to 700053 N and 492627 E; about 200 km south east of Colombo within the Udawalawe National Park, spanning the Ratnapura and Monaragala Districts, of the Sabaragamuwa and Uva Provinces.

## Area:

3,400 ha at full supply level

## Altitude:

Approximately 100 m

## Overview:

Uda Walawe Reservoir is a large multipurpose storage tank constructed in the mid 1960s by damming the Walawe Ganga as part of a plan to develop the irrigation capacity of land in the dry zone of southern Sri Lanka. Apart from irrigating adjoining agricultural lands, it generates about 6GWh of hydroelectricity per year. The reservoir is situated within the Udawalawe National Park, and therefore plays a significant role in maintaining the rich biodiversity of the area, and is particularly important for water birds and elephants. It is a very popular tourist destination and is the third most visited park in the country.

## Physical features:

The reservoir is located on the boundary of the wet and dry zones of Sri Lanka and receives around 1500 mm of rainfall annually. The highest rainfall is during October to January and again from March to May. The relative humidity varies between 70 and 82%, while the annual average temperature ranges from 27°-28°C. The major soil type in the area is the well-drained reddish brown earth (47%) and the poorly drained low humic grey soils in the valley bottoms (34%). Alluvial soils are found in some locations along the rivers and streams. In the Udawalawe reservoir, the average annual amplitude in water level is 8 m, which changes the aquatic area from 34.4 to 14 km<sup>2</sup> and the reservoir capacity from 268.6 to 80 MCM. These fluctuations produce large drawdown areas with terrestrial plant growth, which form part of the energy and carbon sources of the aquatic ecosystem after inundation, and cause dramatic changes in the internal exchange process between the bottom sediments and the water column.

## Ecological features:

The major habitat types surrounding the reservoir include the immediate marshy fringes, the Walawe river and major tributaries within the Park, and the forest and grassland. A characteristic feature of the reservoir is the dead tree trunks standing in the water, which are remnants of the forest that existed prior to the construction of the reservoir. A study conducted in 1986 revealed the occurrence of green algae (*Pediastrum* sp. and *Scenedesmus* sp.) and blue green algae (*Microcystis* spp.) in the reservoir. Of the zooplankton recorded, the most abundant taxonomic group was the rotifers. The Park includes forested land in various stages of succession, along with extensive grasslands. The forested land was largely cleared in the 1960s and the grassland communities are the result of chena cultivation. The reservoir is surrounded by open scrub jungle in the north and east, and by cultivation areas in the west and south (those in the west are illegal as they are within the boundaries of the National Park). In the south, below the reservoir bund, there are sugar cane plantations and paddy fields. In the south-eastern corner there are teak plantations which



were established under a tree plantation programme of the Forest Department before the park was gazetted. 94 species of plants have been recorded from the park, while 21 species of fish, 12 species of amphibians, 33 species of reptiles, 184 species of birds (including 33 migrants) and 43 species of mammals have been recorded from the environs within and surrounding the reservoir. Among the invertebrates, 135 species of butterflies have been recorded.

#### **Noteworthy fauna:**

One endemic fish species (*Garra ceylonensis*) is recorded from the Walawe River within the park boundary. The introduced fish species (i.e. *Oreochromis* spp., *Osphronemus goramy*, *Catla catla*, *Labeo rohita*) that are found within the reservoir are important food fish species. An array of waterbirds inhabits the reservoir, including large flocks of cormorants (*Phalacrocorax* spp.), *Pelecanus philippensis*, *Anastomus oscitans*, *Mycteria leucocephala*, *Threskiornis melanocephalus* and *Platalea leucorodia*. The reservoir plays a significant role in sustaining a large herd of elephants in the Park.

#### **Noteworthy flora:**

Four endemic plant species (*Hopea cordifolia*, *Memecylon petiolatum*, *Erythroxylon zeylanicum* and *Jasminum angustifolium*) have been recorded from the park. Among them the dry zone Dipterocarp - *Hopea cordifolia* is a noteworthy plant species found along the river. The dominant grass species *Panicum maximum* and *Imperata cylindrica* are important food sources for herbivorous species such as the elephant.

#### **Land use:**

Fisheries within the reservoir occur on a small scale, mainly at subsistence levels. The surrounding land mainly falls with the National Park and therefore human impact is minimal, although illegal settlements are found in the vicinity. The downstream area is mainly used for paddy, banana and sugarcane cultivation, chena cultivation, human settlements and livestock grazing. The park is used for tourism and the Udawalawe - Tanamalwila road runs over the dam.

#### **Possible changes in land use:**

There are several planned development projects for the area. The Irrigation Department has proposed to divert the water of the Mau Ara to the Malala Oya in order to irrigate more land. For this, another dam will be built upstream of the existing Udawalawe reservoir, which might have a negative impact on the water flow to the reservoir. The management plan developed under the ADB/GEF project suggests activities such as boating and rafting within the reservoir environment to attract tourists.

#### **Hydrological and biophysical values:**

Udawalawe reservoir sits within the Walawe River basin with a total catchment area of 2,442 km<sup>2</sup> and has an estimated average discharge volume of 2,165 million m<sup>3</sup> into the sea. The reservoir has a live storage capacity of 240 MCM and a power generating capacity of 6 MW. There are two main canals, the right bank main canal, which is 42 km long and the left bank main canal, which is 31 km in length. Presently, the total irrigated area is as high as 17,400 ha. During the dry season when water levels are low, elephants congregate in the draw-down areas of the reservoir.

#### **Social and cultural values:**

Modern water resource development in the Udawalawe basin is superimposed over a rich history of water management and irrigation dating back to historical times. According to a survey carried out by IWMI in 2003, over 1,600 families are involved in inland fishing activities, and of this, two-thirds fish as a means to

supplement family nutritional needs or incomes. Around 38,000 households are found in the Udawalawe area of which half are farming households. The type of farming in the study area varies between irrigated, rain-fed and chena. The DWC employs some of the villagers on a daily basis for the *Lantana camara* eradication project.

#### **Scientific research and monitoring:**

In 1975, an aquaculture development centre was established near the reservoir by the NAQDA which conducts regular research on fish breeding. A study on small mammals of the Park has been undertaken, while detailed information on the avifauna is regularly gathered by several groups. The CBC has been conducting an annual mid-winter waterfowl census since 1987. In the Framework of the Forest Department/IUCN Conservation Review Project, an inventory was made of the fauna and flora of the area, which was later strengthened by the GEF funded project carried out by the DWC. In 1993, an elephant census was carried out within the park by the DWC. The field station for reservoir fishery development carried out considerable research on fisheries prior to its closure in 1989 when the Government decided to terminate support to inland fisheries. IWMI has also conducted several studies on water resource development of the reservoir. At present, research on the re-introduction of orphaned elephants is being conducted in conjunction with the Born Free Foundation.

#### **Conservation education:**

Information not available

#### **Recreation and tourism:**

Udawalawe National Park is the third most visited wildlife park of the country, and is especially popular for its large elephant population. Three park bungalows have been constructed by the DWC, while there are also bungalows belonging to the Sugar Corporation, Fisheries Corporation, MASL, and the WNPS in the vicinity. Between 1994 and 2001, 452,000 persons, of which 20% were foreigners visited the park. The average revenue for the period between 1998 and 2001 period was US\$ 280,000.

#### **Conservation measures taken:**

The reservoir and a large part of its catchment are protected within the Udawalawe National Park, which was declared under the FFPO in 1972. The main reasons for establishing the 30,821 ha park were to protect the immediate upstream catchments and to provide a refuge to wildlife that was displaced by the clearing of land in the lower reaches of the Walawe River. In 1995 the CEA published a wetland site report and conservation management plan for the reservoir. The Udawalawe Reservoir Fisheries Society established under the Fisheries Act is functioning effectively at present. Under the UNDP/GEF development of wildlife conservation and protected area management project, an eco-development plan for the National Park was developed. In 2005, the ADB/GEF funded PAM project lead to the publication of new management and operation plans. The DWC has initiated a project to physically remove the invasive plant *Lantana camara* from within the National Park.

#### **Conservation measures proposed:**

Under the ADB/GEF funded PAM project activities within the national park including demarcation of the park boundary, fencing off of the elephant corridor to allow secure elephant migration, zoning, buffer zone establishment, improvement of visitor facilities and staff training for tourism are underway.

**Disturbances and threats:**

Reduced rainfall, high sedimentation of the reservoir due to poor land-use planning at the upstream areas including activities such as clearing of natural forests and planting of monospecies cultures of *Pinus* and *Eucalyptus*, and large scale fish kills upstream of the reservoir attributed to river flow interception without measures for stream flow management have affected water levels and aquatic biodiversity. Encroachment of the park by human settlements, poaching, illegal timber extraction, gem mining, animal grazing (around 30,000 cattle) and chena cultivation are activities that pose a threat to the wetland area and the entire National Park. Alien plant invasions and uncontrolled visitation are also becoming problematic. Invasive plant species such as *Lantana camara* and *Phyllanthus polyphyllus* pose a clear threat to the food plants on which elephants depend.

**Land tenure:**

The National Park area is state owned and most lands in the irrigation systems are also state owned. Certain limited rights have been granted to settlers on state lands. These include mortgage rights, transfer to family members or heir and temporary or seasonal leasing out rights.

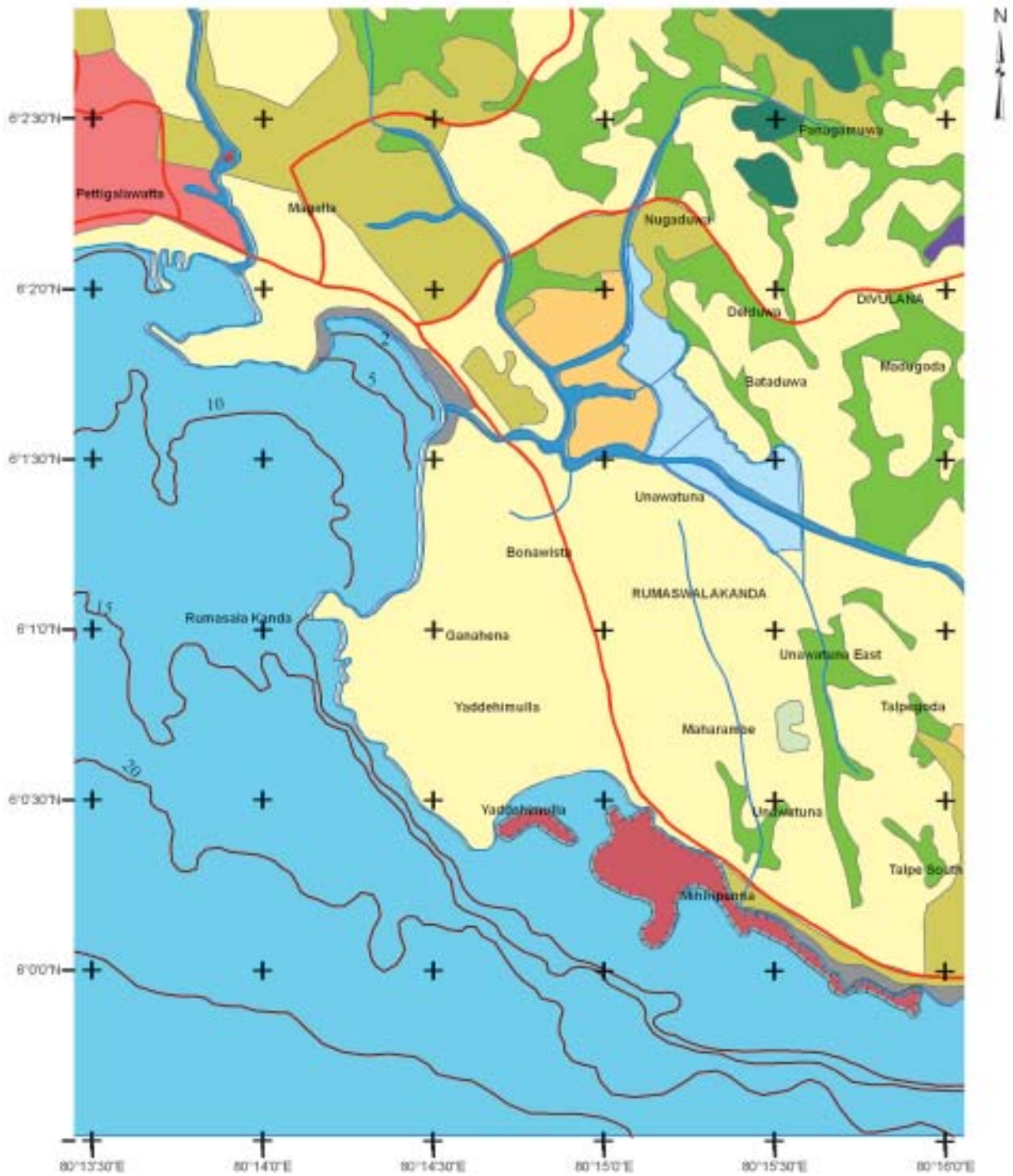
**Management authority and jurisdiction:**

The National Park is under the jurisdiction of the DWC. Operation of the reservoir is handled by the MASL. The MEC bears responsibility for settling farmers and promoting socio-economic development in the downstream areas. The Ceylon Electricity Board controls the hydro-power generation of the dam.

**References:**

ADB (2000); CEA/ARCADIS Euroconsult (1995f); De Silva et al. (2001); DWC (2005b); DWC (2005c); Handawela (2002); Hussain et al. (2002); Molle and Renwick (2005); Schiemer et al. (2001)

# Unawatuna Reef



Legend		
<b>Land Cover</b>		
Sea	Homegardens	Sand
Stream line	Scrubland	Built up area
Marshy land	Coconut	Waterways
Coral reef	Rubber	Main road
Paddy land	Tea	Bathymetrical contour
Grassland		

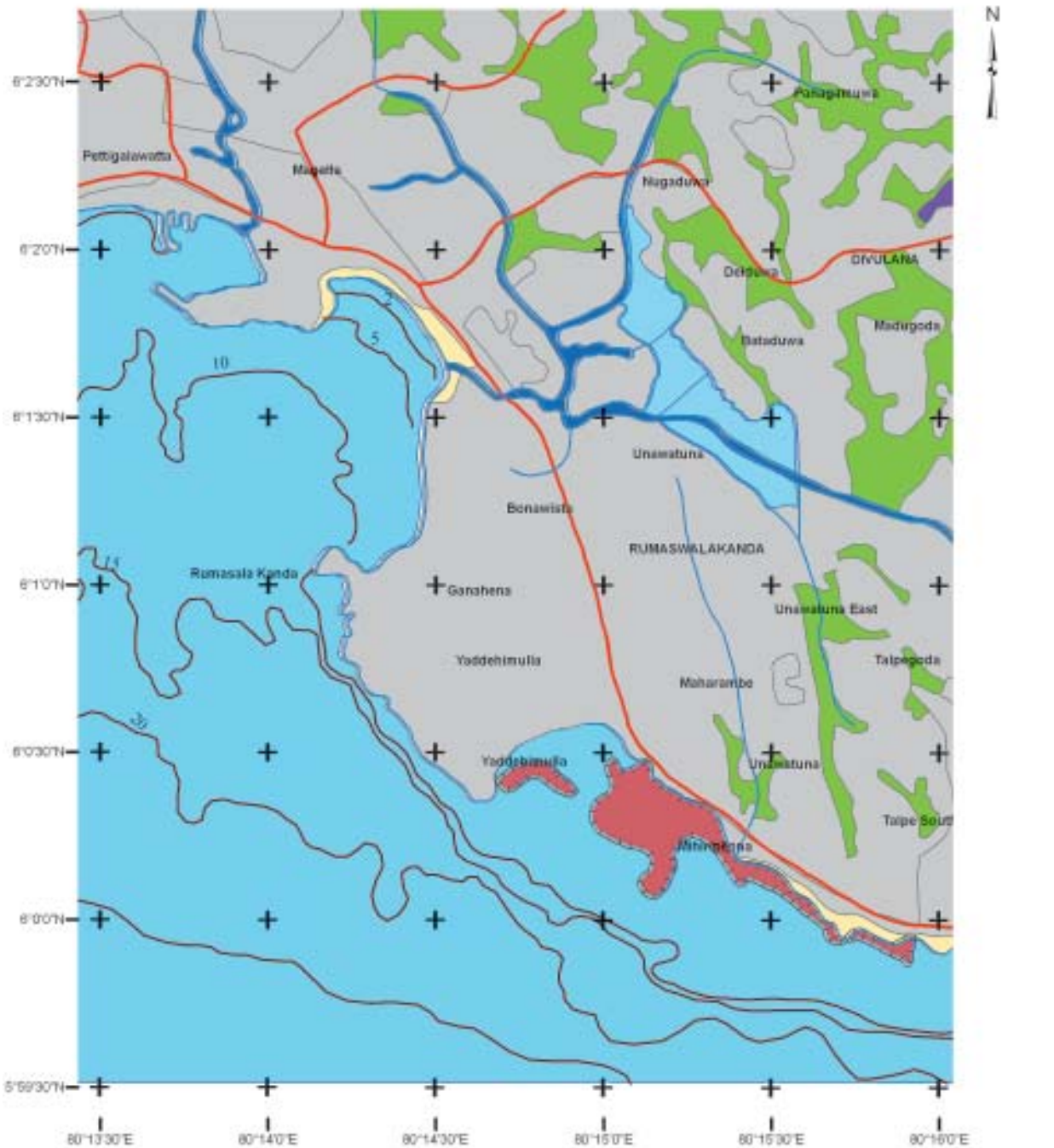
Source: 1:30,000 scale Admiralty chart No. : 107  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Unawatuna Reef

## Wetlands based on Ramsar Classification



0 0.25 0.5 1 Kilometers

Source: 1:30,000 scale Admiralty chart No. : 107  
 U.K. Hydrographic Office, 2000-2001  
 (Datum WGS 84, Projection UTM)

Prepared by GIS Lab/R&SP/EMA/CEA/2006

**Legend**

Sea	Non-wetlands
Canals and drainage channels, ditches	Waterways
Coral reefs	Main road
Sand, shingle or pebble shores	Bathymetrical contour
Permanent freshwater marshes/pools	
Irrigated land	

# Unawatuna Reef

## Location:

6° 3' 0 N and 80° 13' 30 E to 5° 59' 30 N and 80° 16' 0 E; 668794 N and 413314 E to 661416 N and 418838 E; within Unawatuna Bay, in the Galle District, of the Southern Province.

## Area:

Reef area unknown

## Altitude:

Sea level to a depth of 8m

## Overview:

Unawatuna contains a shallow coral reef as well as numerous rocky reef habitats. The beach is popular for tourism and surrounding reefs are popular for diving and snorkelling. The reef is degraded, mainly due to coral bleaching, while human activities continue to pressurize remaining reef resources. The area has now been selected as a site for SAM by the CCD.

## Physical features:

The reef is located within Unawatuna Bay, less than 50m from the beach and is partially protected by a headland. It does not have a distinguishable reef crest and slope, although a small reef crest and sheltered inner reef area is found at the western end. Coral patches exist throughout the Unawatuna Bay, but most are found towards the western shore of the bay at depths between 1-5m. A group of rocky islets are located at the mouth of the bay. Unawatuna is located in the wet zone and receives an average annual rainfall of over 2,000 mm. The reef is influenced by the southwest monsoon, which results in rough seas and strong winds and currents from May to October. The temperature range in the area is 26.6°C to 32.6°C while the pH range is 7.83-8.29.

## Ecological features:

The reef was dominated by tabulate *Acropora* and branching *Pocillopora* with a live coral cover of nearly 50%, but most corals were killed during the El Niño related coral bleaching event in 1998. Some *Acropora* and *Pocillopora* have recovered from bleaching while large stands of *Porites* are also found around the rocky islets. The fish community is dominated by damselfishes (Pomacentridae) and wrasses (Labridae).

## Noteworthy fauna:

Among the reef fish, *Chlorurus rhakoura* and *Pomacentrus proteus* are restricted to Sri Lanka, while *Cheilinus undulates* is globally endangered. Five species of globally endangered marine turtles (*Eretmochelys imbricata*, *Chelonia mydas*, *Lepidochelys olivacea*, *Caretta caretta* and *Dermochelys coriacea*) visit the reef.

## Noteworthy flora:

Marine algae

**Land use:**

Tourism is the dominant activity in the area and the coastal area is dominated by hotels, restaurants and shops. Fishing is carried out mostly in offshore waters while collection of ornamental fish is carried out on the fringing reef as well as offshore reefs.

**Possible changes in land use:**

Extensive reef degradation due to coral bleaching has seriously affected populations of ornamental fish and has impacted associated livelihoods. Continued degradation of the reef due to human impacts and beach erosion may result in decreased appeal as a tourist destination.

**Hydrological and biophysical values:**

The reef provides protection to the shoreline from rough seas and is important for mitigating coastal erosion, which is a major problem at Unawatuna.

**Social and cultural values:**

Up to the 1970's Unawatuna was a community of subsistence fishermen. Since then, the area has been gradually transformed into a tourist resort with a large number of guest houses and restaurants. A third of the population is still dependant on fisheries, although many take up tourism related livelihoods in addition to fishing. The fishermen use traditional (outrigger) and small motorized boats. Collection of spiny lobster and ornamental fish are also popular due to high economic returns. Additionally, there are a number of historically and culturally important sites within the area.

**Scientific research and monitoring:**

The reef has been studied and is currently being monitored by NARA. Several studies have been undertaken as part of the SAM process while periodic surveys have been conducted by the Nature Conservation Group.

**Conservation education:**

Education and awareness activities are currently being carried out as part of the SAM planning process. Several local NGOs and CBOs are also involved in education and community based conservation initiatives.

**Recreation and tourism:**

Unawatuna is one of the most popular tourist areas along the southern coast. Numerous hotels, restaurants and tourist shops are found along the Unawatuna Bay and surrounding area. Several SCUBA diving operators conduct diving and snorkelling excursions to reefs in the area.

**Conservation measures taken:**

The reef and surrounding coastal area has been included into the Habaraduwa SAM plan by the CCD to initiate participatory community based management.

**Conservation measures proposed:**

The reef has been proposed as a Marine Sanctuary by NARA but has not yet been declared as such. A proposal to install mooring buoys for diving boats has been made by local CBOs and dive operators which will decrease the damage caused to the reefs by anchors.

**Disturbances and threats:**

The use of destructive methods for collection of ornamental fish and spiny lobsters, anchoring of boats and reef walking are damaging the reef. Unregulated and poorly planned tourism is a major issue at Unawatuna. Discharge of wastewater and sewage from hotels and houses have degraded the water in the near-shore environment and threaten the survival of the coral reefs. Unauthorized construction and encroachment onto the beach have destroyed natural vegetation and aggravated coastal erosion, as well as led to visual pollution of the area. Recent developments have also prevented turtles from nesting along these beaches. The reef was severely degraded by the 1998 El Niño induced coral bleaching event. The 2004 tsunami also caused physical damage to sections of the reef slope due to the movement of large dead coral blocks and coral rubble. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

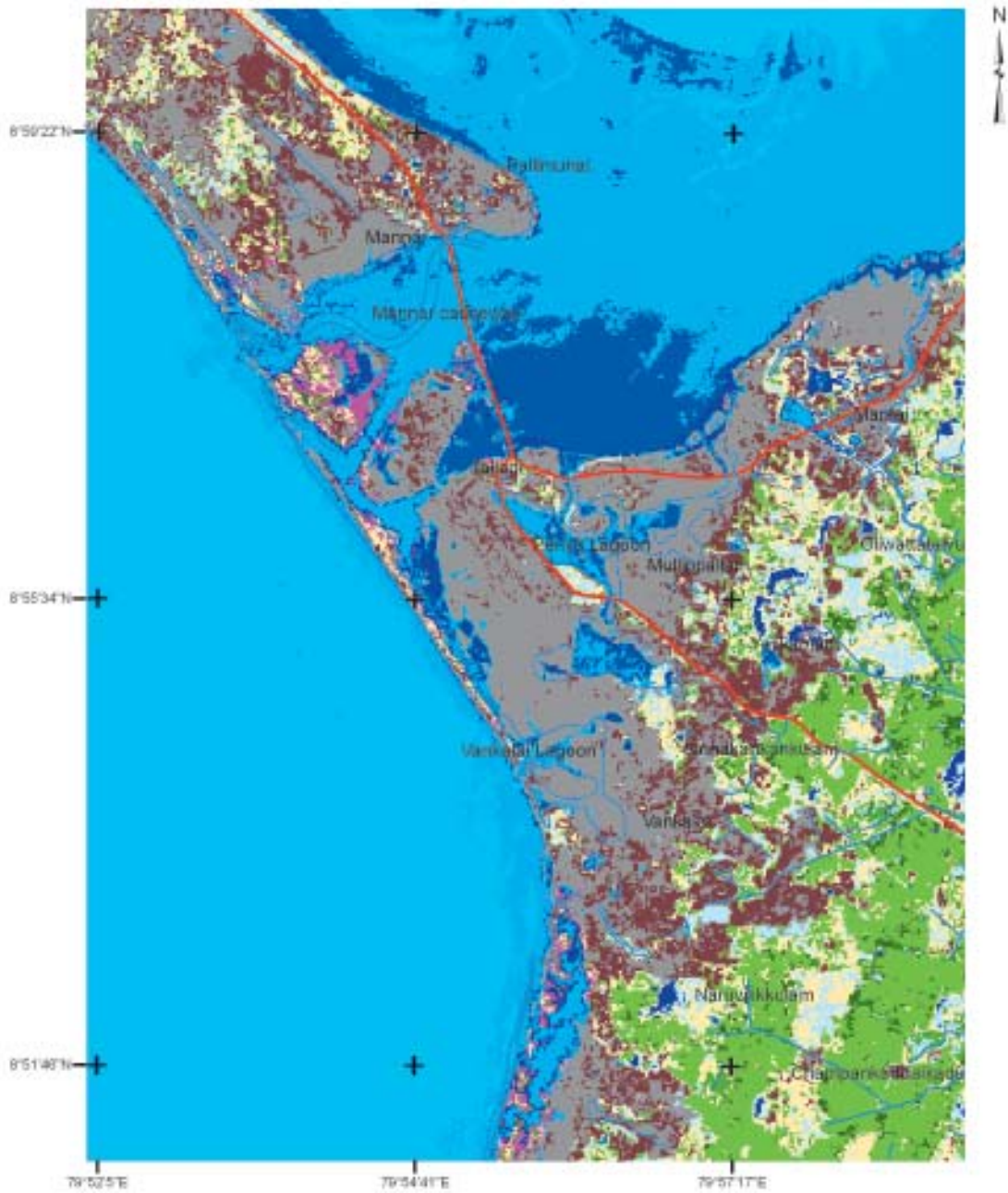
CCD for areas within the coastal zone and the DFAR for fisheries management.

**References:**

CCD (2005a); CCD (2006b); NARA/CORDIO/IUCN/GCRMN/SLSAC (2005); Öhman et al. (1998); Rajasuriya (2005); Rajasuriya et al. (1995); Rajasuriya et al. (1998) Weeramundi (1999)



# Vankalai Triangle



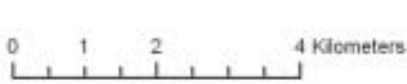
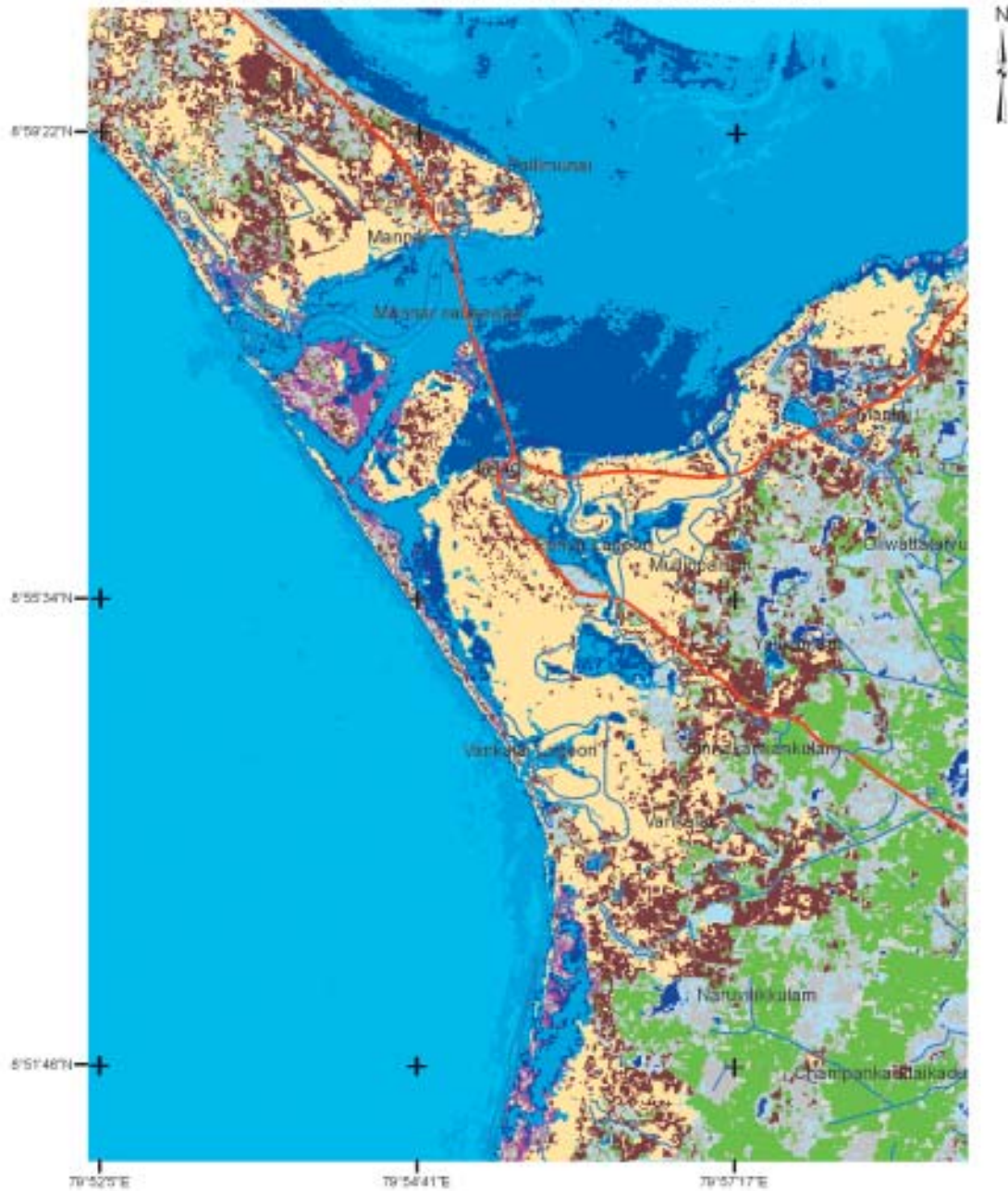
## Legend

### Land Cover

	Sea water (deep)		Natural vegetation (dense)
	Sea water (shallow)		Natural vegetation (moderate dense)
	Brackish water		Scrubland
	Water bodies		Beach/Sand
	Water with aquatic plants		Exposed soil
	Mangroves		Main road
	Marshy land		Waterways
	Paddy land		

Source: Landsat ETM+ 1988 Feb 06  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Vankalai Triangle Wetlands based on Ramsar Classification



### Legend

Class Name	
	Sea water (deep)
	Sea water (shallow)
	Coastal brackish/saline lagoons
	Water storage areas
	Intertidal forested wetlands
	Seasonal/intermittent freshwater marshes/pools
	Irrigated land
	Non-wetlands
	Sand, shingle or pebble shores
	Intertidal mud, sand or salt flats
	Main road
	Waterways

Source: Landsat ETM+ 1988 Feb 06  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Vankalai Triangle

## Location:

8° 59' 22 N and 79° 52' 5 E to 8° 51' 46 N and 79° 59' 0 E; 993202 N and 375417 E to 978421 N and 388203 E; Coastal area bounded by Vankalai, Puliyantivu island and Tiruketiswaram in the Mannar District, including the causeway between the mainland and the Mannar island.

## Area:

Approximately 1000 ha

## Altitude:

Sea level

## Overview:

The area includes a cluster of coastal and marine wetlands, including shallow lagoons, sea-grass beds, seasonal waterholes and tanks, mangrove and salt marshes. The mosaic of wetland habitats is also located within the Central-South Asian migratory bird flyway making it one of the most important bird habitat areas in Sri Lanka.

## Physical features:

The area forms part of the north-western semi-arid zone of Sri Lanka, receiving a mean annual rainfall around 950 mm, mainly during the northeast monsoon period between October and February. The heaviest rainfall is received from October to December. The average annual temperature is around 27°C.

## Ecological features:

The area consists of numerous coastal and marine wetlands, and patches of arid zone dry thorn scrub, arid zone pastures and maritime grasslands, and sand dunes. The vegetation in thorn scrub consists of two distinct strata; a tree layer dominated by *Acacia planifrons*, *Salvadora persica* and *Tamarindus indicus*, and a shrub layer with species such as *Azima tetraantha*, *Cassia auriculata*, *Dichrostachys cinerea*, and *Flueggea leucopyros*. The open areas consist of arid zone pastures and grasslands, which are dominated by grasses (i.e. *Cynodon dactylon*) and sedges (i.e. *Cyperus rotundus*). These open areas are dynamic ecosystems that are transformed into seasonal water bodies during the rainy season. The shallow seasonal water holes contain algal species and submerged vegetation such as *Najas marina*. The single perennial tank in the area is home to floating plants such as *Nymphaea stellata* and *Nelumbo nucifera*. The patches of degraded fringing mangrove in this area are dominated by species adapted to high-saline conditions (i.e. *Avicennia marina*). The shallow margins of lagoons and seasonal water bodies are covered with patches of salt-marsh vegetation consisting of *Halosarcia indica*, *Salicornia brachiata* and *Suaeda* spp. The sand dunes and sandy sea-shore adjoining the lagoon support sparse *Spinifex littoreus* and *Hydrophylax maritima* dominated vegetation. The shallow lagoon has patches of sea-grass beds. The tidal effect in the shallow lagoons results in the exposure of tidal mudflats, consisting of very rich organic matter that supports a high richness of invertebrates, which in turn attracts diversity of water birds. A total of 149 bird species have been recorded from this area, including a large number of migratory species, amounting to more than 20,000 individuals annually.



**Noteworthy fauna:**

The site harbours an array of migratory waders and waterfowl. Large populations of *Phoenicopus roseus*, *Anas penelope*, *Anas acuta* and *Limosa limosa* have been observed in the site. A notable species in this site is the Indian Spot-billed Duck (*Anas poecilorhyncha*), of which a breeding population was discovered recently. Until 2003, this species was known as a very rare migrant. Two species of rare migratory waterfowl that visit the site include *Anas strepera* and *Sarkidiornis melanotos*. Among the other aquatic animals, two species of reptiles (*Melanochelys trijuga* and *Crocodylus porosus*) have been observed from this area.

**Noteworthy flora:**

The patches of fringing mangroves in the area consist of *Avicennia marina*, *Aegiceras corniculatum*, *Excoecaria agallocha*, *Clerodendrum inerme*, *Rhizophora mucronata*, *Lumnitzera racemosa* and *Pemphis asidula*. The patches of sea grass beds scattered in the lagoon consist of *Enhalus acoroides*, *Thalassia hermprichii*, *Halophila ovata* and *Halodule uninervis*.

**Land use:**

Except for a few permanent settlements in the Thiruketiswaram area, the rest of the area is devoid of human settlements. A small Army camp is present in the area. Collection of fuel-wood and livestock grazing is done on a small scale. The civil war has kept off human activity from this area for nearly two decades. Locals in the surrounding areas carry out subsistence fishing in the shallow lagoons.

**Possible changes in land use:**

If the security situation improves, it is likely that human use of the wetlands and surrounding areas will increase significantly. The open areas and scrublands could be converted into uniform stands of *Prosopis juliflora*, due to the spread of this invasive alien species.

**Hydrological and biophysical values:**

These wetlands play an important role in nutrient cycling within the southern Palk Bay area and are connected to the extensive coastal and marine ecosystem complex of the Palk Bay and Gulf of Mannar. The wetlands are also important in flood detention during the rainy season.

**Social and cultural values:**

This area is sparsely inhabited but is historically significant due to the location of several ancient harbours. It is believed that the first Indian settlers in Sri Lanka arrived in the Mannar area.

**Scientific research and monitoring:**

The CBC conducts annual censuses of waterfowl in this area.

**Conservation education:**

The CBC has written several articles highlighting the conservation significance of this site.

**Recreation and tourism:**

Although the site is a bird watchers paradise, the current civil war has prevented many people from visiting this area.



**Conservation measures taken:**

This area used to be subjected to illegal hunting of waterfowl, but the presence of the Army has resulted in a reduction of poaching activities.

**Conservation measures proposed:**

The CBC has urged the government of Sri Lanka to propose this area as a Wetland of International Importance (Ramsar site).

**Disturbances and threats:**

The spread of two invasive alien plants, *Prosopis juliflora* and *Opuntia dillennii* has affected the open areas such as pastures and maritime grasslands. These two species are also found around scrublands, seasonal waterholes and also around salt marshes. Free roaming livestock have facilitated the spread of *P. juliflora* in this area. Large areas of natural vegetation have also been cleared for security reasons.

**Land tenure:**

State owned

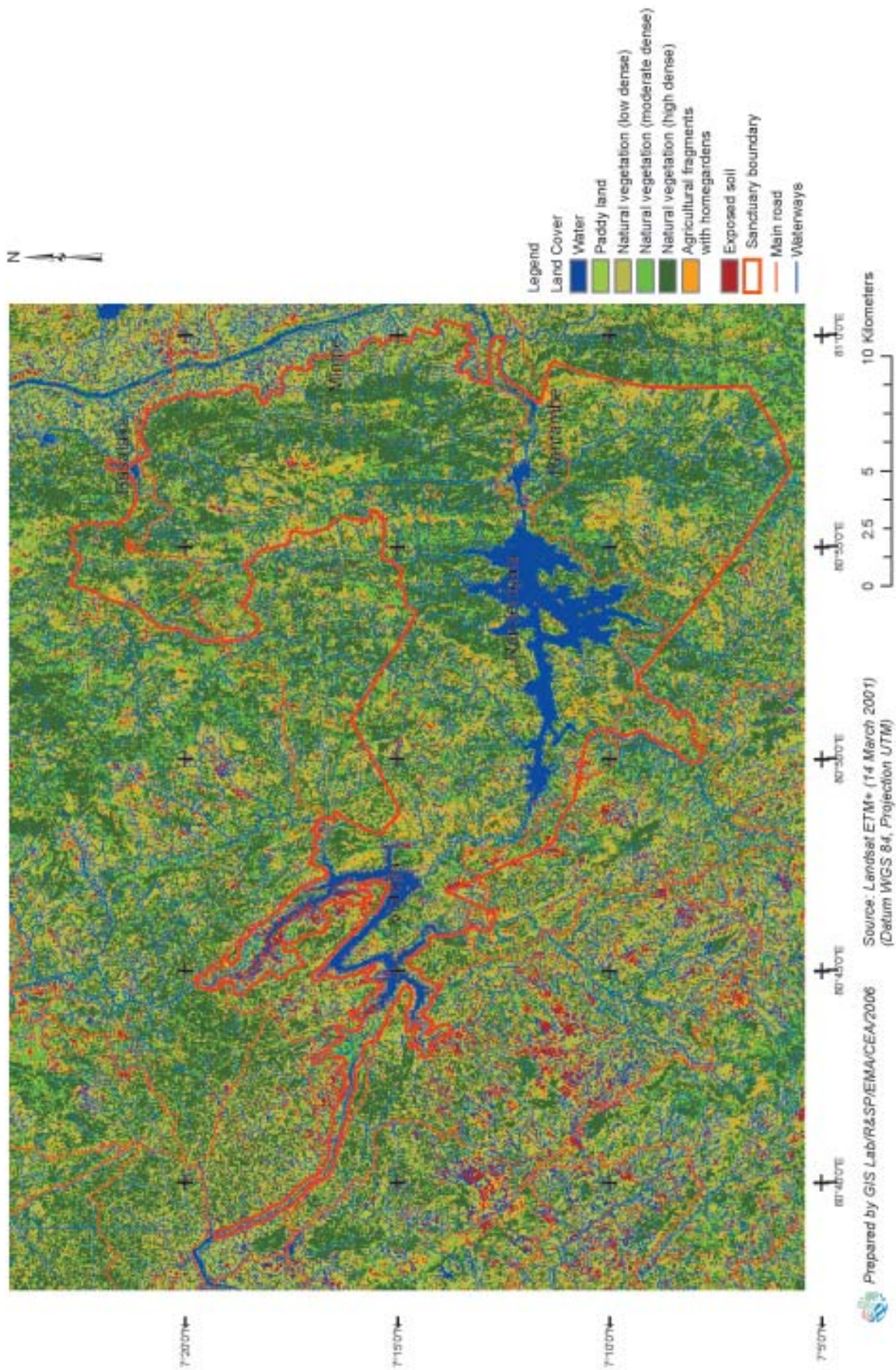
**Management authority and jurisdiction:**

The coastal area falls within the legal jurisdiction of the CCD.

**References:**

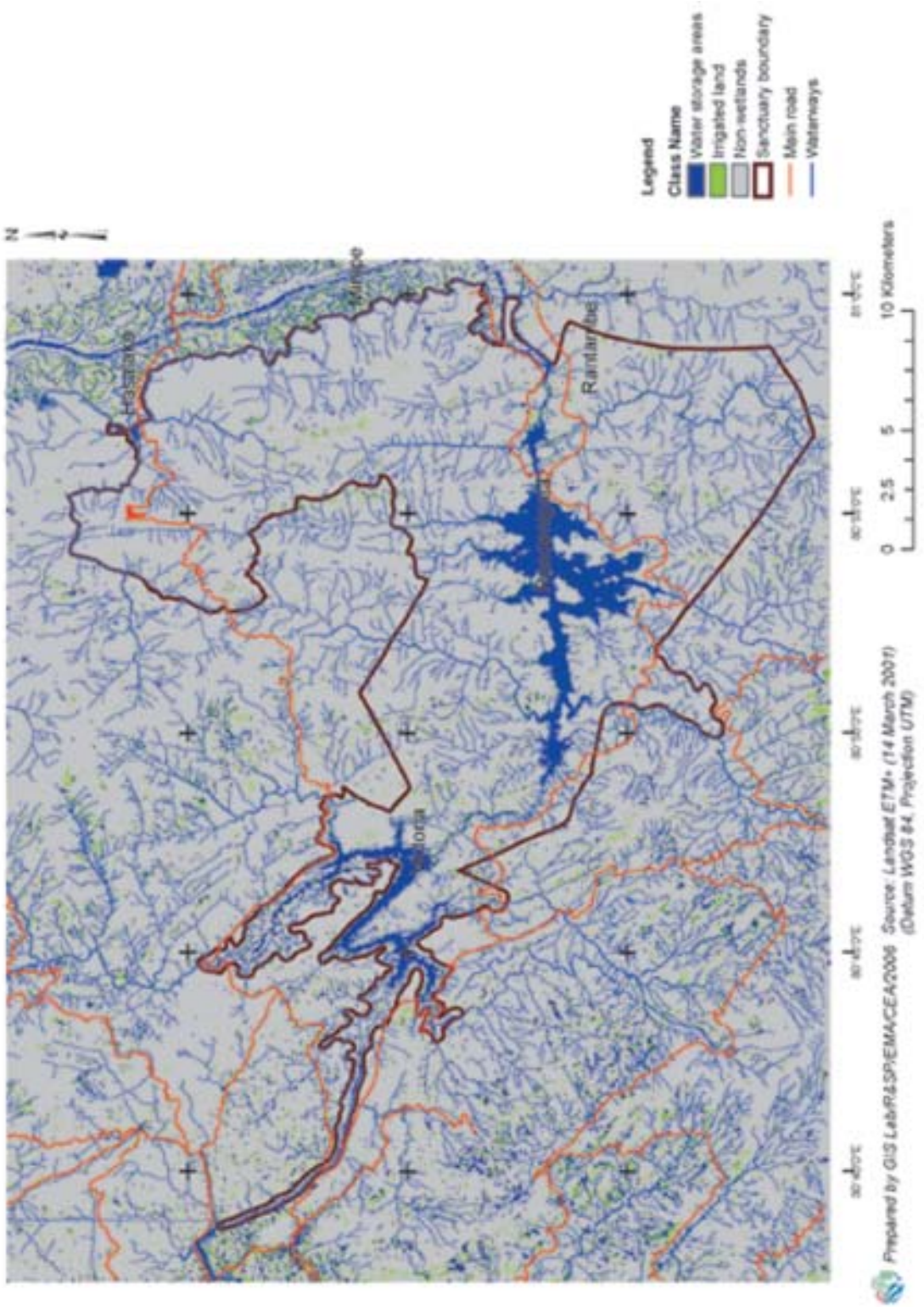
CBC (2006); Siriwardana (2003); Kithsiri Gunawardena personal communication

# Victoria, Randenigala, Rantambe Sanctuary





# Victoria, Randenigala, Rantambe Sanctuary Wetlands based on Ramsar Classification



# Victoria Randenigala Rantambe Reservoirs

## Location:

7° 25' 0 N and 80° 40' 0 E to 7° 5' 0 N and 81° 0' 0 E; 819824 N and 463216 E to 782961 N and 500000 E; spanning the Mahaweli Ganga between Kandy and Minipe anicut within the Districts of Kandy and Nuwara Eliya in the Central Province, and Badulla District in the Uva Province.

## Area:

Surface area of reservoirs is 4,992 ha (Victoria 2,440 ha; Randenigala 2,419 ha; Rantambe 133.8 ha), while the Sanctuary area is 36,507 ha.

## Altitude:

Information not available

## Overview:

The Victoria, Randenigala, and Rantambe (VRR) reservoirs were constructed during the late 1980's under the Accelerated Mahaweli Development Programme, to meet the energy needs of the country, and also to provide irrigation water to the dry zone. In order to protect the upper catchment of the Mahaweli Ganga, the surrounding land area of these reservoirs was declared as a sanctuary in 1987. In addition to these major reservoirs, there are many small artificial and natural water bodies located within the sanctuary.

## Physical Features:

The VRR sanctuary is located in the intermediate zone of the country, receiving an annual rainfall of 1,500-1,700 mm. The mean annual temperature is around 26°C. The VRR sanctuary is composed of Precambrian metamorphic rocks classified under two distinct rock types namely Highland and Vijayan. Major rock types found in the area include Charnockitic Gneiss, Quartzite, Marble, Hornblende Biotite Gneiss, Sillimanite Gneiss, Garnet Biotite Gneiss, Magmatites, and Pink Feldspar Granitic Gneiss. Fourteen seasonal and perennial streams flow through the VRR sanctuary, and Uma Oya and Kurundu Oya have become major perennial streams of the area. Several islands are located within the Randenigala reservoir. The Victoria, Randenigala and Rantambe reservoirs have storage capacities of 722 MCM, 860 MCM, and 7 MCM respectively, with power generation capacities of 210 MW, 126 MW, and 49 MW. Dam heights are 122m at Victoria, 94 m at Randenigala, and 41.5 m at Rantambe.

## Ecological Features:

Major habitat types include fresh water wetlands (reservoirs, streams, tanks, irrigation canals, marshes, paddy lands), and intermediate zone tropical-semi evergreen forest. Other vegetation types in the VRR Sanctuary include sub montane forests, semi-evergreen forests, riverine forests, bamboo forests, and rock outcrop forests. The late successional vegetation is represented by scrub forests, and savannas; and early successional vegetation is represented by home gardens, abandoned home gardens, chenaland, abandoned chenaland, grasslands, and *Leucaena* stands. Nearly 300 species of plants have been recorded from the intermediate zone tropical-semi evergreen forest. The VRR sanctuary provides shelter for an extremely rich faunal diversity. The vertebrate fauna includes 30 (3 endemic) species of freshwater fish, 10 (8 endemic) species of amphibians, 35 (8 endemic) species of reptiles, 153 (12 endemic) species of birds, and 29 (1 endemic) species of mammals. The invertebrate fauna include 71 (3 endemic) species of butterflies, and 41 (31 endemic) species of mollusks.



**Noteworthy fauna:**

Important food fish species in the reservoirs include several species of exotics (*Oreochromis mossambicus*, *O. niloticus*, *Cyprinus carpio*, *Labeo rohita*, *Osphronemus gouramy*) and natives such as *Tor khudree*, *Anguilla bicolor*, *A. nebulosa* and *Etroplus suratensis*. Endemic amphibians such as *Rana gracilis*, *Lankanectus corrugata* and *Polypedates cruciger*, along with endemic reptiles such as *Xenochrophis asperrimus* inhabit the streams around the reservoirs. The waterbirds associated with the reservoirs include numerous species of herons, egrets, cormorants, kingfishers and migratory waders. Among the raptorial birds, species such as *Elanus caeruleus*, *Haliaeetus leucogaster*, *Ichthyophaga ichthyaetus*, and the migratory *Pandion haliaetus* visit the reservoirs to prey on fish. Among the mammals associated with aquatic habitats are *Elephas maximus*, *Lutra lutra* and *Prionailurus viverrinus*.

**Noteworthy flora:**

Some common plant species associated with patches of riverine forests around the reservoirs include *Terminalia arjuna*, *Madhuca longifolia*, *Pongamia pinnata*, *Entada pusaetha*, *Ficus nervosa*, *Ficus racemosa*, and *Pandanus kaida*.

**Land use:**

The main purpose of the reservoirs is storage of irrigation water and power generation. Commercial and subsistence fisheries are also practiced in the reservoirs. Some of the surrounding lands are used for chena cultivation, tobacco cultivation, paddy cultivation and homesteads. Human activity is restricted due to the high security zone around the reservoirs.

**Possible changes in land use:**

Clearing of forest areas for homestead expansions has increased in recent years, and traditional chena cultivation practice has become popular among the new settlers in converting forest vegetation to agricultural lands. Although hunting is strictly prohibited in the Sanctuary, illegal hunting activities have increased in the recent past.

**Hydrological and biophysical values:**

These three reservoirs play a key role in supplying irrigation and drinking water, generation of hydropower, flood control, aquifer recharge, and absorption of pollutants.

**Social and cultural values:**

Nearly half of the country's electricity demand is supplied by these three hydropower schemes, while a vast area of dry zone lands have been cultivated with water from these reservoirs. Approximately 22,000 families are living within the VRR Sanctuary today. Many historical sites such as the ancient Minipe anicut are also located within the VRR sanctuary. The left bank diversion work in the Mahaweli River near Minipe dates back to the 6<sup>th</sup> century B.C, when King Aggabodi constructed the 17 mile long Minipe Amuna to divert the water to the dry zone for paddy cultivation. Other important archaeological sites such as Mundawathagama, Kandeketiya, Lihiniyagala temple inscriptions, Yatimadura, and Bambaragala inscriptions are found within the Sanctuary.

**Scientific research and monitoring:**

The Training Research Education and Extension Centre (TREE centre) managed by the Wildlife Trust of Sri Lanka is located within the Sanctuary. Research projects related to biological, ecological, physio-chemical, hydrological, and socio-economic aspects of the VRR Sanctuary have been carried out in the

recent past. The centre can provide overnight accommodation for more than 100 visitors at a time, and is equipped with auditoriums, classrooms, audio-visual facilities, and guesthouses for researchers and visitors.

#### **Conservation education:**

The TREE center has been conducting numerous education and outreach programmes since 1990.

#### **Recreation and tourism:**

Although the Sanctuary has a range of opportunities for tourism which are related to its natural, historical, and scenic value, there are no planned tourist activities in the area. This is mainly due to large sections of the Sanctuary falling within a high security zone. The TREE centre is the only established visitor center in the area.

#### **Conservation measures taken:**

The reservoirs and surrounding forest areas were declared as a Sanctuary under the FFPO in 1987. A VRR Steering Committee chaired by one of the Government Agents of Badulla, Kandy, or Nuwara Eliya Districts, and comprising representative from all agencies responsible for resource management in the Sanctuary was formed. This committee has a very strong hold on policy, management, and monitoring of activities related to the Sanctuary.

#### **Disturbances and threats:**

Illegal land clearing for chena cultivation and illegal tree felling have become major threats to the Sanctuary. Clearing of forest cover not only destroys wildlife habitat but also resulted in soil erosion, leading to siltation of the reservoirs. An increase of illegal hunting activities has also been reported from the area. The presence of large numbers of families and their livelihood activities have negative impact on natural habitats. Mortality of animals such as crocodiles, python, and otters have been reported in the Randenigala reservoir, due to the use of gill nets by fishermen. The spread of the invasive alien species *Mimosa pigra* along the river banks up to the Victoria reservoir has affected riparian vegetation.

#### **Land tenure:**

The Reservoirs and most forest areas within the Sanctuary are state owned, but there are privately owned lands located within the sanctuary boundary.

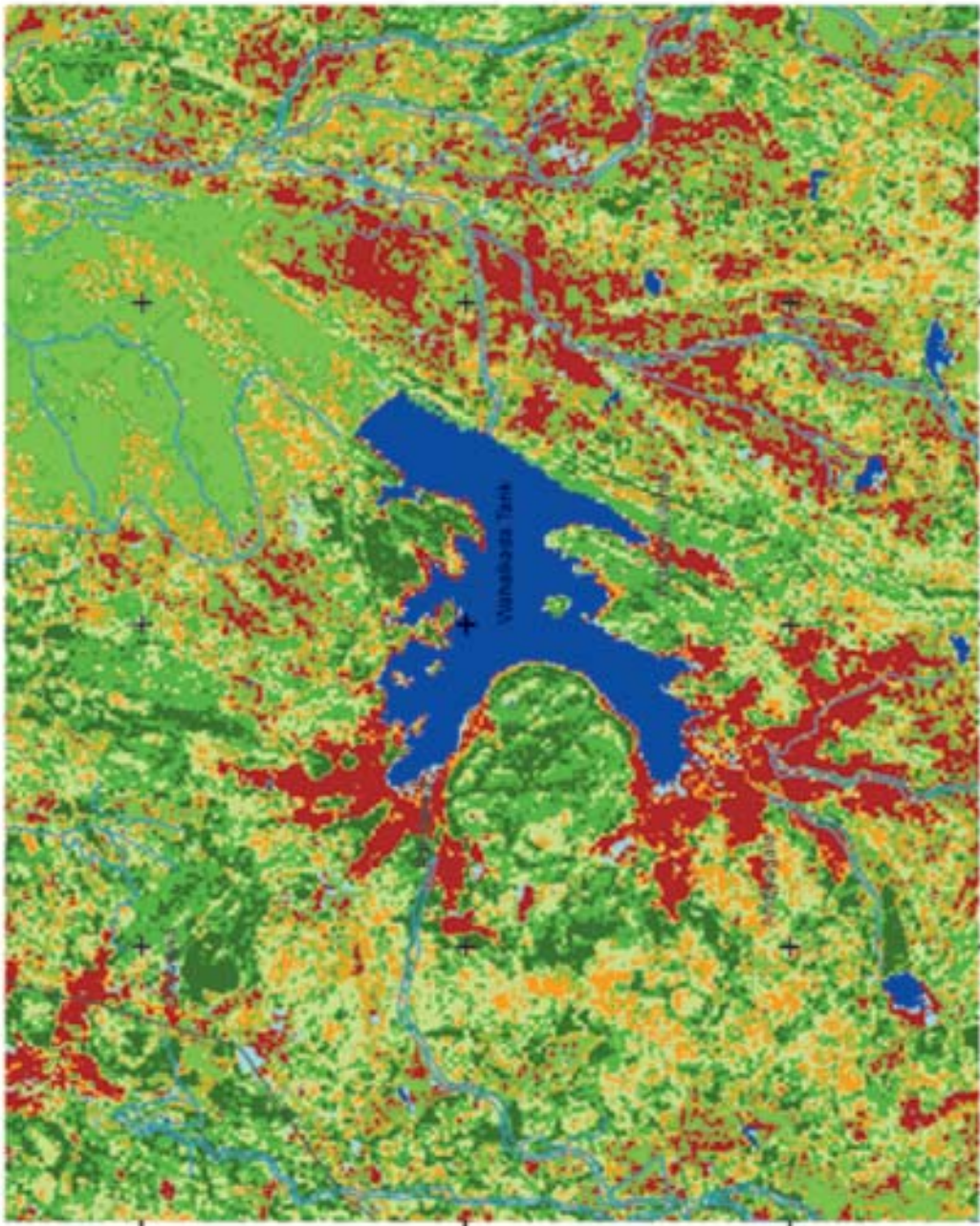
#### **Management jurisdiction:**

The DWC has jurisdiction over the Sanctuary for the protection of fauna and flora. The MASL is a major stakeholder of the Sanctuary, being the authority for the site workforce, security control, and irrigation activities. Operation and maintenance of the hydropower stations and security of power stations is under the CEB.

#### **References:**

DWC (1997)

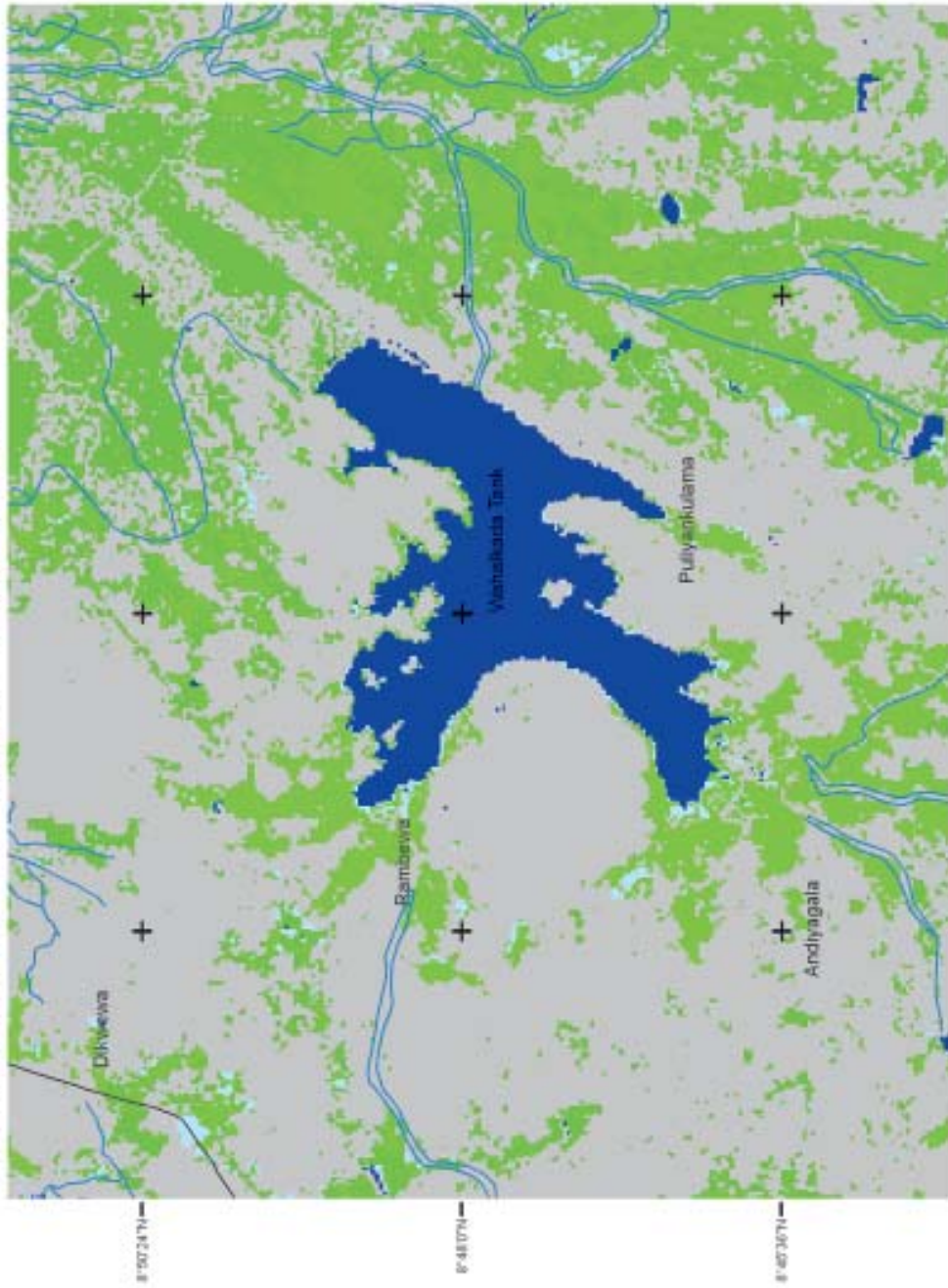
# Wahalkada Tank



Source: Landsat ETM+ 6th Sep 2001  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/RS/PIEM/CEA/2006



# Wahalkada Tank Wetlands based on Ramsar Classification



Source: Landsat ETM+ 6th Sep 2001  
(Datum WGS 84, Projection UTM)  
Prepared by GIS Lab/R&SP/EMA/CEA/2006





# Wahalkada Tank

**Location:**

8° 52' 0 N and 80° 40' 0 E to 8° 38' 24 N and 80° 55' 0 E; 980128 N and 463348 E to 954316 N and 490831 E; about 35 km northeast of Kebethigollawa in the Anuradapura District, of the North-central Province.

**Area:**

2,883 ha at full supply level

**Altitude:**

80 m above mean sea level

**Overview:**

Wahalkada Wewa is one of the largest ancient irrigation tanks, which was built approximately 1,500 years ago during the time of King Mahasen. It was restored in 1973 by the Irrigation Department for the irrigation of paddy cultivation areas and other field crops such as onions, soya beans and groundnut.

**Physical features:**

This relatively shallow tank is situated in the northeastern dry zone in the Yan Oya basin. The tributary of the Yan Oya brings water to the Wahalkada tank. The tank is perennial but large areas of the tank become dry in the dry season, thus exposing large areas of the tank bed.

**Ecological features:**

The aquatic vegetation of the tank comprises of phytoplankton and macrophytes (rooted, rooted with floating leaves and floating plants). The surrounding landscape comprises of degraded dry mixed evergreen forests, chena, paddy lands and home gardens. Furthermore patches of small *Tectona grandis* plantations can also be observed.

**Noteworthy fauna:**

The freshwater fish fauna is dominated by the exotic species (mainly *Oreochromis* spp.), while the endemic species include *Clarias brachysoma* and *Puntius singhala*. Common birds include *Pelecanus philippensis*, *Mycteria leucocephala*, *Phalacrocorax fuscicollis* and *Ichthyophaga ichthyaetus*. Herds of *Elephas maximus* visit the tank to fulfill their water requirements.

**Noteworthy flora:**

*Manilkara hexandra*, *Drypetes sepiaria*, *Schleichera oleosa*, *Pterospermum gardneri*, *Tectona grandis*, *Maba buxifolia* and *Flueggia leucopyrus* are commonly found tree species around the tank. Among the floating aquatic plants, *Nelumbo nucifera* and *Nymphaea stellata* are noteworthy species.

**Land use:**

The surroundings are mainly used for irrigated agriculture, home gardens and forest plantations.

**Possible changes in land use:**

Allocation of more land areas to chena and irrigated agriculture may reduce the natural vegetation cover.

**Hydrological and biophysical values:**

This tank serves as an important water storage tank and regulates the downstream water flow for irrigated agriculture.

**Social and cultural values:**

The fishery related activities are an important livelihood source for the local communities.

**Scientific research and monitoring:**

Information not available

**Conservation education:**

Information not available

**Recreation and tourism:**

Information not available

**Conservation measures taken:**

This reservoir was declared a FMA in 2005 under FARA.

**Conservation measures proposed:**

Information not available

**Disturbances and threats:**

The destruction of natural vegetation adjacent to the tank is caused by expansion of human settlements and agricultural areas. The spread of invasive alien species such as *Lantana camara* also results in habitat deterioration.

**Land tenure:**

State owned.

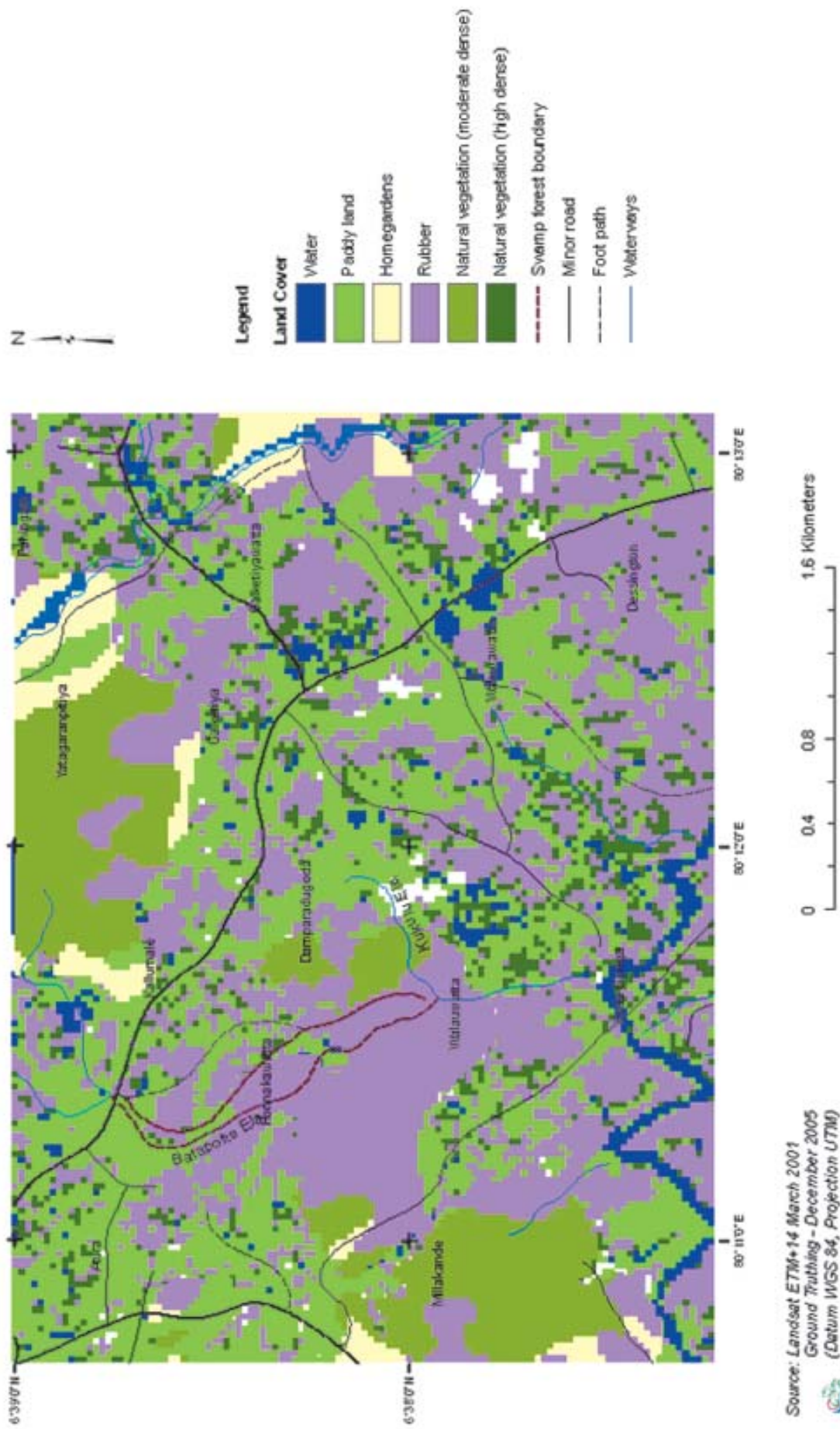
**Management authority and jurisdiction:**

The tank is under the jurisdiction of the Irrigation Department. The fisheries are managed by the DFAR.

**References:**

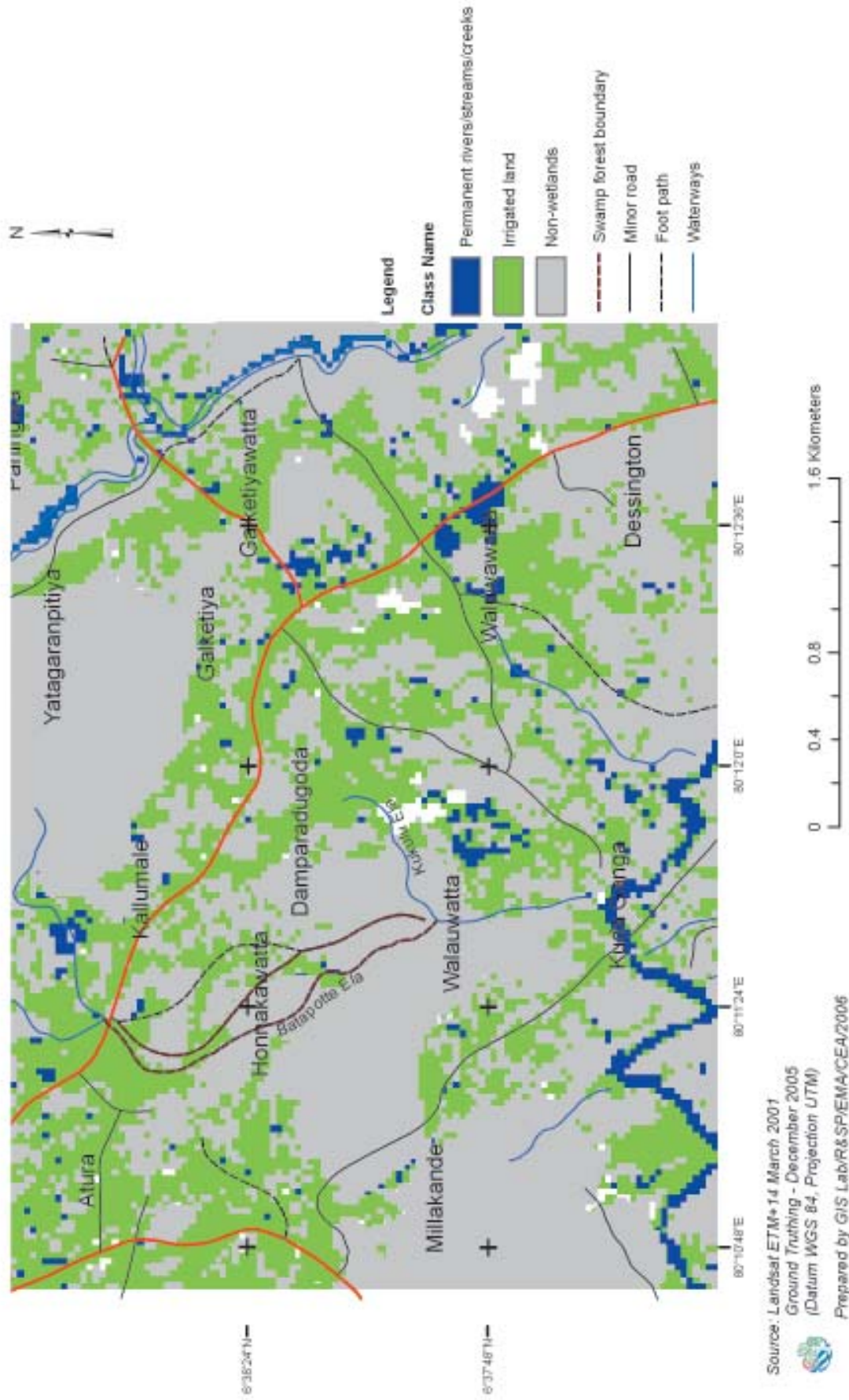
Paiva (1975)

# Walauwatta Wathurana Swamp Forest



Source: Landsat ETM+ 14 March 2001  
 Ground Truthing - December 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&S/PEMA/CEA/2006

# Walauwatta Waturana Swamp Forest Wetlands based on Ramsar Classification





# Walauwatta Wathurana Swamp Forest

## Location:

6° 39' 0 N and 80° 11' 0 E to 6° 37' 0 N and 80° 13' 0 E; 735132 N and 409730 E to 731441 N and 413409 E; near the town of Bulathsinhala in the Kalutara District, of the Western Province.

## Area:

The swamp is spread over 12 ha.

## Altitude:

Information not available

## Overview:

The Walauwatta-Wathurana swamp forest is located in the Kalu Ganga river basin in the southwestern part of Sri Lanka, 25 km inland from the coastal town of Kalutara. More precisely, the site is situated along a stream locally known as the Batapotte ela, which feeds the Kuda Ganga, the latter being a tributary of the Kalu Ganga. Wathurana is the most significant swamp forest in Sri Lanka. As such, it is considered a site of national importance and harbours some unique species of flora and fauna.

## Physical features:

Wathurana is underlain by crystalline, non-fossiliferous rock of Precambrian age. The rock present is mainly charnockitic rock (the ridges), garnetiferous-quartzo-feldspathic rock (in the valleys) with sporadic quartzite bands. According to the soil classification map of the Irrigation Department and national atlas, the soil of the Wathurana area can be classified as "Red-Yellow-Podzolic soil (steeply dissected, hilly and rolling terrain)" with "alluvial soils of variable drainage and texture" in the valleys. The average monthly temperature is 27.3 °C and mean annual rainfall is 4,000-5,000 mm.

## Ecological features:

This swamp is a late successional stage of a freshwater marsh ecosystem. The natural vegetation consists of a freshwater swamp community and patches of lowland rainforest (mainly secondary vegetation). These natural vegetation types are surrounded with managed landscapes including rubber plantations and home gardens. The swamp vegetation includes tall trees dominated by *Stemonoporus moonii* and *Mesua stylosa* and herbaceous species (*Cryptocoryne* spp. and *Lagenandra* spp.). The area is subjected to seasonal inundation, especially during the southwest monsoon period.

## Noteworthy fauna:

The swamp and its streams harbour several species of endemic as well as locally declining freshwater fish species, including *Aplocheilichthys dayi*, *Acanthocobitis urophthalmus*, *Channa ara*, *Channa orientalis*, *Clarias brachysoma*, *Lepidocephalichthys jonklaasi*, *Esomus thermoicos*, *Puntius bimaculatus*, *P. cumingii*, *P. pleurotaenia* and *P. titteya*. The endemic amphibians include *Lankanectes currugata* and *Rana gracilis*. The aquatic reptiles include the endemic serpent *Xenochrophis asperimus*. Since the swamp vegetation is bordered by lowland rainforest patches, endemic terrestrial birds such as *Ocyrceros gengalensis*, *allopardix bicalcarata*, *Loriculus beryllinus*, *Megalaima flavifrons*, *Turdoides rufescens*, *Psittacula calthropae* and

*Zoothera spiloptera* can be found at this site. Among the noteworthy mammals, two endemic primate species (*Macaca sinica* and *Trachypithecus vetulus*) and *Lutra lutra* inhabit this site.

#### **Noteworthy flora:**

This site harbours a large number of endemic species of which two, namely *Mesua stylosa* and *Stemonoporus moonii* are found exclusively in Wathurana. Other woody endemic species in the lowland rainforest patches and locally declining species, include dipterocarps (*Dipterocarpus hispidus*, *Shorea dyeri*, *Doona affinis*), rattans (*Calamus delicatulus*, *Calamus digitatus*) and other trees (*Cullenia ceylanica*, *Cullenia rosayroana*, *Garcinia hermonii*, *Garcinia quaesita*, *Calophyllum moonii*, *Vateria copallifera*, *Mangifera zeylanica*, *Schumacheria castaneifolia*, *Semecarpus gardneri*, *Semecarpus moonii*, *Areca concinna*).

#### **Land use:**

Most slopes are in use as rubber or tea plantations, and abandoned chenas are common. Some places are densely vegetated with wet lowland forest (e.g Honaka forest). The valleys are 1-2 km wide, have little or no slope, and usually lie below the 15 msl (50ft) contour. Most valleys are used for paddy cultivation. Narrow streams are present at the lowest sections of the valleys along which swamp forests have developed in some locations (as in the case of Wathurana).

#### **Possible changes in land use:**

A reduction of water flow into Wathurana due to harmful activities such as sand mining and construction of dams could lead to a decline in the extent of the swamp area. The spread of invasive plant species such as *Wormia suffruticosa* could also lead to the establishment of uniform stands within the swamp area, with the replacement of native endemic vegetation.

#### **Hydrological and biophysical values:**

This is the only swamp forest in Sri Lanka harbouring a number of endemic floral species.

#### **Social and cultural values:**

Information not available

#### **Scientific research and monitoring:**

The YZA conducted a comprehensive survey in 2001. However, this data was not compiled and remains unpublished.

#### **Conservation education:**

The YZA has conducted awareness raising programmes.

#### **Recreation and tourism:**

Information not available

#### **Conservation measures taken:**

The CEA produced a conservation management plan for this site in 1994.

**Conservation measures proposed:**

The conservation management plan produced by the CEA recommends certain conservation measures. In addition, the CEA is currently taking steps to declare Wathurana Swamp forest as an EPA under the provision of the NEA.

**Disturbances and threats:**

Major threats include felling of trees and clearing of land for cultivation. The swamp area is experiencing low inundation (shortening of inundation period as well as lowering of inundation levels), possibly due to sand mining in Kuda Ganga and regulation of water flow in inter-connected networks of streams. This has also facilitated the spread of invasive alien plant species such as *Wormia suffruticosa*, *Clidemia hirta* and *Lantana camara* in the area. The local communities in the area over-exploit fish species for consumption. They even use poisonous substances to collect fish, which has led to the large-scale mortality of fish in streams. Need urgent action to mitigate existing threats.

**Land tenure:**

Privately owned

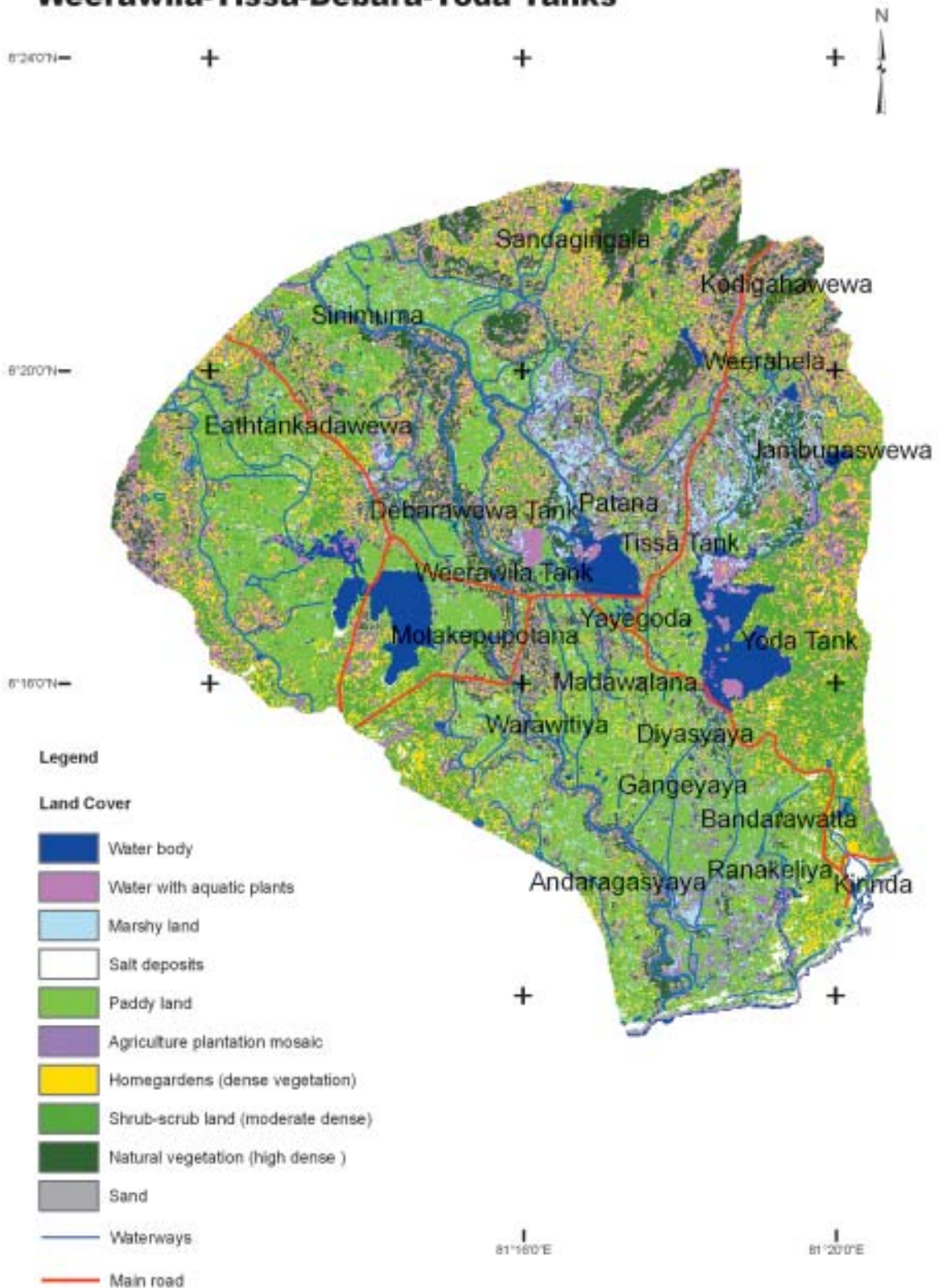
**Management authority and jurisdiction:**

Private

**References:**

CEA/ARCADIS Euroconsult (1994i); IUCN/FAO (1997)

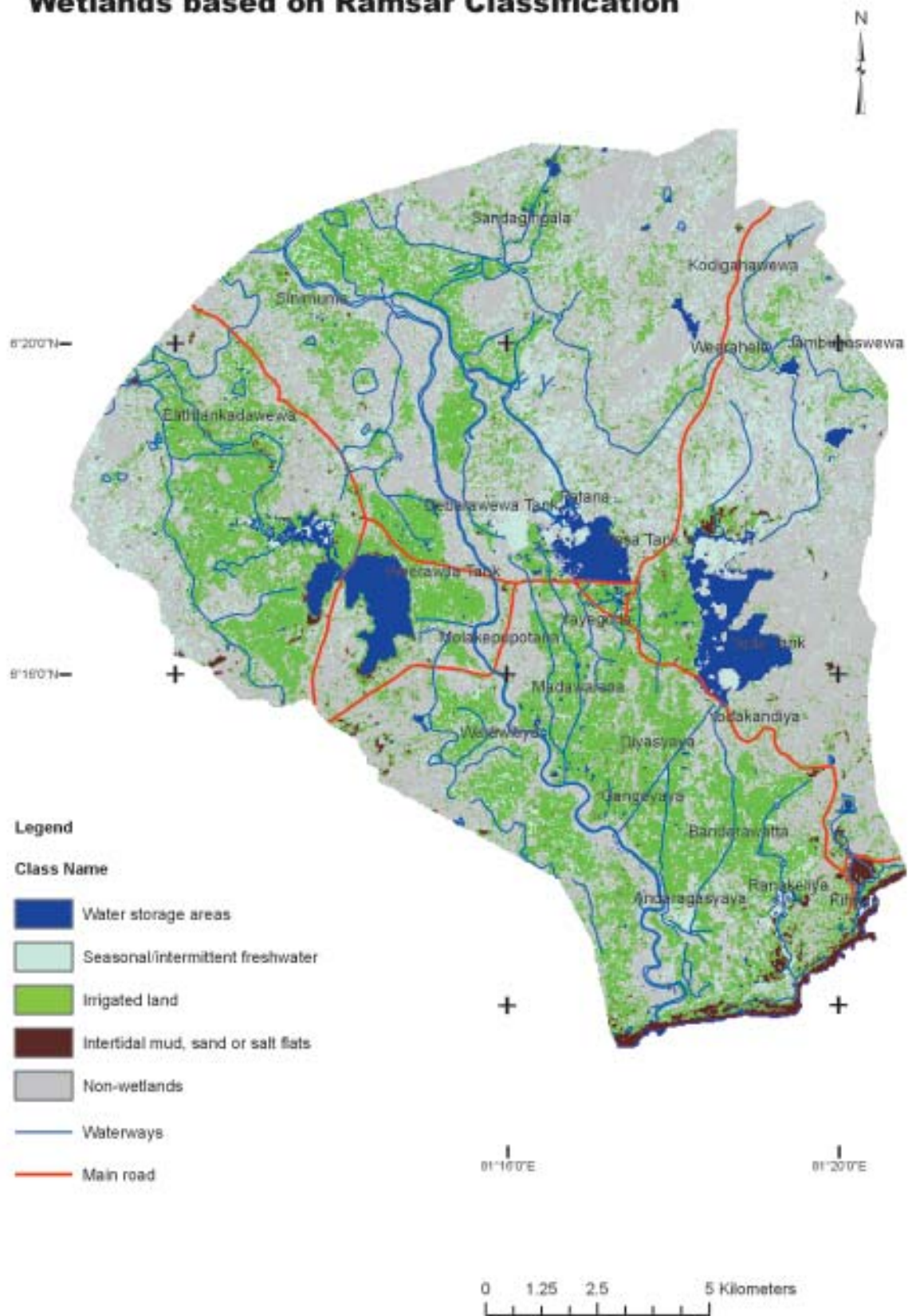
# Weerawila-Tissa-Debara-Yoda Tanks



Source: Landsat ETM+ September 2000  
 Ground Truthing - May 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Weerawila-Tissa-Debara-Yoda Tanks Wetlands based on Ramsar Classification



Source: Landsat ETM+ May 2001  
 Ground Truthing - May 2005  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/R&SP/EMA/CEA/2006

# Weerawila-Tissa-Debara-Yoda Tanks

## Location:

6° 24' 0 N and 81° 12' 0 E to 6° 8' 0 N and 81° 20' 0 E; 707426 N and 522117 E to 677955 N and 536881 E; between 5-10 km inland from the southeast coast around the town of Tissamaharama, in the Hambantota District, of the Southern Province.

## Area:

Surface area at full supply level 1,590 ha (Pannangamuwa – 116 ha; Weerawila - 621 ha; Debara – 78 ha; Tissa - 285 ha; Yoda - 490 ha)

## Altitude:

0 – 125m elevation above sea level

## Overview:

The Weerawila, Debara, Tissa, Pannangamuwa and Yoda wewa tanks form a multi-purpose, ancient, shallow, freshwater tank cluster ranging from small to medium in size. Located in the old area of the Kirindi Oya Irrigation and Settlement Project (KOISP), the tanks are of major importance for buffer storage of irrigation water and are surrounded by densely populated, intensively managed agricultural lands. The tanks provide an alternative series of freshwater habitats for water birds in the network of predominantly brackish to saline coastal wetlands in southeast Sri Lanka. The Weerawila tank is considered an IBA, due to its high richness of aquatic birds. Part of the tank system falls within the Weerawila-Tissa wildlife sanctuary and remnants of Sri Lanka's ancient Ruhuna kingdom are also found within the wetland cluster.

## Physical features:

The tank cluster lies within the southeast low country dry zone and receives 1,100 – 1,200 mm rainfall annually. Most of the rainfall occurs within March-May and October-January periods. Annual average temperature is around 27°C with minimal monthly fluctuations. The southwest monsoons (May to September) bring desiccating winds, which cause severe drought conditions locally. These tanks, being part of a cascade, are hydrologically interlinked. The main canals of the KOISP scheme intersect the natural catchments of the tanks, while most water entering the tanks originate from the Lunugamvehera reservoir. Due to the predominance of paddy cropping on highly percolated soils, there is marked water shortage and as a result most tanks dry out regularly due to competition for these scarce water resources. Principal soil classes in the valley are low humic gley soils and poor to imperfectly drained alluvial soils.

## Ecological features:

The tanks are bordered by seasonally inundated fringing vegetation and catchment forests consisting of dry-mixed evergreen forests. The aquatic vegetation types of the tank cluster depend on the depth of the tank and the degree to which the tank dries up during the dry season. Shallow, quick drying water bodies such as Pannangamuwa and Debara Wewa (maximum depth around 2.5 m) possess dense bottom-rooted emergent lotus plants (e.g. *Nymphaea* spp.). Yoda Wewa with a maximum depth of 3.7 m and large areas of shallow water supports clumps of emergent vegetation in the wet seasons. Tissa and Weerawila tanks are deeper (4.7 m and 4.1 m) and have more open surface water with scattered patches of floating weeds (e.g. *Salvinia*, *Pistia*) and supports no emergent vegetation as they dry out more rarely. In many places of the tank bunds large *Albizia saman* trees are present. Tank bed perimeter vegetation types indicate heavy

grazing pressure. The tank shores are grassy with dominant species such as *Cynodon dactylon* and *Cyperus rotundas*. Diminutive natural vegetation remains in the uplands, due to clearance for paddy and chena cultivation and home gardens. There are few remnant patches of thorn scrub and woodland to the south of Weerawila tank and at the northern end of the Yoda wewa and Beraliyahela hill. In terms of wildlife habitat, the chena and scrub areas on the eastern shores of Yoda Wewa form part of a continuous belt of sparsely populated thorn scrub vegetation, stretching east and southeast through Nimalawa Sanctuary and the Palatupana Lewaya area to Yala National Park. 78 plant species have been identified from the area. Of the fauna, 25 fish species, 8 reptiles, 3 amphibian species and 5 mammals have been recorded from the tank environs.

#### **Noteworthy fauna:**

The freshwater fish in the tanks are dominated by exotic species such as *Oreochromis* spp., *Catla catla*, and *Labeo rohita*. The aquatic reptiles in the tanks include *Crocodylus palustris*, *Melanochelys trijuga* and *Lissemys punctata*. The tanks are home to several large water birds (e.g. *Ardea cinerea*, *Threskiornis melanocephalus*, *Anastomus oscitans*, *Mycteria leucocephala*, *Pelecanus philippensis*), large flocks of waterfowl (*Anas querquedula*, *Dendrocygna javanica*) and cormorants (*Phalacrocorax* spp.). These tanks also function as important water sources for large mammals such as *Elephas maximus*.

#### **Noteworthy flora:**

The seasonally inundated vegetation is dominated by trees such as *Terminalia arjuna*, *Diospyros malabarica* and *Vitex leucoxydon*. The catchment forests consist of timber species such as *Manilkara hexandra*, *Dryptes sepiaria* and *Chloroxylon sweitenia*. The native aquatic vegetation of the tanks includes *Nymphaea pubescens*, *Utricularia* spp., *Ceratophyllum demersum*, *Polygonum* spp. and *Ludwigia adscendens*.

#### **Land use:**

The tank system serves as a major water supply scheme for irrigation, domestic use and fisheries. The surrounding land area is mainly used for human settlements, home gardens, paddy cultivation and as a grazing ground. Man-made infrastructure includes main motorways as well as numerous secondary roads. The Weerawila Air Force airstrip lies south of Weerawila tank. The most common agriculture activity is irrigated paddy cultivation while scattered chena farms (vegetables) are also found. Fishing is done with gill and cast nets from out-rigger canoes in July – August when water levels are low. 90% of fish catches consist of Tilapia. In the two smaller tanks, Debarawewa and Pannangamuwa wewa, fishing is mainly done for home consumption, because the water surfaces of these tanks are almost completely covered with lotus and other vegetation. Clay is extracted from the Weerawila tank bed for brick manufacturing.

#### **Possible changes in land use:**

Planned expansion of KOISP can increase the water flow to the tank cluster.

#### **Hydrological and biophysical values:**

Important for buffer storage of irrigation waters within the Lunugamvehera KOISP scheme. Maximum water storage occurs during the rainy season and the water is released for irrigation activities (paddy cultivation).

#### **Social and cultural values:**

The area forms part of the old remnants (> 2000 years) of the Kingdom of Ruhuna, which includes ancient tanks and 4 dagobas that are of national archaeological significance. Most of the people in the area are

poor and depend on government assistance. A large number of families raise cattle and buffaloes. Around 25 families are involved in extracting lotus flowers from the Debara Tank as a livelihood.

#### **Scientific research and monitoring:**

Studies conducted in and around the tank system include bird censuses conducted by the CBC, various fisheries programmes undertaken by universities and NARA, water quality studies undertaken by the Agricultural Experimental station, Weerawila and more recently several research activities have been undertaken by IWMI.

#### **Conservation education:**

Information not available

#### **Recreation and tourism:**

The area surrounding Tissa tank is a popular tourist spot, due to the easy access to visitor facilities. Boat trips can be made in the tank and the site is a popular stopover place for tourists visiting Bundala and Yala National Parks as well as Kataragama.

#### **Conservation measures taken:**

The 4,170 ha Weerawila-Tissa Sanctuary enclosing Weerawila, Debara, Tissa and Pannangamuwa tanks was established in 1938. In 1994, the CEA developed a wetland site report and a conservation management plan for the wetland cluster under the wetland conservation project. Weerawila Tank has been identified as an IBA, according to the selection criteria of Birdlife International. The Irrigation Department maintains these tanks with the help of the local farmer organisations.

#### **Conservation measures proposed:**

Some recommendations were proposed in the management plan produced by the CEA which included the following; review the status of the Sanctuary; develop a zoning plan to accommodate fisheries activities; provision of stricter protection. Take measures to control water quality and quantity as well as the distribution of water.

#### **Disturbances and threats:**

Inflow of drainage water from the KOISP has increased the salinity levels of the tanks as well as the risk of eutrophication due to agrochemicals and cattle dung. Continuous clearing of vegetation for chena and encroachment of paddy cultivation and human settlements into the tank reservation area is a major problem. Spread of invasive alien species such as *Salvinia molesta*, *Pistia stratiotes* and *Eichhornia crassipes* has affected the native aquatic vegetation in tanks. Other concerns include heavy grazing and trampling of tank border area by livestock, excessive extraction of lotus flowers and uncontrolled expansion of clay mining. The tanks are heavily silted due to improper land use activities in the catchment. Discharge of effluents from hotels to the Tissa Tank and pollution by the large number of pilgrims and jeeps being washed in the tank are also major problems. The bund of the tank gets damaged when tourist boats turn near the bund. The biggest problem for all these tanks is the lack of regular maintenance.

#### **Land tenure:**

The tanks, tank-edge reserves and the Kirindi Oya reserves are under state ownership while the settlements, home gardens and paddy lands are under private ownership.



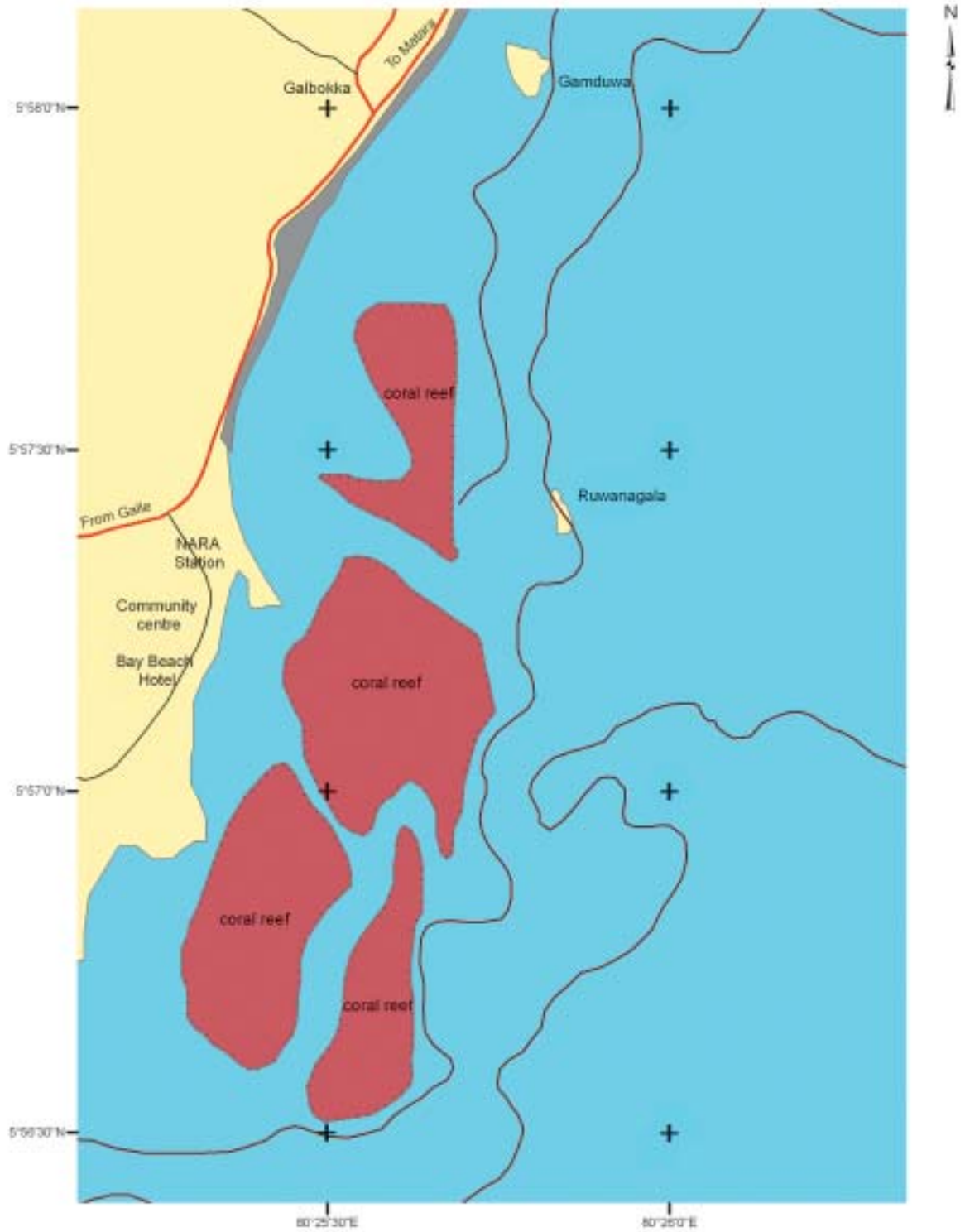
**Management authority and jurisdiction:**

The Weerawila-Tissa wildlife sanctuary is under the purview of the DWC. Tank waters are under the control of the Irrigation Department.

**References:**

Bakker (2000); BirdLife International (2004); CEA/ARCADIS Euroconsult (1994j); Matsuno et al. (2000)

# Weligama Reef



0 0.15 0.3 0.6 Kilometers

Legend	
<span style="color: blue;">■</span> Sea	<span style="background-color: gray;">■</span> Beach/Sand
<span style="background-color: red;">■</span> Coral reef	<span style="border: 2px solid red;">—</span> Main road
<span style="background-color: yellow;">■</span> Homegardens	<span style="border-bottom: 1px solid gray;">—</span> Minor road
	<span style="border-bottom: 1px solid black;">—</span> Bathymetrical contour

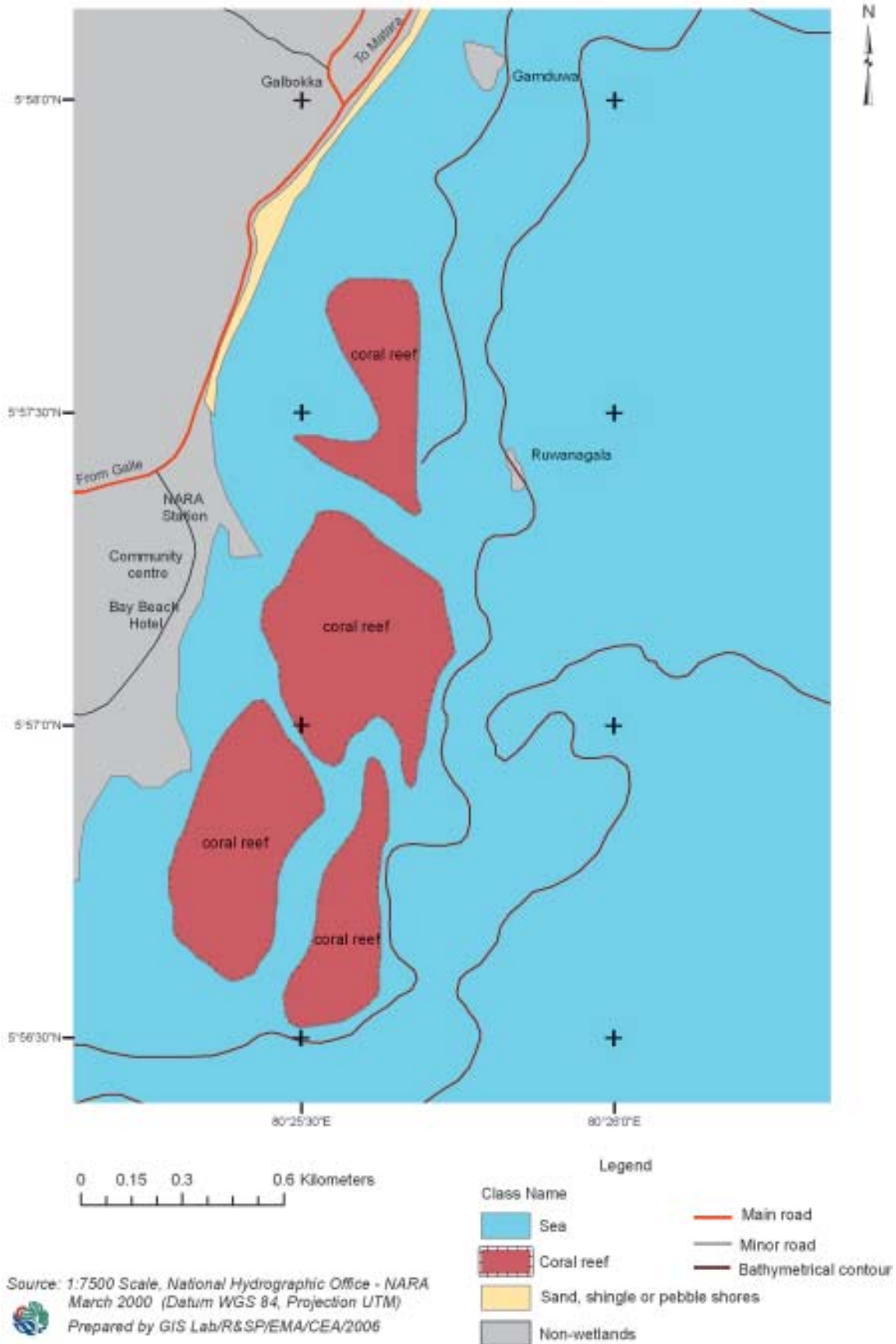
Source: 1:7500 Scale, National Hydrographic Office - NARA  
March 2000 (Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&S/PI/EMA/CEA/2006

# Weligama Reef

## Wetlands based on Ramsar Classification



# Weligama Reef

## Location:

5° 58' 15 N and 80° 25' 15 E to 5° 56' 15 N and 80° 26' 25 E; 659554 N and 435438 E to 655867 N and 437279 E; at the western end of the Weligama Bay at Kapparatota, in the Matara District, of the Southern Province.

## Area:

Reef area unknown

## Altitude:

Sea level to a depth of around 6m

## Overview:

The Weligama reef is an important shallow fringing coral reef habitat located along the southern coast. It was once considered to be one of the best coral reefs along the southwest coast with a live coral cover of over 80%, but has since been severely degraded by both human and natural impacts. Weligama is an important fishing area and the reef is important for the collection of ornamental fish species.

## Physical features:

The reef contains a shallow reef crest and inner reef lagoon with an outer reef slope containing a spur and groove formation to a maximum depth of around 6m. The outer reef slope is exposed to high-energy conditions and has a low coral cover dominated by encrusting corals. Coral patches varying in size from a few meters to over 30m across are scattered throughout the reef lagoon. The depth within the reef lagoon varies from 1m to around 3m. The reef is influenced by the southwest monsoon from May to October, which results in rough seas, although calm conditions tend to prevail throughout the year within the sheltered reef lagoon. Sea conditions are best between November and April. Weligama lies within the wet zone of Sri Lanka, which is characterized by an annual rainfall of over 2,000 mm per year and a mean annual temperature of around 27° C.

## Ecological features:

The inner reef lagoon contains extensive coral habitats dominated by branching *Acropora* spp. Significant stands of *Montipora* and *Pocillopora* are also found. There are extensive algal beds and significant sea grass patches within the reef lagoon dominated by *Thalassia* sp. Over 150 species of reef fish have been recorded from the reef, and the fish community is dominated by wrasses (Labridae) and damselfishes (Pomacentridae), including large colonies of territorial *Stegastes* spp. Several species of marine birds such as gulls and terns are also found around the reef area. The 1998 coral-bleaching event resulted in a decrease in species diversity of corals and fishes dependant on live coral. Currently, the live coral cover is around 32%.

## Noteworthy fauna:

Among the reef fish, *Chlorurus rhakoura* and *Pomacentrus proteus* are restricted to coral reefs in Sri Lanka. The rare and protected *Labroides bicolour* has been recorded at this reef, while *Carcharhinus melanopterus* are occasionally seen along the outer reef slope. Two species of globally endangered marine turtles (*Chelonia mydas* and *Lepidochelys olivacea*) visit the reef.



**Noteworthy flora:**

There is a high diversity of marine algae within the reef consisting mainly of *Halimeda*, *Caulerpa*, and *Sargassum*. Seagrasses include *Thalassia* sp. and *Halodule* sp.

**Land use:**

There is extensive collection of ornamental fish from the reef, which is a major livelihood for the associated community. Some artisanal fishing occurs within the reef area. The reef lagoon is used as an anchorage for multi-day fishing boats.

**Possible changes in land use:**

Continued degradation of the reef would possibly result in reduced live coral cover and reduced diversity of corals and reef fish that may affect livelihoods of fish collectors.

**Hydrological and biophysical values:**

The reef is part of a system of marine habitats within the Weligama Bay. The reef protects the shoreline from direct exposure to monsoon waves and influences the current pattern within Weligama Bay. Extensive algal beds act as sediment traps, and coralline algae such as *Halimeda* are major producers of sand. The shallow reef and associated sea grass habitats act as feeding and breeding grounds for a number of fish species.

**Social and cultural values:**

The reef is extremely important for sustaining local fisheries related livelihoods, which are traditional activities in the area.

**Scientific research and monitoring:**

Weligama reef is monitored by NARA as part of its long-term coral reef monitoring programme supported by the GCRMN and CORDIO. The University of Ruhuna has also conducted studies on the reef.

**Conservation education:**

NARA and IUCN have conducted education programmes for ornamental fish collectors in partnership with the Ornamental Fish Exporters Association of Sri Lanka.

**Recreation and tourism:**

There is limited tourism within the reef, which is visited by tourists staying in nearby hotels. There is a PADI dive centre at the Bay Beach Hotel located adjacent to the reef, which conducts SCUBA diving tours.

**Conservation measures taken:**

Information not available

**Conservation measures proposed:**

Weligama Bay has been proposed as a SAM site by the CCD.

**Disturbances and threats:**

Fish collectors have degraded the reef especially through the use of the illegal moxy nets and other destructive techniques. Corals have also been damaged due to the anchoring of fishing boats within the reef lagoon. Extensive coral bleaching in 1998 resulted in live coral cover decreasing to around 20%, and although many corals have recovered, the species diversity is low. The reef was also impacted by the December 2004 tsunami, which resulted in some loss of live corals. Extensive collection of targeted fish species has resulted in reduced abundance and diversity of reef fishes. Need urgent actions to mitigate existing threats.

**Land tenure:**

State owned.

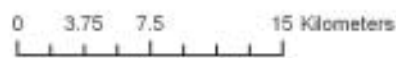
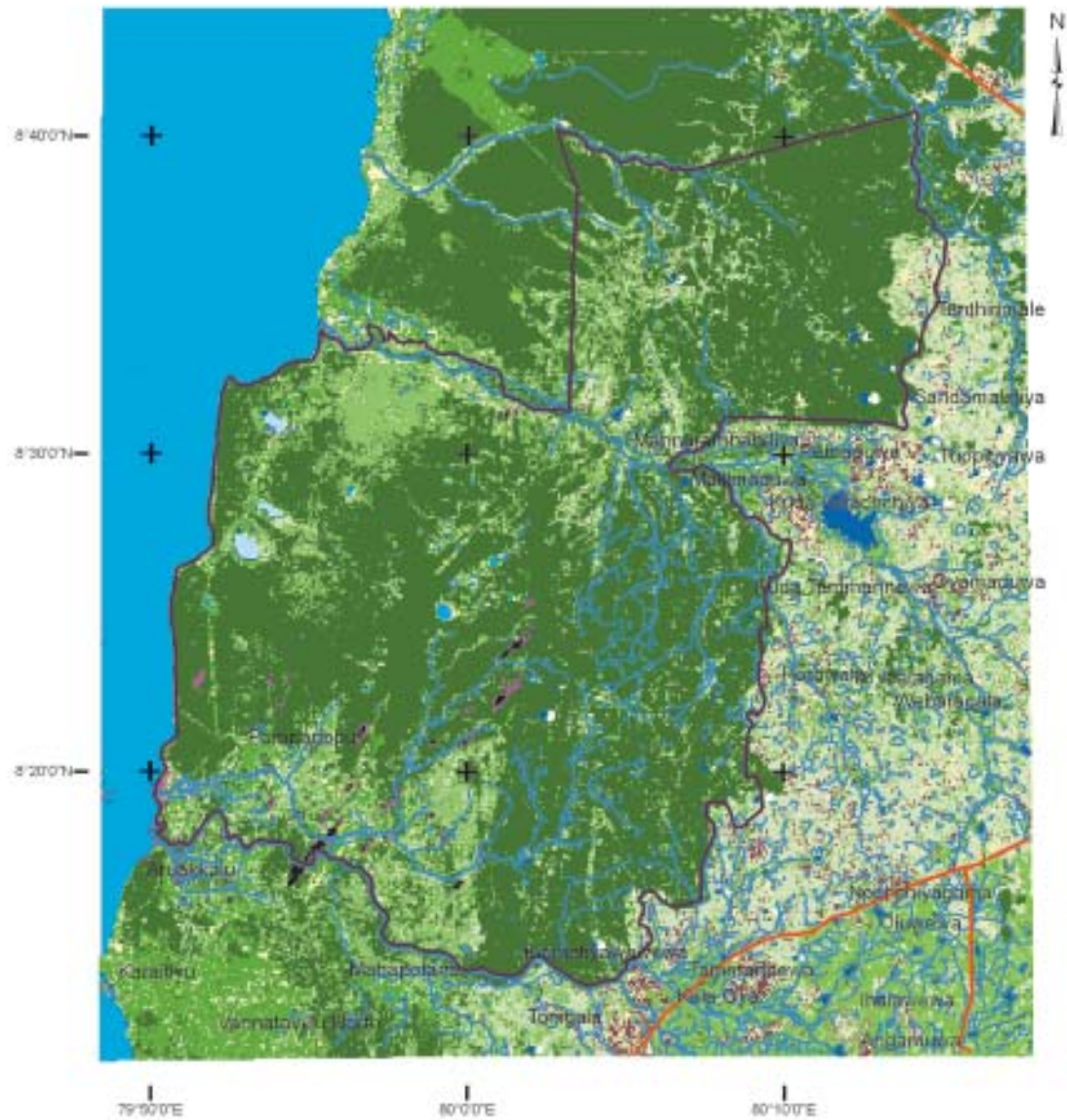
**Management authority and jurisdiction:**

The reef lies within the coastal zone and is therefore under the jurisdiction of the CCD. The DFAR has responsibility in implementing fisheries regulations.

**References:**

De Silva (1985); Öhman et al. (1998); Rajasuriya (2005); Rajasuriya et al. (1995); Rajasuriya et al. (2006); Nishan Perera (personal communication)

# Wilpattu National Park



## Legend

### Land Cover

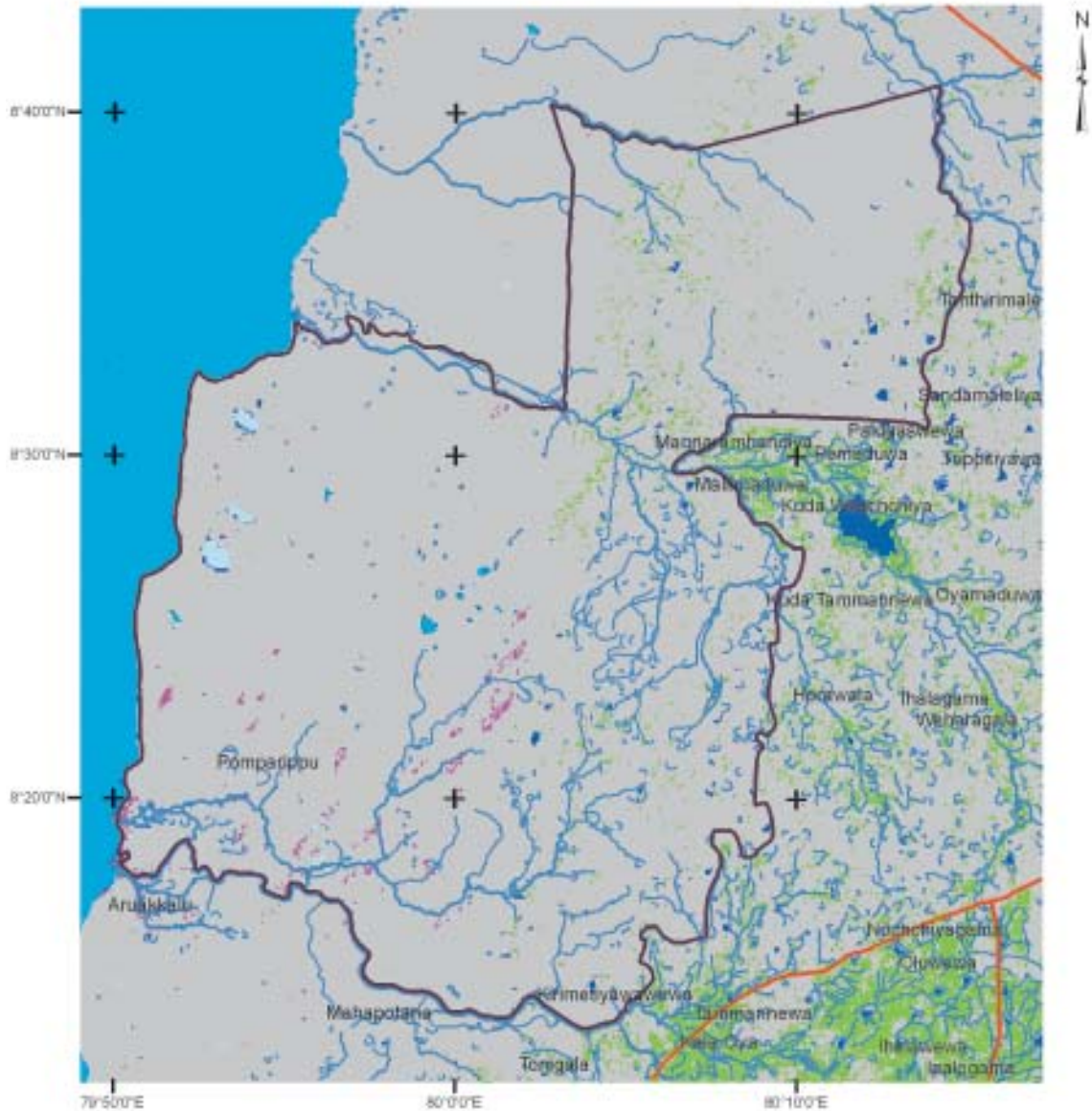
	Sea		Natural vegetation (low dense)
	Water bodies		Natural vegetation (moderate dense)
	Mangroves		Natural vegetation (dense)
	Marshy land		Exposed soil
	Paddy land		Main road
	Homegardens		Waterways
	Scrubland		Park boundary

Source: Landsat TM+ 6th Feb 1988  
(Datum: EGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006










# Wilpattu National Park Wetlands based on Ramsar Classification



0 3.5 7 14 Kilometers

### Legend

#### Class Name

- |  |   |
|--|---|
|  Sea  |  Main road     |
|  Water storage areas                            |  Waterways     |
|  Intertidal forested wetlands                   |  Park boundary |
|  Seasonal/intermittent freshwater marshes/pools |   |
|  Irrigated land                                 |   |
|  Non-wetlands                                   |   |

Source: Landsat TM+ 6th Feb 1988  
(Datum WGS 84, Projection UTM)



Prepared by GIS Lab/R&SP/EMA/CEA/2006



# Wetland Cluster in Wilpattu National Park

## Location:

8° 40' 0 N and 79° 50' 0 E to 8° 15' 0 N and 80° 10' 0 E; 958197 N and 371643 E to 912032 N 408221 E; 30 km due west of Anuradhapura, spanning the Puttalam District and Anuradhapura District, of the North-western and North-central Provinces.

## Area:

The park area is 131, 693 ha

## Altitude:

Sea level to 152 m

## Overview:

Situated at the extreme downstream end of the Kala Oya basin, the Wilpattu National Park, is the largest protected area in Sri Lanka, and contains significant biodiversity. The park covers 454 km<sup>2</sup> of the Kala Oya basin and receives water from four other river systems. These rivers and rainwater sustain several types of wetlands including ancient irrigation tanks, 'vil/villus', water holes, estuaries and lagoons. More than 40 'vil/villus' (a type of shallow lake) are scattered in the park and these wetlands support a variety of wildlife. Each villu ranges from about 2 to 400 ha in extent, with the largest being the Periya Vila.

## Physical features:

The main topographical feature in the park is the concentration of villus (covering ca.1500 ha), which are located in flat, basin like fault depressions on the surface and contain purely rainwater. The villus are associated with limestone sand and form the major water reservoirs for animals during the drought periods. Most of the flood plains within the park are abandoned paddy fields, and as such, most of them have altered their topography to a certain degree. Isolated flood plains are present along the Kala Oya, which is connected to the river only during the rainy season and in other times remains a flooded wetland. A large number of reservoirs are also present within the flood plain area and although most of them are not in working condition, they fill up during the rainy season. Kokkarevillu is the only brackish waterhole within the national park and in August the salinity level of the surface water is around 5 ppt. The park is situated in the low country dry zone and receives an annual precipitation of around 1,000 mm, especially during the northeast monsoons. Rain is also received during the inter-monsoon period, which extends from March to April, while an extensive drought exists between May to early September. Mean annual temperature is 27.2°C.

## Ecological features:

The floodplains in the park have in the past, been used extensively for paddy cultivation and thus the flora in these wetlands has developed subsequent to them being abandoned due to the declaration of Wilpattu National Park. Ancient irrigation tanks such as Maradanmaduwa harbour rich aquatic vegetation, including floating, submerged and emerging plants. These tanks are bordered by seasonally inundated fringing vegetation, dominated by large trees such as *Terminalia arjuna*, *Diospyros malabarica*, *Pongamia pinnata* and *Vitex leucoxydon*. The abandoned reservoirs in the floodplains are now being occupied by dry zone forest tree species and amphibious herbaceous plants typically found in floodplain wetlands. A clear

zonation of herbaceous plants could be observed in the villus, determined by the receding floodwater levels. The center of the villu consists of floating (i.e. *Nelumbo nucifera* and *Nymphaea pubescens*), submerged (i.e. *Hydrilla* spp.) and emerging (i.e. *Dopatrium* spp., *Potamogeton* spp.) aquatic vegetation. The middle region consists of sedges (i.e. *Eriocaulon* spp., *Cyperus* spp.), while the peripheral region consists mainly of grasses (i.e. *Eragrostis* spp.). In Kokkare villu (brackish water), the vegetation is poor in diversity, being dominated by the exotic *Najas marina*, while the exposed peripheral areas are sparsely populated with *Fimbristylis* sp. and *Typha angustifolia*. The villus are surrounded by scrubland and monsoon forest with tall emergents such as *Manilkara hexandra*, *Chloroxylon swietenia*, and *Vitex altissima*. Around 73% of the park is made up of dense forest or scrub while the rest is more open habitat. A recent survey conducted by IUCN has documented about 180 species of plants and 290 species of vertebrates (23 fish, 17 amphibians, 61 reptiles, 149 birds, 40 mammals) from the Wilpattu National Park.

#### **Noteworthy fauna:**

Among the vertebrate species recorded, 20 are endemic (1 fish, 2 amphibians, 10 reptiles, 3 birds, and 4 mammals) while 31 are nationally threatened (2 fish, 2 amphibians, 14 reptiles, 7 birds and 6 mammals). The threatened and/or locally declining vertebrates include several wetland dependent species (Fish - *Horadandia atukorali*, *Puntius ticto*; Amphibians - *Bufo atukoralei*; Reptiles - *Lissemys punctata*, *Melanochelys trijuga*, *Crocodylus palustris*, *Xenochrophis asperimus*; Birds - *Pelecanus philippensis*, *Esacus recurvirostris*, *Leptoptilus javanicus*; Mammals - *Lutra lutra*, *Prionailurus viverrinus*). Many species of large mammals in the park, including *Elephas maximus*, are dependant on the villus and tanks as a source of water and succulent vegetation, especially during the dry season. The birds include 24 winter visitors, including several species of waders and waterfowl.

#### **Noteworthy flora:**

The large trees bordering tanks and villus, including *Terminalia arjuna*, *Diospyros malabarica*, *Pongamia pinnata* and *Vitex leucoxylon* which function as important roosting sites of colony nesting water birds. The tanks and villus harbour a diversity of aquatic plants, and common species include *Aponogeton natans*, *A. crispus*, *Aeschynomene indica*, *Elaeocharis caribaea*, *E. congesta*, *Nelumbo nucifera*, *Nymphaea nouchali*, *Nymphaea pubescens*, *Schoenoplectus articulatus*, *Scripus articulatus*, *S. supinus*, *Ludwigia adscendens* and *L. hyssopifolia*. The dry monsoon forests around the villus and tanks harbour economically important timber species such as *Diospyros ebenum*, *Chloroxylon swietenia* and *Vitex altissima*. A noteworthy introduced plant that is found in the floodplains of Pomparippu aru is *Adansonia digitata* (Baobab), which was introduced by the Arab traders who frequently visited Sri Lankan coastal areas via the silk route.

#### **Land use:**

The main purpose of the area is the conservation of biodiversity, and as such there are no major human settlements. A small fishing village is situated at Pookulum which is at the extreme north-western corner of the park. There are additional seasonal fishing camps along the coast at Kudirimalai, Palugaturai and Kolankanatte.

#### **Possible changes in land use:**

If the park is unused due to the prevailing security situation, illegal activities such as logging may increase, which in turn will adversely affect the existing biodiversity.

**Hydrological and biophysical values:**

The wetlands, particularly the flood plains, play an important role in minimizing flood damage to the adjacent land areas. They also serve as a breeding site for aquatic fauna such as prawns and fish, and support special assemblages of species such as Indi (*Phoenix pusilla*) and Karan koku.

**Social and cultural values:**

Being located in a relatively remote area away from human habitation and forming a part of the Wilpattu National Park, the wetlands of the lower basin of Kala Oya are minimally disturbed. Gange wadiya is the closest settlement to the lower basin area and it appears that poachers from this and other villages such as Karathivu and Serakkuliya visit the wetlands and associated forests frequently. The park and its surroundings are associated with much legend and history. The remnants of the early history of the country (starting from King Vijaya), especially the palace of Kuveni the jungle princess and an old harbour are found within the park. The historic Catholic church at Pallakandal is visited by several thousand pilgrims annually. The parks proximity to the well-known, archaeologically important center of Anuradhapura also supports the view that this area was a center of civilization in the past.

**Scientific research and monitoring:**

In 1969, the Smithsonian Institute carried out research on the behaviour and ecology of elephants and the plant ecology of the park. The MASL has undertaken an in depth study on the Kala Oya basin including the wetlands in the Wilpattu National Park. During 2005 and 2006, IUCN conducted a comprehensive biodiversity and archaeological study of the park, including its wetlands.

**Conservation education:**

A visitor centre/museum is situated at the park entrance in Hunuwilagama.

**Recreation and tourism:**

The national park is popular among nature lovers, particularly for those interested in leopard spotting. Due to security reasons, the park was closed to visitors from 1985 – 2003. There are 7 circuit bungalows inside the park for use by the general public.

**Conservation measures taken:**

The area was declared as a sanctuary in 1905 and upgraded to a National Park in 1938. The Wilpattu sanctuary is contiguous with the park.

**Conservation measures proposed:**

The adjacent areas of Dutch and Portugal bays have been proposed as marine extensions to the park, largely to protect the endangered *Dugong dugon*.

**Disturbances and threats:**

A high level of poaching and timber extraction was recorded during the parks period of closure. The release of toxic material during the decomposition of dead vegetation has been attributed to the sudden death of crocodiles in the Kokkare villu, which has been observed at the end of the drought period. The Kala Oya floodplains south of the Wilpattu national park are becoming popular illegal entertainment sites for groups of local tourists. Large groups of people have been observed camping out in the wild areas such as Monaravilluwa and engaging in activities such as hunting, fishing etc under the patronage of the locals from

the area for whom it has become a source of income. During the dry season, water shortage in some tanks (e.g. Telbeepuwewa, Ulpathwewa, Nikawewa etc) of the Kala Oya basin negatively impacts the wildlife of the surrounding areas. Spread of invasive alien aquatic plants such as *Hydrilla verticillata*, *Najas marina*, *Eichhornia crassipes* and *Salvina molesta* and invasive alien fish such as *Oreochromis mossambicus* could cause problems to the endemic aquatic biodiversity, especially in Villus.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

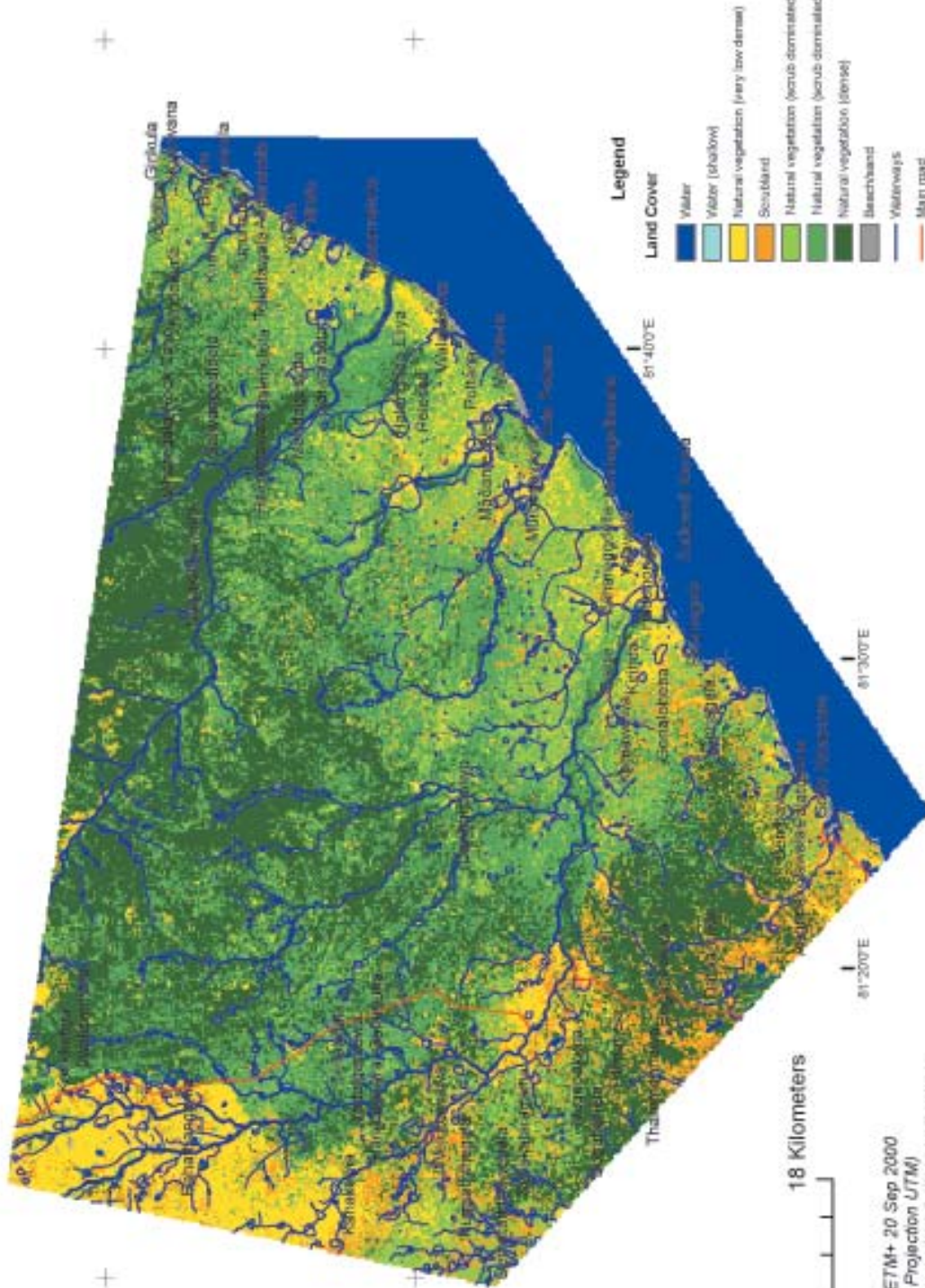
DWC

**References:**

DWC (2004); Eisenberg and Lockhart (1972); Kotagama (1989); MASL (2002); MASL (2005); Ratz (1975)



# Ruhuna National Park and Yala East



## Legend

### Land Cover

- Water
- Water (shallow)
- Natural vegetation (very low dense)
- Scrubland
- Natural vegetation (scrub dominated, low dense)
- Natural vegetation (scrub dominated, moderate dense)
- Natural vegetation (dense)
- Beachband
- Waterways
- Main road

0 4.5 9 18 Kilometers

Source: Landsat ETM+ 20 Sep 2000  
 (Datum WGS 84, Projection UTM)  
 Prepared by GIS Lab/ R&SP/ EMA/ CEA/ 2006





# Yala East National Park

## Location:

6° 42' 0 N and 81° 10' 0 E to 6° 10' 0 N and 81° 45' 0 E; 740588 N and 518420 E to 681687 N and 582979 E; 12 km south of Arugam Bay, in the Ampara District, of the Eastern Province.

## Area:

Park area 18,196 ha (Block I= 17, 863.4 ha and Block II 265.3 ha), with wetlands covering 626 ha

## Altitude:

Sea level to 90 m

## Overview:

The two blocks of the National Park are rich in biodiversity and comprise a diversity of habitats including wetlands such as lagoons, water holes, tanks, mangrove, villu and mudflats, and natural rock pools. The main feature is the 200 ha Kumana mangrove swamp and villu surrounded by plains and a dry zone tropical thorn forest. Large saline lagoons are also present along the coast. The park is reputed for its avifauna which congregates in the mangrove and villu areas to nest, while an array of migratory waterfowl and waders also visit the wetlands.

## Physical features:

The Kumbukkan Oya flows along the southern boundary to form the Kumana estuary and villu (200 ha) before flowing to the sea. The confluence of the Alakola Ara and other streams flow to the Kumbukkan oya and smaller streams such as the Girikula and Bagura Ara flow to lagoons. The chain of shallow, brackish to saline coastal lagoons includes Bagura Kalapuwa (154 ha), Andarakala, Itikala and Yakkala lagoons (272 ha). The lagoons are less than 2 m deep, and are subject to extensive drying out during the dry season. Bagura Kalapuwa is seasonally tidal and the Kumana villu is occasionally inundated by seawater. The Yala East National Park lies within the low country dry zone where the mean temperature is 27.3°C and the average annual rainfall is around 1,300 mm.

## Ecological features:

The park comprises of semi-arid thorn scrub with fairly large areas of dense forest comprising species such as *Manilkara hexandra*, *Hemicyclea sepiaria*, *Bauhinia racemosa*, *Cassia fistula*, *Chloroxylon sweitenia* and *Salvadora persica*. A patch of mangrove is present around the Okanda lagoon. Pristine riverine forests can be found along the Kumbukkan oya.

## Noteworthy fauna:

The main fish species caught by the fishermen from the wetlands in Yala East include Tilapia (*Oreochromis* spp.), and Mullet (*Mugil* spp.), while *Channa* spp. are also caught occasionally. Common reptiles inhabiting the wetlands of Kumana include *Crocodylus palustris*, *Lissemys punctata*, and *Melanochelys trijuga*. The Kumana Villu in particular is a hot-spot for birds. Breeding populations of rare large water birds such as *Ephippiorhynchus asiaticus*, *Leptoptilus javanicus*, *Platalea leucorodia* and *Esacus recurvirostris* inhabit the villu. Several species of migratory waders (families Scolopacidae and Charadriidae) and waterfowl (Family Anatidae) visit the shallow lagoons and mudflats. The wetlands are also visited by mammals such as *Canis*



*aureus*, *Sus scrofa*, *Elephas maximus*, *Lutra lutra* and *Prionailurus viverrinus* to feed on aquatic plants and/or animals.

**Noteworthy flora:**

The trees in the Kumana villu are dominated by *Sonneratia caseolaris*, while the reeds are dominated by *Typha angustifolia*. Patches of *Achrosticum aureum* are also present in the villu. The riverine forest along the Kumbukkan oya is dominated by large trees of *Terminalia arjuna*. Aquatic species such as *Ludwigia* spp., *Nelumbo nucifera*, *Nymphaea pubescens*, *Aponogeton* spp. and *Neptunia oleracea* are common in ponds and tanks.

**Land use:**

Biodiversity conservation

**Possible changes in land use:**

Information not available

**Hydrological and biophysical values:**

The sand bars breach annually with the heavy rains in November and December releasing the excess water and thereby preventing flooding in the upland areas. This phenomenon also assists many fish and crustaceans to spawn.

**Social and cultural values:**

This area was part of an ancient civilization dating back to the 3<sup>rd</sup> century BC. At the base of most rock outcrops are caves, some with rock inscriptions of the first and second century BC.

**Scientific research and monitoring:**

The CBC conducts annual censuses of waterbirds.

**Conservation education:**

Information not available

**Recreation and tourism:**

The park is popular among nature lovers, especially for bird watching. Due to security reasons, the area was closed to visitors from 1985 – 2003. Two bungalows and a campsite are available for overnight stay.

**Conservation measures taken:**

The Kumana villu was initially declared a bird sanctuary in 1938 and is now included within the Yala East National Park. Block II of the Park was established in December 1969, followed by Block I in January 1970. The Park is contiguous with Ruhuna (Yala) National Park.

**Conservation measures proposed:**

IUCN has proposed to declare the Kumana wetlands as a Ramsar wetland site.



**Disturbances and threats:**

Poor land use practices in the upland areas of rivers and streams has led to siltation of the lagoons. Poaching, mainly for game meat, but also occasionally for leopard skins is known to be common. Illegal timber extraction also takes place within the park.

**Land tenure:**

State owned

**Management authority and jurisdiction:**

DWC

**References:**

DWC (2004); Fauna International (1993); Kotagama (1989)

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