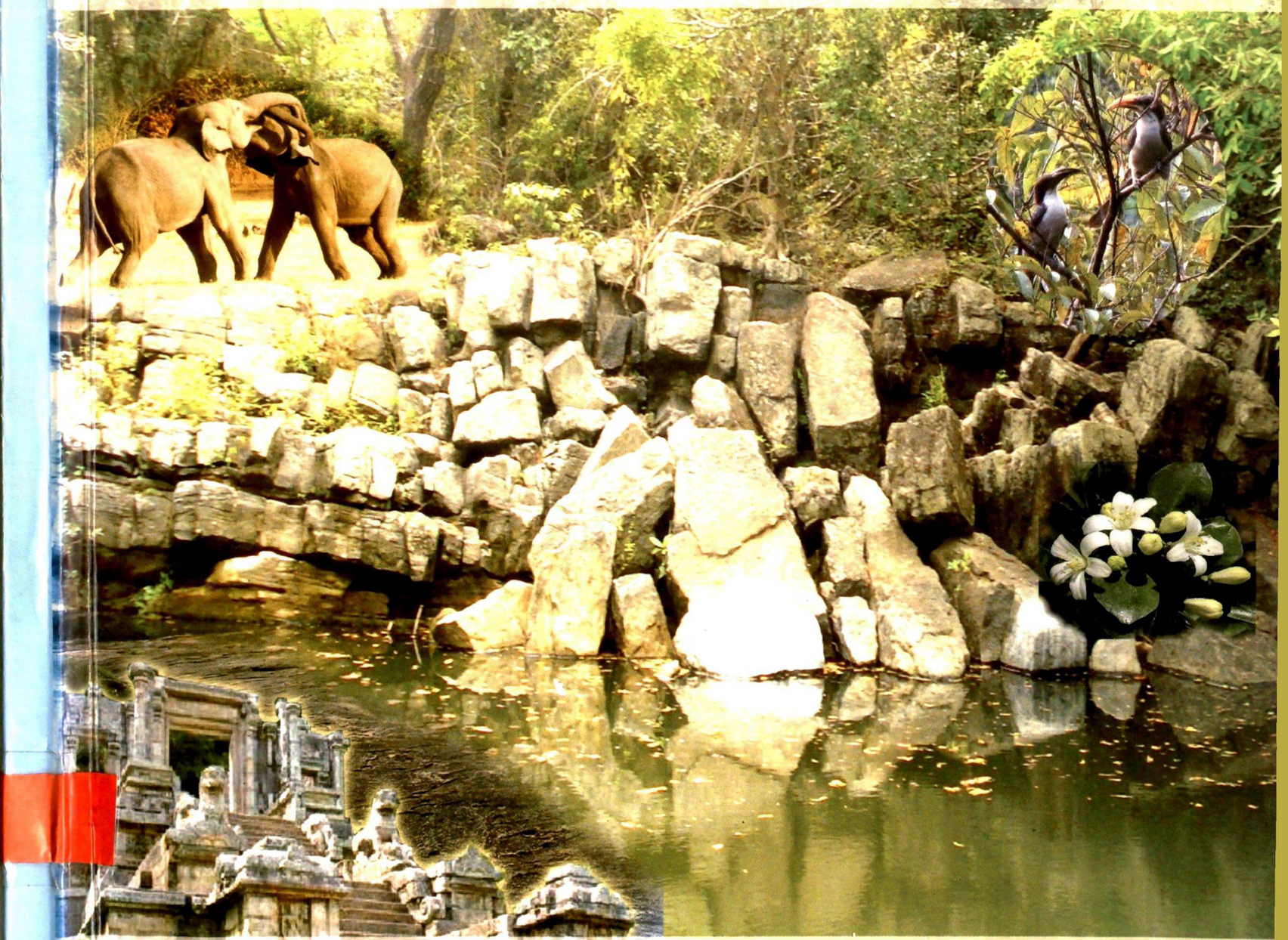


NORTH-WESTERN PROVINCE BIODIVERSITY PROFILE AND CONSERVATION ACTION PLAN



MINISTRY OF ENVIRONMENT AND NATURAL RESORUCES
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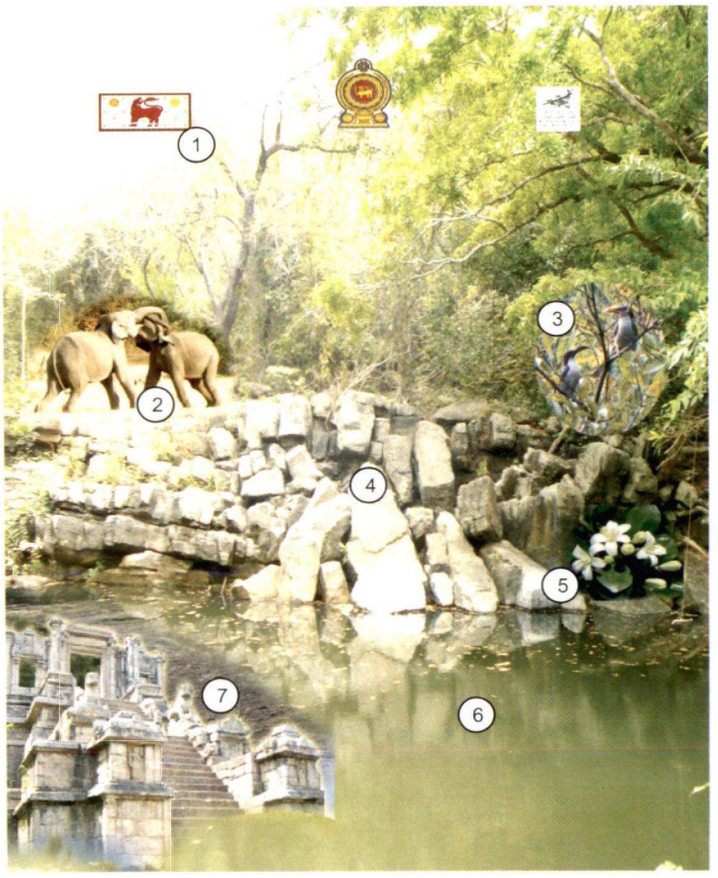

1- Provincil Flag
2- *Elephas maximus* – Elephant (*Aliya*)
3- *Ocyceros gingalensis* -Grey Hornbill (*Alu Kandaththa*)
4- Well joined & bedded felds pathic Sand stone, Tabboawa wewa (Jurassic beds)
5- *Murraya paniculata* - "Etteriya" *a*
6- Tabbowa spil cannal (Wan ela)
7- Ruins of Yapawwa

North-Western Province Biodiversity Profile
And
Conservation Action Plan

Sumedha Madawala Wickramasinghe

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A Publication of

Biodiversity Secretariat

Ministry of Environment and Natural Resoruces

December, 2008

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Message from the Hon. Minister

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Sri Lanka is a small island with rich biological diversity and high level of endemism. Biodiversity of the the country is unique and hence it has universal value. Nevertheless, it is currently under threat from ever increasing human interferences. Due to this extraordinary endemism and also high level of threat the country is considered as one of the global biodiversity hotspots.

Biodiversity Conservation is not a new phenomenon to Sri Lanka. From ancient times Sri Lankans have had close relations with flora and fauna and they were very much concerned about their conservation and protection for the benefit of future generation. As we all know the world's first recorded sanctuary, "Mihintale" is located in Sri Lanka.

Sri Lanka has adopted a positive approach in formulating new policies and strategies towards conserving its biological wealth. We have signed and ratified the Convention on Biological Diversity (CBD) and are already in the process of implementing relevant provisions. I am proud to say that Sri Lanka is one of the very first countries that prepared Biodiversity Conservation Strategy and Action Plan.

Nevertheless, we are facing severe problems in conserving our biological diversity. As outlined in the 2007 Red List of Threatened Fauna and Flora of Sri Lanka, the rate of biodiversity loss in Sri Lanka is increasing rapidly as can be seen in other countries in the world.

Therefore, we need to act now to reduce the biodiversity loss or hold the extinction of endangered species. I believe these Provincial Biodiversity Conservation Profiles and Action Plans are a key strategy to achieve this objective. Biodiversity issues are not concentrated to a particular locality of the country but are distributed in various provinces of the country in different scales.

I strongly believe that this document would be an excellent guide with immense value to all stakeholders who are working on conservation and sustainable use of biodiversity.

Patali Champika Ranawaka
Minister of Environment and Natural Resources

Message from the Secretary

Sri Lanka has signed and ratified the "Convention on Biological Diversity" and is obliged to implement the relevant provisions of the Convention. This Ministry has developed the "Strategy for the Conservation and Sustainable use of Biological Diversity" as early as in 1994 by way of implementing Article 6 of the Convention. This was followed by the development of the "Biodiversity Framework Action Plan" in 1998. In 1997, Sri Lanka finalized the preparation of complete Biodiversity Conservation Action Plan (BCAP) with the development of the "Addendum to the Biodiversity Conservation Framework Action Plan".

A consultative approach was followed in the preparation of the addendum. During the addendum preparatory process a series of workshops were held by the Ministry with relevant Provincial Administrations and all other relevant stakeholders of the province to discuss draft recommendations and they were revised when and where necessary. At these workshops it was highlighted that the addendum recommendations were focused on national level and adequate attention was not paid to provincial issues. As a solution to this issue, it was decided to develop Bioidversity Conservation Profiles and Action Plans (BDCPAP) at provincial level. The Component "C" of the Protected Area Management and Wildlife Conservation Project of the Ministry provided necessary financial assistance.

The Ministry considers that the preparation of BDCPAP at provincial level is a unique exercise as it is one of the first such activities done in the world. This Ministry has ensured that all stakeholders of the relevant province were involved in the preparatory process. Thus we can be happy that this unique exercise produced a document through the collective efforts of all stakeholders for the conservation of biodiversity at provincial level. I strongly believe that the final product is very comprehensive and meets the needs of the North Western Province.

M A R D Jayatilleke
Secretary
Ministry of Environment and Natural Resources

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I would like to take this opportunity to show my gratitude to many personnel who have extended their kind and constructive assistance in many ways to make this exercise a reality. First of all I would like to extend a special thank to Mr. Gamini Gamage, Director, Biodiversity Secretariat, Ministry of Environment and Natural Resources who is also the Overall Coordinator of this project, for providing information and literature and also encouragement. I would also like to extend my thanks to Mr. Saman Senanayake, Director, Provincial Environment Authority (NWP) for arranging three workshops under his patronage to meet the officials from different governmental and non-governmental institutes to acquire necessary information in order to facilitate the preparation of this North-Western Province Biodiversity Profile And Conservation Action Plan profile and the action plan.

Next, I would like to acknowledge the role played by Mr. Sujith Ratnayake, Environmental Management Officer and Mrs. Kalyani Prematilleke, Programme Assistant at the Biodiversity Secretariat, Ministry of Environment and Natural Resources for their continuous assistance through out this whole exercise in numerous ways to reach a successful end of this difficult task. I also would like to take this opportunity to thank Mrs. Dhammika Maillawa at the Provincial Environment Authority (NWP) for arranging three successful workshops in Kurunegala. I would also like to show my gratitude to officers from numerous governmental and non-governmental institutes from Kurunegala and Puttalam districts who attended three workshops held in Kurunegala and for sharing their knowledge and experience with me. They have provided very valuable information and literature and without their kind assistance this exercise would have been much tedious. I would also like to express my gratitude to them and would like to apologise for my inability to acknowledge them individually. I also would like to extend a special thank to Profs. C.V.S. Gunetilleke and I.A.U.N. Gunetilleke, Department of Botany, Faculty of Science, University of Peradeniya for their continuous support throughout this exercise and for providing me with literature and data to include in this report.

Finally, I would like to thank my father, Mr. H.M.S. Madawala for providing his wealth of knowledge about the NWP and also assisting me in numerous ways during this period to make this task a reality.

CONTENTS

Message from the Hon. Minister		iii
Message from the Secretary		iv
Ackowledgements		v
Contents		vi
List of Diagrams		viii
List of Tables		x
Acronyms		xiii
CHAPTER 1	Introduction	1
CHAPTER 2	Bio-geographical – Physical and Edaphic Aspects	2
	Administrative structure	3
	Economical back ground	5
	Climate	7
	Land Resources	8
	Mineral Resources	15
	Industries	15
CHAPTER 3	Bio-geographical areas	17
	Bioregions	17
	Agroecological regions	17
	Floristic Zones	22
	Avifaunal Zones	24
	Ichthyofaunal Zones	24
	Bio Mammalian Zones	25
CHAPTER 4	Ecosystem Profile	26
	Major Ecosystems	26
	Forests	28
	Inland water bodies and stream network	30
	Ground water resources	40
	Coastal and Marine	43
	Unique and internationally important ecosystems	48
CHAPTER 5	Species Profile	49
	Sea grass Ecosystems	50
	Faunal Diversity	50
	Donkey(Ass) Population	54
CHAPTER 6	Insitu Conservation Protected Areas	55
	Archaeological Reserves	59
	European Colonial Monuments	63

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CHAPTER 7	Exsitu Conservation	64
	Exsitu Faunal Facilities	64
	Insitu Floral Facilities	64
CHAPTER 8	Cultural and other releated biodiveristy	67
	Bio-archeological sites	67
	Bio-cultural Aspects	78
	Traditional Knowledge Profile	79
CHAPTER 9	Impact on Biodiversity	87
	Human population	87
	Unemployment	90
	Migrant population	90
	Man made ecosystems	91
	Fragmentation of Coconut lands	92
	Illegal Shrimp Farming	94
	Human Elephant Conflict (HEC)	98
	Invasive Species	101
	Mite Disease in Coconut	101
	Sand Mining	102
CHAPTER 10	Biodiversity related institutional aspects	103
CHAPTER 11	Action Plan	104
References		110
Appendices		112

List of Diagrams

Figure 2.1 : District boundaries of the NW Province 2

Figure 2.2 : Provincial boundaries of Sri Lanka 5

Figure 2.3 : Gross Domestic Product of the NWP 6

Figure 2.4 : Major climatic zones of Sri Lanka 7

Figure 2.5 : Average rainfall (mm) and maximum temperature (^{0}C) (for a period of 20 yrs.) in Kurunegala (1976-1996) & Puttlam (1973-1993) districts 8

Figure 2.6 : Land area and area under inland water resources of the NW Province of Sri Lanka 9

Figure 2.7 : Geology of Sri Lanka 11

Figure 2.8a : Generalized soil map of Sri Lanka 12

Figure 2.8b : Major Soil types in Sri Lanka 13

Figure 3.1 : Agro-ecological map of Sri Lanka 1979 20

Figure 3.2 : Agro-ecological Regions of Sri Lanka ,2002 21

Figure 3.3 : Floristic regions of Sri Lanka 23

Figure 3.4 : Important Bird Areas 25

Figure 4.1 : Major Natural Vegetation types in Sri Lanka 27

Figure 4.2 : A map showing the distribution of the forest cover in Sri Lanka in the year 1999 28

Figure 4.3 : Forest area decline (as a %) by districts over the period 1983-1992 29

Figure 4.4 : Stream network of Sri Lanka 31

Figure 4.5 : Major river basins in Sri Lanka 33

Figure 4.6 : Selected River basins in five stratigraphic unites 35

Figure 4.7 : Distribution of reservoirs/tanks(perennial and seasonal) of Sri Lanka 36

Figure 4.8 : Inland water resources of the North Western Province of Sri Lanka 37

Figure 4.9 : Different types of Aquifers in Sri Lanka 41

Figure 4.10 :Distribution of tube well sites 42

Figure 6.1 : In the Wilpattu National Park, the extent of Land area (%) represented by four districts 59

Figure 8.1 : Flag of the NW Province 82

Figure 9.1 : Estimated mid year population in Kurunegala and Puttlam districts during the year 2002 to 2004 88

Figure 9.2 : Population density changes (number per sq.km) in two districts Kurunegala and Puttlam 1871-2001 89

Figure 9.3 : Change in agricultural land extent (ha) between 1973-1982 period 92

Figure 9.4 : Change of coconut land extent in Kurunegala and Puttlam districts during the period of 1982-2005 94
Figure 9.5 : Aquaculture resources of Sri Lanka 96
Figure 9.6 : (a) Regional distribution of elephant deaths and (b) Causes of elephant deaths in the NWP during the period of 1990-2003 in Sri Lanka 99
Figure 9.7 : Severtity of HEC in Sri Lanka 100
Figure 9.8 : Distribution of (a) human deaths and (b) elephant deaths in Sir Lanka in 2004 100
Figure 9.9 : Percentage loss of the harvested nuts due mite damage 101
Figure 9.10: Fresh husk weight per nut 102

List of Tables

Table 2.1 : Land statistics of the NW Province, Sri Lanka

Table 2.2 : Number of Divisional Secretariats and Grama Niladhari Divisions in Kurunegala and Puttlam districts

Table 2.3 : District wise GDP and Development Indices in the NW Province of Sri Lanka

Table 2.4 : Extent of land and inland surface water(sq.km) in the NW Province

Table 2.5 : Land use information for Kurunegala and Puttlam districts

Table 2.6 : Major soil groups in Climate zones come under the NWP

Table 2.7 : Number of industries situated in the Kurunegala and Puttlam districts and persons engaged in those industries

Table 3.1 : Bioregions of the NW Province in Sri Lanka

Table 3.2 : Distinguished characteristics of Agro-ecological regions represent in NW Province in Sri Lanka

Table 3.3 : Agro-ecological zones and their extent of land – Kurunegala district

Table 3.4 : Extent of land under Dry and Intermediate zones – Puttlam district

Table 3.5 : Extent of land area under different climate zones in Kurunegala and Puttlam districts

Table 3.6 : Floristic regions that located in NWP and their characteristic vegetation types and dominant plant communities

Table 3.7 : Preliminary IBA's in the NW Province of Sri Lanka

Table 4.1 : Natural forest types in the Kurunegala and Puttlam districts in Sri Lanka

Table 4.2 : Major rivers and their drainage areas (km^2)in the NW Province of Sri Lanka

Table 4.3 : Issue of permits for sand mining in 1998 for some DS divisions in the NW Province

Table 4.4 : Major and minor irrigation schemes in the Kurunegala District recorded by the Irrigation Department of Sri Lanka and their respective command areas (in ha)

Table 4.5 : Major and minor Irrigation schemes in the Puttlam District

Table 4.6 : The amount of groundwater and its percentages of supply over total supply in urban, rural and industrial zones

Table 4.7 : The extent of coastal habitats in the Puttlam district

Table 4.8 : Coral Reef Locations in NW coast, their status and causes of damage or threats

Table 4.9. : Locations and extent of Mangrove vegetation (ha) around Puttlam lagoon in 1981 & 1982

Table 4.10 : Location and extent of Mangrove vegetation (ha) around Dutch Bay area in 1981 & 1982

Table 4.11 : The aerial extent of mangrove coverage in 6 districts of Sri Lanka as in the Land Use Map of the Survey Department

Table 4.12 : Type of vegetation and land use pattern of sites prior to the construction Shrimp frams in some of the DS divisions in the Puttlam district

Table 4.13 : Locations and extent of Salt Marshes around Puttlam lagoon and Dutch Bay area in the NW coastline in 1981 & 1992

Table 5.1 : List of True Mangrove and Mangrove associated species in Puttlam Lagoon and Dutch Bay

Table 5.2 : Sea grass Ecosystems

Table 5.3 : Fin fish and shellfish species reported to occur in Puttlam lagoon

Table 5.4 : A list of migratory shorebirds and other birds in the Mundel Lake

Table 6.1 : Extent and designations of forest types in the Kurunegala and Puttlam districts managed by the Forest Department and Department of Wildlife Conservation, Sri Lanka

Table 6.2 : The summary of the protected areas administrated by the Forest Department and Department of Wildlife Conservation, Sri Lanka

Table 6.3 : Archaeological Reserves in the NWP of Sri Lanka

Table 7.1: The extent of Forest Plantations (in ha) established by the Forest Department upto 1995

Table 7.2 : Extent of land (Acres) under Cashew, Banana and Mango by DS divisions in the Puttlam

Table 8.1 : Archeologically important sites identified by the Department of Archeology in the NW Province of Sri Lanka

Table 8.2 : Archaeological Protected Monuments in the NWP of Sri Lanka

Table 8.3 : Examples of Sinhala words with Portuguese Etyma

Table 8.4 : Traditional classification of ecosystem types

Table 8.5 : Soil Type Indicator Plants

Table 8.6 : Ground Water Indicator Plants

Table 8.7 : Botanical Indicators of Soil Alkalinity

Table 8.8 : Alkalinity Absorbing Plant Varieties

Table 9.1 : Population distribution by ethnic groups 1981, 2001

Table 9.2 : Population, Annual Growth rate during 1981-2001 and Population Density in the Kurunegala and Puttlam districts

Table 9.3 : Land:man and forest land:man ratio of the Kurunegala and Puttalam districts
Table 9.4 : Population by different regions
Table 9.5 : Poverty headcount ratio of Kurunegala and Puttalam districts
Table 9.6: Percentage of migrant population by district of previous residence and sex for Kurunegala and Puttalam districts separately.
Table 9.7: Extent (ha) of various land uses by districts in Sri Lanka.
Table 9.8: Extent of Agricultural Lands in hectares.
Table 9.9 : Potential yield and Extent of coconut land under each suitability class.
Table 9.10 :Distribution of existing shrimp farms and areas by land use categories
Table 9.11: Comparison of critical water quality in main water resources for shrimp culture in Sri Lanka.
Table 9.12: Survey on shrimp farms and hatcheries in the Puttalam district, NWP of Sri Lanka.
Table 9.13 : Legislation available for environmental management of aquaculture and their scopes
Table 11.1 : Action Plan for biodiversity conservation and its sustainable use in the NW Province

ACRONYMS

AIS	Alien Invasive Species
ARDB	Asian Red Data Book
ADB	Asian Development Bank
BCAF	Biodiversity Conservation Action Framework
BD	Biodiversity
BCAP	Biodiversity Conservation and Action Plan
CRI	Coconut Research Institute
CCD	Coast Conservation Department
CCB	Coconut Cultivation Board
CDA	Coconut Development Authority
DMEF	Dry Mixed Evergreen Forests
DDTS	Dry Deciduous Thorn Scrub
DWC	Department of Wildlife Conservation
DREF	Dry Riverine Evergreen Forests
DS	Divisional Secretariat
EEP	Environmental Evaluation Process
EIA	Environmental Impact Assessment
FSMP	Forestry Sector Master Plan
FOGSL	Field Ornithology Group of Sri Lanka
FD	Forest Department
FR	Forest Reserve
GDP	Gross Domestic Product
GDI	Gender Development Index
GIS	Geographical Information System
GEI	Gender Empowerment Index
GSMB	Geological Survey and Mines Bureau
GN	Grama Niladhari
GMF	Genetically Modified Food
HEC	Human Elephant Conflict
HPI	Human Poverty Index
HDI	Human Development Index
IWMI	International Water Management Institute
IBA	Important Bird Area
IUCN	World Conservation Union
IBL	Immature Brown Loams
LHG	Low Humic Gley soils
MMEF	Moist Mixed Evergreen Forests
MANF	Mangrove Forests
MAB	Man and Biosphere Reserve
MENR	Ministry of Environment and Natural Resources

MOFE	Ministry of Forest and Environment
NWP	North Western Province
NSF	National Science Foundation
NCR	National Conservation Review
NARA	National Aquatic Resources Agency
NCP	North Central Province
NWP	North Western Province
PEA	Provincial Environment Authority
PRBs	Priority River Basins
PFR	Proposed Forest Reserve
PAs	Protected Areas
RBE	Reddish Brown Earth
RBL	Reddish Brown Latosolic soils
RYP	Red Yellow Podzolic soils
SAND	Sand Dunes
SPOF	Sparse and Open Forests
SAVG	Savanna Grasslands
S	Sanctuary
SD	Survey Department
UNEP	United Nations Environment Programme
VILG	Villu Grasslands

CHAPTER 1

INTRODUCTION

The basic concept of biodiversity (BD) and its conservation has a long history of recognition which goes back to more than 200 years. Early monarchs recognized the value of biodiversity and its importance hence established so called 'protective areas' prohibiting people from poaching and felling trees. However, with the ever increasing population and associated pressures such as infrastructure development and intensive agriculture, biodiversity is constantly under threat. This problem is not confined to one region or to a country but considered as a global issue. As an initiative step towards conserving the biological diversity and its sustainable use for present and future generations, Convention of Biodiversity was signed by 150 heads of states at the United Nations Conference on Environment and Development (Earth Summit) held on the 5th June 1992. Sri Lanka ratified the Convention in March 1994. Since then, the Sri Lankan government has undertaken numerous legislative enactments to deal with conservation and sustainable use of biodiversity. With ever increasing developmental projects and new threats to natural resources, the existing information on biodiversity and legislative measures have become insufficient and inadequate over the years.

Biodiversity Conservation Action Plan (BCAP) and Addendum has been formulated for the whole country without acknowledging different regions/provinces. This generalized information have cause many set backs when initiating provincial development projects where the existing problems and biodiversity related issues are differ from other parts of the country. This problem has become more severe due to the fact that government has undertaken many steps to decentralize the state administration to provincial and district levels. Many large-scale developmental plans did not progressed to peoples' expectations due to the lack of information related to biodiversity at provincial level.

In order to deal with this specific problem, the Ministry of Environment and Natural Resources (MENR), Sri Lanka together with the Protected Area and Wild Life Conservation Project has launched a new and timely initiative in 2006 to prepare a biodiversity profile and an action plan at the provincial level. The present exercise will give some background information on the resources available and precise problems faced by the people from different provinces. This information available at the provincial level would be much important when introducing new legislations. Based on the information and ideas gathered during the exercise, priority areas have been identified and a tentative action plan has also been prepared. Therefore, in the future, this can be used as a guide by the provincial biodiversity planners and stakeholders when planning and managing provincial biodiversity resource in a sustainable manner. This information and action plan also would be helpful when carrying out new provincial developmental projects and programmes also when enforcing new regulations to curb any threats to the biodiversity.

CHAPTER 2

BIO-GEOGRAPHICAL – PHYSICAL AND EDAPHIC ASPECTS

North Western Province (also known as 'Wayamba') of Sri Lanka considered as the second largest province in the island and includes 2 districts, Kurunegala and Puttalam. The 'Kala Oya' considered as the northern boundary of the province while 'Maha Oya' as the southern boundary. The province predominate by flat terrain with slopes (west to east – 2%) while the east of the coastal region covers by gently undulating peneplain with slopes. Highly to moderately rolling hills can also be found in the south and south-east parts of the province. The North Western Province (NWP) encompasses all three major climatic zones; intermediate, dry and wet zones. These different climatic zones together with the coast have made this province very diverse in nature.

The North Western Province consists of 3 main cities namely Kurunegala, Puttalam and Chilaw. Kurunegala and Puttalam districts are located in parallel to the western coast of the island (Fig. 2.1). The Kurunegala, which is the main city of the province, borders Puttalam district in the west, Kandy and Matale districts from the east and Kegalle and Gampaha districts in the south. Puttalam district is encompasses the western part of the NW province with a 228 km of coastal belt. The Puttalam district borders the Kala Oya and Modara Gam Aru in the north, Anuradhapura and Kurunegala districts in the east, Maha Oya in the south and the Indian Ocean in the west. Kurunegala is considered as the main city of the North Western province and covers a land area of 4816 km^2 while Puttalam district covers about 3072 km^2 which is 7.4% and 4.7% from the total land area of the country, respectively (Table 2.1). The North Western Province covers approximately 13% from the total land mass of the island. The province has an area of 7,888 km^2 and a population of 2,184,136 (as at 2005).

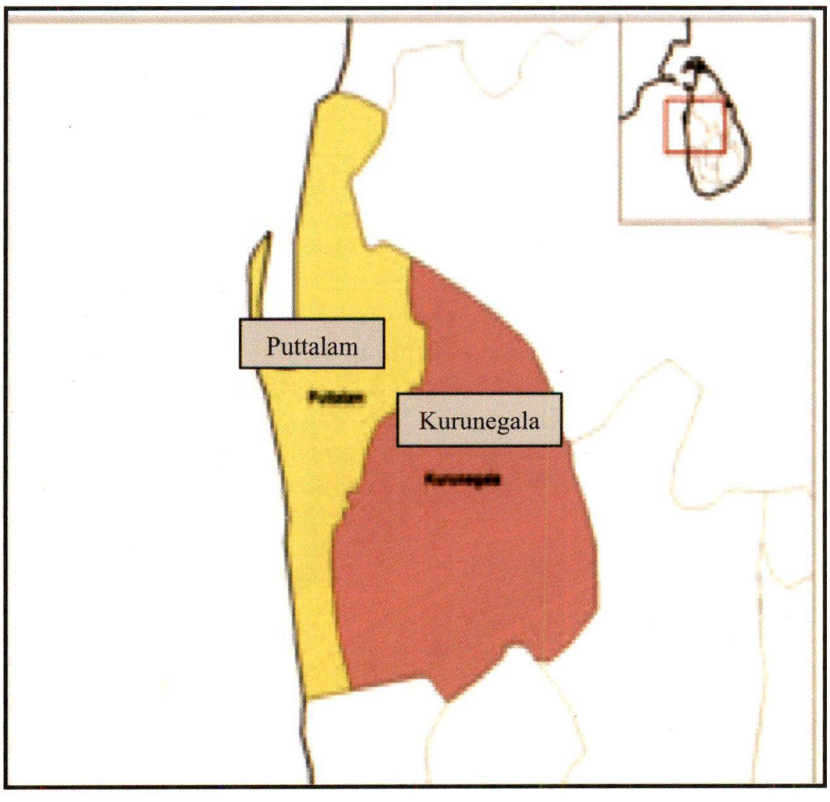


Fig. 2.1 – District boundaries of the North Western Province
Source: http://en.wikipedia.org/wiki/North_Western_Province,_Sri_Lanka

Table 2.1 - Land statistics of the North Western Province, Sri Lanka.

	Kurunegala	Puttalam	Total
Total Land Area (sq.km)	4816	3072	7888
Proportion % (Province)	67%	33%	100%

Administrative structure

The NWP has 46 divisional secretariat (DS) divisions, 2158 grama niladhari (GN) divisions and about 5705 villages. Out of which 30 DG divisions, 1610 GN divisions and 4310 villages are belong to the Kurunegala district. Puttalam district has 16 DS divisions, 548 GN divisions and 1395 villages (Table 2.2). Kurunegala district has 1 Municipal Council, 1 Urban Council, 18 Pradeshiya Sabhas, while Puttalam district has no Minicipal Councils, 2 Urban Councils and 10 Pradeshiya Sabhas.

Table 2.2 – Number of Divisional secretariat and Grama Niladhari divisions in Kurunegala and Puttalam districts

. District	*DS division*	*No. of GN Divisions*
Kurunegala	Giribawa	35
	Galgamuwa	62
	Ehetuwewa	35
	Ambanpola	28
	Kotavehera	31
	Rasnayakapura	28
	Nikaweratiya	42
	Mahawa	68
	Polpithigama	82
	Ibbagamuwa	74
	Ganewatta	42
	Wariyapola	60
	Kobeigane	35
	Bingiriya	52
	Panduwasnuwara	78
	Katupotha	36
	Bamunakotuwa	21
	Maspotha	23
	Kurunegala	64
	Mallawapitiya	45
	Mawathagama	71
	Rideegama	113
	Weerambugedara	38
	Kuliyapitiya East	45
	Kuliyapitiya West	68
	Udubaddawa	43
	Pannala	87
	Narammala	54
	Alawwa	66
	Polgahawela	84
Total		**1610**

District	*DS division*	*No. of GN division*
Puttalam	Kalpitiya	31
	Vanathavilluwa	17
	Karuwalagaswewa	26
	Nawagattegama	19
	Puttalam	22
	Mundalama	31
	Mahakumbukkadawala	25
	Anamaduwa	35
	Pallama	18
	Arachchikattuwa	33
	Chilaw	49
	Madampe	49
	Mahawewa	47
	Nattandiya	47
	Wennappuwa	52
	Dankotuwa	47
Total		**548**

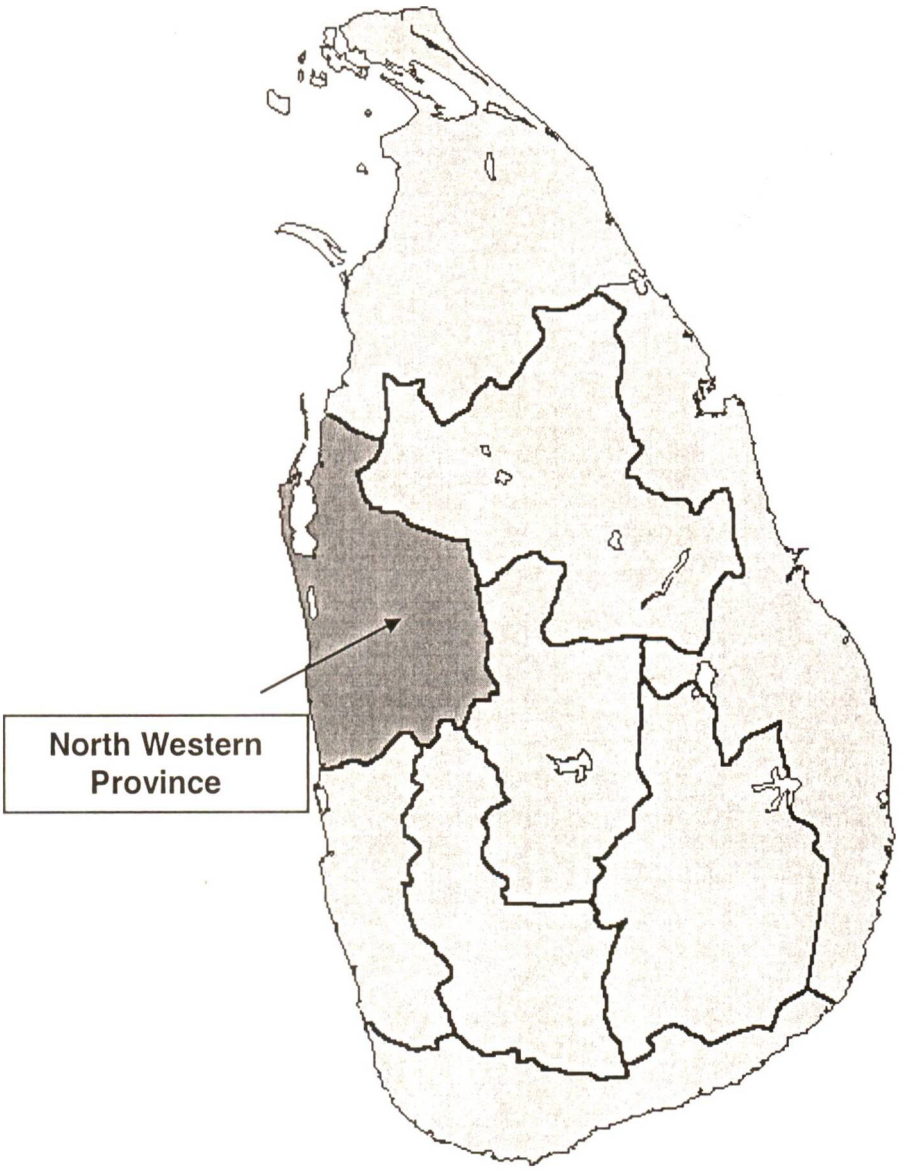


Fig. 2.2 – Provincial boundaries of Sri Lanka.
Source: http://en.wikipedia.org/wiki/North_Western_Province,_Sri_Lanka

Economical Background

North Western province (Fig. 2.2) has a highly developed agriculture-centered economy, growing a variety of fruits and vegetables, flowering plants, spices, oil-seeds in addition to the traditional plantation crops such as coconut, rubber and rice. NW province is the third largest paddy producing area in Sri Lanka. However, lack of irrigation facilities and high dependence on rainfall for agriculture are some of the constraints face by the farmers in the province. The western coast of the NWP is endowed with rich fisheries and other aquatic resources. The major varieties found in abundance are tuna, prawns, lobsters and cuttlefish. The country's export-oriented commercial prawn farming industry is concentrated in the coastal areas of the Puttalam district.The highest fraction of GDP in the province comes from the coconut industry while the second highest has reported from the fisheries industry (Fig. 2.3).

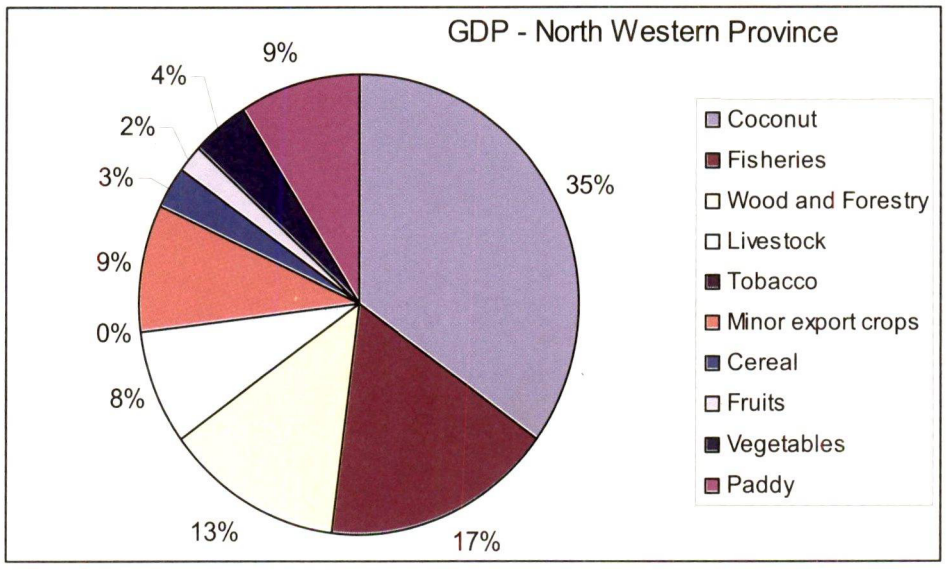


Fig. 2.3 – Gross Domestic Product of the NWP

Most of the development indices are comparatively high in the Kurunegala district than in the Puttalam, with Kuruengala district scoring higher values than the national averages in regards to some economic indices such as Human Development Index, HDI, Gender Development Index, GDI and Gender Empowerment Index, GEI. Gender Development Index (GDI) and Empowerment Index (GEI) are two indices which reflect women's socio-economic status (Table 2.3). GEI score is significantly very low in the Puttalam district compared with the score obtained by the Kurunegala district. Although Kurunegala district performs well in HDI and basic living standards, it has high HPI (Human Poverty Index) level and has also experienced slow economic growth over the years (Murray and Little, 2001). Puttalam performs badly in both HDI and HPI and also scores poorly in both GDI and GEI indices. Neighboring North Central province has recorded the greatest economic growth rate in the recent years since the initiation of the Mahaweli Development programme which has converted large extent of land into cultivable land.

Table 2.3 - District wise GDP and Development Indices in the North Western Province of Sri Lanka

Source: National Human Development Report, 1998.

District	GDP (Rs) Per Capita 1994	HDI	HPI	GDI	GEI
Kurunegala	8905	0.88	22.2	0.48	0.26
Puttalam	7314	0.73	19.1	0.36	0.03
Sri Lanka	**8411**	**0.75**	**23.4**	**0.465**	**0.21**

HDI (Human Development Index) variables: Life expectancy, adult literacy, primary to tertiary education enrolment, real GDP per capita.

HPI (Human Poverty Index) variables: Mortality before age 40, primary to tertiary education enrolment, access to safe drinking water, safe sanitation, child birth outside formal medical institutions, Immunization of population and pregnant women against infectious diseases, access to electricity.

GDI (Gender Development Index): Calculated as for HDI but differentiated by gender. GEI (Gender Empowerment Index) variables: Parliamentary, managerial, professional representation and proportion of national income earned by females.

Climate

All three major climatic zones (wet, dry and intermediate zones) are represented in the NWP (Fig. 2.4). Kurunegala district covers all three main climatic zones while the Puttalam district falls within the dry and intermediate zones only. Relatively a small area in the southern and south eastern parts of the Kurunegala district falls within the wet zone of the country while the majority of land mass comes under the Intermediate and Dry zones.

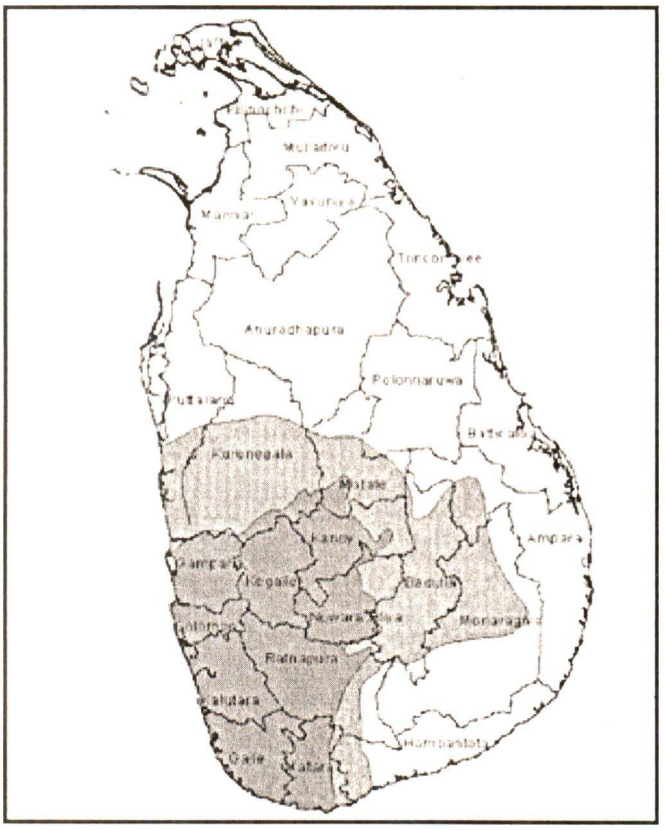


Fig. 2.4 - Major climatic zones of Sri Lanka.
Source: National Atlas of Sri Lanka.

The climate of the NWP has a marked dry season, with temperatures averaging between 25°C in January to 28°C in March. The south of the province is wetter, with almost 2000 mm of rainfall per year, but the north of the province is one of the driest regions in Sri Lanka, averaging less than 1000 mm of annual rainfall. The southern part of the province which comes partly under the wet zone, receives a well-distributed rainfall from both south-west and north-east monsoons while northern drier parts receive rainfall only from the north-east monsoons which brings comparatively lower rainfall to the country (Fig. 2.5).

The Kurunegala has an average temperature of 27.5°C and during October to February it is 25°C. Kurunegala district receives the highest rainfall during the months of October to November and again in April to May. Two dry spells prevail during the periods of mid-January to mid-March and a

much longer spell in June to September. In the Puttalam district, Wennappuwa, Dankotuwa, Madampe, Mahawewa and Chilaw come under the Intermediate climatic zone while Karuwalagaswewa, Wanathaviilu, Nawagattegama, Anamaduwa, Pallama, Maha Kumbukkadawala, Puttalam and Mundel, Aarachchikattuwa, Kalpitiya come under the Dry Zone. The Puttalam district experiences the minimum temperature in the range of 20.2°C – 26.5°C while the maximum temperature in the range of 30.0°C – 34.8°C. Puttalam district receives much of its rainfall from the south-western monsoons (during the months of September to January) while the southern part of the district also receives rainfall from the north-eastern monsoons (March – June). The mean annual rainfall in the northern part of the Puttalam district is 760 – 1600 mm and the southern part receives some what higher rainfall of 1522 – 1964 mm.

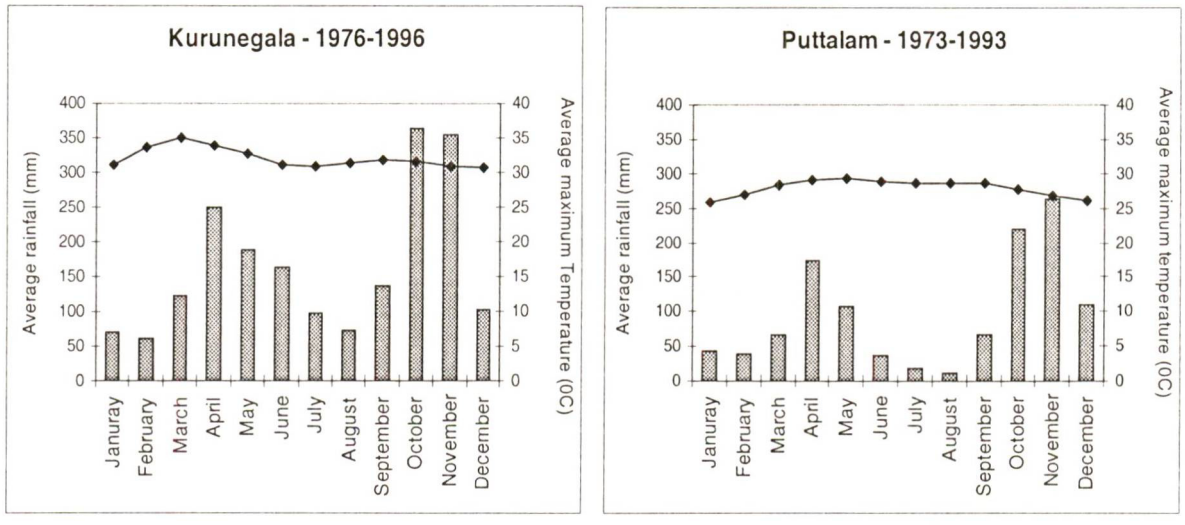


Fig 2.5 – Average rainfall (mm) and maximum temperature (°C) (for a period of 20 years) in Kurunegala (1976-1996) and Puttalam (1973-1993) districts.
Source: Meteorological Department, Sri Lanka.

Land Resources

The detailed information on the land area and the area comes under inland water resources in the NW province are given in the following table (Table 2.4 and Fig. 2.6).

Table 2.4 – Extent of land and inland surface waters (sq. km) in the North Western Province.
Source: Survey Department (as at 1988).

	Kurunegala	Puttalam	
Land area	4,624.00	2,882.00	7,506.00
Inland waters	192.00	190.00	382.00
Total area	4,816.00	3,072.00	7,888.00
Coastal belt (km)	-	241.34	241.34
Land:water Ratio	24.08	15.17	19.65
Inland waters (%)	4.0	6.2	4.8

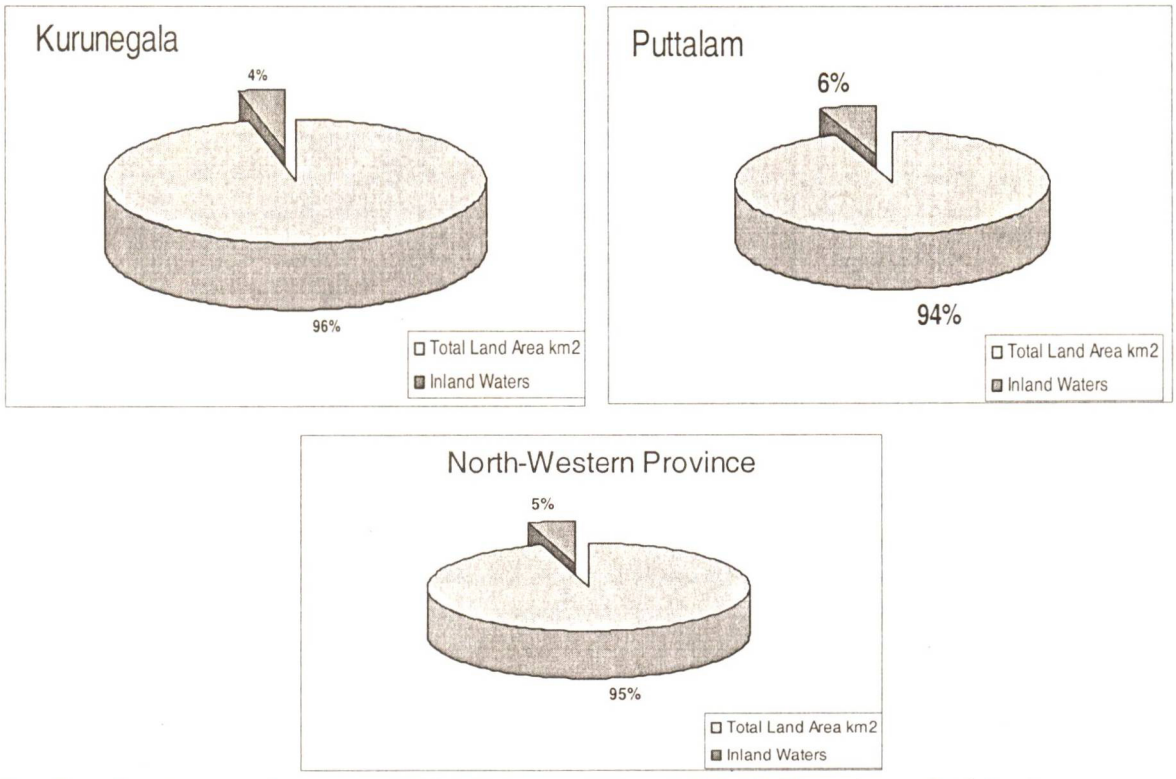


Fig. 2.6 – Land area and area under inland water resources of the NW province of Sri Lanka.

The population increase has significantly changed the land use patterns in the NWP over the years. The land use patterns of the two districts *viz.* Kurunegala and Puttalam have given in the following table (Table 2.5).

Table 2.5 – Land use information for Kurunegala and Puttalam districts.

Land Use Type	Area (ha)		
	Kurunegala	Puttalam	Sri Lanka
Paddy[@]	77,690	18,712	708,738
Tea*	29	-	210,622
Rubber*	2,753	-	114,678
Coconut*	133,570	46,091	394,836
Forests #	24,746	99,634	2,046,611
Home gardens¤	72,892	64,747	818,394
Range Lands	7,400	23,670	593,520
Built up area	440	1,880	29,190
Water bodies	19,160	18,950	290,520
Wetlands	-	6,298	61,810
Barren Lands	2,110	10,660	77,480

* Census of Agriculture and Livestock, 2002
¤ http://www.fao.org/docrep/ , 1992
Legg and Jewell, 1995
[@] Department of Census and Statistics – 2005/2006
All other data (undated) has taken from the Land Use Planning Office in the respective districts.

Geology

More than 90 percent of Sri Lanka's surface lies on Precambrian strata, some of it dating back to 2 billion years. The metamorphic rock surface was created by the transformation of ancient sediments under intense heat and pressure during mountain-building processes. The theory of plate tectonics suggests that these rocks and related rocks forming most of south India were part of a single southern landmass called Gondwanaland. Beginning about 200 million years ago, forces within the earth's mantle began to separate the lands of the Southern Hemisphere, and a crustal plate supporting both India and Sri Lanka moved toward the northeast. About 45 million years ago, the Indian plate collided with the Asian landmass, raising the Himalayas in northern India, and continuing to advance slowly to the present time. Sri Lanka experiences few earthquakes or major volcanic events because it rides on the center of the plate.

Cooray (1984) has sub-divided the Precambrian deposits of Sri Lanka into major units viz.

(i) Highland series of meta sediments; metamorphosed for the most part under granulite facies conditions,

(ii) The Southwestern Group, and

(iii) The Vijayan Complex.

Of the Precambrian deposits, the Highland series and the Southwestern group fall within the wet and intermediate climatic zones and the Vijayan complex almost entirely into the dry zone (Fog. 2.7). The ways in which Precambrian deposits have reacted to the climatic conditions in the different zones are thought to be reflected in the soil pattern and groundwater conditions. Cooray (1984) has pointed out that over the island as a whole, and therefore in the Precambrian generally, climatic factors have the most influence on the ecology, and that lithological factors are subordinate.

The island contains relatively limited strata of sedimentation surrounding its ancient hills. Aside from recent deposits along river valleys, only two small fragments of Jurassic (140 to 190 million years ago) deposits occur in the Puttalam District, while a more extensive belt of Miocene (5 to 20 million years ago) limestone is found along the northwest coast, overlain in many areas by Pleistocene (1 million years ago) deposits.

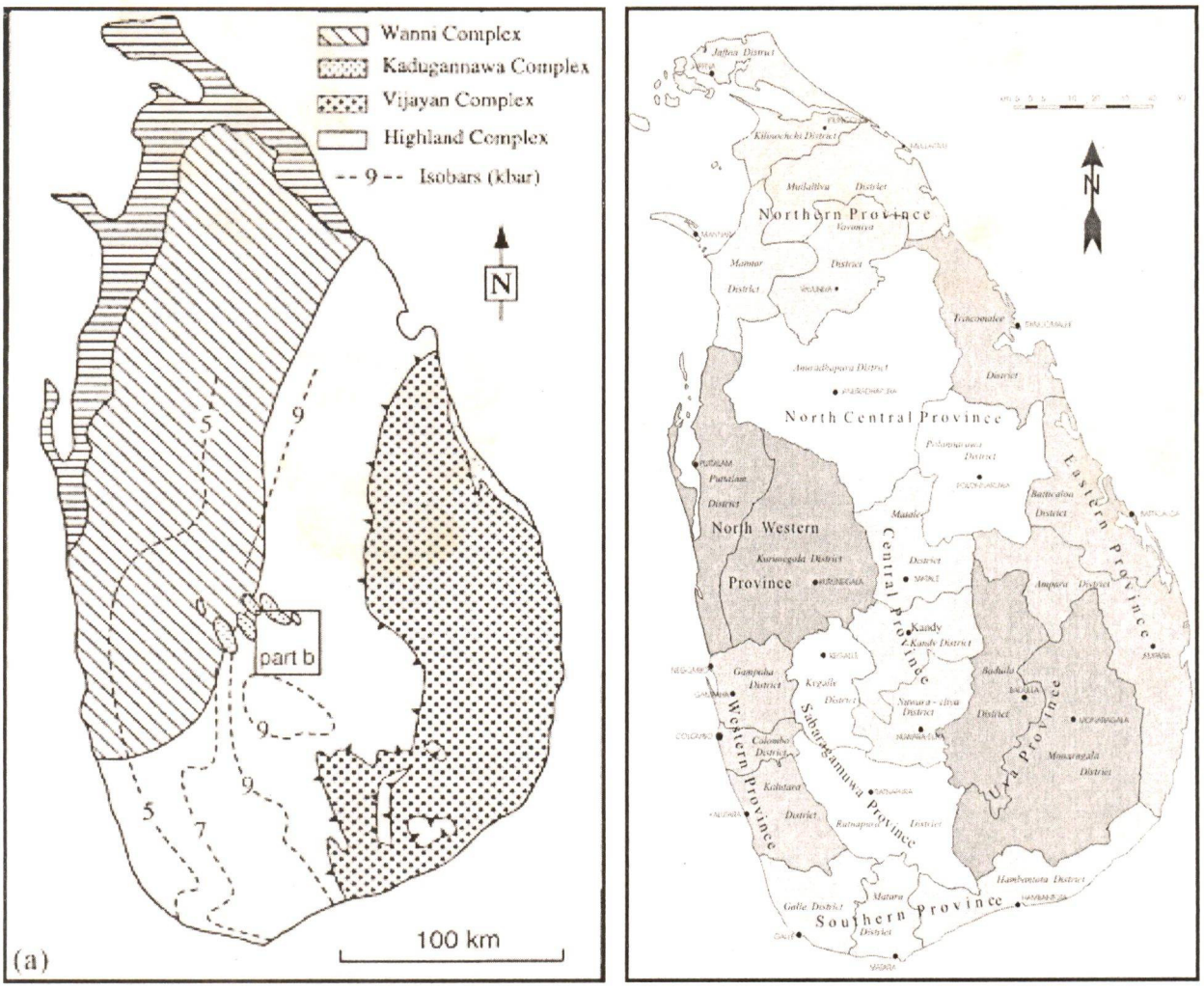


Fig. 2.7 – Geology of Sri Lanka.
Source: http://www.oxfordjournals.org/.../graphics/egc056f1.gif

Soil

The NW province consists of major soil groups such as Immature Brown Loams (IBL), Reddish Brown Earth (RBE), Low Humic Gley soils (LHG), Reddish Brown Latosolic soils (RBL), Alluvial soils, Red Yellow Podzolic soils (RYP), Non- Calcic Brown soils etc (Table 2.6 and Fig. 2.8a and b). Out of all these major soil groups, the RBE dominates the NWP, which considered as the major soil group in the dry and intermediate climatic zones of Sri Lanka.



Fig. 2.8a – Generalized soil map of Sri Lanka.
Source: http://www.agridept.gov.lk

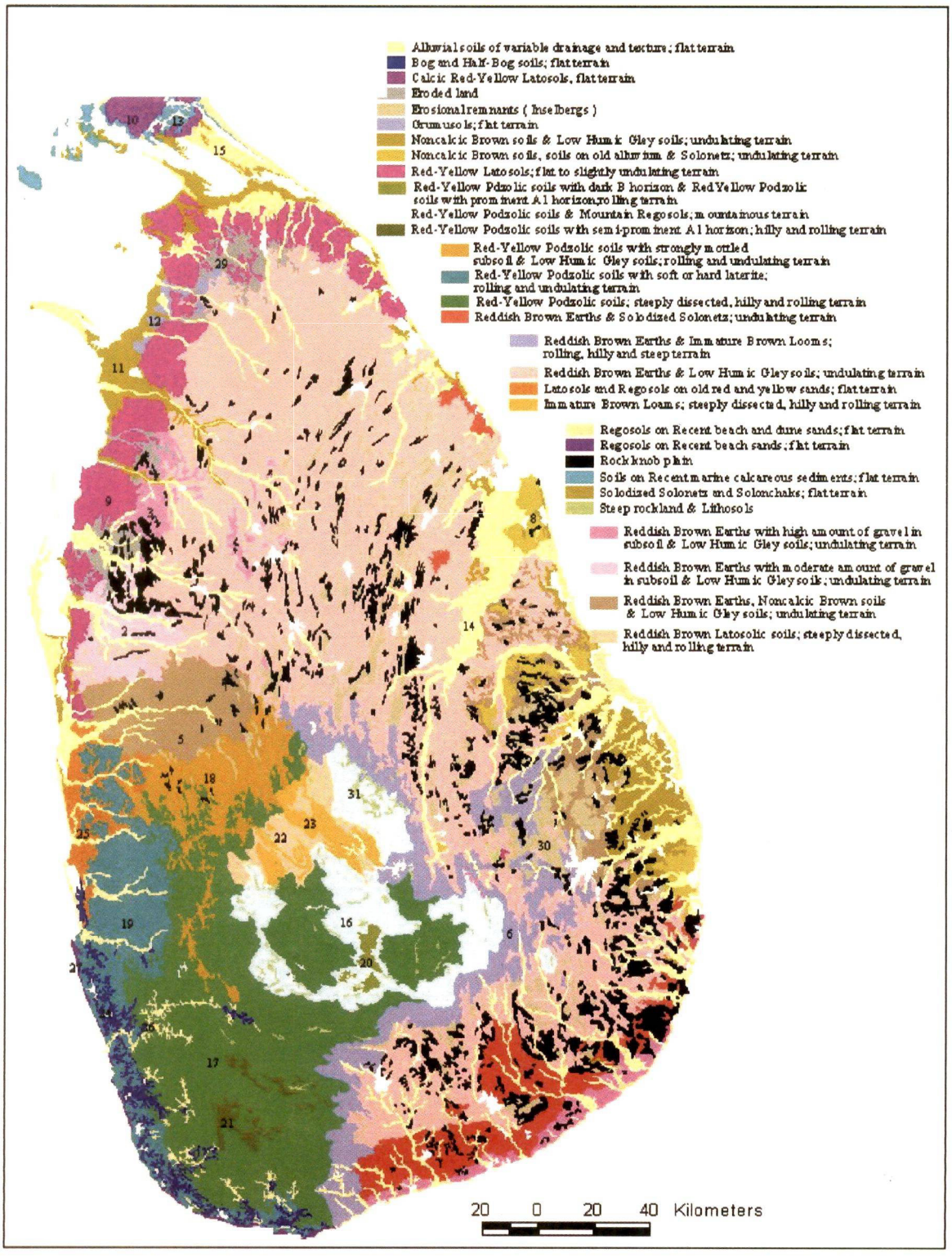


Fig. 2.8b – Major Soil types in Sri Lanka
Source: Gap Analysis Report, 2006).

Table 2.6 - Major soil groups in Climatic Zones come under the NWP

Dry and Semi Dry Intermediate Zones
Reddish Brown Earths & Low Humic Gley soils; undulating terrain
Reddish Brown Earths & Solodized Solonetz; undulating terrain
Reddish Brown Earths, Noncalcic Brown soils & Low Humic Gley soils; undulating terrain
Reddish Brown Earths & Immature Brown Looms; rolling, hilly and steep terrain
Noncalcic Brown soils, soils on old alluvium & Solonetz; undulating terrain
Red-Yellow Latosols; flat to slightly undulating terrain
Calcic Red-Yellow Latosols, flat terrain
Solodized Solonetz and Solonchaks; flat terrain
Grumusols; flat terrain
Alluvial soils of variable drainage and texture; flat terrain
Regosols on Recent beach sands; flat terrain
Wet and Semi Wet Intermediate Zones
Red-Yellow Podzolic soils & Mountain Regosols; mountainous terrain
Red-Yellow Podzolic soils; steeply dissected, hilly and rolling terrain
Red-Yellow Podzolic soils with strongly mottled subsoil & Low Humic Gley soils; rolling and undulating terrain
Red-Yellow Podzolic soils with soft or hard laterite; rolling and undulating terrain
Red-Yellow Podzolic soils with dark B horizon & RedYellow Podzolic soils with prominent A1 horizom;rolling terrain
Reddish Brown Latosolic soils; steeply dissected, hilly and rolling terrain
Immature Brown Loams; steeply dissected, hilly and rolling terrain
Bog and Half-Bog soils; flat terrain
Latosols and Regosols on old red and yellow sands; flat terrain
Alluvial soils of variable drainage and texture; flat terrain
Regosols on Recent beach sands; flat terrain

Reddish Brown Earths (RBE)

This is the most widespread great soil group in Sri Lanka and occupies the largest area (1,800,129 ha) compared to all other soil groups. RBE derived mainly on residuum and colluviums derived from Intermediate and basic Precambrian rocks. RBE is mainly confined to the Dry Zone of Sri Lanka.

The surface soil structure is weak to moderate, coarse, sub angular blocky. Soils are extremely hard when dry, friable to firm when moist and sticky when wet. RBEs are characterized by low water holding capacity with a rapid release of soil moisture when the tension is low (Panabokke, 1996).

Red Yellow Podzolic soils (RYP)

RYP is the main soil group in the wet zone of Sri Lanka, both in the lowlands as well as in the highlands. Under this major soil group, many subgroups can be identified. This soil group developed on a wide variety of parent materials. These are mainly residuum, colluviums or local

alluvium derived from a wide variety of Precambrian crystalline metamorphic rocks belonging to the highland series and southwestern group.

Mineral Resources

North Western Province is also rich with several types of mineral deposits such as silica sands, limestones, graphite, mica etc. Best known silica sand deposits are found in the Marawila, Madampe and Nattandiya areas of the province. The largest deposits of Miocene limestone are found in the north western coastal belt near Puttalam. The limestones are used for cement manufcturing. Graphite mines are located in Bogala, Kahatagaha and Dodamgaslanda. In addition to these minerals, mica, beach mineral sands (Ilmenite) and clay also can be considered as important mineral resources found in the NWP.

Recent investigations by an Australian Company revealed a significant reserve of mineral sands along the north western coastal belt including Puttalam. The estimated amount is around 1.07bn tons of sand with 7-8% heavy minerals, mainly consisting of ilmenite.

Industries

According to a survey carried out by the Department of Census and Statistics in 2001, from the total employed population, 33.1% involved in industries related to Agriculture and Forestry in the Kurunegala district while it is 18.1% for the Puttalam district. In the Puttalam district the highest number (20.1%) of people involved in the manufacturing industries.

The NWP have 2 Export Processing Zones (EPZ) at Mawathagama and Polgahawela each with an extent of 48 acres. In addition, NWP also boasts 9 industrial Estates (IE).

Dambadeniya IE	9 acres
Makandura West IE	51 acres
Makadura East IE	15 acres
Pannala IE	19 acres
Lunuwila IE	28 acres
Heraliyawela IE	25 acres
Dangaspitiya IE	25 acres
Dankotuwa IE	53 acres
Noorani IE	17 acres

According to the census carried out in 2003/2004 by the Department of Census and Statistics, Sri Lanka, the following table gives the number of industrial establishments located in the Kurunegala and Puttalam districts (Table 2.7).

Table 2.7 – Number of Industries (Small, Medium and Large) situated in the Kurunegala and Puttalam districts and persons engaged in those industries.
Source: Department of Census and Statistics, Sri Lanka.

District	Small Industries (persons engaged less than 10)		Medium and Large Industries (persons engaged 10 or more)	
	No. of establishments	Persons engaged	No. of establishments	Persons engaged
Kurunegala	16,943	37,868	877	48,384
Puttalam	5,930	16,451	737	25,491
Sri Lanka	**121,426**	**285,623**	**9,961**	**747,828**

Some of the major BOI companies located in the Kurunegala district are:

Kuruwita Manchester Textile Mills Ltd. (Sri Lanka)

G.T.B. Colombo Corporation (Pvt.) Ltd. (India)

United Breweries Lanka (Pvt.) Ltd. (Mauritius/ Sri Lanka)

Cargills Food Processors (Pvt.) Ltd. (Sri Lanka)

Omega Line Ltd. (Luxembourg)

Eastern Food Specialities (Pvt.) Ltd. (Sri Lanka).

The major BOI projects situated in the Puttalam district are :

Holcim (Lanka) Ltd. (Netherlands / Sri Lanka)

Bhuwalka Steel Ind. (Sri Lanka) Ltd. (India)

Nuwan Sea Foods (Pvt.) Ltd. (Sri Lanka)

Dankotuwa Porcelain Ltd. (Japan / Sri Lanka)

Ace Luggage Lanka (Pvt.) Ltd. (Korea/ USA).

CHAPTER 3

BIO-GEOGRAPHICAL AREAS

Bioregions

One of the recommendations given by the Biodiversity Conservation and Action Plan (BCAP) is the identification of bio-regions in order to facilitate the provincial administrators to identify the areas needed priority action in terms of biodiversity conservation and management. According to this, 15 bio-regions have been identified and the BCAP recommends that these bio-regions should be considered as provisional (MENR, 1998). Out of 15 bioregions, NW province represented by 4 bioregions coded as B2, B3, B13 and B14 (Table 3.1).

Table 3.1 – Bioregions of the NW province of Sri Lanka.

Code	Specification
B2	Dry Zone
B3	Intermediate zone
B13	Kandakuliya to Chilaw
B14	Mannar to Kandakuliya

Agroecological Regions

The categorization of major climatic zones into agro-ecological regions based on the climatic factors represents homogeneous regions with soil, land forms and agricultural activities. Based on many decades of work, 7 agro climatic zones were initially defined and been further divided into 24 agro-ecological regions in 1979. The differentiation of the Wet Zone into its distinctive agro-ecological regions was primarily driven by differences in the rainfall distribution. In the Dry Zone, on the other hand, it was the nature of the soil that primarily determines the identity of individual agro-ecological region. In the Intermediate Zone, the rainfall distribution and soils play an equally important role in this categorization. There are 10 agro-ecological regions in the Wet Zone, 9 in the Intermediate Zone and 5 in the Dry Zone (Fig. 3.1). The 10 agro-ecological zones present in the NWP are IL1, IL2, IL3, IM3, WL2, WL3, WM3, DL1, DL2 and DL5. Out of these 10 agro-ecological regions, only IL1 represent in both districts. The agro-ecological zones that come under the dry zone (DL1, DL2 and DL5) are occur in the low country and posses significant differences in relation to the monthly rainfall expectancy and its distribution throughout the year. DL1 has a 75 percent expectancy (pe) of monthly rainfall of 775 mm while DL5 with 500 mm. DL1 and DL5 have a strong bimodal distribution of rainfall while DL2 almost unimodal or very weakly bimodal. All three dry zone regions, DL1, DL2 and DL5, are known to have an important significance for rain-fed agriculture (Table 3.2).

Table 3.2 - Distinguishing characteristics of Agro-Ecological regions represent in the North Western province of Sri Lanka.
Source: Panabokke, 1996.

Agro-Ecological Region	Annual Rainfall (mm)[1]	Terrain	Soils
Intermediate Low Country (**IL1**)	> 1020 mm	Flat, undulating to rolling terrain	Low Humic Gley Soils (LHG), Alluvial, Imperfectly drained Red Yellow Podzolic soils with strongly mottled sub soil
Intermediate Low Country (**IL2**)	>1150 mm	flat, undulating terrain to rolling terrain	Reddish Brown Earth (RBE), LHG, and Immature Brown Loams (IBL), Alluvial soils
Intermediate Mid Country(**IM3**)	> 900 mm	rolling, hilly and steep terrain	RBE and IBL Red Yellow Podzolic soil and Reddish Brown Latosolic soils
Wet Low Country 2 (**WL2**)	> 1900 mm	rolling and undulating terrain	Red Yellow Podzolic soil with strongly mottled sub soil, LHG and some Alluvial soils
Wet Low Country 3 (**WL3**)	>1520 mm	flat terrain	Red Yellow Podzolic soils in soft latarite and Alluvial soils
Wet Mid Country 3 (**WM3**)	>1270 mm	steeply dissected, hilly, rolling and undulating terrain	Red Yellow Podzolic soil, RBL and IBL soils
Dry Low Country 1 (**DL1**)	>775mm	Undulating	RBE and Low Humic Gley soils
Dry Low Country 2 (**DL2**)	> 900mm	Undulating and flat	Non-calcic brown, RBE, alluvium, Solodized Solonetz, Regosols
Dry Low Country 5 (**DL5**)	> 500 mm	gently undulating terrain	RBE, LHG and Alluvial soils

[1]at the 75% expectancy level.

Out of the 24 agro-ecological zones, the Kurunegala district represents 7 zones. The percentage extent of land comes under each agroecological zone in the Kurunegala district are given in the table 3.3. According to the information, the intermediate zone (IL1, IL3 and IM3) covers the largest area in the Kurunegala district which is 76% from the total area of land. The agroecological zones categorized under the wet zone represent 4% while the dry zone covers (DL1) 20% from the total land area in the Kurunegala district (Table 3.3).

Table 3.3: Agro-ecological zones and their extent of land – Kurunegala District
Source: Department of Agriculture, Sri Lanka.

Agro-ecological zone	Area (sq.km)	Proportion (%) (district)
DL1	950	20
IL3	1600	33
IL1	2000	42
IM3	50	1
WM3, WL3, WL2	175	4
Total area	**4775**	**100**

The Puttalam district only represents by two major climatic zones; Dry and Intermediate (Table 3.4). Five agroecological zones (DL2, DL5, DL1 and IL1 and IL2) represent in the Puttalam district. In the Puttalam district, Dry Zone covers 83% of the land while the Intermediate Zones covers approximately 17%. However, no information was available on the extent of land comes under each agro-ecological zone separately.

Table 3.4 – Extent of land under Dry and Intermediate Zones – Puttalam district.

D.S. Division	Area (sq.km)	Area under Dry or Intermediate Zones
Kalpitiya	94.0	2515.0 (Dry Zone)
Anamaduwa	225.3	
Arachchikattuwa	168.3	
Karuwalagaswewa	523.7	
Nawagattegama	127.2	
Mundel	134.0	
Pallama	116.5	
Puttalam	150.2	
Vanathavilluwa	710.4	
Mahakumbukkadawala	264.2	
Total area (%)	**2515.0 (83.4%)**	
Chilaw	142.0	498.9 (Intermediate Zone)
Dankotuwa	77.7	
Madampe	70.5	
Nattandiya	72.8	
Wennappuwa	38.8	
Mahawewa	97.1	
Total area (%)	**498.9 (16.6%)**	

Data: Census of population and housing, 2001, Department of Census and Statistics.

However, with the availability of spatial and temporal data, and advancement of GIS technology have led to a further division of the existing agro-ecological region map of Sri Lanka into a map with 46 agro-ecological sub-regions on an enhanced scale in 2002 (Fig. 3.2).

Table 3.5 – Extent of land area under different climatic zones in Kurunegala and Puttalam districts.

	Land area (ha)				
District	**Wet Zone**	**Dry Zone**	**Intermediate Zone**	**Total**	**Ratio**
Kurunegala	17,500	95,000	365,000	477,500	1:5:21 (W/D/I)
Puttalam	-	251,500	49,890	301,390	1:5 (I/D)
NW province	17,500	346,500	414,890	778,890	1:20:24 (W/D/I)

W = Wet Zone, D = Dry Zone and I = Intermediate Zone

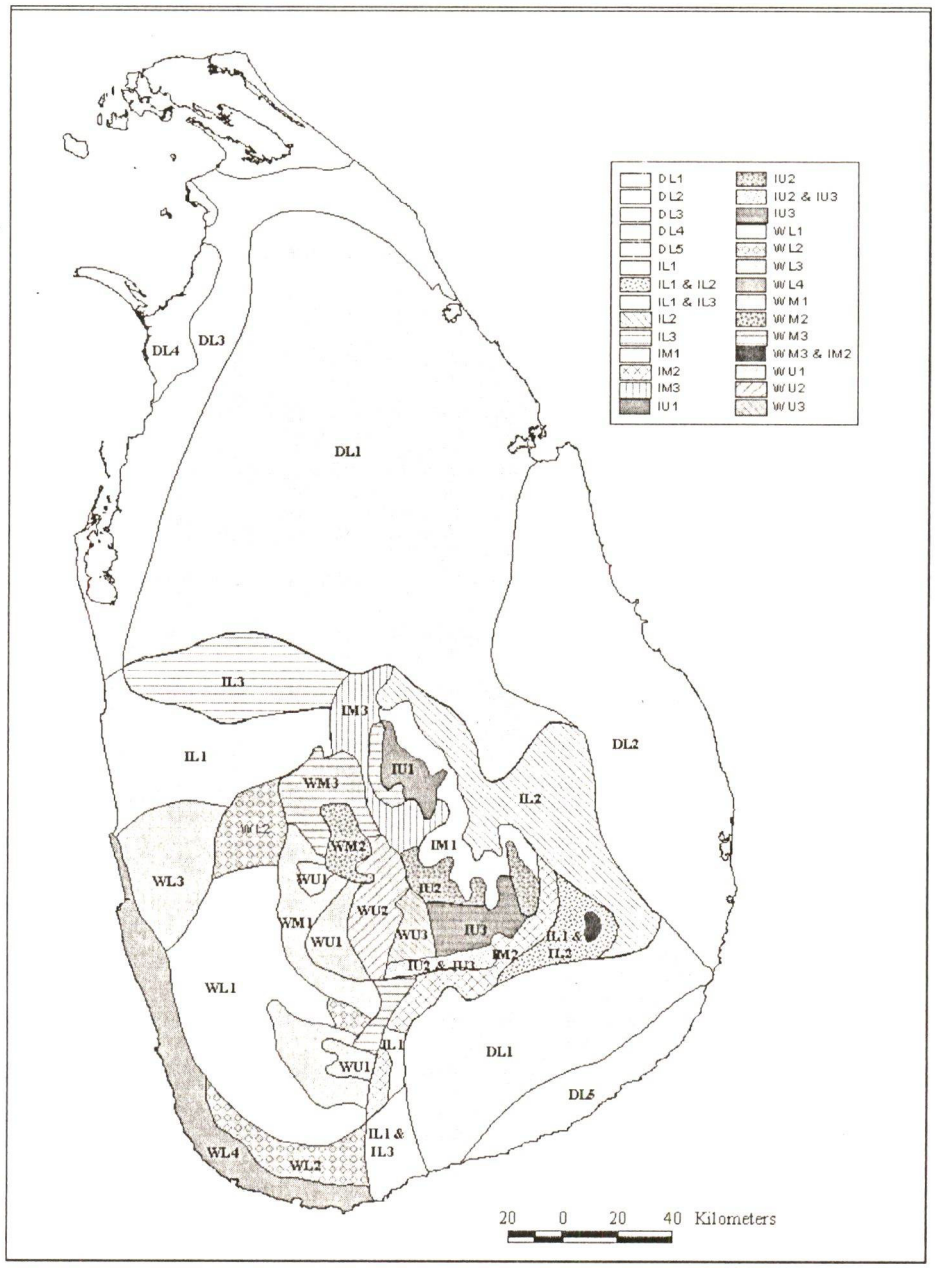


Fig. 3.1 – Agro-ecological map of Sri Lanka, 1979.

Source: http://www.agridept.gov.lk

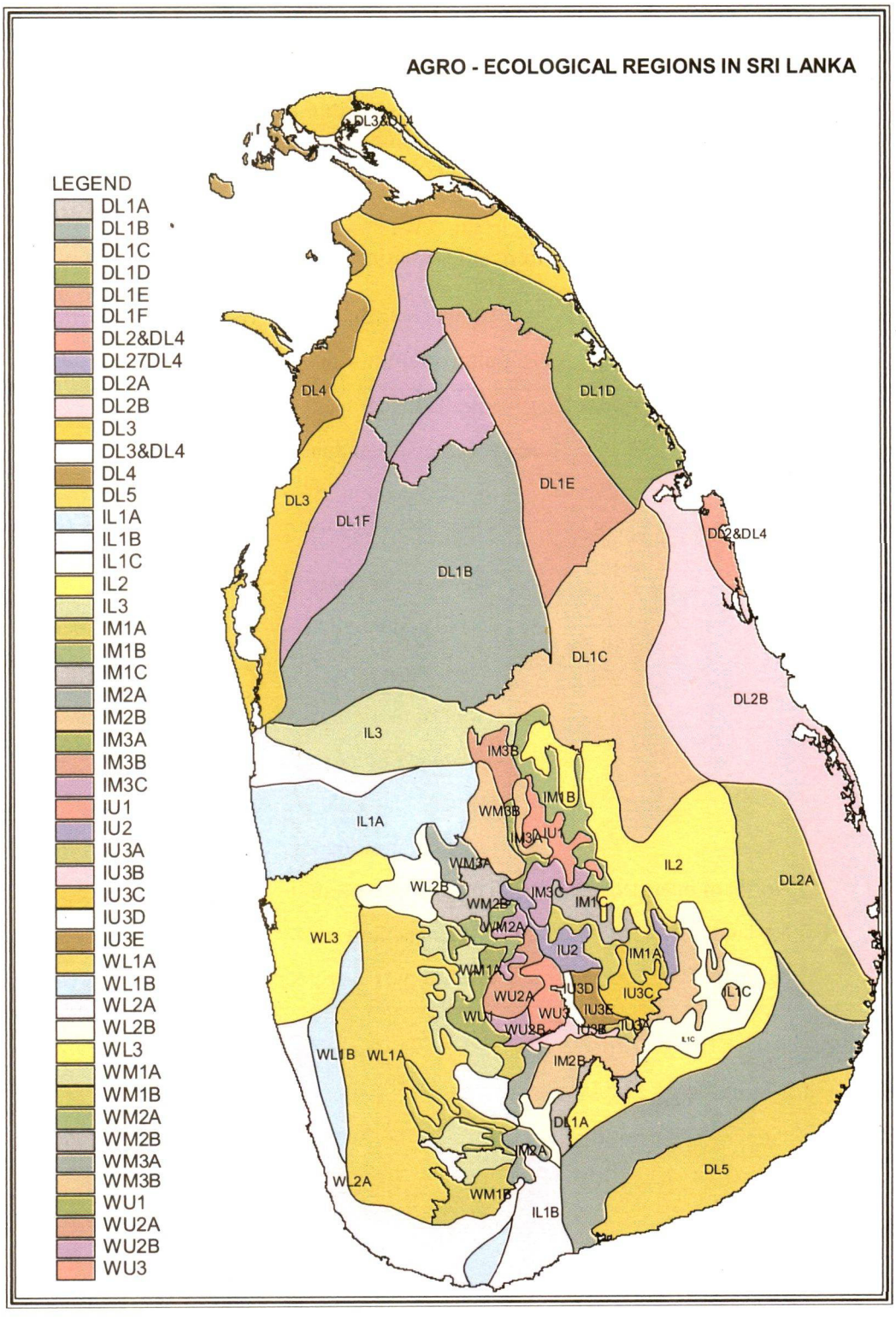


Fig. 3.2 – Agro-ecological Regions of Sri Lanka, 2002.

Floristic Zones

Ashton and Gunatilleke (1987) defined 15 floristic regions from which only 12 are mapped (Fig. 3.3) According to this categorization, 4 floristic regions located in the North Western Province viz. coastal and marine belt (I), dry and arid lowlands (II), Northern Intermediate lowlands (III) and Northern Wet Lowlands (V). Each floristic zone found within the NW province dominated by its own characteristic natural vegetation types (Table 3.6). The different vegetation types that are located within the NWP were given in the Appendix 1.

Table 3.6 - Floristic regions that located in the NWP, and their characteristic vegetation types and dominant plant communities (Ashton and Gunatilleke, 1987).

No	Floristic region	Characteristic natural vegetation types (dominant plant communities)
I	Coastal and marine belt	Marine mangroves Salt marsh and dunes Stand vegeation
II	Dry and arid lowlands	Tropical dry mixed evergreen forests *Manilkara* community Mixed community (*Chloroxylon-Vitex-Berrya-Schleichera* series) Tropical thorn forests (Manilkara- *Chloroxylon-Salvadora-Randia* series) Damana and Villu grasslands Flood-plain wetlands, Riverine and gallery forests
III	Northern intermediate lowlands	Tropical moist semi-evergreen forests (*Filicium-Euphorbia-Artocarpus-Myristica* series)
V	Northern Wet Lowlands	Tropical wet evergreen forests

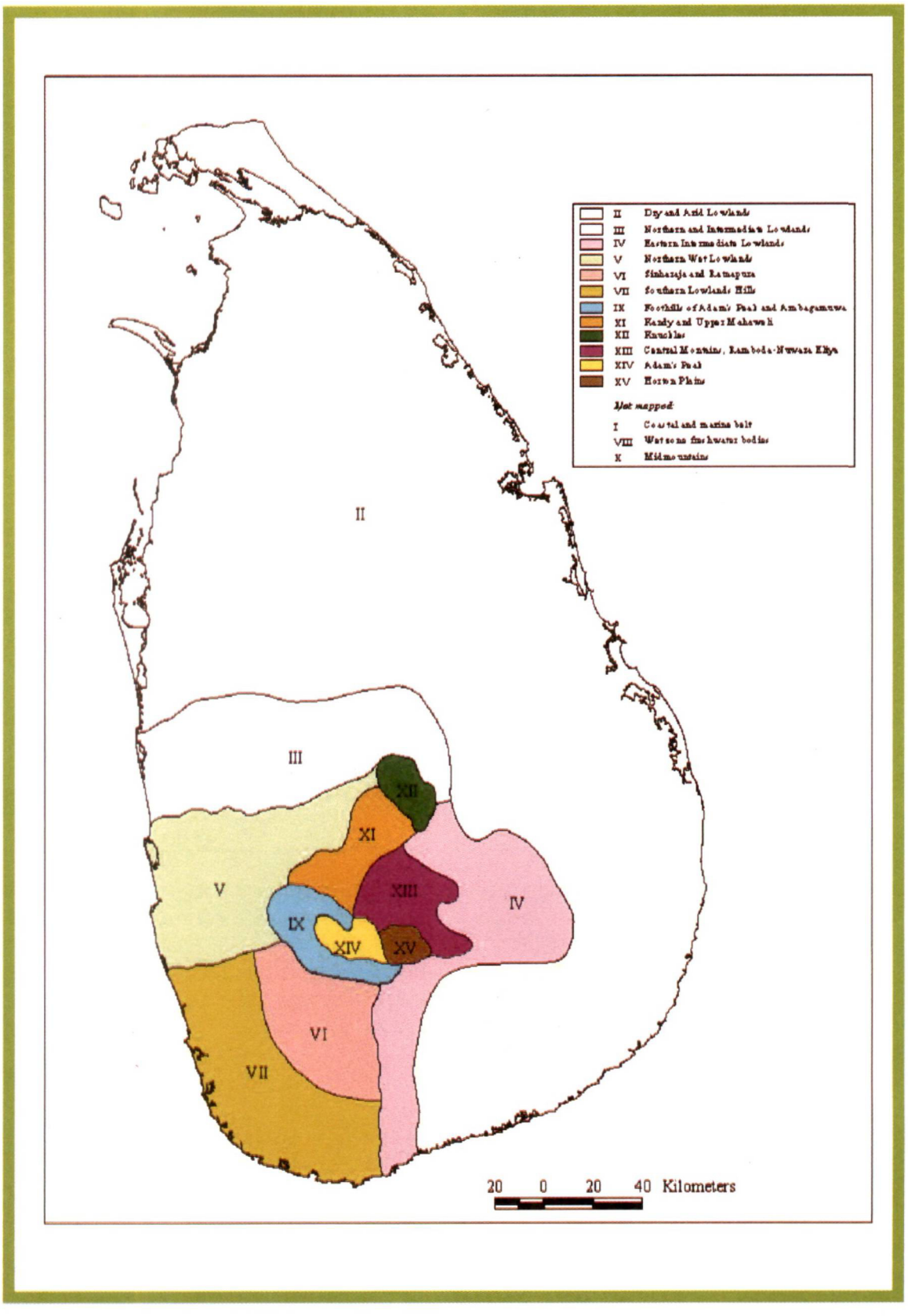


Fig. 3.3 - Floristic regions of Sri Lanka.
Source: World Conservation and Monitoring Center (http://www.unep-wcmc.org)

Avifaunal Zones

Kotagama (1989) defined 6 avifaunal zones and out of that 2 avifaunal zones come under the NW province. They are dry zone avifauna (A4) and low-country wet avifauna (A2). However, this categorization is not closely related to the climate, vegetation zones or geomorphological features etc.

Along with the Asian Red Data Book (ARDB) programme, Field Ornithology Group of Sri Lanka (FOGSL) has commenced a preliminary programme on the identification of Important Bird Areas (IBA) based on the identification of candidate species which categorized under 4 groups *viz.* globally threatened species, restricted range species, biome-restricted assemblages and congregations. This categorization was later accepted by the Technical Committee on the Asian IBA programme of the BirdLife Asia Council. This IBA programme which has started in February, 2000, identified 111 preliminary IBA's in Sri Lanka. According to this categorization, NW province has only 8 IBA's, while the Sabaragamuwa and the Southern provinces encompass the highest number of IBA's (26 and 23 sites respectively) (Table 3.7).

Table 3.7. – Preliminary IBA's in the North Western Province of Sri Lanka.
Source: Field Ornithology Group of Sri Lanka, 2003

Site Code	Site Name	District	IBA category	Conservation Status
38	Neugalkanda	Kurunegala	A2, A3	Proposed Forest Reserve
39	Usgla Siyabalangamuwa	Kurunegala	A4	Not defined
40	Anawilundawa	Puttalam	A1, A2, A4	Sanctuary
41	Maiyawa wewa	Puttalam	A4	Not defined RAMSAR
42	Mundel Lake	Puttalam	A4	Not defined
43	Periyakadawela	Puttalam	A4	Not defined
44	Pinkattiya wewa	Puttalam	A4	Not defined RAMSAR
45	Seguwantive Mudflats	Puttalam	A4	Not defined

However, more recently the Gap Analysis report (2006) has indicated some drawbacks in this Kotgama's classification due to the fact that some species of certain avifaunal zones have also been located in other avifaunal zones in significant numbers. However, the Gap Analysis report (2006) has included an improved Important Bird Area (IBAs) map prepared by Kotagama and Kaluthota with 70 identified IBAs (Fig. 3.4). According to this new IBA map, there are only 3 coastal sites (No.s 48, 49 and 63) found within the Puttalam district in the NW province.

Ichthyofaunal Zones

Senanayake and Moyle (1982) identified 4 Ichthyofaunal Zones in Sri Lanka. Out of these 4 zones, NW province comes under the low country dry zone.

Bio Mammalian Zones

Sri Lanka delineated into 7 mammanlian zones by Eisenberg and McKay in 1970. Out of them, only 3 mammalian zones (A1, B and C) had fallen within the NW province. This mammalian distribution was based on the vegetation distribution patterns described by Mueller-Dombois (1968). The Gap Analysis report (2006) stressed the importance of using more recent map of floristic regions of Sri Lanka described by Ashton and Gunatilleke (1987) to identify the mammal zones in Sri Lanka rather than using the existing map on bio mammalian zones.

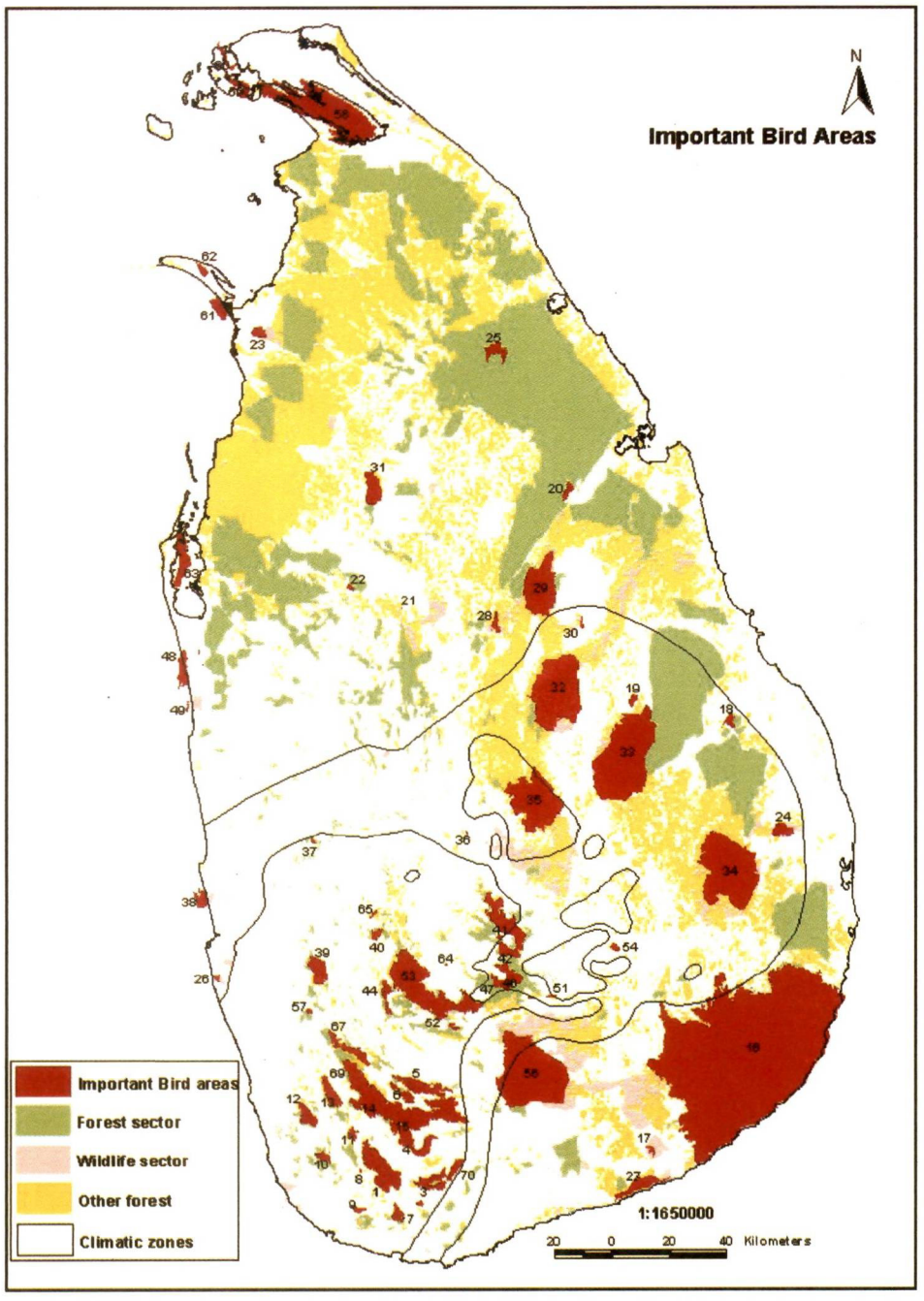


Fig. 3.4 – Important Bird Areas
Source: Gap Analysis Report

CHAPTER 4

ECOSYSTEM PROFILE

Major Ecosystems

Sri Lanka's diverse vegetation types have been classified by many scientists over the years (Chapman, 1947, De Rosayro, 1950, Gaussen *et al.*, 1964, Holmes, 1956, Koelmeyer, 1957 & 1958, Mueller-Dombois, 1968, Perera, 1975, Greller and Balasubramaniam, 1980, Werner, 1984, Ashton and Gunatilleke, 1987, Survey Department of Sri Lanka, 1988, Greller and Balasubramaniam, 1993, Legg and Jewel, 1995 and UNEP, 2003).

The natural vegetation of Sri Lanka covers an area of 375 million hectares of land which represents a 36% of the total land area of the country. This includes mainly the natural vegetation types such as closed and open forests. In addition, "sparse forests" also covers about 7% of the land area bringing the country's total forest cover to 43% (MOFE, 1999). Grasslands and other coastal vegetation types (salt marshes, sand dunes, mangroves etc.) also will contribute a significant extent to the Sri Lanka's natural vegetation cover.

Spatial datasets on the natural forest cover and the elevational map of Sri Lanka (Legg & Jewell 1995, Sri Lanka Survey Department 2001) provided useful information to revise the existing map of major natural vegetation types in Sri Lanka for the Gap Analysis report (2006). A provisional map consists of 14 major natural vegetation types which include 9 forest types, 4 grassland types and the sand dunes. Plantation forests and minor natural vegetation types have been omitted in the map (Figure 4.1).

Gap Analysis Report published in 2006 has proposed user-friendly classification with 14 main terrestrial and semi-terrestrial vegetation types constituting 9 forest types, 4 grassland types and the sand dunes. Each vegetation type was then characterized by its species composition based on most recent research work (Appendix 1). According to this classification, the NW province includes 6 forest types; Dry Mixed Evergreen forests (DMEF), Moist Mixed Evergreen forests (MMEF), Dry Riverine Evergreen forests (DREF), Sparse and Open forests (SPOF), Mangrove forests (MANF) and Dry Deciduous Thorn Scrub (DDTS); and 2 grassland types, Savanna grasslands (SAVG), Villu grasslands (VILG) and Sand Dunes (SAND).

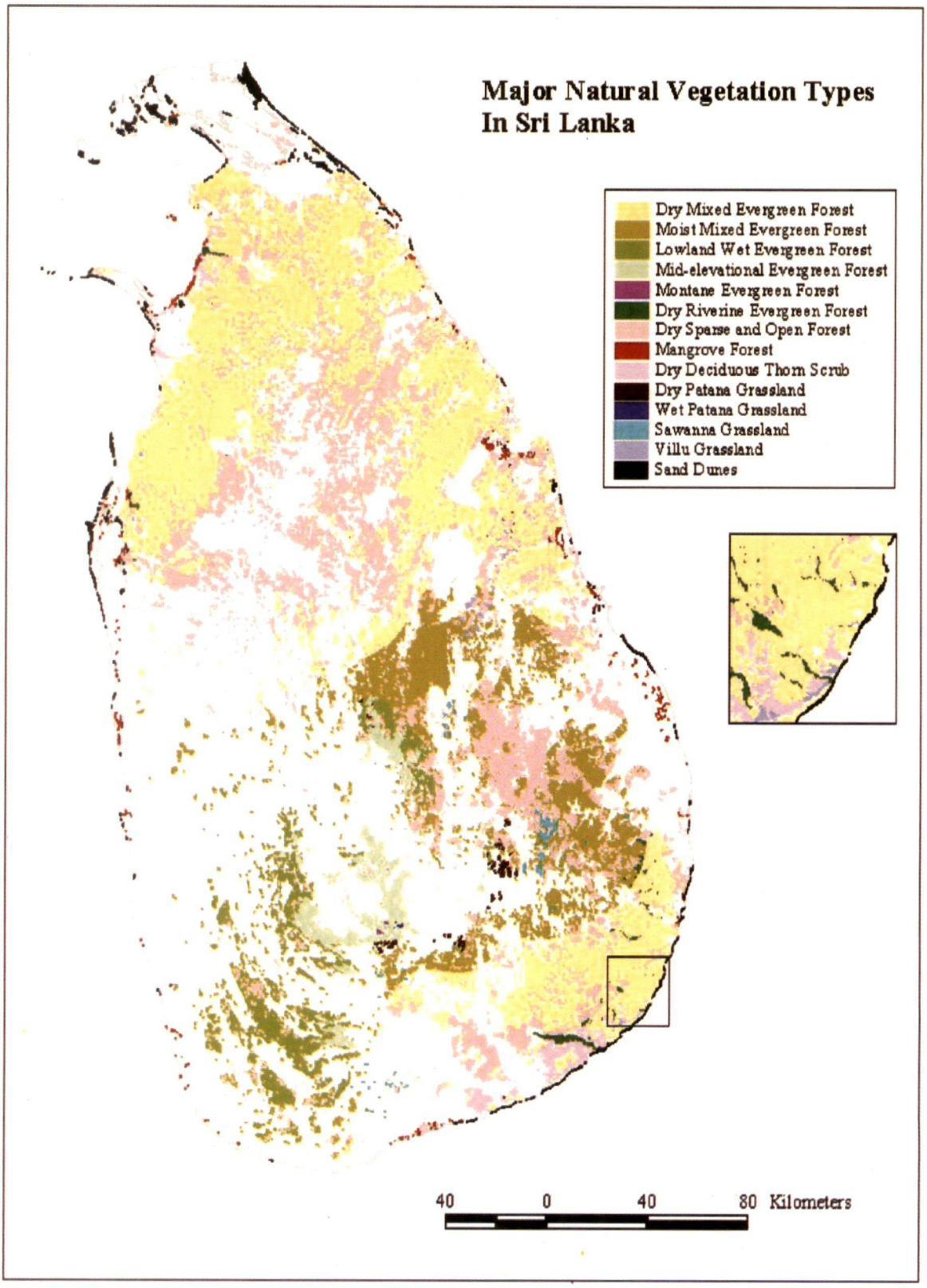


Fig. 4.1 – Major Natural Vegetation types in Sri Lanka.
Source: Gap Analysis Report (2006).

Forests

In 1956, 44 percent of Sri Lanka was covered by forests. After nearly 4 decades, the closed canopy forest cover has declined to about 24 percent.

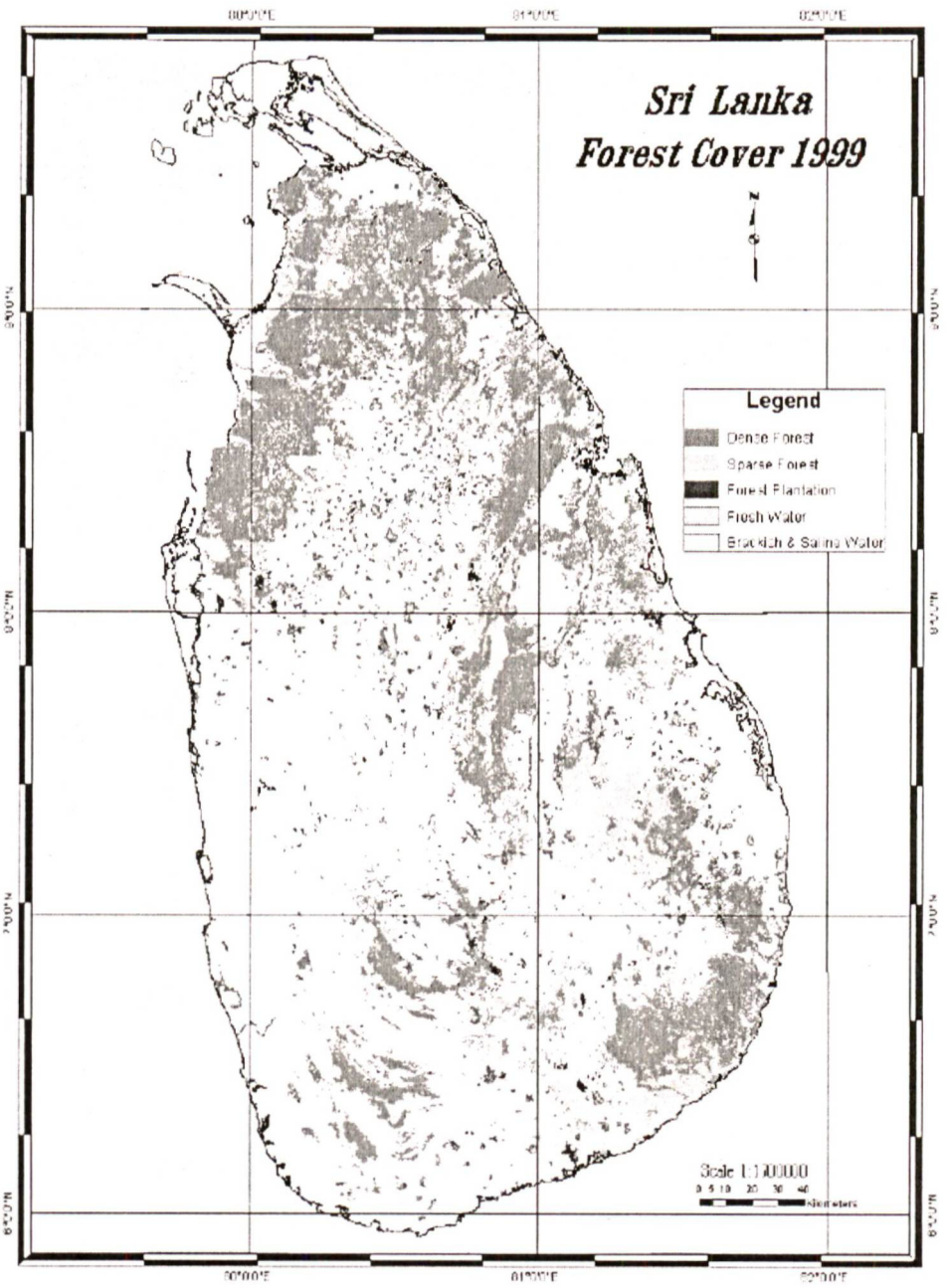


Fig. 4.2 – A map showing the distribution of the forest cover in Sri Lanka in the year 1999.
Source: http://www.sgpptf.org/docs/CGPsrilanka.pdf

Deforestation has caused mainly due to shifting cultivation, infrastructure development and land conversion for agriculture. A study conducted to assess the district-wise forest cover change during the period of 1992 to 2001 has identified the Puttalam district as one of the 4 districts where there is a prominent reduction of more than 5% (9.9% in the Puttalam district) in the close canopy forest area (Ratnayake, Abeykoon and Chemin, 2001). In contrast, the same study showed that the Kurunegala district records a steady increase in the forest cover area over the same period. In an earlier study carried out by other workers (Jewel and Legg, 1994) on the forest cover decline over the period of 1981 to 1992, found that in both districts there is a steady decline in the forest cover (Fig. 4.3).

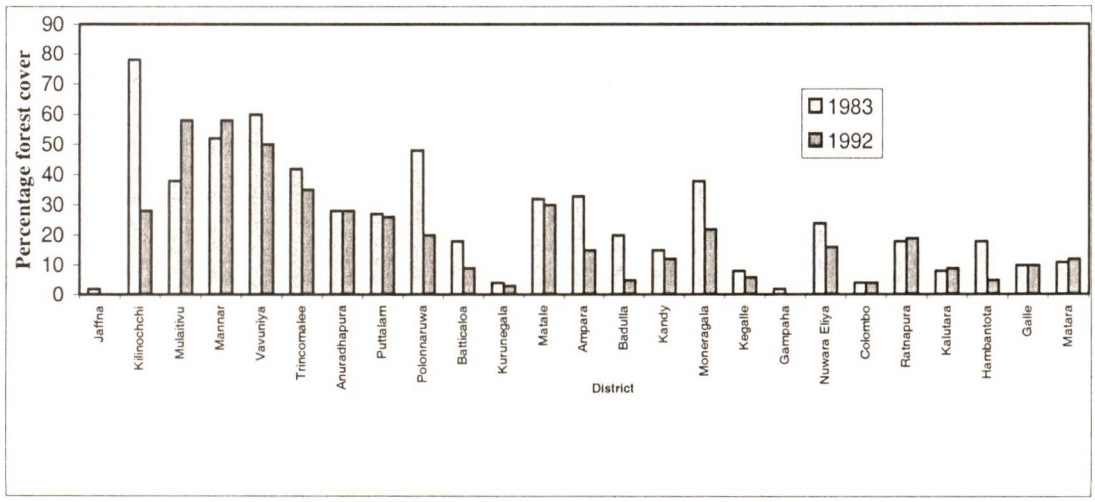


Fig. 4.3 – Forest area decline (as a %) by districts over the period of 1983 – 1992.
Source: Jewel and Legg (1994).

According to Legg and Jewell (1995), the NW province of Sri Lanka, approximately 805,272 ha in extent, consist mainly of 5 different natural forest types *viz.* moist monsoon forests, dry monsoon forests, riverine dry forests, mangroves and sparse forests which encompass 0.75 %, 8%, 3.6%, 26.1% and 6.9% from the total cover respectively (Table 4.1).

Table 4.1 – Natural forest types in the Kurunegala and Puttalam distrits in Sri Lanka (hectares).
Source: Legg and Jewell, 1995 and website information

District	Land area	Moist monsoon	Dry Monsoon	Riverine dry forests	Mangrove	Sparse
Kurunegala	489,787	1,827	8,153	0	0	14,766
Puttalam	315,485	0	79,452	814	2,264	17,104
NW Province (as a %)	805,272 (12.2%)	1,827 (0.75%)	87,605 (8.00%)	814 (3.6%)	2,264 (26.1%)	31,870 (6.9%)
Sri Lanka (1995)	6,616,627	243,877	1,094,289	22,412	8,688	463,848
Sri Lanka (1999)	6,616,627	224,187	1,016,981	18,140	9,531	-

INLAND WATER BODIES AND STREAM NETWORK

Sri Lanka has almost no natural lakes, yet it has a vast extent of man-made water bodies (approximately 3 ha of inland water per km^2 of land) with greatest concentrations in the North Western and North Central Provinces (DAS, 1996). According to the land use information gathered by the Survey Department (SD) of Sri Lanka during 1982 and 1988, wetlands and water bodies in the NWP covered an area of 4,670 ha and 38,110 ha respectively. According to Fernando and De Silva (1984), the inland water bodies cover an area of 10,265 ha (which consist of 1311 reservoirs) and 3833 ha (94 reservoirs) in Kurunegala and Puttalam districts respectively.

Rivers

Sri Lanka's rivers rise from the Central Highlands and flow radially towards the sea (Fig. 4.4a). There are sixteen principal rivers longer than 100 kilometers in length, with twelve of them carrying about 75 percent of the mean river discharge in the entire country. Out of these 16 major rivers, 5 are located in the north western province with Deduru oya (Box 1) as the largest. In addition, there are 5 other rivers in the NWP. Out of these 10 rivers, 8 located within the province while the other two are in the provincial boundaries (Table 4.2). The 10 rivers located with the NW province covers a catchment area of 9690 ha which represents 16.4% of the total catchment area covered by all the major rivers in Sri Lanka. In addition, there are 6 other minor rivers also located in the peneplains of the North Western province.

Table 4.2 – Major rivers and their drainage areas (km^2) in the North Western Province of Sri Lanka.
Source: Survey Department, 1983 and FSMP (1995).

River basin No.	River Basin	Drainage area (km^2)	Annual Runoff (km^3)
93	Kala Oya	2,873	0.59
94	Moongil Aru	44	0.01
95	Mee/Mi Oya	1,516	0.34
96	Madurankuli Aru	62	0.03
97	Kalagamuwa Oya/Kolamunu Oya/ Battulu Oya	151	0.05
98	Patampola oya	215	0.07
99	Deduru Oya/Sengal Oya	2,616	1.61
100	Karambala Oya	589	0.25
101	Ratmal oya	215	0.09
102	Maha Oya	1,510	1.61
	From All Major Rivers in Sri Lanka	59,233	



Fig. 4.4 – Stream network of Sri Lanka
Source: Gap Analysis Report, 2006.

The river and stream basins vary in size, from less than 10 to more than 10,000 sq km. In the NW province, Kala oya, Mee Oya, Deduru Oya and the Maha Oya are the 4 major rivers, with a drainage area of more than 1500 sq.km.

The gap analysis (2006) has selected the boundaries of the major river basins to define 5 stratigraphic units (SU) (Figure 4.5). Out of these 5 units, SU2 (Kala-Deduru Unit) is one of the two largest stratigraphic units that cover the entire NW province of Sri Lanka which consist of varying climatic zones such as wet, intermediate, dry and north-western semi-arid zone. Rivers located in the southern part of this stratigraphic unit are perennial, e.g. Maha Oya, while those located in the northern dry zone are seasonal. Kala Oya (Box 2) is originally a non-perennial river but has been transformed into a perennial river due to the diversion of the Mahaweli River in the 1970s. River Basins were ranked taken into consideration two criteria (Wilderness Index and River Density) separately, under each stratigraphic unit. Later, a Combined Rank was given to each river basin considering both criteria together. Finally, the **Priority River Basins (PRBs)** were selected using combined ranks based on a simple sum of the separate rank values, under each SU. Kala Oya has chosen as one of the PRBs in the SU2 and is the only priority river basin that comes under the NW province. The importance of Kala Oya in terms of large extents of pristine mangrove forests occurring in its estuaries, the Bar Reef Sanctuary, sea grass beds and other ecosystems of the Puttalam lagoon, was strongly considered for this selection.

BOX 1 – Deduru Oya

Deduru Oya basin is the fifth largest river basin in the country covering 2616 km^2. There are four major reservoirs to support irrigated agriculture in the basin. In addition to the major reservoirs, approximately 3000 small and medium size tanks are found in the Deduru Oya basin. 97% of the basin's area comes under the North Western Province (Kurunegala and Puttalam Districts) and 3% in the Central Province (Kandy and Matale Districts). Currently, the main problem faced by the farmers in the Deduru Oya and Mee Oya Basins is the non-availability of assured water supply for the agricultural areas, since the basins are predominantly situated in the dry zone of the country.

Source:http://www.lankalibrary.com



Fig. 4.5 – Major River basins in Sri Lanka. River basin numbers 93 to 102 falls within the boaundaries of the North Western Province of Sri Lanka

BOX 2 – Kala Oya

The Kala-Oya Basin is 2873 sq. km. in size and spreads over intermediate and dry zones, beginning from Matale district cutting across Anuradhapura and Kurunegala districts and ending up in the Puttalam district. The Kala oya basin covers a land area of 52% of Anuradhapura, 18% of Matale, 14% of Kurunegala and 16% of Puttalam. The forest cover in the basin is 45% while paddy area accounts for 21% of the land use.

Main stream of the Kala oya and its tributaries flows into the Dutch Bay before entering the sea. Kala oya estuary harbours the largest tract of intact riverine mangrove in Sri Lanka due to its remote location partially bordering the Wilpattu National Park. In this largest extent of mangrove, *Phizophora mucronata* and *Avicennia marina* are the major constituent species. This estuary also harbours variety of fish species (about 55 fish species) belonging to 33 families.

Illegal siting of prawn farms is a possible threat to this relatively undisturbed ecosystem. The improvements of roads leading to Gange Wadiya from Eluwankulama has increased the accessibility to Kala oya estuary and could be considered as a potential threat to the whole estuarine ecosystem. In order to curb some of these threats, the IUCN has already made recommendations to the government to propose a large marine and coastal Ramsar wetland site which includes the Kala oya estuary.

Many industries are taken place in association with these river basins and out of which most of them are either paddy or coconut-based. A large number of rice and coconut-based industries (197 and 126 respectively) are in the Bingiriya DS division in the Kurunegala district (IWMI, Working Paper 58, 2003). Shrimp farming is another major income generating industry at the mouth of these river basins and hence located along the coastal belt in Chilaw and Arachchikattuwa. Sand mining is another industry along major rivers and their tributaries and this is particularly extensive along Deduru Oya and Maha Oya in the NW province. Number of permits have been issued for sand mining during the year 1998, but illegal sand mining is also taking place unabated (Table 4.3). However, tough regulations have been imposed recently to curtail this problem.

Table 4.3 – Issue of permits for sand mining in 1998 for some DS divisions in the NW province.
Source: IWMI, Working Paper, 58 (2003).

DS Division	No. of Permits
Ridigama	02
Mawathagama	12
Ibbagamuwa	25
Ganewatta	3
Maho	4
Wariyapola	2
Nikaweratiya	6
Kobeigane	8
Rasnayakepura	2
Bingiriya	35
Chilaw	2
Arachchikattuwa	12
Total	**113**

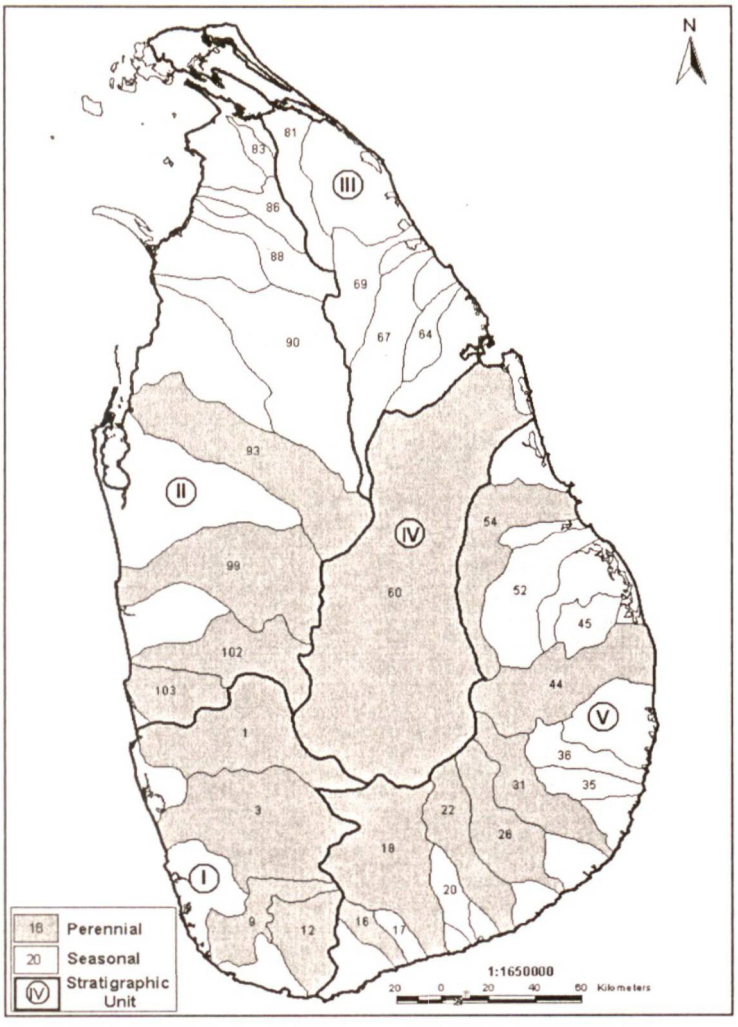


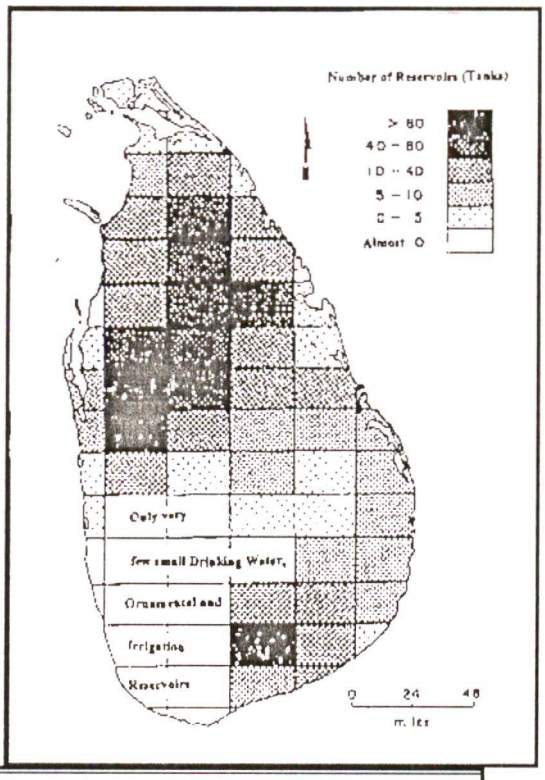
Fig. 4.6 - Selected River Basins in Five Stratigraphic Units

Source: Gap Report, 2006

Tanks and Reservoirs

The highest concentration of reservoirs in the world is probably found in Sri Lanka with over 10,000 reservoirs scattered in a land area of 65,600 km^2. Another report stated that Sri Lanka has more than 18,000 functioning irrigation schemes covering some 600,000 hectares at full capacity. About 90% of this is classed as minor irrigation schemes (Box 3; IMMI, 1998). According to the figure 4.7a and b, NWP considered as a province with a high concentration of surface water resources. All these tanks are man-made and no natural lakes are located in Sri Lanka.

(a)



(b)



Fig. 4.7 - Distribution of reservoirs/tanks (perennial and seasonal) of Sri Lanka.
These include ancient restored, ancient abandoned and recently constructed Reservoirs
Source: Anon, 1991 and Gap Analysis Report, 2006

BOX 3 - Administrative classification of Irrigation systems in Sri Lanka, based on size of command area.

Classification	Size (ha)
Major	>600
Medium	80-600
Minor	<80

Source: DAS, 1986

The NW province is one of the worst-hit provinces by drought especially during the Yala season and as a result rain-fed crops fail. Some crops suffered water stress during the later stages of their life cycle, resulting lower yields. Even the minor irrigation schemes can get affected due to low rainfall. As a result, in most years, only the major irrigation schemes provide continuous water supplies to crops. The Yala crop expected to be extremely poor in both Puttalam and Kurunegala districts due to low availability of irrigation water as well as rainfall. To add to this problem, most minor irrigations tanks are almost non-functional due to poor maintenance, silting etc. During the period between 1979/80 and 2002/03, the Irrigation Department of Sri Lanka has recorded major and medium irrigation schemes established in the NW province (Tables 4.4 and 4.5, Fig. 4.8). In Sri Lanka, the size of the command area is used as a major criterion for classifying irrigation schemes into minor, medium and major irrigation schemes (Appendix 2). Irrigation schemes also have been classified according to the mode of irrigation. According to this classification, irrigation schemes can be classified as reservoirs or tank systems, diversions or anicut schemes and lift or pump operating systems.

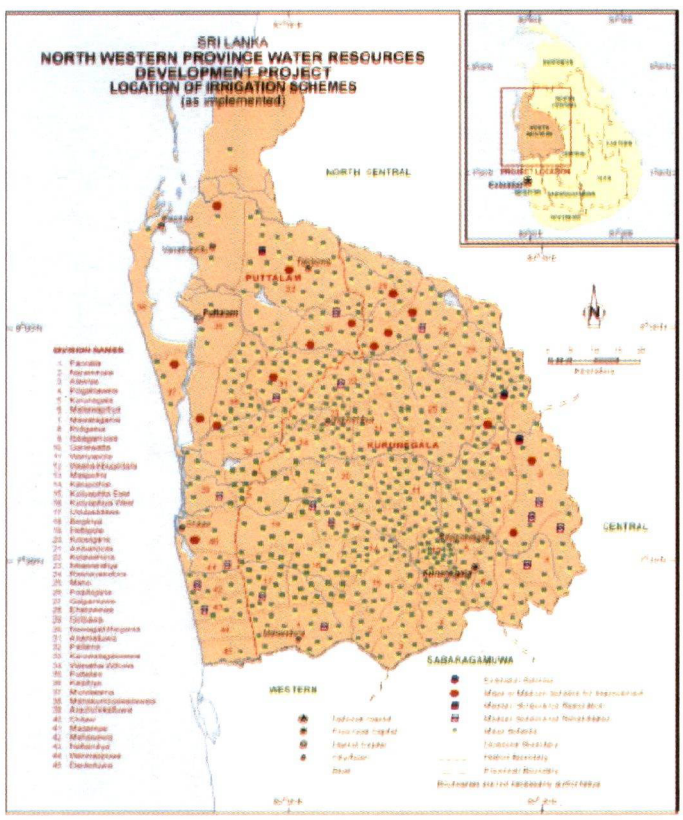


Fig. 4.8 - Inland water resources of the North Western Province of Sri Lanka. Source: ADB Report, 2004.

Table 4.4 - Major and minor irrigation schemes in the Kurunegala District recorded by the Irrigation Department of Sri Lanka and their respective command areas (in hectares).

Irrigation Scheme	Mode of Irrigation	Capacity (Ac.ft)	Functional command area (ha)	Class
Ambakolawewa	Reservoir	6,700	340	Medium
Attaragalla	Reservoir	3,668	419	Medium
Bathalagoda	Anicut/Reservoir	4,840	3,238	Major
Hakwatunaoya	Reservoir	19,727	2,093	Major
Hulugalle	Reservoir	DNA	DNA	Medium
Kimbulwana oya	Reservoir	6,900	674	Major
Kospothu oya		DNA	DNA	DNA
Madulla		DNA	DNA	DNA
Maha Siyambalangamuwa	Reservoir		197	Medium
Makandura		DNA	DNA	DNA
Meddeketiya	Reservoir	DNA	208	Medium
Nikapitiya		DNA	DNA	DNA
Palukadawala	Reservoir	7,688	820	Major
Galgamuwa	Reservoir	DNA	404	Medium
Welikumbura		DNA	DNA	DNA
Diyature	Anicut	1,556	415	Medium
Magalla	Anicut /Reservoir	7,440	5,654	Major
Maha Nanneriya	Reservoir		172	Medium
Mediyawa	Reservoir	2,595	486	Major
Moragoda		DNA	DNA	DNA
Morathi oya		N/A	N/A	DNA
Usgala Siyambalangamuwa	Reservoir	22,000	850	Major
Wennaruwewa	Reservoir	1,490	190	Medium
Maha Galgamuwa		6,537	163	Medium
Karawita	Anicut	N/A	DNA	Medium
Hiriyala Settlement scheme	Lift Irrigation	N/A	101	Medium
Wellangiriya Settlement Scheme	Lift Irrigation	N/A	85	Medium

N/A - Not applicable
DNA – Do not available

Table 4.5 - Major and minor Irrigation schemes in the Puttalam District
Source: Irrigation Department of Sri Lanka, Regional Office, Puttalam

Scheme	Mode of rigation	Mode of Irrigation	Capacity (Ac.ft)	Class
Inginimitiya*	Reservoir	Mee Oya	58,835	Major
Karawita*	Reservoir	Kolamuna oya	3,000	Major
Tabbowa*	Reservoir	Mee Oya	15,400	Major
Anavilundawa	Reservoir	Rathambala Oya (Deuru Oya)	DNA	Medium
Andanankattuwa	Reservoir	Sengal oya (Deuru Oya)	DNA	Medium
Eluwankulama	Reservoir	Kala Oya	210	Medium
Maha Uswewa	Reservoir	Mee Oya	3,400	Medium
Maiyawa	Reservoir	Rathambala Oya (Deuru Oya)	DNA	Medium
Pahariya	Reservoir	Mee Oya	1,800	Medium
Suruwila	Reservoir	Rathambala Oya (Deuru Oya)	DNA	Medium
Uriyawa	Reservoir	Mee Oya	1,040	Medium
Kottukachchiya	Reservoir	Mee Oya	3,870	Medium
Neela Bamma#	Anicut	Kala Oya	N/A	Medium
Wattakandal#	Anicut	Mee Oya	N/A	Medium
Pawattamadu#	Anicut	Mee Oya	N/A	Medium
Radavi Bendi Ela#	Anicut	Mee Oya	N/A	Medium

* Schemes over 400 ha capacity.
# Anicut (diversion) schemes
N/A – not applicable
DNA – Do not available

BOX 4 – Tabbowa Reservoir

This man-made reservoir was constructed by damming the Nanneri Oya, a major tributary of Mi Oya,for irrigation purposes. This tank and its environments are comes within the Karuwalagaswewa Sanctuary, which is considered as an important habitat for elephants and water birds. This area has rich fossiliferous soils that are rare in other parts of Sri Lanka. Jurassic sediments at Tabbowa are stimated to be 500 m in depth.

The wetland has a very rich biodiversity including its immediate environment consisting of tropical dry/mixed evergreen forest, scrubland and grassland communities. About 65 macrophytes have been identified in the wetland and its environments. In the periphery of the reservoir, trees and shrubs such as *Terminalia arjuna, Nauclea orientallis, Barringtonia ceylanica, Syzygium makull, Vitex lecoxylon* and *Caesalphia bonduce* have known to occupy. There are many economically valuable timber species (*Diospyros ebenum, Tectona grandis, Terminalia arjuna, Azadirachta indica and Manilkara hexandra*) around the reservoir. The reservoir also has exotic forms of freshwater fishes and provides a habitat for many water birds.

The introduction of the exotic tree species of *Eucalyptus camaldulensis* to reforestation programs in the area has contributed to the significant degradation of the vegetation cover in the immediate catchment. The spread of invasive alien *Prosopis juliflora* is another growing threat to the biodiversity in the area.

BOX 5 - Anaiwilundawa Tank Sanctuary

The total area of the Anaiwilundawa Tank Sanctuary is 1,397 ha in extent while the total tank area is 188 ha. It has an ancient system of 7 casacding tanks that dates back to the 12th century. This is mainly a rain fed tank with Rathambala Oya as another water supplier to this cascading tank system. Due to the unique biodiversity and its cultural heritage, the Anaiwilundawa Tank Sanctuary was declared as a Ramsar site in 2001. This is also recognized as a IBA site. Anaiwilundawa Tank Sanctuary has a rich floral and faunal biodiversity with 290 plant species (24 aquatic plants, 120 woody plants, 61 shrubs, 49 herbaceous and 34 climbers) and 282 vertebrate species (47 fish, 11 amphibians, 34 reptiles, 168 birds, 21 mammals) that have been recorded in the area.

Ground Water Resources

As the water scarcity is a huge problem in the NWP, the groundwater can be considered as an important water resource not only for household consumption but for agricultural purposes as well. Six types of groundwater aquifers have been adequately studied and characterized, and their location and distribution patterns have also been delineated and mapped (Sirimanne, 1952, 1968 and Arumugam 1966, 1974 and Fig. 4.9).

The six types of aquifers are;
1. Shallow Karstic Aquifer of Jaffna Peninsula
2. Deep Confined Aquifers
3. Coastal Sand Aquifers
4. Alluvial Aquifers
5. Shallow Regolith Aquifer of the Hard Rock Region
6. South Western Lateritic (Cabook) Aquifer

Out of these 6 aquifers, 5 are located in the NWP. Number of deep confined aquifers occurs within the sedimentary limestone and sandstone formations of the northwestern (Vanathaviilu) coastal plains. Three main types of coastal sand aquifers have been recognized and characterized in Sri Lanka, and out of which the shallow aquifers on coastal spits and bars found in the Kalpitiya peninsula. Until recently, the coastal sand aquifers in Kalpitiya area were under-utilized. The deeper and larger alluvial aquifers occur along the lower reaches of the major rivers such as Mahaweli Ganga, Kelani Ganga, Deduru Oya, Mi oya, Kirindi Oya, and Malwathu Oya.

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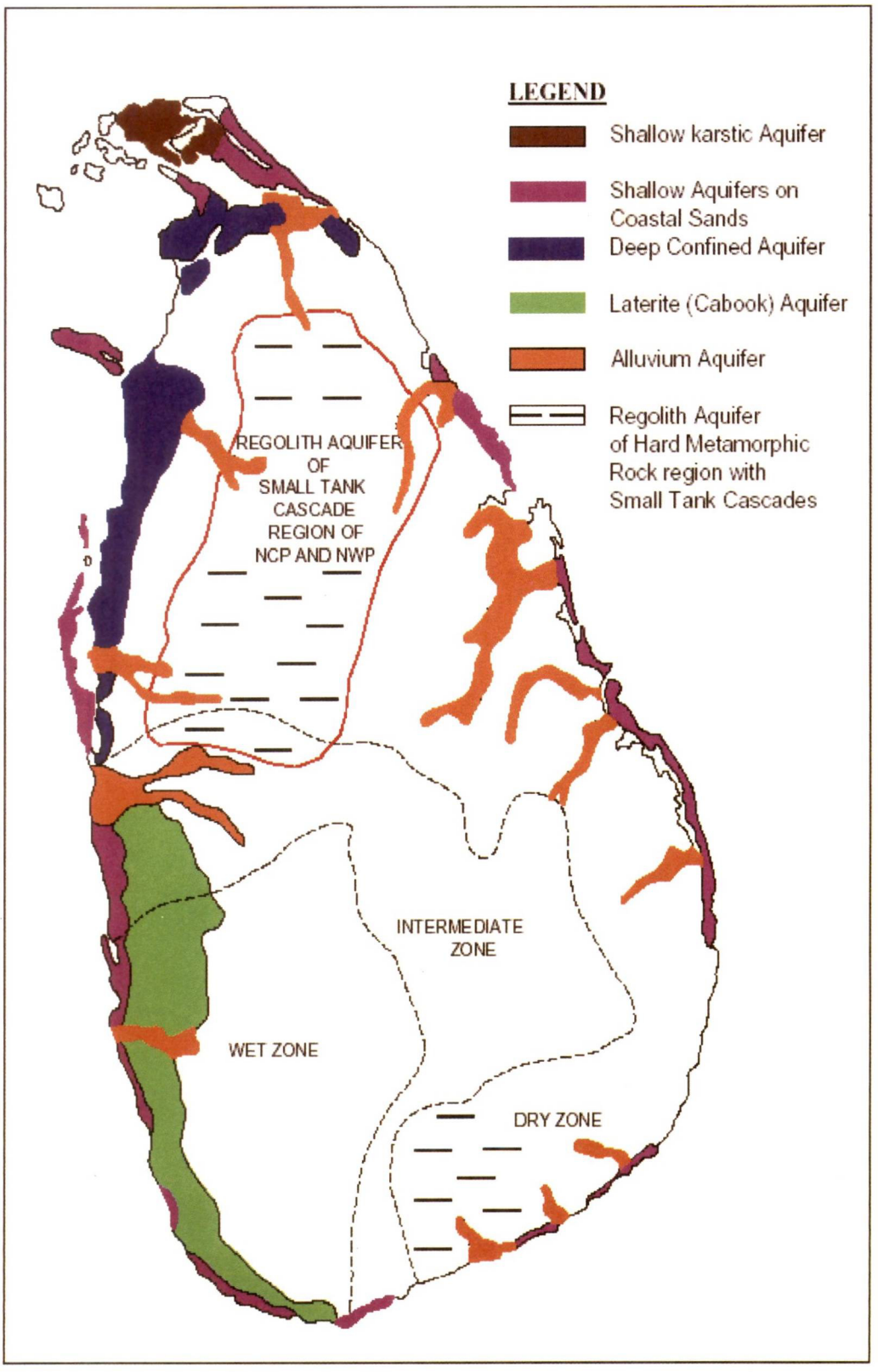


Fig. 4.9 - Different Types of Aquifers in Sri Lanka

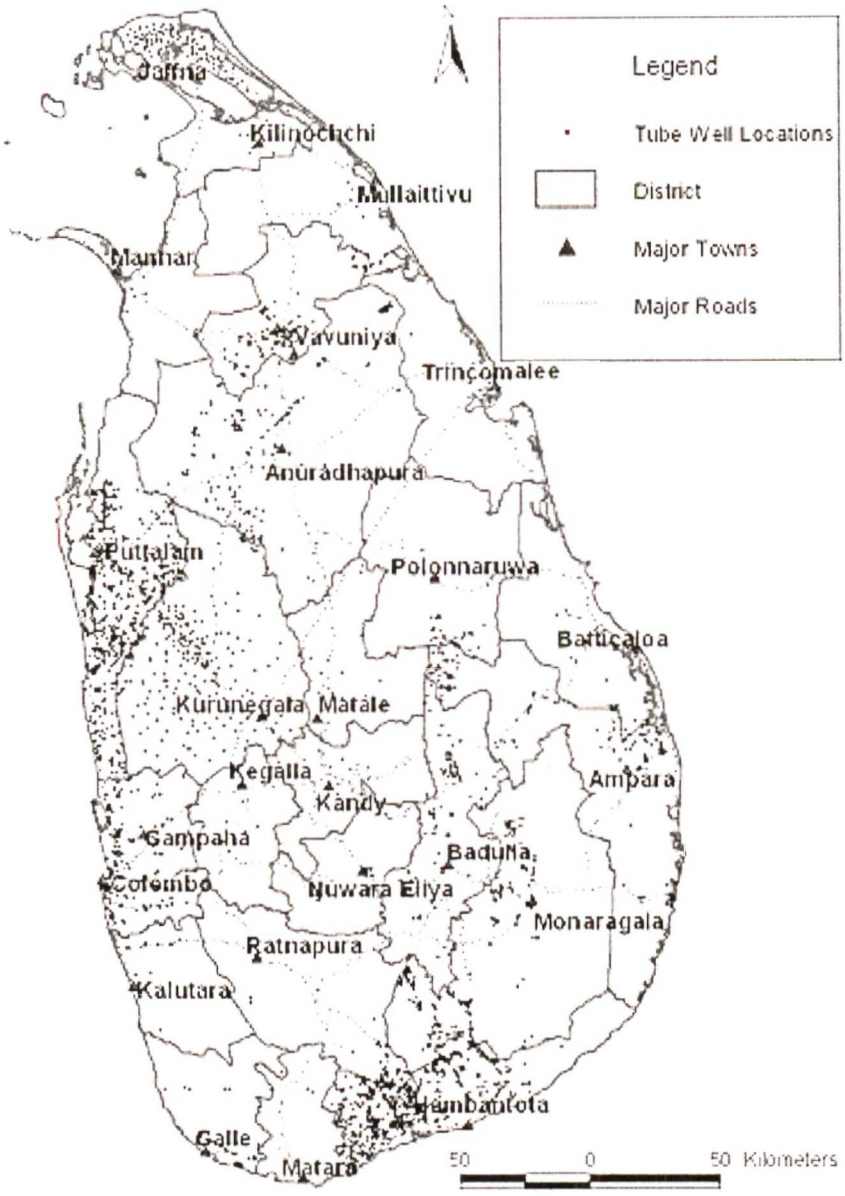


Fig. 4.10 - Distribution of tube well sites.
Source: WRB (Water Resources Board) Database.

Groundwater is a reliable water source for small farmers, particularly during drought periods when tank storage is not sufficient. In coastal sand aquifer located in the Kalpitiya Pennisular, there had been intensive use of the shallow groundwater for agriculture during the last two decades. The map on the distribution of tube wells in the island clearly shows that the NWP is one of the regions in Sri Lanka where there is a high concentration of tube wells (Fig. 4.10). Groundwater had been increasingly utilized for aquaculture ponds in Puttalam and Chilaw (Panabokke and Perera, 2005). Puttalam is one of the few districts where high dependence on ground water resources could be observed. From the total supply of water resources (surface and ground water), 97% is coming from groundwater resources in the Puttalam district while it is only 16% in the Kurunegala district (Table 4.5).

Table 4.6 - The amount of groundwater and its percentages of supply over total supply in urban, rural and industrial zones.
Source: Panabokke and Perera, 2005.

District	Total supply of surface an ground water resources (m3/day)	Supply of ground water resoures (m3/day)	Percentage (%) (From the total supply of water)	Percentage (%) (from the total surface water supply)
Kurunegala	11483.0	1800.0	15.6	84.4
Puttalam	8694.0	8424.0	96.8	3.2

Coastal and Marine

The 1585 km coastline of Sri Lanka is endowed with lagoons, estuaries and inlets with lesser distribution in the north and north-western coasts (Fig. 4.11). In Sri Lanka, lagoons and estuaries alone cover an area of 158,017 ha while 18, 839 ha of the coastline represent by other coastal water bodies. Puttalam district which represent the NW coastline has an area of 39,119 ha of lagoons and estuaries (24.8%) while other coastal water bodies cover an area of 3428 ha (18.2%) (Table 4.6). In 1990, the Coast Conservation Department of Sri Lanka (CCD) has mapped 45 basin estuaries and coastal lagoons, out of which only three represent the NW coastline. The 3 major brackish water bodies in the NW province are the Puttalam lagoon, Mundal lagoon and Chilaw lagoon. Eighty percent of the shrimp farms are located along a manmade canal (Dutch canal) which connects Daduru Oya, Mundal lagoon system and Puttalam lagoon.

Table 4.7 - The extent of coastal habitats in the Puttalam district
Source: Coast Conservation Department Interred Report No. 13: Report on the preparation of Coastal Habitats, 1986

Habitat	Extent (ha) Puttalam	Extent (ha) Sri Lanka	% from Sri Lanka	% from the total area of the district
Mangroves	3210	12,189	26.3	1.1
Salt Marshes	3461	23,819	14.5	1.2
Dunes	2689	7606	35.3	0.9
Beaches	2772	11,800	23.5	1.0
Barriers and Spits				
Lagoons	39,119	158,017	24.7	13.4
Estuaries				
Basins				
Other Water bodies	3428	18,839	18.2	1.2
Marshes	2515	9754	25.8	0.9

Coral Reefs

According to Swan (1983), about 2% of the coastline contains near shore fringing reefs. The growth of coral reefs around Sri Lanka is influenced mainly by the monsoons which has a major impact on the level of turbidity and fresh water input in the coastal waters. As a result, coral reef habitats are limited to areas having lower levels of sedimentation with semi-dry climates as found in the north-western and eastern coastal areas. Fringing coral reefs also occur around some of the islands around the Jaffna Peninsula. However, there is no exact quantification of the extent of coral cover in Sri Lanka, except the information on estimated distribution and their current conditions. Many

anthropogenic activities such as destructive fishing methods, coral mining for lime production and sedimentation are considered as major causes for the presence of high percentage of dead coral reefs in some areas including Puttalam. The destruction of coral reefs in the north-western of Sri Lanka is also through a coral predator known as 'Crown of thorns' Starfish (Rajasuriya and Rathnapriya, 1994). According to a survey conducted in 1984 by the Coast Conservation Department (CCD) in the south-western and southern coastal areas, revealed that 18,000 tons of coral is being supplied annually to the lime industry, indicating the enormity of this problem. Five important coral reefs (coral reef and sand shore reef off Talawila, two sand shore reefs in Kandakuliya and another near-shore coral reef in Kandakuliya) have been identified by De Silva and Rajasuriya (1989) along the coastline off Puttalam lagoon, with varying conditions (Table 4.7).

The Bar Reef Sanctuary off Kalpitiya in the NW coastline with an extent of approximately 306 sq.km (1011.6 ha) is one of the two marine sanctuaries in Sri Lanka, protected under the law. The reef is influenced by rough sea conditions during the southwest monsoons and also from turbid water that brings through several river outlets and also the Puttalam lagoon (Ohman *et al.,* 1993). Though it is declared as a sancturay in 1992, there is no existing management programme to conserve this unique ecosystem (Amarasinghe *et al.,* 2003). But nevertheless the Bar Reef has remained relatively undisturbed due to its inaccessible location.

Table 4.8 - Coral Reef Locations in the NW coast, their status and causes of damage or threats. Sources: De Silva, 1985; Rajasuriya & White 1995

Location	Status	Causes of Damage or Threats
Bar Reef Marine Sanctuary	Shallow coral area are partially damaged, deep coral area are in good condition	Crown of Thorns Starfish, destructive Fishing, uncontrolled harvesting, boat anchors
Kandakuliya	Shallow coral areas are heavily damaged	destructive fishing, boat anchors, uncontrolled harvesting
Talawila	Shallow coral areas are damaged	destructive fishing, boat anchors, uncontrolled harvesting
Chilaw	Partially damaged	destructive fishing, uncontrolled harvesting

Mangroves

Mangroves can be located in brackish coastal water bodies including estuaries and lagoons. In a report produced by the NARESA in 1991, 45 basin estuaries and lagoons have been mapped along the coast of Sri Lanka. According to this map, the NW coast has three true lagoons such as Puttalam lagoon, Mundel Lake and Chilaw lagoon. The mangroves are salt tolerant, woody, seed bearing plants occurring along sheltered intertidal coastlines in connection with estuaries and lagoons. Puttalam lagoon alone has a considerable area of mangrove coverage and its extent has been estimated to be about 2970 ha (Jayawardhana, 1986; Tables 4.8 and 4.9). Remote Sensing surveys have indicated that there is a considerable extent of mangrove coverage than it was estimated earlier (NSF, 2000). The mangrove ecosystems that fringe the Puttalam lagoon, Dutch Bay and Portugal bay complex alone is estimated at 3,385 ha (NSF, 2000).

Table 4.9 – Locations and extent of Mangrove vegetation (ha) around Puttalam lagoon in 1981 and 1992.
Source: Amarasinghe and Perera. 1995

Puttalam Lagoon	1981	1992	Change (1981-1992)
Daluwa-Palavi	77.7	36.7	- 41.0
Vettali	65.6	14.3	- 51.3
Anjittivu islands	6.1	8.4	+ 2.3
Mi Oya basin	664.6	398.6	- 266.0
Islets off Mi Oya	15.3	7.9	- 7.4
Tannkudah	9.6	9.4	- 0.2
Kanaludaha-Palliwasalthurai	52.1	31.4	- 20.7
Pullupidi Island	45.3	37.1	- 8.2
Udayarpidi Island	40.4	15.4	- 25.0
Mungil Aru	34.9	21.8	- 13.1
Nagamadu	-	5.5	+ 5.5
Serakkuli	51.7	35.3	- 16.4
Matuutivu Island	10.0	14.0	+ 4.0
Ambantativu Island	17.0	16.3	- 0.7
Wannimundel	14.0	13.0	- 1.0
Mandalakudah-Kurungipitiya	70.0	54.8	- 15.2
Neduntivu Islands	7.2	11.9	+ 4.7
Total	**1181.5**	**431.6**	**- 749.9**

Mangroves also located in the Anawilundawa Wetland Sanctuary and its periphery. The mangrove vegetation was found mainly on the banks of the Dutch canal and around Muthupanthiya Lagoon and also composed of common mangrove species (Table 4.9).

Table 4.10 – Locations and extent of Mangrove vegetation (ha) around Dutch Bay area in 1981 and 1992.
Source: Amarasinghe and Perera. 1995

Dutch Bay	1981	1992	Change (1981-1992)
Anniwasal	10.9	10.4	- 0.5
Vellaimanal	13.2	1.7	- 11.5
Kovikudaha	49.3	15.8	- 33.5
Odakarantivu Islands	29.9	21.8	- 8.1
Erumathivu Islands	63.1	66.7	+3.6
Kirimundel	91.5	100.6	+ 9.1
Sinna Arichchal Island	9.3	14.3	+ 5.0
Periya Arichchal Islands	29.7	30.8	+ 1.1
Total	**296.9**	**262.0**	**- 34.9**

Table 4.11 – The aerial extent of mangrove coverage in 6 districts of Sri Lanka as in the Land Use Map of the Survey Department.
Source: Survey Department of Sri Lanka.

District	Area (ha)
Colombo	9
Ampara	54
Gampaha	723
Trincomalee	1,020
Batticaloa	1,520
Puttalam	2,970
Total	**6,296**

The most of the destruction of these ecosystems take place through shrimp farming. Over 2,400 ha of coastal land between Chilaw and Puttalam alone (closely associated with Chilaw lagoon, Dutch canal, Mundel lake and Puttalam lagoon) have been developed for shrimp aquaculture. Many of these shrimp farms have established on mangrove areas (Table 4.11).

Table 4.12 – Type of vegetation and land use pattern of sites prior to the construction shrimp farms in some of the DS divisions in the Puttalam district.
Source: Centre for Rural Aquaculture Economics and Management, 2003

Name of the DS Division	Type of vegetation/land use prior to the establishment of the shrimp farm					
	Thick mangrove area	Thin mangrove area	Marshy land	Scrub land	Paddy land	Coconut land
Kalpitiya	-	9	3	1	-	1
Wanathavilluwa	1	4	-	1	-	-
Puttalam	-	1	-	2	-	-
Mundalama	1	8	3	2	-	-
Arachchikattuwa	-	5	2	2	2	3
Chilaw	1	-	2	-	-	4
Madampe	3	1	-	-	-	-
Mahawewa	-	1	-	-	-	1
Wennappuwa	-	1	2	-	-	1

Seagrass beds

The seagrass beds composed of rooted, seed-bearing marine plants occurring in shallow and sheltered ecosystems associated with estuaries and lagoons. These ecosystems are highly productive systems and their locations and extent have not been mapped precisely. However, an extensive occurrence of seegrass beds has been traced from Dutch Bay to the western end of the Jaffna peninsular (NSF, 2000). Seagrass beds are known to thrive in basin estuaries and lagoons in the Puttalam district (NSF, 2000). Seagrass ecosystems also recognized as nursery grounds and habitats of a number of marine organisms, including the threatened marine mammal called Dugong (*Dugong dugong*) (Colin and Bertram, 1970).

Salt Marshes

These are habitats (tidal flats) inundated with sea water. Salt marsh vegetation characterized by herbaceous, salt-tolerant plants and associated biota. In the Puttalam area, these are used for the collection of milkfish (*Chanos chanos*) for brackish water aquaculture (NSF, 2000) (Table 4.12). In the NW coastline, high saline coastal water bodies have been converted into saltpans.

Table 4.13 – Locations and extent of Salt Marshes around Puttalam lagoon and Dutch Bay area in the NW coastline in 1981 and 1992.

	1981	1992	Change (1981-1992)
Puttalam Lagoon			
Daluwa-Palavi	447.1	109.9	-337.2
Vettali	148.5	44.6	-103.9
Anjittivu islands	-	-	
Mi Oya basin	381.3	302.9	-78.4
Islets off Mi Oya	6.9	4.1	-2.8
Tannkudah	-	-	
Kanaludaha-Palliwasalthurai	273.3	109.8	-163.5
Pullupidi Island	na	6.8	
Udayarpidi Island	na	16.3	
Mungil Aru	46.2	28.9	-17.3
Nagamadu	na	9.0	
Serakkuli	na	6.7	
Matuutivu Island	na	-	
Ambantativu Island	na	2.1	
Wannimundel	-	-	
Total	**1303.3**	**640.9**	**-662.4**

Dutch Bay	**1981**	**1992**	**Change (1981-1992**
Anniwasal	42.0	3.8	-38.2
Vellaimanal	na	2.3	
Kovikudaha	na	9.3	
Odakarantivu Islands	na	5.8	
Erumathivu Islands	15.0	24.6	+9.6
Kirimundel	13.3	4.1	-9.2
Sinna Arichchal Island	na	1.88	
Periya Arichchal Islands	na	9.0	
Total	**70.3**	**60.5**	**-9.8**

Beaches and Dunes

Over one fourth of the Sri Lankan coastline is beach fringed with an extent of 11,800 ha. The coastline of the NWP in particular, is approximately 120 km in length and includes several lagoons, estuarine systems and connected water areas. But no information available on the distribution and exact extents of the beaches and dunes along the NW coast of Sri Lanka. However, Kalpitiya peninsula has endowed with many sand dunes which are under continous threat from the sand miners.

UNIQUE AND INTERNATIONALLY IMPORTANT ECOSYSTEMS

Anawilundawa Sanctuary

The Anawilundawa Wetland sanctuary has an extent of 1400 ha and located between the coast and the Negambo-Puttalam railway, in the Puttalam district of the North Western Province of Sri Lanka. On the account of the rich bird diversity in the ecosystem, the Department of Wildlife Conservation (DWLC) has declared it as a Sanctuary in June, 1997, under the provisions given by the Fauna and Flora Protection Ordinance. Later recognizing its unique biodiversity, cultural heritage and its value as a feeding ground for migratory waterfowl, Anawilundawa wetlands have been recognized as a Wetland of International Importance under the Ramsar Convention in August 2001. Sri Lanka has only three Ramsar sites and Anawilundawa is one of them.

Bar Reef Sanctuary

The Bar Reef Sanctuary off Kalpitiya in the NW coastline with an extent of approximately 306 sq.km (1011.6 ha) is one of the two marine sanctuaries in Sri Lanka, protected by the law. In 1992, this area encompassing coral reefs, sandstone reefs, soft bottoms and seagrass beds was declared as the Bar Reef Marine Sanctuary in order to protect threatened sub-tidal ecosystems and associated biodiversity. According to the IUCN-Sri Lanka, information has been gathered for the declaration of the Bar Reef Sanctuary as the country's first marine Ramsar site. Recent survey has revealed that there is a year round abundance and diversity of marine mammals and suggested that the northern and central areas may be considered a cetacean 'hotspot'.(www.nation.lk/2007/06/10/special3.htm). In another joint proposal formulated between the Environment Ministry and IUCN, suggested a larger marine and coastal area spanning 700,000 hectares north of Kalpitiya (including Trincomalee Bay, Pigeon Island, the Gulf of Mannar cluster which includes Palk Bay, Mannar Island, Adams Bridge, Dhanuskodi in Sri Lanka and Rameshwaram in India) be declared as a Man and Biosphere (MAB) reserve. Any future development projects in the NW coast of Sri Lanka should be carried out with caution with these new initiatives taken by the authorities to declare this area as an internationally protected area.

CHAPTER 5

SPEICIES PROFILE

Floristic Diversity

Information on floristic diversity was taken from number of sources for different vegetation types. Without making a single list of all plants for the NWP, separate lists of flora were prepared for different ecosystems for easy reference (Tables 5.1, 5.2 and Appendices A and B).

Table 5.1 - List of True Mangrove and Mangrove associated species in Puttalam lagoon and Dutch Bay

True Mangrove Species	Mangrove Associated Species
1. *Acanthus ilicifolius*	1. *Acrostichum aureum*
2. *Aegiceras corniculatum*	2. *Ardisia eliptica*
3. *Avicennia marina*	3. *Calophyllum inophyllum*
4. *Bruguiera cyllindrica*	4. *Cassia auriculata*
5. *Bruguiera gymnorhiza*	5. *Cerbera manghas*
6. *Ceriops tagal*	6. *Cissus quadrangularis*
7. *Cynometra iripa*	7. *Clerodendron inerme*
8. *Excoecaria agallocha*	8. *Cordia subcordata*
9. *Lumnitzera racemosa*	9. *Cryptolepis buchanania*
10. *Rhizophora apiculata*	10. *Derris uliginosa*
11. *Rhizophora mucronata*	11. *Flagellaria indica*
12. *Scyphiphora hydrophyllaceae*	12. *Gyrocarpus sp.*
13. *Sonneratia alba*	13. *Hibiscus tiliaceus*
14. *Xylocarpus granatum*	14. *Indigofera sp.*
	15. *Ipomoea maritime*
	16. *Pemphis acidula*
	17. *Phoenix sp.*
	18. *Premna integrifolia*
	19. *Salicornia brachiata*
	20. *Salvodora persica*
	21. *Sesuvium portulacastrum*
	22. *Sueda maritime*
	23. *Sueda monoica*
	24. *Sueda nudiflora*
	25. *Syzygium cumini*
	26. *Tamarix gallica*
	27. *Thespesia populnea*
	28. *Typha sp.*
	29. *Vitis carnosa*

(Amarasinghe, 1989).

Sea grass Ecosystems

Table 5.2 - Sea grass species recorded from the Puttalam lagoon.

Seagrass Species
Enhalus acaroides
Thalassia hemprichii
Halodule uninervis
Siringodium isoetifolium
Cymodocea rotundata
Cymodocea serrulata
Halophila ovalis
Halophila decipiens

(Jayasuriya, 1991)

Faunal Diversity

The faunal diversity also have been listed for different ecosystems separately rather than preparing a single list for the whole province (Appendices C, D, E, F, G, H, I, J, K and L).

Table 5.3 - Finfish and shellfish species reported to occur in Puttalam lagoon

Family	Scientific name	Common name
Finfish		
Anguillidae	*Anguilla bicolor (Juveniles)*	Kalu aandha
Ariidae	*Arius subrostratus*	Ura angulawa
	Arius thalassinus	Hora angulawa
Bagridae	*Macrones tengura*	Iri ankutta
Carangidae	*Caranx sem*	
	Parastramateus niger	Kalu vavalaya
	Scomberoides commersonianus	Kattawa
	Atule mate	Kaha parawa
	Trachinotus blochii	Kukulamaha
Chanidae	*Chanos chanos*	Vekkaya
Cichlidae	*Oreochromis mossambicus*	Thilapia
	Etroplus suratensis	Koralia
Clupeidae	*Nematalosa nasus*	Koiya
	Ophistopterus tardoore	Thottawa
	Ilisha megaloptera	Puvalia
	Escualosa thoracata	Sudu sudaya
	Sardinella longiceps	Pesalaya
	Sardinella albella	Sudaya
	Dussumieria acuta	Thondaya
	Tenualosa toli	Seriya
Cyanoglossidae	*Cyanoglossus sp.*	
Elopidae	*Elops machnata*	Mannawa
Gerreidae	*Gerres oyena*	Thiraliya
	Gerres filamentosus	Thiralia
Hemiramphidae	*Hemiramphus sp.*	Moralla
Lactarriidae	*Lactarius lactarius*	Pulunna
Latidae	*Lates calcarifer*	Moda (Koduwa)

Family	Scientific name	Common name
Lathrinidae	*Lethrinus lentjan*	Meewetiya
	Lethrinus nebulosus	Meewetia
Leiognathidae	*Leiognathus splendens*	Katukaralla
	Secutor insideator	Karalla
Lutijanidae	*Lutijanus fulviflamma*	Ranna
	Mugil cephalus	Serayawa
	Liza vaiglensis	Godaya
Mullidae	*Upeneus bensasi*	Nagariya
	Upensues taniopterus	Kahairi nagariya
Platycephalidae	*Platycephalus indicus*	Ariala
Plotosidae	*Plotosus limbatus*	Magure
Polynemidae	*Elutheronema tetradactylum*	Kalawa
	Polynemus microstoma	Kalawa
Scaridae	*Scarus russeli*	Girawa
Scatophagidae	*Scatophagus argus*	Ilattiya
Sciaenidae	*Johnius belangerii*	
	Johnius carouna	Kaththalaya
	Otolithus rubber	Pannawa
	Otolithus cuvieri	Muhudu mandaliya
	Dendrophysa russeli	
	Protonibea dicanthus	Gal mandaliya
	Rastrelliger kanagurta	Kumbalawa
Scombridae	*Epinephalas tauvina*	Kossa
Serranidae	*Siganus javus*	Iri orawa
Siganidae	*Siganus canaliculatus*	Bada orawa
	Sillago sihama	Kalanda
Silliganidae	*Sphyraena jello*	Jeelawa
Sphyraenidae	*Pampas argenteus*	Sudu vavalaya
Stromateidae	*Hippocampus kuda*	Muhuda aswaya
Syngnathidae	*Terapon puta*	Keeliya
Terapontidae	*Terapon jarbua*	
Tricanthidae	*Tricanthus sp.*	Thunkatta
Crustaceans	*Penaeus monodon*	Karandu issa
	Penaeus indicus	Kiri issa
	P. merguensis	Kiri issa
	P. semisulcatus	Kurutu issa
	Metapenaeus dobsoni	Weli issa
	Scylla serrata	Kalapu kakuluwa
	Portunus pelagicus	Sinnakkali
	Thalassina anomala	

Amarasinghe *et al.*, 2003

Table 5.4 – A list of migratory shorebirds and other birds in the Mundel Lake.

English Name	Scientific Name
SHOREBIRDS	
1. Red- wattled Lapwing (R)	*Vanellus indicus*
2. Grey Plover (M)	*Pluvialis squatarola*
3. Pacific Golden Plover (M)	*Pluvialis dominica*
4. Greater Sandplover (M)*	*Charadrius leschenaultii*
5. Ringed Plover (M)*	*Charadrius hiaticula*
6. Little Ringed Plover (R, M)*	*Charadrius dubius*
7. Kentish Plover (R, M)*	*Charadrius alexandrinus*
8. Lesser Sandplover (M)*	*Charadrius mongolus*
9. Whimbrel (M)	*Numenius phaeopus*
10. Eurasian Curlew (M)	*Numenius arquata*
11. Black-tailed Godwit (M)	*Limosa limosa*
12. Bar-tailed Godwit (M)	*Limosa lapponica*
13. Redshank (M)	*Tringa totanus*
14. Marsh Sandpiper (M)	*Tringa stagnatilis*
15. Greenshank (M)	*Tringa nebularia*
16. Nordmann's Greenshank (MR)	*Tringa guttifer*
17. Green Sandpiper (M)	*Tringa ochropus*
18. Wood Sandpiper (M)	*Tringa glareola*
19. Terek Sandpiper (M)	*Xenus terek*
20. Common Sandpiper (M)	*Actitis hypoleucos*
21. Turnstone (M)	*Arenaria interpres*
22. Red Knot (M)	*Calidris canutus*
23. Great Knot (M)	*Calidris tenuirostris*
24. Little stint (M)	*Calidris minutus*
25. Curlew Sandpiper (M)	*Calidris ferruginea*
26. Broad-billed Sandpiper (M)	*Limicola falcinellus*
27. Black-winged Stilt (R)	*Himantopus himantopus*
28. Stone Curlew (R)	*Burhinus oedicnemus*
29. Great Stone Plover (R)	*Esacus magnirostris*
OTHER SPECIES	
30. Indian shag (R)	*Phalacrocorax fuscicollis*
31. Little Cormorant (R)	*Phalacrocorax niger*
32. Grey Heron (R)	*Ardea cinerea*
33. Purple Heron (R)	*Ardea purpurea*
34. Little Green Heron (R)	*Butorides striatus*
35. Pond Heron (R)	*Ardeola grayii*
36. Cattle Egret (R)	*Bubulous ibis*
37. Large Egret (R)	*Egretta alba*
38. Median Eget (R)	*Egretta intermedia*
39. Little Egret (R)	*Egretta garzetta*
40. Night Heron (R)	*Nycticorax nycticorax*
41. Yellow Bittern (R)	*Ixobrychus sinensis*
42. Black Bittern (R)	*Dupetor flavicollis*
43. Open-bill Stork (R)	*Anastomus oscitans*
44. Lesser Adjutant Stork (R)	*Leptoptilos javanicus*
45. Spoonbill (R)	*Platalea leucorodia*
46. Lesser Tree-Duck (R)	*Dendrocygna javanica*
47. Pintail (M)	*Anas acuta*
48. Gargany (M)	*Anas querquedulla*
49. Black-winged Kite (R)	*Elanus caerulus*
50. Brahaminy Kite (R)	*Haliastur Indus*
51. Shikra (R)	*Accipiter badius*
52. White-bellied Sea-Eagle (R)	*Haliaeetus leucogaaster*

	English Name	Scientific Name
53.	Pale Harrier (M)	*Circus macrourus*
54.	Crested Serpent-Eagle (R)	*Spilornis cheela*
55.	Osprey (M)	*Pandion haliaetus*
56.	Kestrel (M)	*Falco tinnunculus*
57.	Grey Partrige (R)	*Francolinus pondicerianus*
58.	Purple Coot (R)	*Porphyrio porphyrio*
59.	Brown- headed Gull (M)	*Larus brunnicephalus*
60.	Black-headed Gull (M)	*Larus ridibundus*
61.	Whiskered Tern (M)	*Chlidonias hybrida*
62.	White-winged Tern (M)	*Chlidonias leucopterus*
63.	Gull-billed Tern (M)	*Gelochelidon nilotica*
64.	Caspian Tern (R, M)	*Hydroprogne caspia*
65.	Common Tern (M)	*Sterna hirundo*
66.	Little Tern (R)	*Sterna albifrons*
67.	Large Crested Tern (R)	*Sterna bergii*
68.	Lesser Crested Tern (M)	*Sterna bengalensis*
69.	Orange-breasted Green Pigeon (R)	*Treron bicincta*
70.	Spotted Dove (R)	*Streptopelia chinensis*
71.	Rose-ringed Parakeet (R)	*Psittacula krameri*
72.	Pied Crested Cuckoo (R)	*Clamator jacobinus*
73.	Koel (R)	*Eudynamys scolopacea*
74.	Common Coucal (R)	*Centropus sinensis*
75.	House swift (R)	*Apus affinis*
76.	Palm Swift (R)	*Cypsiurus parvus*
77.	Crested Tree-swift (R)	*Hemiprocne longipennis*
78.	Common Kingfisher (R)	*Alcedo atthis*
79.	Stork-billed Kingfisher (R)	*Pelargopsis capensis*
80.	White-breasted Kingfisher (R)	*Halcyon smyrnensis*
81.	Blue-tailed Bee-eater (M)	*Merops philippinus*
82.	Green Bee-eater (R)	*Merops orientalis*
83.	Indian Roller (R)	*Coracias bengalensis*
84.	Hoopoe (R)	*Upapa epops*
85.	Brown-headed Barbet (R)	*Megalaima zeylanica*
86.	Golden-backed Woodpecker (R)	*Dinopium benghalense jaffense*
87.	Red-backed Woodpecker (R)	*Dinopium benghalense psarodes*
88.	Black-backed Woodpecker (R)	*Chrysocolaptes festivus*
89.	Bush Lark (R)	*Mirafra assamica*
90.	Ashy-crowned Finch Lark (R)	*Eremopterix grisea*
91.	Eastern Skylark (R)	*Alauda gulgula*
92.	Sand Martin (M)	*Riparia riparia*
93.	Barn Swallow (M)	*Hirundo rustica*
94.	Brown Shrike (M)	*Lanius cristatus*
95.	Black-headed Oriole (R)	*Oriolus xanthornus*
96.	White-bellied Drongo (R)	*Dicrurus caerulescens*
97.	Ashy Swallow-Shrike (R)	*Artamus fuscus*
98.	Brahminy Mynah (R)	*Sturnus pogodarum*
99.	Rosy Paster (R)	*Sturnus roseus*
100.	Common Mynah (R)	*Acridotheres tristis*
101.	House Crow (R)	*Corvus slpendens*
102.	Black Crow (R)	*Corvus macrorhynchos*
103.	Wood-Shrike (R)	*Tephrodornis pondicerianus*
104.	Common Iora (R)	*Aegithina tiphia*
105.	Red-vented Bulbul (R)	*Pycnonotus cafer*
106.	White-browed Bulbul (R)	*Pycnonotus luteolus*
107.	Common Babbler (R)	*Turdoides affinis*

	English Name	Scientific Name
108.	Wren Warbler (R)	*Prinia subflava*
109.	Ashy Prinia (R)	*Prinia socialis*
110.	Large Prinia (R)	*Prinia sylvatica*
111.	Common Tailor-Bird (R)	*Orthotomus sutorius*
112.	Hume's Whitethroat (M)	*Sylvia althaea*
113.	Magpie Robin (R)	*Copsychus saularis*
114.	Richard's Pipit (M)	*Anthus novaeseelandiae richardi*
115.	Indian Pipit (R)	*Anthus rovaeseelandiae malayensis*
116.	Purple-rumped Sunbird (R)	*Nectarinia zeylonica*
117.	Purple Sunbird (R)	*Nectarinia asiatica*
118.	Loten's Sunbird (R)	*Nectarinia lotenia*
119.	House Sparrow (R)	*Passer domesticus*

(M) – Winter Migrant
(R) – Resident
(MR) – Rare Migrant
(R, M) - Both resident & migrant populations are present.

Donkey (Ass) Population

The ass (*Equus africanus*) was introduced to Sri Lanka many centuries ago by the Arab traders and become naturalized in the north-western coastal areas of the island. They have been used to transport salt by the traders. After so many decades a small isolated populations of ass still can be seen in the area. According to a study carried out in 1995, the density of this ass population was determined as 16.8 per sq.km (Santiapillai *et al.*, 1999). In the study, the researchers have recorded 101 individuals and the area covered in the study transect was 6 sq.km. They also indicated the fact that the survival of this ass population has been threatened due to loss of habitat as a result of shrimp farming, tourist developments and refugee settlements, and stressed the importance of their immediate management and protection through habitat conservation. In 1998, another survey conducted by then Provincial Secretary Mr. Chadrasiri Bandara and claimed that there is a population of approximately 500 individuals in the Kalpitiya area alone (Lankadeepa on the 29th April 2007 by P.K. Kankanamge). There is a belief among the locals that the coconut beetle population drops when asses neigh and therefore they have been reared in coconut plantations.

CHAPTER 6

IN SITU CONSERVATION

In-situ conservation is considered as the best method to conserve the biological diversity in different ecosystems. In this concept, identifying and demarcating 'protected areas' has become the most popular mechanism towards *in situ* conservation in this country. Many forest patches through out the country have already been categorized as protected areas (PAs) while others have been proposed to be categorized as PAs. Although about 23% of the country is under some sort of protection, only 12 % is under complete protection. But still, this is a very significant allocation compared to other regional countries.

PROTECTED AREAS

According to the Fauna and Flora Protection Ordinance established in 1938, 5 categories of protected areas have been listed; Strict Nature Reserves, National Parks, Nature Reserves, Jungle Corridors and Intermediate Zones. Out of these categories 4 are still exist (Strict Nature Reserves, National Parks, Nature Reserves and Jungle Corridors). Three other categories were introduced in 1993 (Act no. 49) by amending the Fauna and Flora Ordinance in Sri Lanka. The introduced categories are Refuges, Marine Reserves and Buffer Zones. Altogether there are 8 categories (including Sanctuaries) of PAs administered by the Department of Wild Life and Conservation of Sri Lanka (DWLC). No areas have been declared up to now under the three new categories introduced in 1993.

The protected area network of Sri Lanka that comes under the direct control of DWLC has only three Strict Nature Reserves and none of them found in the North Western Province. Out of 14 declared National Parks, some parts of the Wilpattu National Park (Blocks 1, 2 and 5) come under the Puttalam district in the NW province (Fig. 6.1). Five Sanctuaries have been located in the NW province which includes the Bar Reef Marine, Kahalla-Pallekelle, Kimbulwana Oya, Anawilundawa and Tabbowa. The total extent of land designated as Sanctuaries and National Parks in the NW province is 56,442 and 83,459 ha respectively (18.4% and 16.5% respectively from the total extent of land that comes under these two protective area categories in Sri Lanka).

The protective land area directly comes under the administration of the Forest Department (FD is mostly confined to the Wet Zone while DWLC-controlled areas largely occur in the Dry Zone of the country. According to this categorization, from the total land area comes under the protection of the FD (140,921 ha), 37,819 ha of land area is designated as Forest Reserves (FR) while 103,102 ha as Proposed Reserves (PR). The land area designated as Forest Reserves in the NW province is about 8.1% from the total area of Forest Reserves in Sri Lanka and 17.5% for Proposed Reserves. Therefore, 13.3% of land in the NWP comes under the direct management of the Forest Department while a larger extent of land (18.7%) is administered by the DWLC (Table 6.2).

Table 6.1: Extent and designations of forest types in the Kurunegala and Puttalam districts managed by the Forest Department and Department of Wildlife and Conservation, Sri Lanka. Nationally designated protected areas come under FD and DWLC are listed here. The information listed here was extracted from three different sources; NCR (1997), FSMP (1995) and GAP (2006). NCR and FSMP give similar information for PAs under FD.

Name Forest Department	National Designation	Area GIS (ha) (GAP/NRC/FSMP)	District
Ambalanmukalana	FR	1180.80	Kurunegala
Angurukandayaya	PR	125.30	Puttalam
Arachchikotuwa	PR	6.40	Puttalam
Attavillu	FR	8695.30	Puttalam
Attavillu	PR	462.90	Kurunegala
Badagamuwa	FR	241.00	Kurunegala
Badapeliyagoda	FR	45.70	Kurunegala
Banhedawaka	PR	158.40	Kurunegala
Barigoda	FR	147.80	Kurunegala
Dambuwa	PR	74.30	Kurunegala
#Dambuwa	PR	1772.03	Kurunegala
#Dambuwa	PR	27.17	Kurunegala
Dampitiya	PR	62.10	Kurunegala
Dawatagolla	FR	56.10	Kurunegala
#Dawatagolla	FR	51.40	Kurunegala
Degadaturawa	PR	268.30	Kurunegala
Dewalakanda	FR	111.03	Kurunegala
Digalla	FR	60.85	Kurunegala
Digalla	FR	13.72	Kurunegala
Digalla	FR	27.60	Kurunegala
Dikkele mukalana	FR	324.53	Kurunegala
Doluwakanda	PR	499.15	Kurunegala
Dunkanda	PR	488.41	Kurunegala
Elawaka	PR	67.60	Kurunegala
#Elawaka	PR	95.40	Kurunegala
Galkiriyakanda	PR	1208.70	Kurunegala
Galketiyagama	PR	122.28	Kurunegala
Getadiwula	PR	573.34	Kurunegala
Etaritiya	PR	1482.75	Puttalam
Gonagama	PR	467.09	Kurunegala
Gorakadola	FR	230.03	Kurunegala
Habilikanda	PR	198.11	Kurunegala
Henegedaralanda	PR	671.24	Kurunegala
*Ipologama	PR	4805.10	Puttalam
Iriminna	FR	16.68	Kurunegala
Kadawatkele	PR	258.03	Kurunegala
Kaduruwewa	PR	102.04	Kurunegala
Kala oya	PR	5127.53	Kurunegala
Kalugala	PR	3149.28	Kurunegala
Kalugalkanda	PR	197.33	Kurunegala
Kankaniyamulla	FR	310.54	Kurunegala

Name Forest Department	National Designation	Area GIS (ha) (GAP/NRC/FSMP)	District
Kanugollayaya	PR	254.09	Kurunegala
Kendahena	FR	77.23	Kurunegala
Kendahena	PR	109.21	Kurunegala
Kirindigolla	FR	26.6	Kurunegala
Kirindigolla	FR	185.26	Kurunegala
Kumbalpola	PR	79.03	Kurunegala
Kumbalpola	FR	31.58	Kurunegala
Likolawewa	FR	63.81	Kurunegala
Likolawewa	FR	3382.35	Kurunegala
Maeliyakanda	FR	261.10	Kurunegala
Manapaya	PR	318.90	Kurunegala
Manuwangama-Nariyagama	FR	385.70	Puttalam
Maragalkanda	FR	125.39	Kurunegala
Mawattagama	PR	2178.80	Kurunegala
Meeambakanda	FR	160.38	Kurunegala
Minuwangeta	PR	22.11	Kurunegala
Minuwangeta	PR	624.43	Kurunegala
Mipitikanda	PR	284.38	Kurunegala
Moragolla	FR	24.24	Kurunegala
Moturampatana	PR	110.19	Kurunegala
Moturampatana	PR	319.98	Kurunegala
Mudungoda	PR	832.15	Kurunegala
Nakele	PR	93.12	Puttalam
Nawagatta	PR	54.30	Kurunegala
Nelawa	FR	57.92	Kurunegala
Nelligalkanda	FR	77.55	Kurunegala
Neugalkanda	PR	417.5	Kurunegala
Nikawekanda	PR	140.87	Kurunegala
Nugampola	PR	486.55	Kurunegala
Pallekelle	FR	74.30	Kurunegala
Pallekelle	FR	15173.10	Kurunegala
Pallekelle	FR	9.93	Kurunegala
Pallekelle	FR	35.13	Kurunegala
Pallekelle	FR	71.89	Kurunegala
Pannagama	PR	193.46	Kurunegala
Pannawa-Geppalawa	PR	389.81	Kurunegala
Pansalhinna	PR	131.89	Kurunegala
Panwewa	FR	247.94	Kurunegala
Paragaharuppu	FR	50.95	Kurunegala
Polgolla	FR	68.17	Kurunegala
Polkatukanda	FR	155.33	Kurunegala
Potuwewa	PR	219.94	Kurunegala
Rambodagalla	PR	124.78	Kurunegala
Sangappale	PR	4536.46	Kurunegala
Sawarangalawa	PR	7096.05	Kurunegala/Puttalam
Sellakanda	FR	3779.5	Puttalam

Name Forest Department	National Designation	Area GIS (ha) (GAP/NRC/FSMP)	District
Sundapola	PR	60.02	Kurunegala
Sundapola	PR	143.02	Kurunegala
Sundapola	PR	78.40	Kurunegala
Talagomuwa	FR	58.33	Kurunegala
Timbiriwewa	PR	1043.59	Kurunegala
Timbiriwewa	PR	313.32	Kurunegala
Tonigala	PR	1546.15	Puttalam
Tonigala	FR	747.49	Puttalam
Udapolakanda	PR	98.26	Kurunegala
Unaliya	PR	1540.03	Puttalam
Wanniyagama	PR	15843.60	Puttalam
Waulkele	FR	22.13	Kurunegala
Weerakulicholai-Elavankulam	PR	30664.76	Puttalam
Weherabandikele	PR	334.22	Puttalam
Welikumbura	FR	64.83	Kurunegala
Weuda mukalana	FR	144.67	Kurunegala
*Wilpotha	PR	2683.60	Puttalam
Yakdessakanda	PR	1464.86	Kurunegala
Yatale	PR	61.53	Kandy/Kurunegala
Total Area under FD		**140,920.93**	

Department of Wildlife Conservation	National Designation	Area (Ha)	GIS (Ha)	Distric	Date of declaration
Bar reef marine (Welipara)	S	30670.0	28036.00	Puttalam	1992.04.03
Kahalla-Pallekelle	S	21690.0	23172.50	Anuradhapura/Kurunegala	1989.07.01
Kimbulwana oya	S	492.1	610.00	Kurunegala	1963.06.21
Anawilundawa	S	1397.0	-	Puttalam	1997.06.11
Wilpattu Block 1	NP	54953.2	-	Anuradhapura/Puttalam	1938.02.25
Wilpattu Block 2	NP	7021.4	-	Puttalam	1938.02.25
Wilpattu Block 5	NP	21484.8	-	Puttalam	1938.02.25
*Tabbowa	S	2193.0	22696.08	Puttalam	
Total Area under DWLC		**139,901.50**			

Source: Sri Lanka Forestry Sector Master Plan (1995), Ministry of Agriculture, Lands and Forestry.
* not listed in the GAP Report.
# Listed in the GAP report but not in the NRC and FMP reports. The PAs listed in the GAP does not indicate the district of each PA and therefore the district of those 'new' PAs not given in this table.

Table 6.2 – The summary of the protected areas administered by the Forest Department and Department of Wildlife Conservation, Sri Lanka.

Protected Area Category	Extent of Land in the NW Province (ha)	Total Extent of Land under each PA category (Sri Lanka)** (ha)	As a % of the total land area under each category
FD protected Areas			
Forest Reserves	37,819	466,335	8.1%
Proposed Reserves	103,102	589,388	17.5%
Sub Total	**140,921**	**1,055,723**	**13.3%**
DWLC protected Areas			
Sanctuaries	56,442	284,117	19.9%
National Parks	83,459	462,448	18.0%
Sub Total	**139,901**	**746,565**	**18.7%**

** Gap Analysis Report, 2006

Out of all 4 categories of Protected Areas listed here, the NW province alone takes in about 15.6% from the total extent of protected land in Sri Lanka.

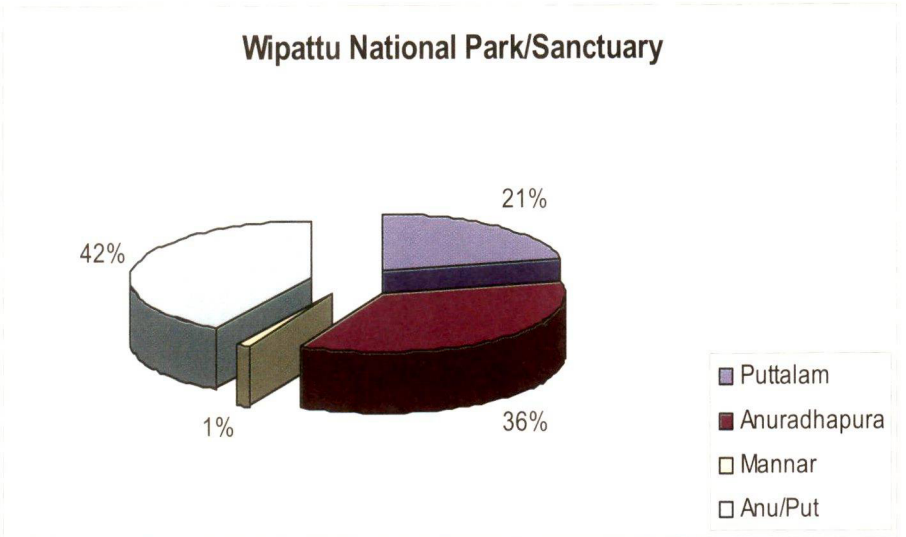


Fig. 6.1 – In the Wilpattu National Park, the extent of land area (%) represented by four districts.

ARCHAEOLOGICAL RESERVES

In the biodiversity conservation, archeological reserves also play an important role though it is not duly recognized. These archeological reserves play a dual role in conservation; archelogical site as well as the associated flora and fauna. There are 56 archelogical reserves situated in 10 DS divisions within the NWP, where 54 sites located in the Kurunegala district and 2 sites in the Puttalam district (Table 6.3).

Table 6.3 - Archaeological Reserves in the NWP of Sri Lanka
Source: Department of Archaeology, Sri Lanka

District	DS Division	Village	Land Name and details	Land Extent A/R/P	Gazette Number	Date
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 1, Panduwasnuwara Jungle	00/00/33	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 2, Area of the Panduwasnuwara Ancient Palace Ruins	17/01/05	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 2 1/2, Moat	01/02/33	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 3, Panduwasnuwara Moat	00/02/15	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 25, Jungle	00/00/29	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 26, Panduwasnuwara Jungle	10/00/35	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 28C, Panduwasnuwara Polwatta	00/02/23.5	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 28D, Panduwasnuwara - Nagas Jungle	04/03/16	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 29A, Panduwasnuwara Polwatta	00/00/23.4	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 42A, Panduwasnuwara Polwatta	00/00/20.3	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 43, Panduwasnuwara Polwatta	00/01/10	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 48A, Panduwasnuwara Polwatta	00/01/15.8	7851	30-Apr-31
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 48B, Panduwasnuwara Polwatta	00/00/17	7851	30-Apr-31

District	DS Division	Village	Land Name and details	Land Extent A/R/P	Gazette Number	Date
Kurunegala	Hettipola	Ambagahawewa	Final Village Plan 1708, Lot No. 48, Panduwasnuwara Hena	00/03/31	7851	30-Apr-31
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 1 Rajasanthakadun Kanda Land	24/00/21.22	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 2, Pansalmulle Rajasanthaka Land	11/00/12.1	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 3 Vana Ela	00/00/15.1	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 4 Gedarawela Pillewaga Ela	00/02/8.4	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 5 Kadurugas Devaliya	00/01/9.3	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 6 Aluthwewa	00/01/11.5	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 7 Gedaravelapillewa	06/02/8.8	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 8 Pansal ,Mullewewa	05/01/34.7	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 9 Horowwa, Ela	00/01/23.8	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 10 Aluthwewahena	00/02/12.7	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 11 Foot Path	00/00/5.5	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 12, Pansal Mullehenyaya	04/01/21.6	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 13 Madukanda Jungle	05/03/21	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 14 Pansalmulleela	00/02/17.5	7690	24-Jun-27
Kurunegala	Ganewatta	Arankele	Preliminary Plan 5303, Lot No. 15, Agara	00/00/28.6	7690	24-Jun-27
Kurunegala	Hettipola	Bathalagodawewa	Final Village Plan 1690, Lot No. 9, Panduwasnuwara Moat	00/03/35	7851	30-Apr-31
Kurunegala	Hettipola	Bathalagodawewa	Final Village Plan 1690, Lot No. 10, Panduwasnuwara Jungle	01/01/37	7851	30-Apr-31

District	DS Division	Village	Land Name and details	Land Extent A/R/P	Gazette Number	Date
Kurunegala	Hettipola	Bathalagodawewa	Final Village Plan 1690, Lot No. 11, Panduwasnuwara Jungle	08/03/02	7851	30-Apr-31
Kurunegala	Kuliyapitiya	Elabodagama Gedara	Final Village Plan 13, 2Addition, Lot No. 14, Panavitiya	00/30/30.5	14960	28-May-71
Kurunegala	Kotavehera	Galkadawala	Preliminary Plan 256 A, Rajangane	28/02/29	8428	27-Jan-39
Kurunegala	Mahawa	Kandegedara	Final Village Plan 2338, Lot No. 26L	00/02/37	14342	12-Mar-65
Kurunegala	Kuliyapitiya	Karagahagedara	Final Village Plan 2589, Lot No. 201, Ambalanpitiyegala Ambalama	00/00/21	167	7-Jun-75
Kurunegala		Kondadeniya	Final Village Plan 1902, Lot No. 67, Dangahamula hena	01/01/00	12-585 No. 245	24-Dec-76
Kurunegala	Mahawa	Kuda Katuwannawa	Final Village Plan 2381-2381D, 1 Addition, Lot No. 96	01/02/39.7	14906	15-May-70
Kurunegala	Mahawa	Maligama	Final Village Plan 1900, 1 Addition Lot,No. 1D, Weedipilhenyaya	00/03/26	8240	21-Aug-36
Kurunegala	Galgamuwa	Nillakgama	Preliminary Plan 1557A Lot No. 1, Bodhigaraya	05/00/03	14342	12-Mar-65
Kurunegala	Hettipola	Pahala Mdihe Kotambepitiya	Final Village Plan 1711, Lot No. 26, Moat	01/00/36	7851	30-Apr-31
Kurunegala	Hettipola	Pahala Mdihe Kotambepitiya	Final Village Plan 1711, Lot No. 27, Jungle	02/03/07	7851	30-Apr-31
Kurunegala	Hettipola	Pahala Mdihe Kotambepitiya	Final Village Plan 1711, Lot No. 28, Cemetry	00/00/33	7851	30-Apr-31
Kurunegala Kurunegala	Hettipola Polpithigama	Pahala Mdihe Kotambepitiya Siyambangamuwa,	Final Village Plan 1711, Lot No. 25, Hena Final Plan 07, Lot No. 2, 3 and Plan 1880, Lot No. 39	03/03/18 10/02/27	7851 14146	30-Apr-31 21-Aug-64
Kurunegala	Mahawa	Katupathwewa Yapahuwa	Final Village Plan 1888, 2 Addition Lot,No. 19A, Munamalgahamula Henyaya	00/03/31	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 2 Addition Lot No. 19B, Munamalgahamula Henyaya	00/03/16	8240	21-Aug-36

District	DS Division	Village	Land Name and details	Land Extent A/R/P	Gazette Number	Date
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 2 Addition Lot No. 32A, Kongahamula wewa	00/01/34	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 1 Addition Lot No. 11A, Nugagahamulawatta	00/03/26	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 1 Addition Lot No. 15A, Yapahuwa Pansala watta Kongahamula wewa	00/01/34	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 1 Addition Lot No. 15B, Yapahuwa Pansala watta	03/03/3.8	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 1 Addition Lot No. 18, Nugagahamula watta	00/01/10.2	8240	21-Aug-36
Kurunegala	Mahawa	Yapahuwa	Final Village Plan 1888, 1 Addition Lot No. 37F, Kandepaulahena	00/01/36	8240	21-Aug-36
Puttalam	Kalpitiya	Kalpitiya	Preliminary Plan No. A1655, Lot No. 1-8, Dutch Fort	00/03/26.7	13931	24-Jan-64
Puttalam	Vanathavilla	Karadipuwal	Preliminary Plan No. 7387, Lot No. 70, Malwila Vihara	10/01/15	124	9-Aug-74

Source: http://www.archaeology.gov.lk/explor.html

European Colonial Monuments

The well preserved Dutch Fort in Kalpitiya (Puttalam district) dating back to 1670 is an evidence of the North Western Province's European colonial period. The fort is complete with barracks, store houses and living quarters, Dutch colonial pillars and ancient tombstones. Kurunegala has many 19th century relics of the British colonial period including the government Agent's residence and the Rajapihilla Rest House.

CHAPTER 7

EX SITU CONSERVATION

EX-SITU FAUNAL FACILITIES

Ornamental fish aquariums are found in Wennappuwa (fresh and marine) and Makandura (only fresh water fishes) areas. No documentation or statistics regarding these ex-situ faunal facilities were found during this study.

IN-SITU FLORAL FACILITIES

Forest Plantations

Large-scale forest tree planting in Sri Lanka started in late 1950's and has covered about 135,052 ha of forest plantations by the end of 1996, of which, about 87,000 ha belong to the Forest Department. The main plantation species are Teak, Eucalyptus (mainly *Eucalyptus grandis*), Pine (*Pinus caribaea*) and Mahogany. The current emphasis is on the indigenous hardwood species like Teak and Margosa while planting of Pines is banned and *Eucalyptus* is being planted only on a very limited scale.

The different sources of information provided on the extent of forest plantations in the NW province give somewhat varying results (Tables 6.1a, b and c). Therefore, the validity of these results is disputed. Irrespective of the source, a significantly higher extent of Mahogany plantations is confined to the NW province while the second highest extent of land is under Teak or *Acacia* plantations. Detailed information on the forest plantations in the Kurunegala district is given in the Appendix N.

Table 7.1 - The extent of Forest Plantations (in hectares) established by the Forest Department up to 1995. The data were taken from three different sources.
Source: Legg and Jewell, 1995

(a) (Area in hectares)

	Kurunegala	Puttalam	Total extent for the country	As a % from the total – NW Province
Conifers	50	-	16,766	0.3
Eucalyptus	413	944	16,202	8.4
Teak	2944	5292	35,270	23.4
Mahogany	3239	211	4,055	85.1
Total	**6646**	**6447**	**72,293**	**18.1**

(b) (Area in hectares)

	Kurunegala	Puttalam
Teak	5106	4568
Eucalyptus	1055	62
Pinus	114	-
Fuelwood	224	5289
Others	257	25
Total	**6756**	**9944**

Source: Forest Department's FORDATA database and 1992 forest cover data.

(c) (Area in hectares)

	Kurunegala	Puttalam	Sri Lanka	NW Province (as a %)
Teak	55.0	7129.3	39,876.2	18.0 %
Mahogany	2,406.0	89.5	5,939.8	42.0 %
Pinus spp.	14.0	-	17,466.0	0.08 %
Acacia spp.	415.4	1,250.0	7,185.2	23.2 %
Margosa	231.6	376.0	34,015.0	1.8 %
Eucalyptus sp.	549.4	4,988.0	254,970.0	2.2 %
Other spp.	399.1	379.4	12,318.0	6.3 %
Mixed spp.	444.9	667.5	10,659.0	10.4 %
Total	**4515.4**	**14,880.0**	**131,309.0**	**14.8 %**

Source: Forest Department Administrative Report, 1995.

Medicinal Gardens

Medicinal gardens promote ex-situ conservation of medicinal plants and at the same time supply plant material for the market. The NW Province has many such medicinal gardens. Ganewatta Medicinal Plant Garden which is managed by the Department of Agriculture is situated about 15 miles away from Kurunegala. As it is located in the intermediate zone, it offers an ideal site for cultivating a large number of medicinal plants. The garden is 56 acres in extent and from which large extent is under coconut cultivation. The most common medicinal plants grown in this garden are Nelli, Munamal, Sandalwood, Tamarind and Eth-demata etc. While maintaining a germ plasm collection of a large number of medicinal plants, this site also provide an educational facility for schools, NGO's and to the general public.

Fruit Plantations

In addition to forest plantations, fruit plantations such as cadju, banana, mango etc. also can be categorized under the ex-situ conservation sites (Table 7.2). In addition to these, there are other places where ex-situ conservation sites are established such as Makandura for ornamental plants and Narammala for Beetles.

Table 7.2 – Extent of land (Acres) under Cashew, Banana and Mango by DS divisions in the Puttalam district.

Source: Environmental profile – Puttalam district (2002), Central Environmental Authority, Sri Lanka.

DS Division	Cashew	Banana	Mango
Anamaduwa	693	154	94
Arachchikattuwa	268	109	74
Chilaw	83	103	47
Kalpitiya	15	60	0
Karuwalagaswewa	383	122	60
Nawagatthegama	49	74	22
Maakumbukkadawala	850	136	47
Mundel	166	74	60
Nattandiya	88	270	115
Puttalam	98	34	72
Wanathavillu	3,253	418	44
Wennappuwa	11	112	88
Mahawewa	47	83	76
Dankotuwa	79	461	73
Madampe	258	98	144
Pallama	679	65	91
Total	**7,020**	**2,373**	**1,107**

The Coconut Research Institute (CRI) at Lunuwila and Rice Research and Development Institute (RRI) at Batalagoda also play an important role in conserving the germ plasms of coconut and paddy and therefore can be considered as places for ex-situ conservation.

CHAPTER 8

CULTURAL AND OTHER RELATED BIODIVERSITY

BIO-ARCHEOLOGICAL SITES

The North Western Province is a treasure house of archaeology and was under four kingdoms of Sri Lanka between the mid 12th and mid 14th centuries. As a result of that, impressive remains of those citadels, palaces, Buddhist temples and monasteries have been located in the province and provide exciting sight seeing to the visitors. The following table (Table 8.1) has given the archeologically imporatnt sites excavated and identified by the Department of Archaeology from time to time.

Table 8.1 – Archeologically important sites identified by the Department of Archeology in the NW Province of Sri Lanka.

Provincial Secretariat Division	Grama Niladhari Division	Name of the Archeological Site
KURUNEGALA DISTRICT		
Giribawa	Weragala	**Weragala Maha Viharaya (Gurugoda)** Caves with carved drip-ledges, Dagoba, carved stone terraces and the old pond
	Timbiripokuna	**Timbiripokuna Archeological Reserve** Dagoba, base columns of the stone bridge over Kala Oya
	Ihala Giribawa	**Archeological Monument on the Mangala Rock** Buddha-statue, old pokuna, Old dunes, Stone stairway, stone columns
	Madige	**Kudagalkadawela Monastery** Caves with carved drip-ledges
	Maillewa	**Sri Shailabimbarama Viharaya** Caves with carved drip-ledges and other archeological ornaments
	Aliyawetunuwewa	**Purana Weragala Viharaya** stairway carved on the rock, Dagoba, old pond
	Sole wewa	**Dutugemunu Raja Maha Viharaya** Ruins of a dagoba
		Sri Sandagala Rajamaha Viharaya Ruins of a Dagoba Pre-historic remains
	Kokmaduwa	**Sri Shaila Pushkrance Rajamaha Viharaya** Caves with carved drip-ledges Stairway carved on a rock Base columns on a rock Old pond

Provincial Secretariat ivision KURUNEGALA DISTRICT	Grama Niladhari Ivision	Name of the Archeological Site
Giribawa	Hettiarachchigama	**Kokmaduwa, Hangiligama ruins** Caves with carved drip-ledges Old pond **Devalagala rock** Old pond etc. **Niraviya Pabalugala** Old beads and hearths
	Warawewa	**Warawewa Sri Bodhimalu iharaya** Old statues and other ruins
	Ihala Maradankadawela	**Mahagala rock** Ruins
	Solepura	**Paddy field belong to a person known as Ranjini**
	Sarasumgala	Old Brick and tiles Stone columns **Kaadigala rock** Stairway carved on the rock Ruins of a Dagoba
Nikaweratiya	Randenigama	**Sri Wardhanarama Viharaya** Caves with carved drip-ledges Stone inscriptions
	Dalukgolla	**Sri Poorwarama Tampita Viharaya**
	Nabadewa	**Thalakolahena Sri Sudharshanaramaya** Old Dharma Shalawa Stone columns The Bo tree
	Mawathagama	**Kitulwetiya Kadurugahahena plot** Ruins of a building
	Hulugalle	**Sri Bodhirukkaramaya** Tampita Viharaya
	Hulogedhara	**Thunhiriyagala** Caves with carved drip-ledges
	Magallegama	**Maagul Raja Maha Viharaya** Dagoba and stone columns
	Kaluwannawa	**Sri Nagarukkaramaya** Tempita Viharaya
	Viharagama	**Budumunnawa Raja Maha Viharaya** Tempita Viharaya
Alawwa	Damunupola	**Damunupola Grama Niladari Division,** Pre – historic place
	Vilgamuwa	**Vilgamuwa Purana Viharaya** Columns, base columns of building, stairway carved on the rock at Bolanliyadde.

Provincial Secretariat Division KURUNEGALA DISTRICT	Grama Niladhari Division	Name of the Archeological Site
Alawwa	Alauwa North Ganekandagama Hittarapola (Me Ambakanda) Divulgahakotuwa (Batagollakanda)	**Land of Mr. S.M. Dingiri Appu,** Natural cover of cave, pre historic remains at Hambelikanda Government conservation area Pre-historic remains in caves with carved drip-ledges. **Situated at the Batagollakanda.** Natural cover of cave, pre-historic remains.
Hettipola	Panduwasnuwara Bamunumulla Ridikanda Nikapitiya Malagane	Archeological conservation land. Bamunumulla conservation area. Ridikanda archeological conservation area. Nikapitiya stone columns Malagane Viharaya
Ganewatta	Arankele	Arankele archeological conservation area
Polpitigama	Nagolla	Archeological conservation area, Maligatenna archeological conservation area, Polpitigama - pre historical cemetery at police station
Mahawa Giribawa	Yapawwa Kondadeniya Rajanganaya	Archeological conservation area Pingama Stoned cemetery Rajanganaya archeological conservation area.
Narammala Galgamuwa	Dambadeniya Dewagiriya Nillakgama	Dambadeniya archeological conservation area Dewagiriya Purana Viharaya Nillakgama Bodhigharaya
Wariyapola	Padeniya Netiya Navinna	Padeniya Purana Viharaya Netiya Nuwarakanda Viharaya Navinna Purana Viharaya
Anamaduwa	Divulwewa	**Karuwalagaswewa Paddy.** Stairway carved on the rock, - Caves with carved drip-ledges. **Labugala Purana Viharaya** Ruins of Dagoba, Carves with carved drip-ledges, old stair way, epigraph

Provincial Secretariat Division PUTTALAM DISTRICT	Grama Niladhari Division	Name of the Archeological Site
Anamaduwa	Uriyawa	**Labugala Sankangyagama** Stony area with Pre-historic remains, Kummatiyagama Viharaya, Dagoba, ruins of hummock
		Manikkankanda Viharaya ruined Dagoba, old hummock, epigraph, Uriyawa tank
	Swarnapaliyagama	**Near to Stream at Swarnapaliyagama village** old stone mortar
	Paliyagama	**Near to Stream at Swarnapaliyagama village** stone columns
	Kottukachchiya- II state	**Kottukachchiya –II state, Etungoda, land of J.M. Dingiri Banda,** stone columns, **Mudalakkuliya Viharaya,** Dagoba, stone columns, Tem inscription, other antiques
	Merangoda	**Village 8, Padigalayaya Paddy,** Stairway carved on the rock, Buddha statue and stone columns at Merangoda land of Mr. S.P. Jayatilake.
	Koiladigama	**Kottagama school,** Ruins of hummock, stone columns, evidences of building, Dagoba
	Kottukachchiya - I state	**Bodhirukkarama Viharaya** Tempita Viharaya, Dagoba, Buddha statue
	Siyambalagashena	**End of Pahalagama tank,** Evidences of old building.
	Mahauswewa South Parmakanda	**Kettararama Viharaya** dagoba, inscription, inscription board **Paramakanda Viharaya** hall with Buddha statues, Dagoba, Caves with carved drip-ledges, old monastery, inscription board, epigraph, ruins of building, Paramakanda tank, Galen Bindunu wewa,

Provincial Secretariat Division PUTTALAM DISTRICT	Grama Niladhari Division	Name of the Archeological Site
Kalpitiya	Kalpitiya North Palliwasaiturei Anawasala Karungnanpitiya	Holland fort, Holland church Palliwasaiturei- Church. Mutu kumari amma Hindu temple. Allarani Palace, old dagoba
Halawata	Diganwewa Mukunuwatawana Marakkalagama Nallandarankattuwa Punchivilattawa Potuvila Halawata town Munneshwaram	**Weherabendikele Rajamaha Viharaya** Viharaya, old dagoba Weherakele Viharaya, Nariyagama old dagoba, ruins of old buildings. **Mangana Rajamaha Viharaya** Old dagoba, Stone columns, Mangana tank Taniwella fane Wajirawatta- old Pond Ratnagiri Rajamaha Viharaya **Puliyankadawara Rajamaha Viharaya** Dagoba Heda Bandara fane old clock tower at court, Halawata archiepiscopal house Halawata Munneshwaram fane, Halawata tank.
Puttalama	Puttalama North Puttalam Puttalama - South	Mari Amman Hindu temple. Holland Building (Present District registrar office) Holland Building (Police DIG office) DRO office, St/ Klementu Church, Holland Building Kasem palace building 1, 11.
Karuwalagaswewa	Tabbowa – Pawattaya Maduwa Ihala Puliyankulama Munamalgaswewa	**Tabbowa Purana Viharaya** Dagoba, epigraphs, Old buildings, stone of sacred foot, Tabbowa Tank, Jurassic fossil. **Weheragala Rajamaha Viharaya** Dagoba **Vilandagoda archeological conservation area.** 500 acre –caves with carved drip ledges, old ponds, monastery, and caves of vihara. **Weheragala** Caves with carved drip-ledges, natural caves, old dagoba, stone of sacred foot.

Provincial Secretariat Division	Grama Niladhari Division	Name of the Archeological Site
PUTTLAM DISTRICT		
Karuwalagaswewa	Saliyawewa	**Government conservation area** Caves with caved drip-ledges, ruins of buildings
	Egodagodayagama	Ruins of buildings at Muriyakulama Village.
	Ipalogama	**Galawewa village, Weherayaya Viharaya** Ruins of dagoba, Helambawetiya tank, Siyambalawewa
	Eramadugaswewa	Circular building, Old buildings, dagoba
	Murukkuwatawana	Caves with carved drip-ledges, epigraph, ruins of old dagoba
	Tewanuwara	Circular building, pre historic remains, old buildings, Base column on a rock (Viharapitiya Government conservation area)

Source: Department of Archaeology, Provincial Office (Wayamba), Panduwasnuwara, Hettipola

The following table provides a list of archaeological protected monuments situated in the NWP (Table 8.2).

Table 8.2 - Archaeological Protected Monuments in the NWP of Sri Lanka

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Galgamuwa	Sasseruwa	Buddha Statue and Cave Inscription	10054	16-Dec-1949
Kurunegala	Hettipola	Dorabawila	Dorabawila Viharaya	10108	2-Jun-1950
Kurunegala		Mahagalboda	Hadamagama Viharaya	11633	2-Jan-1959
Kurunegala	Narammala	Dambadeniya	Ancient Image House at Dambadeniya Vijayasundararama Raja Maha Vihara	12977	9-Mar-1962
Kurunegala	Mahawa	Yapahuwa	Cave temple and paintings at Yapahuwa Raja Maha Vihara	13647	24-May-1963
Kurunegala	Wariyapola	Padeniya	Ancient Image House at Padeniya Raja Maha Vihara	14172	18-Sep-1964

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Wariyapola	Egodagama	Kabellelena Viharageya	14472	6-Aug-1965
Kurunegala	Udubaddawa	Karandawila	Ancient Monuments	14501	9-Sep-1965
Kurunegala	Alawwa	Madawala	Ancient Cave Temple and Painting	14702	1-Jul-1966
Kurunegala	Nikaweratiya,	Pingama	Budumuttewa Ancient Tampita Vihara	14708	12-Aug-1966
Kurunegala	Katupotha	Kahatawilagedara	Ancient Tampita Viharageya	14737	23-Feb-1967
Kurunegala	Kuliyapitiya	Bihalpola	Ancient Tampita Vihara and Dalada Maligawa	14737	23-Feb-1967
Kurunegala	Katupotha	Kolambagama	Ancient Tampita Vihara at Kolombagama Raja Maha Vihara	14749	19-May-1967
Kurunegala	Kuliyapitiya - East	Nakkawatta	Ancient Tampita Vihara	14749	19-May-1967
Kurunegala	Maspotha	Rathkarawita	Ancient Dagoba and Inscription	14749	19-May-1967
Kurunegala	Nikaweratiya	Dalukgolla	Ancient Tampita Vihara and Drumming Hall at Dalukgolla Purvarama Vihara	14749	19-May-1967
Kurunegala	Ridigama	Ridigama	Rock including inscription and cave temple in 1100-1800 period	14761	11-Aug-1967
Kurunegala	Wariyapola	Padeniya	Ancient Library (Pothgula) at Padeniya Raja Maha Vihara	14765	9-Sep-1967
Kurunegala	Maspotha	Nathagane	Nathagane Dagoba and Other Ancient Monuments	14775	17-Nov-1967
Kurunegala	Kuliyapitiya -	Diyadora Ihala Kohote	West Ancient Buildings	14775	17-Nov-1967
Kurunegala	Hettipola	Ambagahawewa	Dalada Maligawa Panduwasnuwara Raja Maha Vihara	14897	13-Mar-1970
Kurunegala	Kuliyapitiya	Bihalpola	Doorway	82	19-Oct-1973
Kurunegala	Alawwa	Waduwawa	Ancient Cave Temple and Painting	95	18-Jan-1974

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Narammala	Wiharegama	Narammala Dagoba	127	30-Aug-1974
Kurunegala	Kuliyapitiya	Kadawalagedara	Tampita Vihara and Dagoba	10259	11-Oct-1974
Kurunegala	Bingiriya	Vihararama	Tampita Vihara at Bingiriya Rajamaha Vihara	139	22-Nov-1974
Kurunegala	Wariyapola	Padeniya	Ancient Buildings	53	7-Sep-1979
Kurunegala	Maspotha	Kudagalgamuwa	Ancient Image House and paintings	86	24-Apr-1980
Kurunegala	Kurunegala	Ihalahewapola	Ancient Image House and paintings at Bambawa purana Raja Maha Vihara	948	1-Nov-1996
Kurunegala	Polpithigama	Doraveruwa	Ancient Image House and paintings at Naindunawa Viharaya	948	1-Nov-1996
Kurunegala	Galgamuwa	Moragollagama	Ancient Image House and paintings at Kuda Dambulu Vihara	948	1-Nov-1996
Kurunegala	Ibbagamuwa	Kumbukgete	Ancient Image House and paintings at Kasagala Vihara	948	1-Nov-1996
Kurunegala	Mahawa	Beruwewa	Ancient Image House and paintings at Handungirigama Magampura Raja Maha Vihara	948	1-Nov-1996
Kurunegala	Kuliyapitiya	Kumbalwala	Ancient Image House and paintings at Kumbalewa Dewala Vihara	948	1-Nov-1996
Kurunegala	Pannala	Wattegedara	Ancient Image House and paintings at Murutenge Kanugala Vihara	948	1-Nov-1996

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Polgahawela	Imbulgoda	Ancient Image House, Dagaba and Awasa geya	1214	7-Dec-2001
Kurunegala	Polgahawela	Kalugondiwala	Ancient Tampita Viharaya	1214	7-Dec-2001
Kurunegala	Polgahawela	Imbulgoda	Ancient Image House and Dagaba	1214	7-Dec-2001
Kurunegala	Polgahawela	Hathlispawwa	Ancient Image House, Stupa and Dagaba	1214	7-Dec-2001
Kurunegala	Polgahawela	Hondalla	Ancient Image House	1214	7-Dec-2001
Kurunegala	Polgahawela	Talawattegedara	Ancient Tampita Viharaya	1214	7-Dec-2001
Kurunegala	Polgahawela	Kalawana	Ancient Tampita Viharaya	1214	7-Dec-2001
Kurunegala	Polgahawela	Medakalugamuwa	Ancient Image House	1214	7-Dec-2001
Kurunegala	Polgahawela	Lihinigiriya	Ancient Image House at Andawala Pothgul Vihara	1214	7-Dec-2001
Kurunegala	Polgahawela	Egalla	Ancient Image House at Galmuththagala Purana Vihara	1214	7-Dec-2001
Kurunegala	Polgahawela	Gammana	Ancient Tampita Viharaya	1214	7-Dec-2001
Kurunegala	Polgahawela	Galadenikada	Ancient Cave Temple	1214	7-Dec-2001
Kurunegala	Polgahawela	Udukedeniya	Ancient Cave Temple at Gedigamuwa Raja Maha Vihara	1214	7-Dec-2001
Kurunegala	Polgahawela	Okandapola	Ancient Vihara and Awasage	1214	7-Dec-2001
Kurunegala	Kurunegala	Ambalampitiya	Ancient Vihara and stone posts	1214	7-Dec-2001
Kurunegala	Kurunegala	Kurunegala	Ancient Vihara and Archaeological finds	1214	7-Dec-2001
Kurunegala	Kurunegala	Attanapitiya	Ancient Cave temple	1214	7-Dec-2001
Kurunegala	Kurunegala	Thiththawella	Ancient Vihara	1214	7-Dec-2001
Kurunegala	Alawwa	Palagama	Ancient Vihara and Archaeological finds	1214	7-Dec-2001
Kurunegala	Alawwa	Renagama	Ancient Ambalama	1214	7-Dec-2001

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Alawwa	Kapuwarala	Ancient stone posts, pedastals and Siri Pathula	1214	7-Dec-2001
Kurunegala	Mallawapitiya	Indulgoda	Ancient Tampita Vihara	1214	7-Dec-2001
Kurunegala	Mallawapitiya	Katupitiya	Ancient Tampita Vihara	1214	7-Dec-2001
Kurunegala	Mallawapitiya	Konpola	Ancient Tampita Vihara	1214	7-Dec-2001
Kurunegala	Mallawapitiya	Sevendana	Ancient Vihara at Seruwagala Purana Vihara	1214	7-Dec-2001
Kurunegala	Kuliyapitiya	Bogahamulla	Ancient Building of Stone posts, Inscription and other Antiquity	1214	7-Dec-2001
Kurunegala	Udubaddawa	Horanepola	Tampita Vihra at Sri Pushpara Vihara	1264	22-Nov-2002
Kurunegala	Polpithigama	Hangamuwa	Dagoba and Image House	1264	22-Nov-2002
Kurunegala	Polpithigama	Kumbukkadawala	Ancient Dagoba, Bodhigara and Image House and Nilgiri Raja Maha Vihara	1264	22-Nov-2002
Kurunegala	Polpithigama	Halmillewa	Cave Temple and Inscription Gomadiyagala Vihara	1264	22-Nov-2002
Kurunegala	Polpithigama	Karagaswwewa	Ledged Cave Temple at Sri Pushparama Vihara	1264	22-Nov-2002
Kurunegala	Pannala	Bopitiya	Preaching Hall at Sri Sudarshanarama Vihara	1264	22-Nov-2002
Kurunegala	Kobeigane	Dorabavila	Tampita Vihara at Dorabavila Vihara	1264	22-Nov-2002
Kurunegala	Narammala	Rukmale	Ledged Cave Temple at Giriguharamaya Vihara	1264	22-Nov-2002
Kurunegala	Mawathagama	Digampitiya	Tampita Vihara at Gidigampitiya Purana Vihara	1264	22-Nov-2002
Kurunegala	Polpithigama	Madahapola	Tampita Vihara at Sri Rathanapalarama Vihara	1264	22-Nov-2002
Kurunegala	Mawathagama	Hettipola	Yahangala	1264	22-Nov-2002

District	DS Division	Village	Monument	Gazette Number	Date
Kurunegala	Narammala	No. 1053	Bund of Tank	1264	22-Nov-2002
Kurunegala	Kurunegala	Katupitiya	Tampita Vihara	1264	22-Nov-2002
Kurunegala	Kurunegala	Vegolla	Nilagirilen Purana Vihara at Kalugalla	1264	22-Nov-2002
Kurunegala	Kurunegala	Kidapola	Sri Namalu Purana Vihara at Kadapola	1264	22-Nov-2002
Kurunegala	Kurunegala	Maspotha	Siyabalangamuwa Monaragala raja Maha Vihara	1264	22-Nov-2002
Kurunegala	Polgahawela	Okandapola	Image House, Avasa Ge, and Stupa at Niruthayalankara Raja Maha Vihara	1264	22-Nov-2002
Kurunegala	Polgahawela	Algama	Avasa Ge and Cave Temple at Algama Sagaraja Raja maha Vihara	1264	22-Nov-2002
Kurunegala	Polgahawela	Algama	Ledged Cave and Hatariyan lena at Algama Sri Sailabimbaramaya Cave Temple	1264	22-Nov-2002
Kurunegala	Polgahawela	Panaliya	Image House and Inscription at Gotabaya Gallen Raja maha vihara	1264 22-Nov-2002	
Kurunegala	Mallawapitiya	Katupitiya	Tampita Vihara at Sri Nagarukkarama Vihara	1264	22-Nov-2002
Kurunegala	Alawwa	Rangallepola	Rock including Ruins	1264	22-Nov-2002
Kurunegala	Veerambugedara	Samendana	Image House, Chetiya Rampart at Seruwagala Purana Vihara	1264	22-Nov-2002
Kurunegala	Kurunegala	Vilbawa	Inscription, Dagoba and Caved Temples	1264	22-Nov-2002
Puttalam	Anamaduwa	Paramakanda	Ancient Vihara and Paintings	948	1-Nov-1996
Puttalam	Kalpitiya	Kalpitiya	Portugees Fort	Hanzad	
Puttalam	Kalpitiya	Kalpitiya	Portugees Church	Hanzad	

Source: http://www.archaeology.gov.lk/explor.html

Pre-historic Sites

There are few pre-historic burial sites located in the NWP. These burial sites are believed to be well over 2000 years old. These sites which were discovered early this century have shed new light on the island's prehistory and early history given rise to a number of speculations as to its origins. An extensive urn burial site has been excavated at Pomparippu which is located about 6 km east of the North-Western coast and about 32 km north of Puttalam. The Pomparippu burial site has attracted much interest ever since its discovery by A.M. Hocart during the course of his survey of the Puttalam - Mannar coast in 1923 (http://www.angelfire.com). Number of urn burials was excavated by Raja De Silva in 1956 during the course of a detailed archaeological survey undertaken by the Department of Archaeology. The excavations unearthed a total of 14 burials containing the skeletal remains of about 23 persons. The urns were 40 - 90 cm diameter in size and had been placed in pits sealed with limestone boulders. The bones had been disarticulated before burial and it appears that the bodies were exposed to the elements for some time before interment. Other major urn burial sites have been located at Tekkam and Karamban Kulam, both comes within the Wilpattu wildlife sanctuary.

BIO-CULTURAL ASPECTS

Kaffrinha (*Kaffir*) Community in Puttalam

In the coastal district of Puttalam there is a small community of Kaffrinha (also known as Kaffirs). They were brought to the island of Ceylon by the Portuguese from African villages. They have an African origin and were first brought to Sri Lanka during the Second World War. They were later settled here and their descendants speak Portuguese Creole. A small group of Kaffir population is still living confined to a small area in the NW province of Sri Lanka. A website document claims that they were brought to Sri Lanka by the Portuguese, Dutch and British as a part of the naval force and for domestic work (http://www.lankalibrary.com/geo/portu/portu5.htm). Now they have been living in certain locations in the Puttalam district such as Senakudirippu, Sirambiadi, and in the Puttalam town and also close to Lourdes Church near Kala Oya. In addition, they have also re-located in Tabbowa, Trincomalee, Mihinthale, Colombo in small numbers. The Kaffirs are mainly chena cultivators but a few have found employment in the Puttalam Salt Pans, hospitals and in local government offices as peons and labourers. They have withstood cultural pressures for a long time but now they have intermingled with other communities through cross-cultural marriages.

From their physical appearance, they carry Negroid characteristics because of their African origin. A majority of them are devout Roman Catholics. The early inhabitants have been used the Portuguese language but now they can speak Sinhala fluently. Few elderly people in their community still can speak Portuguese. They have a special folk dance called 'baila' which is a popular dance among Sri Lankans. The music that they use for this dance is known as 'Manjo' or 'Kaffirincha'. However, during my literature survey I haven't come across any document that gives the exact population statistics of the *Kaffir* community (they have been classified under 'other' category in all the Census carried out so far by the Department of Census and Statistics, Sri Lanka) living in Sri Lanka for more than 100 years.

Even though the languages, Portuguese and Sinhala are not similar typologically and therefore lexical borrowing cannot be occurred. Sri Lanka Portuguese Creole (the language used by the Kaffir community in Sri Lanka) is a language which combines linguistic elements from Portuguese and Sinhala. The following table (Table 8.3) gives some Portuguese borrowings in Sinhala.

Table 8.3 - Examples of Sinhala words with Portuguese Etyma.
Source: (http://www.lankalibrary.com/geo/portu/portu5.htm).

Semantic fields	*Sinhala*	*Portuguese*	*Glossary*
Civil administration	gudam(a)	gudão	warehouse
Judicial administration	petsam(a)	petição	petition
Military structure	bayinettu(va)	baioneta	bayonet
Land administration	tombu(va)	tombo	record/archive
Architecture	rippa(ya)	ripa	lath
Furniture	mesa(ya)	mesa	table
Cuisine	koppa(ya)	copo	cup
Dress	saya	saia	skirt/petticoat
Education	iskola(ya)	escola	school
Flora	pera	pera	pear
Names	Peduru	Pedro	Peter
Music	viyole	viola	viola
Dance	baila(ya)	baile	dance
Religion	anju	anjo	angel

TRADITIONAL KNOWLEDGE PROFILE

Sri Lanka has a wealth of traditional knowledge carries from one generation to another. The village people use and rely on traditional knowledge in their day to day activities. Traditional medical practitioners still carries vast information on the traditional knowledge profile on the floral and faunal diversity. So far no serious attempt has been made to collect and exploit traditional knowledge profile in sustainable development and in conservation of biodiversity, though it can play vital role. In the Biodiversity Conservation Action Framework (BCAP), there was some reference in relation to history and culture, though it didn't receive due recognition. Later, in order to fill this void another attempt was made to gather information related to the traditional knowledge and life style with a special focus on the biodiversity by appointing a task force headed by Prof. C.M. Madduma Bandara (unpublished). This report contains a reasonable amount of information on traditional knowledge profile covering areas like cultural diversity, agricultural diversity, ecosystem diversity, faunal and floral diversity and life style etc. In 2005 and 2006, another two recent publications (Vol. 1 and II) in Sinhala on traditional knowledge profile came out with the patronage of the Biodiversity Secretariat of the MENR. These publications also provide very useful information on tratditional knowledge related to BD. Most of this information on traditional knowledge is at the national level. Therefore, a thorough study will be needed to formulate a traditional knowledge profile for the NWP. However, I would like to incorporate some information on traditional knowledge profile that might related to the NWP which I have extracted from the Task Force Report submitted by Madduma Banadar *et al.* (unpublished).

Floral Diversity

Plants play an important role in culture and religion of the people in Sri Lanka. Apart from using as a food source, plants also play a major role in their other activities and requirements such as firewood, medicine, timber etc. Many villages were named after the most dominant plant in the area (Kosgolla, Meegolla, Polpithigama, Meegolla etc.).

According to the Task Force Report on the 'Biodiversity Dimensions in Traditional Knowledge and Life style' (unpublished), some twenty five plants have been identified in relation to written documentation available on forestry, urban and environmental biodiversity, bio-industry and traditional medicine. Out of that the plants recorded from the climatic zones, dry and intermediate which covers most parts of the Kurunegala and Puttalam districts are listed as follows.

Bulu. ***Teminalia bellirica.***
Commonly present in the wet zone of Sri Lanka. Specimens also examined in Puttalam and Kurunegala Districts as well.

Tala gasa. ***Corypha umbraculifera.***
Commonly present in the wet and dry zones of Sri Lanka. Site: Coastal groves, home gardens, roadsides.

Niyada. ***Sansevieria zeylanica.***
Commonly present in the intermediate zone of Sri Lanka.

Divi kaduru. ***Pagiantha dichotoma.***
Commonly present in the intermediate and wet zones of Sri Lanka.

Ehela. ***Cassia fistula.***
Commonly present in the dry zone of Sri Lanka. Site: roadsides, home gardens, monsoon forest sub canopy and dry lowlands.

Weta keyiya. ***Pandanus kaida.***
Commonly present in the intermediate and wet zones of Sri Lanka.

Sapu. ***Michelia champaca.***
Commonly present in the intermediate and wet zones of Sri Lanka. Site: home gardens, roadsides, forest plantations, intermediate land and wet lowlands.

Aralu. ***Terminalia chebula.***
Commonly present in the dry and intermediate zones of Sri Lanka.

Nelum. ***Nelumbo nucifera.***
Commonly present in the dry and wet zones of Sri Lanka.

Bo. ***Ficus religiosa.***
Commonly present in the dry and wet zones of Sri Lanka.

Samanpichcha. ***Jasminum angustifolium.***
Commonly present in the wet and dry zones of Sri Lanka. Site: secondary forest and scrub and dry lowland.

Kos. ***Artocarpus heterophyllus.***
Commonly present in the wet, dry and intermediate zones of Sri Lanka.

Vee/ Rice. ***Oriza sativa.***
Commonly present in the wet, dry and intermediate zone. Specimens Examined:

We –wel. ***Calamus rotang.***
Commonly present in the wet, dry and intermediate zones of Sri Lanka.

Kalu wara. ***Diospyros ebenum.***
Commonly present in the dry zone of Sri Lanka.

Nuga. ***Ficus benghalensis.***
Commonly present in the dry and wet zone of Sri Lanka.

Na. ***Mesua nagassarium.***
Commonly present in the wet and intermediate zone of Sri Lanka.

Amba. ***(Wal Amba) - Mangifera zeylanica***
Commonly present in the dry, wet and intermediate zone of Sri Lanka.

Faunal Biodiversity

Animals have always been closely associated with Sri Lanka's culture and society. The Kurunegala, the main city of the NW province, has been named after a rock that resembles an elephant ("Elephant rock") which is situated in the middle of the city. "*Kurune*" means Tusker or an Elephant with protruding teeth and *Gala* in Sinhala means rock. Earlier Kurunegala was also known as 'Hasthishailya-pura', which can be translated as 'The city of the Elephant rock'. In some ancient literature the word 'Athugal-pura' is also employed to describe the city of Kurunegala.

Kurunegala also have seven huge rocky outcrops, out which six have been given names of the animals. These rocky outcrops are considered as a distinct geological feature in the city.

- Etha-gala (Elephant Rock)
- Ibba-gala (Tortoise Rock)
- Ada-gala (Eel Rock)
- Elu-gala (Goat Rock)
- Yakdessa-gala
- Kuruminiya-gala (Beetle Rock)
- Wandura-gala (Monkey Rock)

There is an interesting forklore behind these rocky outcrops with animal names. According to folklore legend, the city had experienced a severe drought in the past and to make the problem worst the animals had consumed all the available water. Eventually, a witch had volunteered to alleviate the problem, transforming some of the animals magically into stone figures.

Use of animal signs in traditional crafts and paintings as well as in national, regional and provincial flags is quite common in Sri Lanka. Many such flags bear lion figure in the center. The NWP flag also bears a figure of a lion with sun and moon motifs on either side of the animal print (Fig. 8.1). Early literature, *(Anguttara Nikaya)* refers to four types of lions namely, *thruna sinha* (grassland lion), *Kaala sinha* (possibly a dark lion), *Pandu Sinha* (possibly a bronze coloured lion) and the *Kesara Sinha* (lion with a main). Many such indirect evidence suggests that lions have possibly lived in the Island.

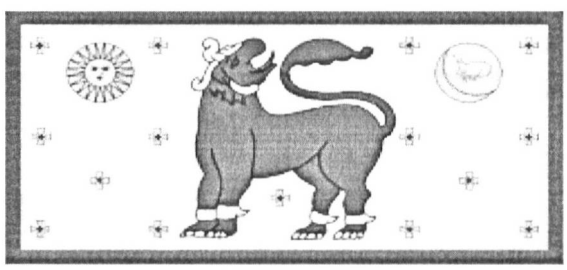


Fig. 8.1 - Flag of the North Western Province
Source: http://www.worldstatesmen.org/Sri_Lanka_prov.html

In addition to all these traditional knowledge related to animals, the ancient book written on traditional medicine (Sarartha Sangrahaya) by King Buddadasa in the 5th A.D. has listed some of the animals having medicinal properties.

Some carved hypothetical animal figures also can be seen in some archeological sites. 'Sarapenda' *(A design with a head of a Lion body of a bird, scales of a fish)* is one such hypothetical bird figure which can be seen in the Ridee Viharaya which is located in the NWP.

Ecosystem Diversity

With a high diversity in the flora and fauna, Sri Lanka also has diverse ecosystems. The traditional knowledge of the country had distinguished a diverse collection of ecosystems that can be categorized as natural, semi-natural and man-made. The ecosystems of the island also been classified by many scientists over the years which considered as modern classification of ecosystems. However, all these different ecosystems have a traditional nomenclature and can be examined with respect to modern classified ecosystems to see whether they can be fitted into different ecosystem categories. According to the traditional nomenclature, a greater number of ecosystems has been classified and identified than in the modern classification system.
According the traditional systems of nomenclature, the forests are known by many names. The modern classification system identified only five different forest types. The term *Adawaiya* (something like a forest range) has implied a sacred value as well as a protected status to the forest (*Sri Pada Aadawiya, Singharaja Adawiya). Landa* is a scrub forest with occasional trees found in an undulating terrain, whereas *Leheba* presumably denotes an isolated patch of forest. The usages such as *gomuwa, gonna, gollewa, pelessa, digiliya* etc. are also the names given for local forest ecosytems. Some other forest ecosystems were given names depicting the most dominant species. There are many coastal types of woodlands known as "Kirala Kele' (*Sonneratia* spp.). There is another forest in the NWP known as Nakele (*Mesua* spp.).

According to special task force report, the *kanattha, ath-danduwawa*, and *mookalana* are names given for secondary forests with different stages of recovery in the succession after abandonment of *chena* lands. Badagamuwa mookalana, Ambalanmukalana, Dikkele mukalana, Weuda mukalana are some of the examples that can give from the NW province.

The grassland and savanna communities also were given local names such as Patana (grassland type), *Talaw*a (savanna type) and *Eliya* (open Wet Patana). *Talawa* and *Damana* grasslands can be found scattered in the NWP. *Talawa* is a grassland characterized with numerous scattered trees. *Damana* is another savanna type of grassland.

Table 8.4 – Traditional classification of ecosystem types.
Source: Special Task Force Report on Biodiversity Dimensions in Traditional Knowledge and Life style' (unpublished).

Ecosystem Type	Sub Type
Forest	Bedda, Kelaya, Vanaya, Adaviya, Aramba, Mookalana ,Gonna, Golla , Badawetiya, Digiliya, Pelessa, Kadolkele, Gomuwa, Ketiya,
Grassland and Savanna	Patana, Eliya, Talawa, Damana, Villu
Wetlands/ Inland Waters	Wagura ,Villu, Oya, Ara, Ganga, Kandura, Hela, Wewa, Kulama, Pokuna, Wila , Owita, Pothaana, Degambada, Kadolaana, Heba, Ebe
Maritime Landforms	Boku, Kalapu, Moya, Wella, Tuduwa, Kadolaana, Helawa. Kaḷa. Duwa.
Inland Landforms	Hinna, Ulla, Tenna, Vinna, Kanda, Ovilla,,Pitiya, Galla, Pane, Goda, Deniya, Kinda, Bokka, Muduna, Munna, Waka
Caves	Lena, Dena, Guhawa Muhudu guhawa, Hummanaya
Traditional Agro-ecosystems	Gewatte,Gangoda, Yaya,Kumbura ,Hena, Kanathu, Ath-danduwawa, Helmalu Ruppawa

The following are some of the traditional names given for inland ecosystems and their brief definitions.

Hela	a wet zone marsh type with a floating peat mat
Owita	a boundary system between a wetland and a highland.
Yaya	refers to a tract of (usually cultivated) paddy land.
Badawetiya	a hedge especially with low trees and shrubs that provides edible fruits, leaves etc., often with imperfect drainage conditions.
Deniya	a physiographic position on a river floodplain with imperfect- to- poor drainage conditions and a variety of associated trees, shrubs and bushes.
Goda	depicting highland area surrounding lowlands.
Pitiya* and *Tenna	a flat land at different elevations.
Wanaatha	a cleared forest strip next to a rice field (Peiris 1956).

Many coastal ecosystems also have traditional names. *Kalapuwa* usually means a lagoon. The beach rock and the coral reefs have been distinguished in the local system as these two systems have two separate indigenous terms; the *Kalapugala* and Hirigala or *Hirigal Paraya* respectively. However, no indigenous name was given for seagrass beds which are considered as one of the main ecosystems in the coastal areas.

Villus are seasonally flooded grasslands (wetlands) located specially in the dry zone floodplains, along the *Mahaweli River*. This indigenous term has been adopted in the modern classification as well. Although there is no clear differentiation of estuaries in the modern system of classification where it is categorized under wetlands, the traditional nomenclature classify them as *Moya, Moya Kata* and *Modera* as sub types of estuaries.

The streams have given different local names depending on their level of hierarchy. *Ganga* is usually a perennial river (Eg. Mahaweli Ganga, *Kalu Ganga, Kelani Ganga*) without pronounced seasonal regime. An *Oya* in the Dry zone is characterized by a seasonal regime while in the wet and intermediate zones it may also mean a tributary of a major river. However, most of the major rivers that have been flowing through the NWP are *Oya's* rather than *ganga's* (Eg. *Kala Oya, Maha Oya, Mee Oya etc.).* The rivulets or creeks are differentiated by terms such as *Ara, Dola, Kandura* etc.

There are some ecosystems (eg. Mountains) also have given local names according to the level of hierarchy. Terms such as *Tumbasa* (ant hill), *goda* (Highland), *Hella* (Hills), *Wetiya or Heenna* (low ranges or spurs), *Kanda* (mountain), *Tenna* (plateau), *Hela* (Escarpment) and *Giri* or *gira* (high mountain) have been used to differentiate these mountainous ecosystems.

Biodiversity related to Traditional Agriculture

According to Mohotti (2002), a well-organized traditional agricultural system exists in the country for nearly 13,000 years. This traditional agricultural system was practiced by the people with locally available resources and indigenous knowledge, until early 1950's when the "Green Revolution" was introduced. Even today, some village farmers to a certain extent still depend on their traditional knowledge profile to curb pest attacks, diseases etc. especially in paddy and coconut cultivation. To overcome such problems some farmers still prefer to use natural chemicals, plant extracts and resins over synthetic chemicals available commercially. Farmers still maintain traditional agricultural systems such as chena cultivation (Dry and Intermediate Zones) and Kandyan home gardens (Wet zone).

In addition to that, traditional farmers have been using plants and animals as indicators of prevailing soil and water conditions. Traditional farmers have their own system of soil classification and use that knowledge to determine the most appropriate crops and their suitability to the particular soil condition.

Table 8.5 - Soil Type Indicator Plants
Source: Traditional Knowledge, Addendum chapter.

Native Name	*Botanical Name*	*Soil Type*
Heen kola Getapan Aligeta Borupan Getapan Halpan	*Pygmacus scirpus* *Capitatus scirpus* *Lateralis scirpus* *Globasus scirpus*	Swampy Soil
Lunuwila Indi	*Bacopa monniera* *Phoenix zeylanica*	Saline soil
Pila Nidikumba Diya siyambala Penithora	*Tephrosia purpuera* *Mimosa pudica* *Aeschynomene indica* *Cassia occidentalis*	Sandy soil
Attora Helamba	*Panicum repens* *Mitragyna Parvifola*	Gravelly Soil

In dry and intermediate zones of Sri Lanka, water scarcity is a major crisis faced by the farmers. The farmers heavily depend on the limited irrigation water supplies. From the early times, people have identified availability of ground water through indicator plants in the location.

Table 8.6 - Ground Water Indicator Plants
Source: Traditional Knowledge, Addendum chapter.

Native Name	*Botanical Name*	*Other associated features*	*Nature of Ground water*
Esala	*Cassia fistula*	A long row of trees	Underground water
Damba	*Ayzygium assimila*	Presence of an ant hill, two and half yards on the east	Underground Spring
Kumbuk + Beli	*Terminela arjuna*	12 yards west from the trees	Underground fountain
Maila	*Bahunia racemosa*	At 4 feet depth	Water spring
Midella	*Barringtonia speciosa*	At 5 feet depth	Water spring
Debara	*Zizyphus*	Under canopy of the tree	Water spring
Kotadimbula	*Ficus hispida*	Under canopy of the tree	Water spring
Wey	*Roxburghi*	Under canopy of the tree	Water spring
Thrasthawalu	*Operculma turpethum*	Associated with anthill	Water spring
Iramusu	*Operculum turpethum*	Associated with anthill	Water spring
Divipahuru	*Pes tigridis*	Associated with anthill	Water spring

Traditional farmers also had the ability to identify the level of soil fertility through indicator plants. Furthermore, the traditional knowledge profile also had the capability to identify the level of soil alkalinity which is considered as a common problem face by the farmers in the coastal areas.

Table 8.7 - Botanical Indicators of Soil Alkalinity

Native Name of Plant	*Botanical Name*
Kokmota	*Eviocaulin setaceum*
Tal	*Borassus flabelifer*
Indi	*Phoenix zeylanica*
Lunuwila	*Herpestis monnieria*
Wel miris	
Maruk	*Panicum*
Heen maruk	

The early farmers not only have the ability to identify particular soil-related problem but also have the capacity to curtail it through natural means. Having identified the soil alkalinity status, they also managed to identify some plants believed to be absorbing various mineral elements related to alkalinity.

Table 8.8 - Alkalinity Absorbing Plant Varieties

Native Name of Plant	*Botanical Name*	*Material Used*
Mee	Madhuca longifolia	leaves
Ingini	*Potatorum*	ashes
Kumbuk	*Terminalia arjuna*	ashes
Madu	*Cycas civiuails*	ashes
Ganhadu		leaves
Karanda	*Pongamia pinnata*	leaves
Madau	*Cyzygium cumini*	leaves

CHAPTER 9

IMPACT ON BIODIVERSITY

HUMAN POPULATION

The last complete population census was carried out in 2001 and therefore I had to rely on the statistics taken in 2001 and estimated population figures taken between 2002 and 2005. The population distribution among different ethnic groups in 1981 and 2001 was given below to evaluate the trends, after 2 decades (Table 9.1). According to these statistics, in the Kurunegala district, all ethnic groups except Sri Lanka Moor and Malay communities have decreased over the period of 20 years starting from 1981. The Moor population has increased approximately by about 1.5%, while the Malay population has increased by a lesser extent of 0.05%. In Puttalam, this decreasing trend was similar for most ethnic groups. However, the percentage decrease was almost 10% with the Sinhalese population while the Sri Lankan Moor population has almost doubled during the same period. The growth rate during the year 1981 to 2001 was 0.9 for Kurunegala district while it was 1.8 for the Puttalam district (Table 9.2). This population growth could be through birth and/or through immigration.

Table 9.1 – Population distribution by ethnic groups 1981, 2001.
Source: Department of Census and Statistics, Sri Lanka
(http://www.statistics.gov.lk/Abstract_2006/Tables/chap%202/AB2-1a.pdf

Ethnic groups				
Kurunegala	**1981**	**2001**	**% (1981)**	**% (2001)**
Sinhalese	1,125,912	1,341,237	92.91	91.85
SL Tamil	14,920	17,585	1.23	1.20
Indian Tamil	6,616	2,972	0.55	0.20
SL Moor	60,791	94,544	5.02	6.47
Burghur	562	613	0.05	0.04
Malay	1,259	2,150	0.10	0.15
Other	1,741	1,114	0.14	0.08
Total	**1,211,801**	**1,460,215**		
Puttalam	**1981**	**2001**	**% (1981)**	**% (2001)**
Sinhalese	407067	523116	82.65	73.71
SL Tamil	32282	48072	6.55	6.77
Indian Tamil	2289	2227	0.46	0.31
SL Moor	49000	133134	9.95	18.76
Burghur	440	735	0.09	0.10
Malay	954	1214	0.19	0.17
Other	501	1179	0.10	0.17
Total	**492,533**	**709,677**		

Table 9.2: Population, Annual Growth Rate During 1981-2001 and Population Density in the Kurunegala and Puttalam districts.
Source: Census of Population Housing 1981/2001. Department of Census and Statistics, Sri Lanka.

District	Population		Annual growth Rate	Population Density per sq.km	
	1981	2001	(1981-2001)	1981	2001
Kurunegala	1,211,801	1,452,369	0.9	254	314
Puttalam	492,533	705,342	1.8	165	245
Sri Lanka	14,846,750	18,732,255	1.1	230	299

According to the provisional information published by the Registrar General's Department, Sri Lanka, the population has increased slightly over the period of 2002 -2004, while keeping the female population slightly higher than the male population which was consistent in both districts (Fig. 9.1).

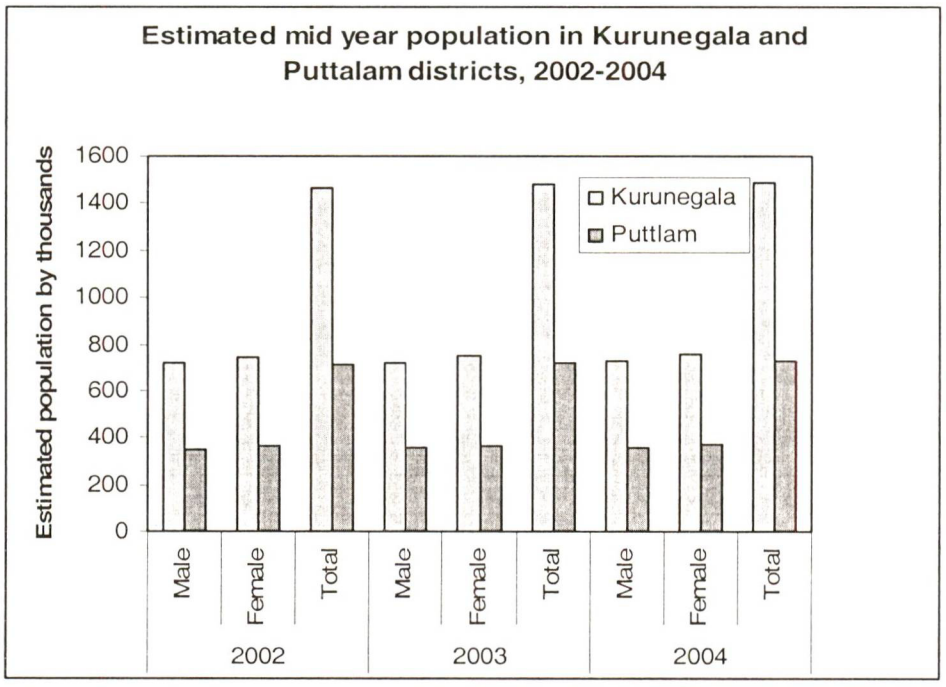


Fig. 9.1 – Estimated mid year population in Kurunegala and Puttalam districts during the year 2002 to 2004 (provisional).
Source: Registrar General's Department, Sri Lanka.

Land:man ratio also indicates the per capita land availability. As the land area of the country remain static (or even reducing), the ever increasing human population can make the land:man ratio value lower with time. This dwindling values may be more prominent with the forest land:man ratios as the forest cover is diminishing at an alarming rate during the past few decades. Land:man and forest land: man ratios are also considered as good indicators to demonstrate how the human population pressure on the available land resources thus leading to high degree of land degradation (Table 9.3). According to the population figures taken in 2001, both land:man and forest land:man ratios were much lesser in the Kurunegala district than the Puttalam district indicating more human pressure on land resources in the Kurunegala than in Puttalam. The land:man ratios of the NWP during the years 2002, 2003 and 2004 (0.35, 0.341 and 0.339 respectively) clearly indicate the human pressure on land resources in the province.

Table 9.3 – Land:man and forest land:man ratios of Kurunegala and Puttalam districts.

	Kurunegala	Puttalam	NW Province
Land area (sq.km)	4,816	3,072	7,888
Population as at 2001	1,460,215	709,677	2,169,892
Land:man Ratio	0.003	0.004	0.0036
Forest area*	51,785	114,129	165,914
Forest land:man ratio	0.035	0.161	0.076

* forest area for each district have been calculated with the help of the data taken from the Sri Lanka Forestry Sector Master Plan, 1995 and WCMC 1997.

Population density is the measure of the number per unit area. It is commonly represented as people per square mile (or square kilometer). Density is only a raw gauge to measure a population's disbursement across the land. The trend in the population density fluctuations in the Kurunegala and Puttalam districts since 1871 to 2001 is given in the following graph (Fig. 9.2). The graph clearly indicates some what fixed density change up to 1958 and then a rapid increase after that. A similar tend is evident in both districts.

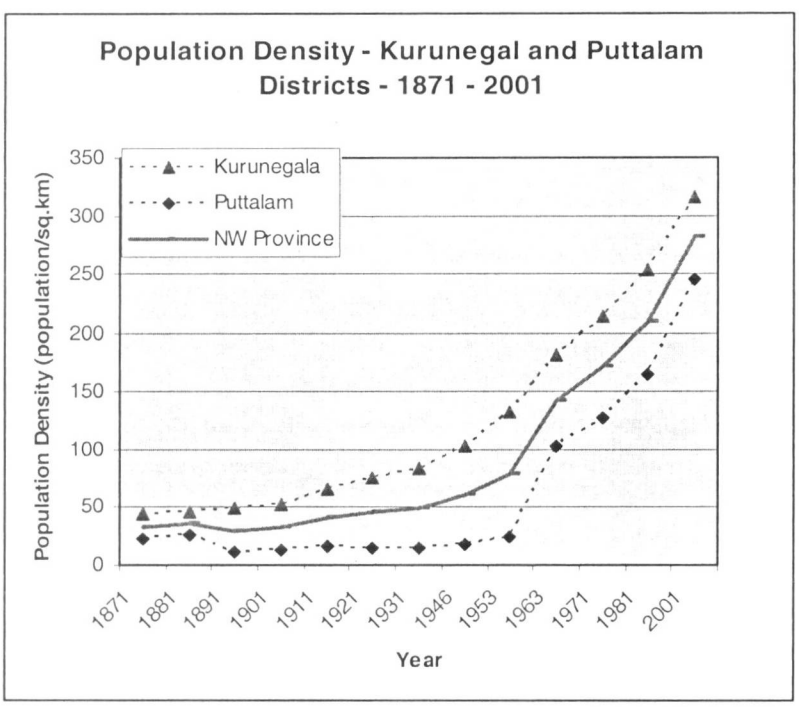


Fig. 9.2 – Population density changes (number per sq.km) in two districts, Kurunegala and Puttalam, from 1871 – 2001.
Source: Department of Census and Statistics, Sri Lanka.

Population by different Religions

The population distribution by different religions in the Kurunegala and Puttalam districts ate given in the following table (Table 9.4).

Table 9.4 – Population by different religions.
Source: Census of Population and Housing 2001, Department of Census and Statistics, Sri Lanka.

District and Sector	Total no. of persons	Religion					
		Buddhist	Hindu	Islam	Roman Catholic	Other Christian	Other
Kurunegala	**1,452,369**	**1,291,654**	**14,022**	**99,677**	**39,973**	**6,719**	**324**
Urban	34,719	24,315	2,493	5,589	1,922	362	38
Rural	1,410,904	1,264,533	8,234	94,074	37,617	6,168	278
Estate	6,746	2,806	3,295	14	434	189	8
Puttalam	**705,342**	**304,009**	**30,395**	**133,697**	**230,336**	**6,677**	**228**
Urban	65,072	8,247	6,212	29,456	20,523	604	30
Rural	638,728	294,952	23,857	104,232	209,437	6,052	198
Estate	1,542	810	326	9	376	21	0
Sri Lanka	**16,864,544**	**12,936,704**	**1,329,020**	**1,431,044**	**1,021,971**	**136,712**	**9,093**

Unemployment

According to the census carried out in 2001 on population and housing by the Department of Census and Statistics, Sri Lanka the unemployment rate (which is expressed as a percentage of unemployed persons to the total labour force) was 8.0% for the Kururnegala district while in the Puttalam district it remained as at 7.0%. In both districts, the unemployment rate of females higher than that of males.

The poverty headcount ratio (another poverty indicator) is the proportion of the national population whose incomes are below the official threshold (or thresholds) set by the national government. According to the information gathered at the household income and expenditure survey in 1990-91, 1995-96 and in 2002 by the Department of Census and Statistics, Sri Lanka, poverty headcount ratios were calculated for different districts separately (Table 9.5). The results indicate that the poverty is increasing over the years in the Puttalam district while there is a decreasing trend in the Kurunegala district.

Table 9.5 – Poverty headcount ratio of Kurunegala and Puttalam districts.
Source - Household Income and Expenditure Survey 1990-91,1995-96,2002
Department of Census and Statistics

Districts	Survey period		
	1990-91 (%)	1995-96 (%)	2002 (%)
Kurunegala	27	26	25
Puttalam	22	31	31
Sri Lanka	**26.1**	**28.8**	**22.7**

Migrant Population

According to the Department of Census and Statistics, out of the total population enumerated in 2001 in the Kurunegala district, 89.3% are usually living in there since birth, while about 5.6% have emigrated from other districts during the period of 1991 to 2001. Largest share (13.3%) of immigrant population has come from the Gampaha district and followed by Puttalam and Kegalle districts (12% and 11% respectively). In the Puttalam district, about 77% are usually living in the district since birth and only about 7.7% have immigrated within a period of 10 years starting from 1991. The largest share (27.8%) of people migrated to the Puttalam district from the Kurunegala district and followed by Gampaha and Mannar districts (16.4% and 11.6% respectively) (Table 9.6).

Table 9.6: Percentage of migrant population by district of previous residence and sex for Kurunegala and Puttalam districts separately.
Source: Department of Census and Statistics, 2003.

District of previous residence	Total	Sex	
		Male (%)	Female (%)
Kurunegala			
Gampaha	13.3	12.9	13.7
Kandy	10.7	10.9	10.6
Puttalam	12.0	12.0	11.9
Kegalle	11.0	9.8	12.0
Colombo	9.0	10.2	8.1
Puttalam			
Kurunegala	27.8	25.7	29.7
Gampaha	16.4	15.5	17.2
Mannar	11.6	11.9	11.4
Colombo	7.6	8.0	7.3

MAN MADE ECOSYSTEMS

Built up lands together with agricultural lands can be considered as man-made ecosystems. The human pressure on the available land resources also can be assessed by studying changes and trends in the extent of man made ecosystems over the years. In the NWP, the man made ecosystems accounts about 594,420 ha of land and out of which 212,630 ha of land comes under coconut plantations (approximately 36%) (Tables 9.7 and 9.8).

Table 9.7: Extent (ha) of various land uses by districts in Sri Lanka.
Source: Land use maps 1982-1988. Survey Department of Sri Lanka.

Land use types	Kurunegala	Puttalam	Sri Lanka	% (NW Province)
Built up lands	440	1880	29,190	7.9
Agriculture lands	430,000	162,100	3,710,880	15.9
Forest lands	18,480	81,670	1,759,440	5.7
Range lands	7400	23,670	593,520	5.2
Wetlands	0	4670	61,810	7.6
Water bodies	19,160	18,950	290,520	13.1
Barren land	2110	10,660	77,480	16.5
Total	**477,590**	**303,600**	**6,523,240**	**12**

Table 9.8: Extent of Agricultural Lands in hectares.
Source: Land use maps and 1982-1988 Survey Department of Sri Lanka.

	Kurunegala	Puttalam	Sri Lanka	% NW Province
Tree crops				
Homesteads	53,640	34,480	781,270	11.3
Tea	280	-	204,050	0.14
Rubber	4890	-	199,030	2.5
Coconut	165,250	47,380	297,620	71.4
Mixed crops	660	200	52,820	1.63
Cinnamon	-	-	9130	0
Cashew	-	330	330	100
Oil Plam	-	-	1070	0
Annual crops				
Paddy	92,530	19,690	801,470	
Sparsely used crop land	112,710	58,700	1,288,530	
Other crops	40	1320	61,660	
Sugar cane	-	-	13,900	
Total	**430,000**	**162,100**	**3,710,880**	

The land under any form of agriculture has risen sharply in both districts during the period of 1973 to 1982 (Fig. 9.3).

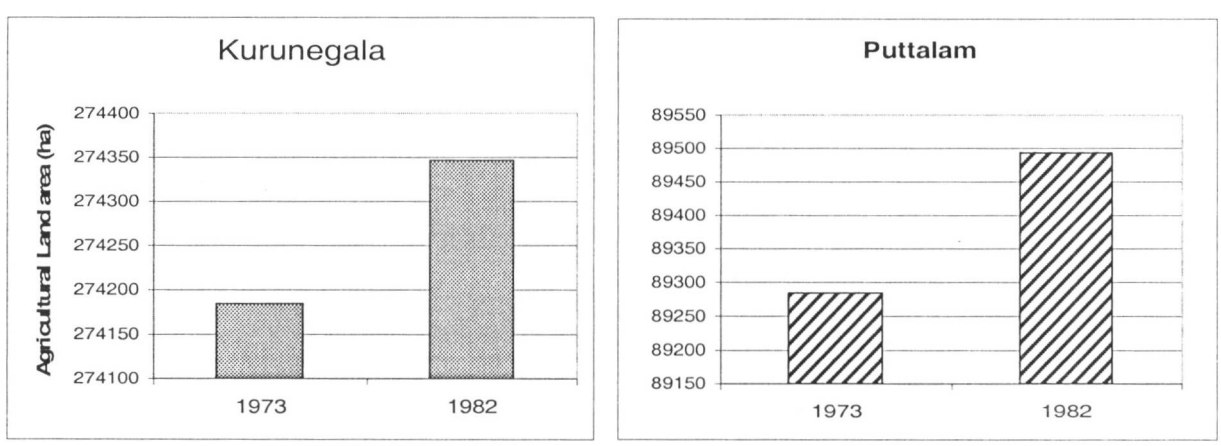


Fig 9.3: Change in agricultural land extent (ha) between 1973-1982 period
Source: Department of Census and Statistics, Sri Lanka

Fragmentation of Coconut Lands

Increasing coconut land fragmentation during the past few decades is considered as a major threat to the coconut industry (Fig.9.4). Coconut land in Kurunegala and Chilaw have become more valuable for alternative uses, with their owners using them for residential and commercial development. This fragmentation or 'blocking out' of coconut lands for private housing and settlements taken place at an alarming rate in districts such as Gampaha, Kurunegala and Puttalam; so called 'coconut triangle' in the country. It was stated that there were 2319 coconut estates covering an area of 113,170 acres of land in the above mentioned districts in 1994. According to a report submitted by the CRI (http://www.cri.lk/landextent_paperarticle.pdf), the rate of decline of coconut lands in Sri Lanka is

highest in the NWP followed by Western Province (WP). Of the districts within those two provinces, the highest rate of decline has occurred in Kurunegala (NWP) followed by Gampaha (WP) and the third highest rate of decline was reported in Puttalam which also comes under the NWP. It has been also observed that the annual decrease of land area under coconut is much higher than the annual increase and hence, leads to the reduction of land area under coconut as well as the production while the demand increases annually. In Mirigama DS division, there were 55 coconut estates in 1995 and has reduced to 5 by the year 2003 showing the severity of this problem (Daily News, 22 Feb., 2003). So called 'property developers' buy these coconut lands at a cheaper price from land owners and then sectioned out into 15-20 perch blocks and develop the physical infrastucture (roads, electricity etc.) before selling them out to interested parties on easy payment schemes but at a higher price per perch. Therefore, this coconut land fragmentation has caused large extents of highly productive coconut lands to disappear within relatively a short period of time. As an initiative towards addressing this grave problem, the Coconut Research Institute (CRI) has surveyed and mapped coconut land in the 'coconut triangle' based on the land suitability index (Table 9.9).

Table 9.9 - Potential yield and Extent of coconut land under each suitability class.
Source: Somasiri *et al.,* 1994.

Class	Suitability level	Potential Yield (nuts/ha/yr)	Extent (ha) Approximate
S1	Highly suitable	>15,000	12,000
S2	Suitable to highly suitable	12,500 – 15,000	202,000
S3	Suitable	10,000 – 12,500	110,000
S4	Moderately suitable	5,000 – 10,000	166,000.
S5	Marginally suitable	2,500 – 5,000	78,000
N1 & N2	Unsuitable lands		80,700
Total			648,700

Most of the lands that are already fragmented or on fragmentation in Gampaha, Kurunegala and Puttalam districts are come under the suitability indeces of S1, S2 and S3, the classes considered as the most suitable lands for coconut cultivation.

The administrative and research bodies such as Coconut Cultivation Board (CCB), Coconut Development Authority (CDA) and Coconut Research Institute (CRI) did not recognize this threat immediately. However, Sri Lanka already has laws and regulations preventing fragmentation of coconut land dating back to early 1970's which was considered as the most economically repressive periods in Sri Lanka's history. This act legislated in 1971, is not strong enough to prohibit this practice. At the moment, the provincial councils have the authority to permit the blocking and selling of coconut land. Therefore, the necessity of introducing new laws and regulations to curb this problem should be acknowledged.

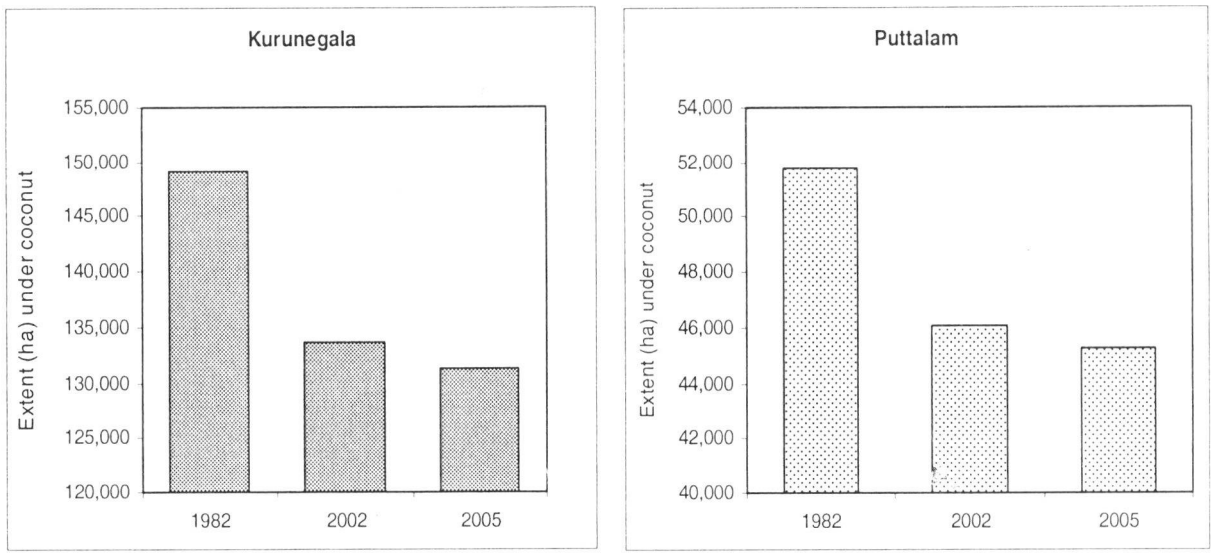


Fig 9.4: Change of coconut land extent in Kurunegala and Puttalam districts during the period of 1982 – 2005. The values given for the year 2005 are estimates
Source: Agricultural Census 1982; Agriculture and Livestock Census of Districts 1992, Department of Census and Statistics, Sri Lanka; http://www.cri.lk/landextent_paperarticle.pdf).

ILLEGAL SHRIMP FARMING

The brackish water area in Sri Lanka is estimated at about 120,000 ha of which 80,000 ha are estuaries and large deep lagoons while the rest represent by shallow lagoons, tidal flats and mangrove ecosystems. The estimated extent of brackish water bodies in the northwestern Province (NWP) is over 15,000 hectares (National Aquatic Research Authority- NARA, 1999). It has been estimated that over 50% of the swamps, salt mashes and mudflats in the North Westerns Province have been converted to shrimp cultivation in the recent past. The shrimp cultivation in the North Western Province is largely concentrated around the Dutch Canal and related water bodies, Chilaw, Mundal and Puttlam lagoons.

Almost all of the shrimp culture development is restricted to the North Western Province (NWP) of Sri Lanka. The coastline of the NWP is approximately 120 km and includes several lagoons, estuarine systems and connected water areas. The shrimp farms are located in all three major climatic zones (wet zone, dry zone and arid zone) which encompass this province. The major brackish water bodies in this province are Puttalam lagoon, Mundal lagoon and Chilaw lagoon. Eighty percent of the shrimp farms are located along a manmade canal (Dutch canal) which connects Daduru Oya, Mundal lagoon system and Puttalam lagoon. This canal serves as source for water supply as well as source for effluent discharge from these farms. Most of the shrimp farms have been established along the coastline specifically on marshlands, mangroves and bare lands causing many environmental problems to the coastal ecosystem (Table 9.10).

In 1994, Sri Lanka earned about Rs. 1,252 million from the shrimp culture industry. This represents 63% of total foreign exchange earnings from the export of aquatic products.

Table 9.10 - Distribution of existing shrimp farms and areas by land use categories

Land Use Category	Extent (ha)	%
Bare land	294.5	25.0
Agricultural land		
Homesteads	127.0	10.7
Coconut	137.6	11.6
Paddy	36.1	3.1
Sparsely used crop land	76.0	6.5
Wetland		
Marshlands and mangroves	349.0	29.6
Unclassified	159.2	13.0
Total	**1,178.0**	**100**

Several environmental problems have emerged due to the recent rapid expansion of aquaculture activities in Sri Lanka which has shown the need to consider environmental factors in aquaculture development and allocate resources in a more sustainable manner. Several studies have been conducted by the National Aquatic Resources Agency (NARA) in order to introduce more environmental friendly aquaculture systems.

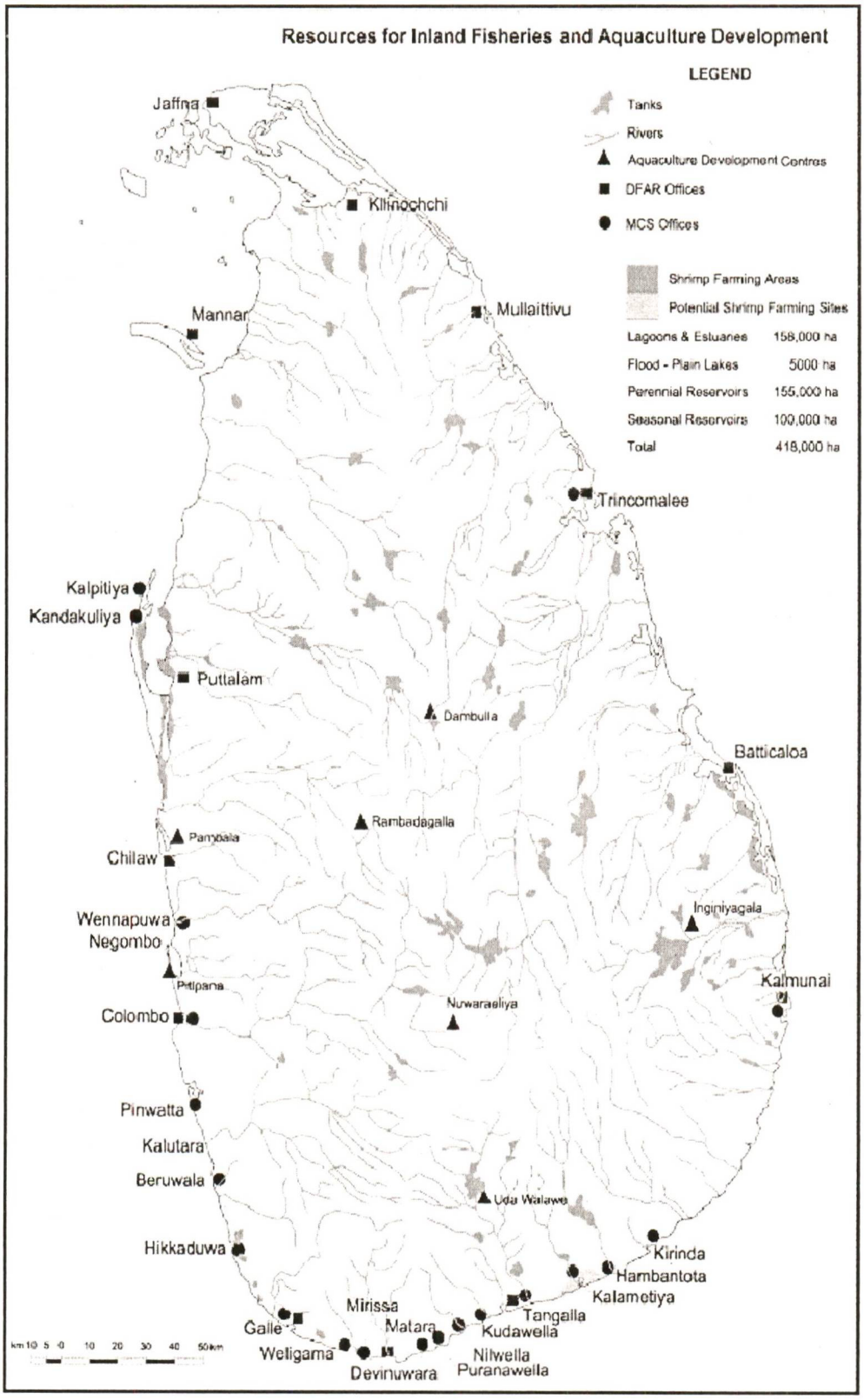


Fig. 9.5 - Aquaculture resources of Sri Lanka
Source: Prepared by National Hydrographic Office, NARA.
http://www.fisheries.gov.lk/maps/images/InlandFish.gif

Table 9.11 – Comparison of critical water quality in main water resources for shrimp culture in Sri Lanka.
Source: Senarath, 1998 (NARA, 1997).

Parameter	Units	Gembarandeniya	Chilaw	Dutch canal	Mundel lake	Dutch canal north	Puttalam laggon (Mee oya area)	Acceptable range
pH		7.3 – 8.2	7.5 – 8.6	7.4 – 8.7	7.2 – 8.7	7.5 – 8.6	7.2 – 8.6	6.8 – 8.7
Salinity	Ppt	2 – 30	5 – 31	0 – 38	2 – 52	1 - 46	10 - 48	10 - 30
Turbidity	NTU	6 – 32	5 – 35	5 – 32	9 – 53	7 - 30	6 - 25	
Nitrite	Mg/L	0.005 – 0.017	0.002 – 0.034	0.002 – 0.51	0.001 – 0.43	0.003 – 0.59	0.002 – 0.14	<0.2
Ammonia	Mg/L	0.007 – 0.08	0.01 – 0.18	0.20 – 0.56	0.09 – 0.47	0.27 – 0.43	0.04 – 0.15	<0.2
Sulphides	Mg/L	0.0 – 0.14	0.04 – 0.36	0.12 -0.72	0.10 – 0.7	0.16 – 0.7	0.16 – 0.6	<0.2
TSS	Mg/L	NA	50 – 300	100 – 400	125 – 425	150 – 400	100 – 275	<100
BOD	Mg/L	NA	8.8 – 20.4	8.6 – 36.2	6.0 – 22.4	10.8 – 48.4	7.8 – 18.2	<10
DO	Mg/L	NA	6.2 – 12.2	6.2 – 13.2	6.8 – 12.4	5.4 – 10.8	4.2 – 9.6	6.8 - 8.7

NA - Not available

Table 9.12 – Survey on shrimp farms and hatcheries in the Puttalam district, NWP of Sri Lanka.
Source: A survey conducted by the Ntional Aquaculture Development Authority (NAQDA) in 2001

Divisional Secretariats	Details of shrimp farms						Number of Hatcheries
	No. of farm units	Area (ha)	Authorized shrimp farm units		Unauthorized shrimp farm units		
			Number	Area (ha)	Number	Area (ha)	
Wennappuwa	10	15.4	1	0.9	9	15	2
Nattandiya	-	-	-	-	-	-	6
Mahawewa	156	161.3	44	108.4	112	52	3
Madampe	24	142.2	7	7.2	6	135	-
Chilaw	183	389.5	75	124.4	108	264	60
Arachchikattuwa	183	950.0	149	788.0	61	161	4
Mundal	448	1759.0	159	896.0	292	868	6
Puttalam	94	584.0	6	96.0	72	434	-
Kalpitiya	71	561.0	29	183.0	42	326	-
Wanathawilluwa	46	359.0	22	189.3	24	169	-
TOTAL	**1215**	**4818.0**	**492**	**2391.0**	**726**	**2426**	**81**

Many rules, regulations, legislation and laws have been introduced to deal with the activities related to aquaculture development. Some of the legislations relevant to environmental management of aquaculture are given in the following (Table 9.13):

Table 9.13 – Legislation available for environmental management of aquaculture and their scopes.

Legislation	Scope
Fisheries Ordinance 1956	Introduction of new species.
Draft Fisheries Act	Licensing of fish farms.
Coast Conservation Act No. 57	Permit procedures for any development activity in coastal zone.
Provincial Environmental Statue No.12 of 1990	Prohibition of discharges and emission of effluent to environment. Environment licensing.
Soil Conservation Act No. 25 1951	Control of soil degradation.
National Aquatic Resources Research and Development act - No. 54, 1981	Development, management and conservation of aquatic resources.
Fauna and Flora Ordinance	
National Wetland Heritage B	

HUMAN ELEPHANT CONFLICT (HEC)

Human Elephant Conflict (HEC) is an important and emerging social issue in Sri Lanka and in particular to the NWP, hence needs immediate and well-planned mitigation measures to tackle this problem. This conflict between humans and elephants is always depending on the position and availability of land and water resources that bring these two parties into contact. Mahaweli Development Project has increased the intensity of this problem by diverting the elephant habitats and fragmenting the forest lands (Santiapillai and Jackson, 1990).

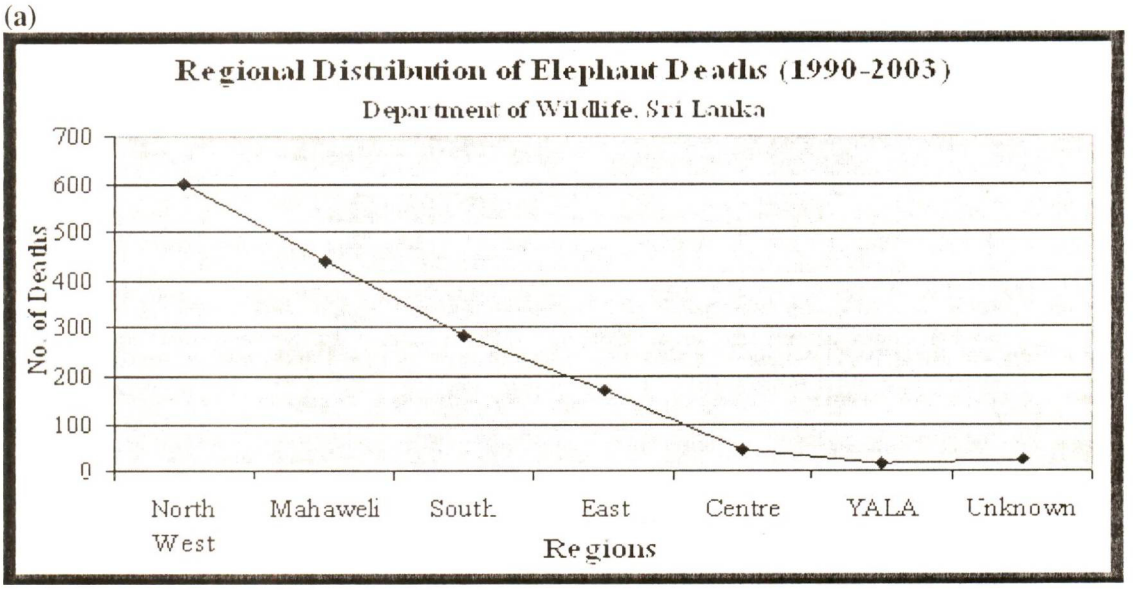
The following graphs (Fig.s 9.6a and b) extracted from the Sri Lanka Wildlife Conservation Society website (http://www.slwcs.org/archives/pdfs/nwr-initial.pdf) has clearly indicated the severity of this HEC in the NWP compared to other regions of Sri Lanka. Within the NWP, Giribawa, Ehetuwewa and Polpithigama DS divisions considered as the regions with high HEC occurrence (Nanayakkara *et al.*, 2005).

According to Nanayakkara *et al.* (2005), the highest number of elephant deaths were recorded in the Galgamuwa (NWP) DS division and the human deaths in the Giribawa (NWP) and Dimbulagala (NCEN) DS divisions during the year 2004 (Fig. 9.7). Single most frequent cause for elephant deaths in the NWP during the period of 1990 to 2003 was gun shot injuries and this clearly has indicated the severity of the HEC in this region of Sri Lanka. The highest frequency of elephant deaths was also recorded in May, 2004 in the NWP and it was 21% of the total elephant deaths in the country.

Paddy cultivation seems to be the major contributory factor for high HEC in the NWP. The results have clearly shown that the HEC is high during the harvesting periods mainly in May and October. This is the period where there is a high incidence of interactions between the farmers and the elephants. Nanayakkara *et al.* (2005) also indicated that there is a clear correlation between the cultivation season and the HEC. The study also has shown some connection of high HEC in locations where there is a protected area/s close by. Some parts of the both Ehetuwewa and Polpitigama DS divisions where there is a highest incidence of HEC, come under the Kahalla-Pallekelle sanctuary.

The same report has suggested some recommendations such as the crop diversification (sesame, tobacco and vegetables) and the introduction of new farming systems (livestock management) to minimize the economic loss experienced by the farmers in these HEC zones. All these factors should take into account when introducing mitigation measures and other regulations to alleviate this social problem in the future.

(a)



(b)

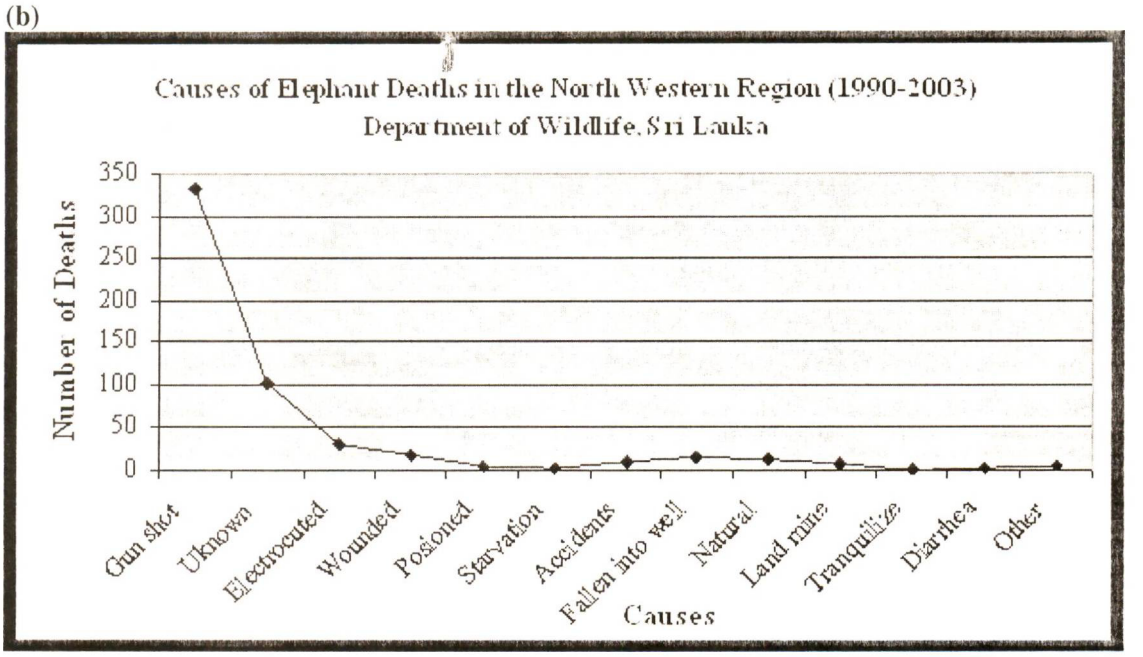


Fig. 9.6 – (a) Regional distribution of elephant deaths and (b) causes of elephant deaths in the NWP during the period of 1990 – 2003 in Sri Lanka
Source: http://www.slwcs.org/archives/pdfs/nwr-initial.pdf

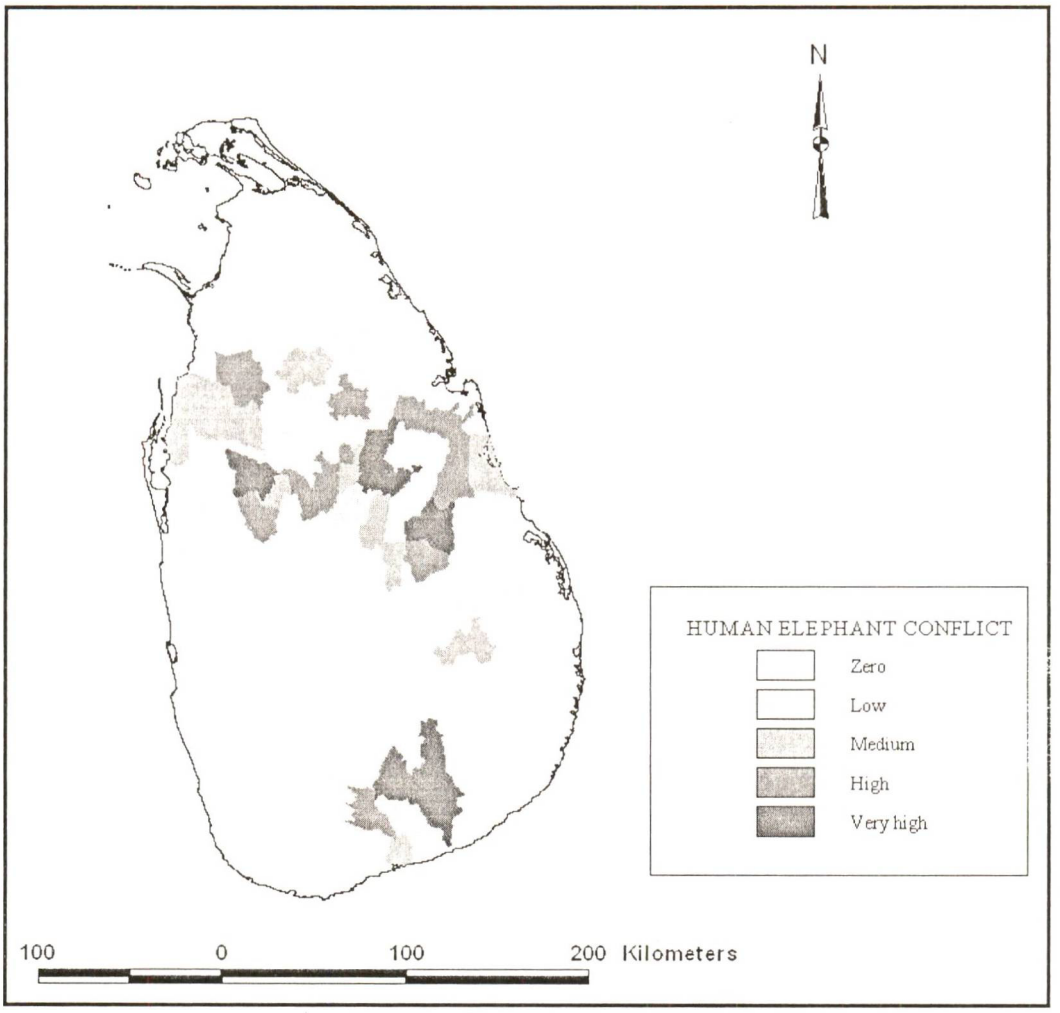


Fig. 9.7 Severity of HEC in Sri Lanka. This has been mapped based on human and elephant deaths
Source: Nanayakkara *et al.*, 2005
(http://www.gissl.lk/Symposia/2nd/Proceedings/2_sym_web_papers/pdf/5_nanayakkara.pdf)

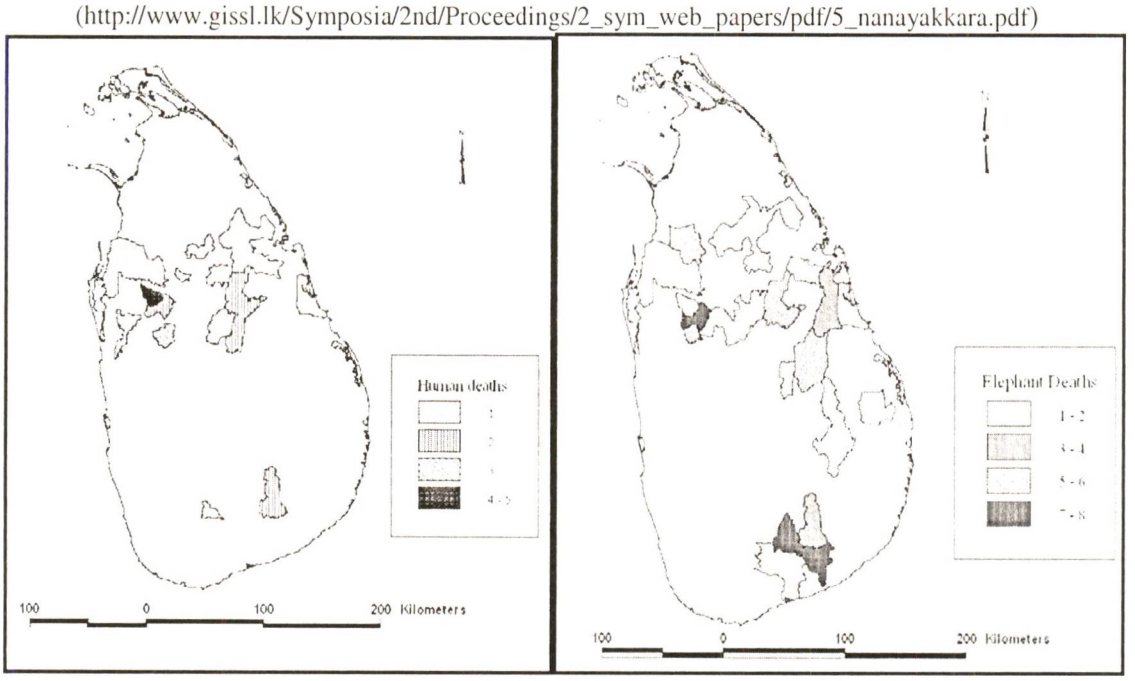


Fig 9.8 – Distribution of (a) human deaths and (b) elephant deaths in DS divisions in Sri Lanka in 2004
Source: Nanayakkara *et al.*, 2005
(http://www.gissl.lk/Symposia/2nd/Proceedings/2_sym_web_papers/pdf/5_nanayakkara.pdf).

INVASIVE SPECIES

Biodiversity of many man-made and natural ecosystems faces threats through out the world due to alien invasive species (AIS). Mc Neely (2001) defined AIS as 'a species introduced into a habitat and whose establishment and spread threatens the ecosystem, habitat or species with economic or environmental harm'. The most important threat by these AIS is the loss of native species and some times even ecosystems. So far, most of the invasive species lists prepared in this country had taken into consideration their distribution on different climatic regions of Sri Lanka. Such a list with invasive fauna and flora commonly come across in representative forest ecosystems in the NWP was given in this report (Appendix M).

MITE DISEASE IN COCONUTS

The coconut mite was first reported in Sri Lanka in late 1997 in the Kalpitiya area of the Puttalam district. According to a survey carried out by the Coconut Research Institute at Lunuwila, 81.1% and 69.8% of nuts were mite infested nuts in the Puttalam and Kurunegala districts respectively. Nut loss due to mite damage at the time of the harvest (defined as the % mite damaged nuts that cannot be sold at the price of a full size normal nut) was highest in the Puttalam district followed by Anuradhapura, in a study carried out in 5 districts to assess this problem (Peiris, undated)(Fig. 9.9).

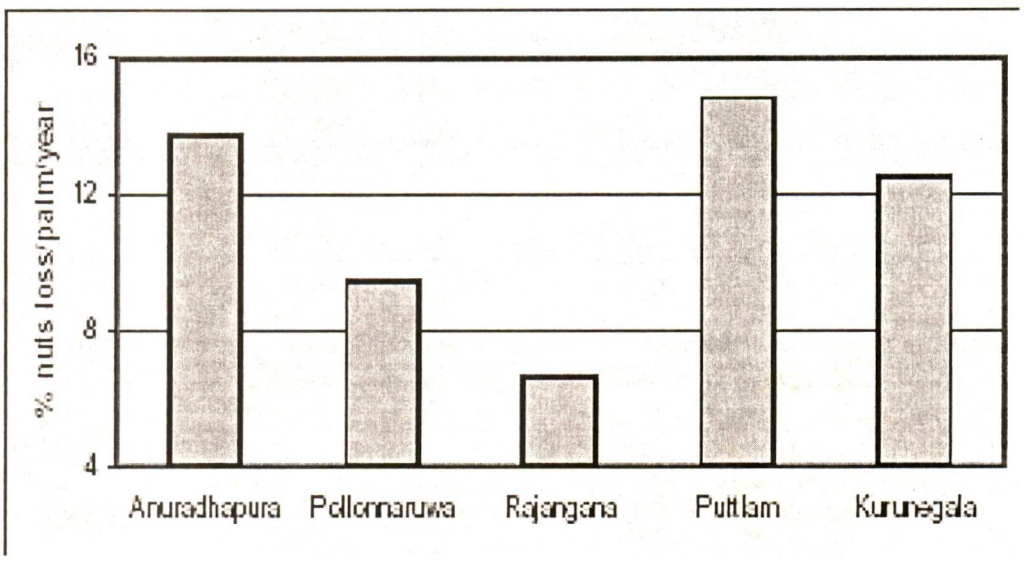


Fig. 9.9 – Percentage loss of the harvested nuts due mite damage.
Source: http://www.cri.lk/Mite_Article.pdf

It revealed that in the Kalpitiya area the nut loss due to mite infestation prior to harvest was 2.9%. The loss of national coconut production due to mite infestation is 55-85 miilion nuts per year. This is about 2-3% of the mean national yield. Other coconut-based industries also suffer due to this mite infestation. Desiccated coconut producers do not purchased mite infested nuts. Coir industry also has some impacts through this mite disease due to the low fresh husk weight per nut in mite infested ones compared to mite-free nuts (Fig. 9.10).

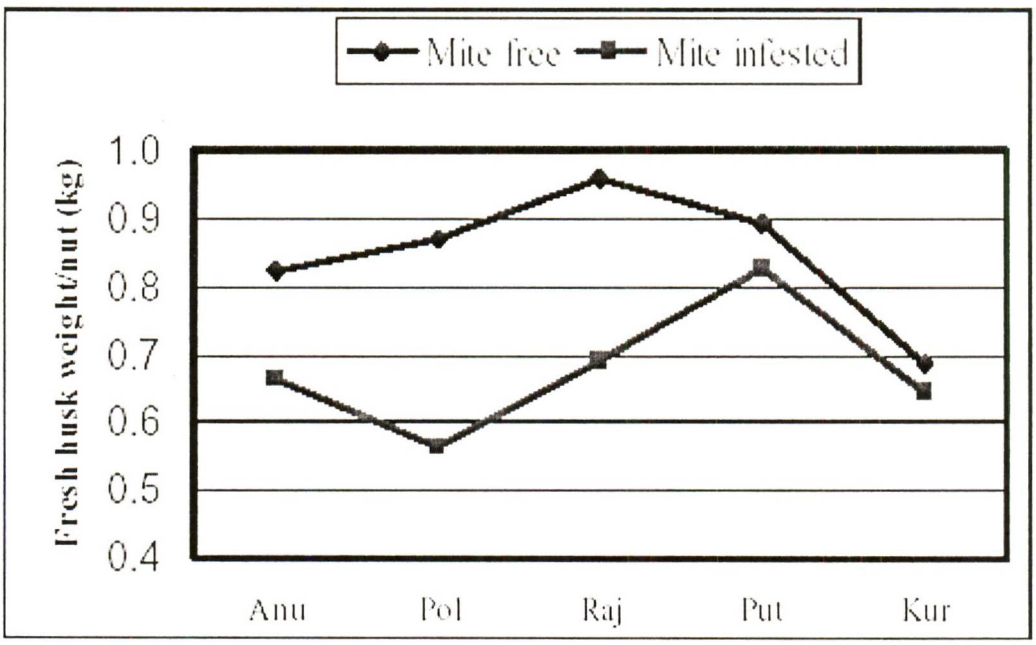


Fig. 9.10 - Fresh husk weight per nut (irrespective of size and shape).

SAND MINING

Sand mining along rivers and beaches in the NWP has lead to serious environmental consequences. Over the years river sand deposits have been badly over-exploited on a massive scale. The Coast Coservation Department (CCD) has identified Kelani, Deduru, Kalu, Maha Oya, Gin Ganga, and Nilwala Ganga as the rivers exposed to this threat on a larger scale. Out of these rivers, Maha Oya and the Deduru Oya belonged to the NWP and are considered as the two main rivers that have been abused extensively through mechanized and manual sand mining (www.sundayobserver.lk/2004/06/13/fea19.html). Illegal sand mining on the banks of the Mee Oya in the NWP is also spreading rapidly causing damage to the immediate environment. Permits are required not only for mining but also for transporting and selling sand but still illegal mining is taking place at an alarming rate. Sand mining is strictly prohibited in the Maha Oya in the NWP and Kelani River in the WP, but despite all these regulations and laws imposed, sand mining continues unabated.

The annual sand requirement of the country is nearly 8 million cubic meters and is growing at an annual rate of 10%. A major portion (77%) of this sand is consumed by 4 provinces – Western, Southern, Cantral and North Western. Therefore, banning of sand mining in river beds has driven the miners to exploit sand dunes along the NW coast. These natural sand dunes for generations protected the people living along coast from gusty sea waves. This exploitation of sand dunes in areas such as Mundel and Kalpitiya peninsula has caused irreparable damage on these sand formations. Due to the destruction caused by the mining of sand dunes in the Kalpitiya area, the Geological Survey and Mines Bureau (GSMB) had taken steps to suspend all mining activities in the Kalpitiya peninsula (http://www.lakdiva.org/suntimes/050213/news/1.html).

Sand mining can cause serious environmental threats such as sea water intrusions, pollution of ground water through fertilizer and pesticides, destroying the existing vegetation and sand dune ecosystems. Despite its negative impacts on the environment, the demand for sand for the construction industry also should be acknowledged. NWP-PEA is currently imposing regulations stipulated by the recent Supreme Court case Nos. SCFR 226/26 for sand mining and SCFR 81/04 for clay mining within the province. Therefore, a balance should be identified between this need and the protection of the environment when imposing regulations and laws and also when recommendations make for alternative sources for sand.

CHAPTER 10

BIODIVERSITY RELATED INSTITUTIONAL ASPECTS

Availability of adequate institutional capacity can be considered as one of the most important and critical single factor in regards to the successful implementation of this Biodiversity Profile and Action Plan.Therefore, identifiying responsible institutions and stakeholders for each and every recommendation are crucial and very important. The significance of the involvement of private sector, Community-Based Organizations (CBOs) and other non governmental organizations (NGOs) in this process has to be duly recognized. Eco-tourism, ornamental fish industry, coir based industries, forest plantations are some of the areas that can be identified as attractive areas for private sector involvement.

The Biodiversity and Conservation Action Plan (BCAP) (2005) have identified major drawbacks and gaps related to the existing legislations and made some recommendations to overcome them. According to the BCAP, the following are the major identified problems with the existing system that need to be resolved.

1. ***Jurisdictional overlaps and uncertainties*** – overlap of responsibilities between many institutions make the system very unhealthy and inefficient. This overlap of responsibilities has severely hindered proper coordination and leads to unhealthy competitions and conflicts between relevant bodies.

2. ***Improper balance between conservation and developmental issues*** – Many factors disturb the balance between the priorities of conservation and development. Promoting activities without considering the socio-economic aspects can be considered as one of the major contributory factor towards this problem.

3. ***Poor governance*** – Political influences and inefficiencies lie with the administration bodies can leads to poor governance of the laws established to safeguard the biodiversity.

Therefore, in order to implement the action plan efficiently and successfully, the institutional arrangement and coordination is important. The following recommendations can be considered in achieving the objectives set by the Action Plan.

1. A provincial committee can be set up in order to identify the responsibilities lay down by the action plan. This also could be done by 2 separate district committees (Kurunegala and Puttalam) to carryout this task more efficiently. An Advisory panel also could be nominated for the province. In addition to this, a 'Biodiversity Cell' can be established under the direct guidance of the Chief Secretary, NWP with the direct responsibility of overseeing the biodiversity-related issues in the NWP.

2. During the identification of the relevant institutes to entrust responsibilities, the relevant recommendations already listed in the provincial annual plan also could be incorporated into this Action Plan. These committees along with the advisory panel can prioritize the activities listed in the Action plan.

3. Pilot projects can be initially carried out in order to see the feasibility of these activities. The future of these relavant priority areas can be decided depending on the successful completion of these pilot projects.

4. Continuous monitoring mechanism is important to find out the smooth administration of these responsibilities entrusted on relevant institutes. For this, Coordinating Committees can play an important role.

5. Monitoring mechanism can be strengthened through half yearly progress review meetings.

CHAPTER 11

ACTION PLAN

The Action Plan for conservation and sustainable utilization of biodiversity resources of NWP is the final step of this whole exercise where the recommendations have been put forward relevant to the biodiversity related issues specially identified during the course of exercise, that need prompt and well-panned actions. During the identification of such issues a feed back from some of the natural resources managers, technical and administrative officers attached to various Natural Resources management institutes in the NWP also have taken into the consideration. However, once this action plan was formulated, was reviewed with a wider participation of administrative officers and other stakeholders of NWP in terms of availability of human and financial resources, in order to make this a reality.

This action plan was formulated specially taking into consideration the issues related to biodiversity that need quick action and the institutional constraints. The time frame given to initiate the activities of the action plan was 5 years.

Table 11.1 - Action Plan for biodiversity conservation and its sustainable use in the NW province

Classified Action	**Responsible institutes**	**Time frame (number of years)**
Overexploitation of resources		
Esatablishment of 'Biodiversity Cell' under the Chief Secretary, NWP To assit the overall Implementation activities of the Provincial Biodiversity Action Plan in NWP Liaise with the BDS-MENR, NWP-PEA and planning units of the two district secretariats and assit the process of integrating biodiversity concerns into provincial BD policy & planning.	PC-NWP,PEA-NWP, DSs-NWP,MENR	2
i) Identifying BD related issues. ii) Forward recommendations to relevant authorities. iii) Oversseing the activities related BD. iv) Assessing the progress and shortcoming in projects implemented by the Action Plan.	CCD, GSMB, NARA, PEA -NWP, CBOs and NGOs.	3
Sand and beach mining i. Identifying and demarcating vulnerable areas. ii. Identifying less vulnerable areas outside the active river systems and beaches where mining may be permitted in the future. iii. After reviewing and identifying the shortcomings of the existing regulatory procedure, provincial recommendation can be formulated. iv. Identification of alternative sources for sand to be used in the construction industry. v. Imposing a tax system to transport biomaterial to other provinces.	CCD, GSMB, Universities, NARA, UDA, PEA-NWP	2

Classified Action	Responsible institutes	Time frame (number of years)
Overexploitation of resources		
Coral Mining i. Identifying areas rich in live coral reefs and bringing them under relevant PA categories.	GSMB, NARA, UDA, PEA-NWP	5
Clay Mining i. Regulating the extraction of clay (Specially along the Ma Oya) for tile industry. ii. Rehabilitation of already degraded sites (clay pits) through excessive clay mining (Introducing fresh water fisheries etc.). iii. Issuing licenses only for identified areas with less risk to the environment.		
Over-exploitation of biomaterial (Coir, cane, medicinal plants etc.) i. A mechanism should be introduced to regulate the extraction of these bio-materials. Maximize the benefits through value addition. ii. Promote cultivation of such species with high commercial demand.	DAg, DAyur, Department of Small Industries	3
Ornamental Fisheries i. Implementing a monitoring system to regulate the process of freshwater species (faunal and floral) exportation. At the moment the monitoring is done only at the Customs. ii. Introduce strict regulations and a mechanism to monitor the breeding centers run by the private sector. There are many instances where the traders are exporting the wild catch rather than the breeding population. iii. Undertake studies to identify the rare and threatened species in these ecosystems along the NWP coast.	CBOs, NARA, Universities	3

Classified Action	Responsible institutes	Time frame (number of years)
Impact on Biodiversity		
Deforestation i. Identifying and demarcating the remaining forest cover within the province. ii. Identifying vulnerable areas (through human activities such as clearing, excessive firewood collection etc.) and bringing them under relevant PA categories. iii. Identifying already degraded areas to introduce suitable reforestation programmes (through community participation). iv. Strengthening of the existing reforestation programs. v. Provide incentives for the private sector to get them involve in plantation forestry to meet the increasing demand for timber thereby reducing the high dependence on timber species in the natural ecosystems. vi. Establish community woodlots on degraded or under-utilized lands close to PAs to minimize the extraction of firewood from these ecosystems. vi. Promote Universities to conduct research projects aiming at forest restoration and other BD related issues in the NWP. vii. Introduction of mixed-culture forest systems for buffer zone enrichment. viii. Convert abandoned chena lands into lands with some form of agroforestry practices.	MENR, FD, DWLC, LRC, PEA-NWP, NSF, Chief Ministry of the NWP, Ministry of Plantations, Universities, CBOs, Private Sector	5
Conservation of Watershed areas i. Steps should be taken to identify and demarcate catchment areas of water bodies within the NWP. ii. Rehabilitation of degraded catchment areas through enrichment and reforestation programmes. iii.Ambitious to establish the traditional cascade system.	Irrigation Dept. FD	5
Clearing of Mangrove forests i. Identification and demarcation of degraded areas along the coast in the NWP. ii. Strengthening the re-plantation program which is already in progress. iii. Encouraging the private sector participation in mangrove reclamation projects.	NARA, CCD, Universities, CBOs, FD, NAQDA, Provincial Ministry of Fisheries, NW Regional Resource Development Authority	5

Classified Action	Responsible institutes	Time frame (number of years)
Impact on Biodiversity		
Aquaculture farms i. Strengthening the Environmental Evaluation Process (EEP) before issuing permits for aquaculture farms. ii. Introduction of strict regulations and guidelines to pond management in aquaculture industry. iii. Poly-culture prawn farming should be encouraged. iv. Increase public awareness of the potential adverse environmental impacts of aquaculture through school projects. v. Introducing ecological restoration programs to rehabilitate the areas destructed due to the abandonment of aquaculture farms.	NARA, CCD, PEA-NWP, CBOs, Private Sector, NARA, NAQDA	3
Tabbowa Reservoir i. Enhance the public awareness of the importance of this ecosystem. ii. Demarcate the most sensitive area within the Tabbowa reservoir and its surroundings where the Jurassic fossils have been located.	CBOs, Universities, FD, DWLC, ID	5
Invasive species i. Initiate a survey on IAS and their ecological and economical impacts: Prepare a register to include IAS (both fauna and flora) list for the province. ii. Conduct research on the distribution of IAS and their management and control. iii. Introduce regulations on importing fish species to be locally sold for aquariums.	FD, DWLC, Universities	3
Crop wild relatives and animal genetic resources i. Initiate a provincial herbarium. ii. Promote research in these areas. iii. Introduce regulations to curb excessive slaughtering of indigenous animals (fowl and cattle) iii. Regulate the importing of genetically modified food (GMF) and crop varieties at the provincial level.	PGRC, HORDI, Universities, NSF	5
Forest Fires i. Implement legislation against man-induced forest fires. ii. Increase awareness among the communities of the negative impacts of such forest fires.	FD, DWLC, CBOs	3
Environmental impacts Mosquito and fruit bat populations have been exploding in some parts of the NWP. Measures should take to control their population.	FD, DWLC, Universities	3

Classified Action	Responsible institutes	Time frame (number of years)
Environmental Pollution		
i. Environmental pollution due to the polythene use is a major problem in the NWP. Identification of efficient disposal and sewage discharge methods is important. ii. Strengthening the process of carrying out Environmental Impact Assessment (EIA) before setting up large industrial units in the NWP. The recommendations of these reports should be strictly adhered to. iii. Steps should be strictly taken to locate these industrial units within the identified industrial zones. Siting of these industries close to wetlands and other PAs should be prohibited. iv. Promote the use of organic manures and natural pesticides to minimize the excessive use of chemical fertilizers and pesticides.	CEA, UDA, CCD, Universities,	5
Unplanned Constructions		
i. Accelerate the detailed zoning plan for the province. Urban Development Authority has initiated this detailed zoning project and has done only the City limits of the Kurunegala. This can be used as a guide when issuing permission for Urban constructions.	UDA, Provincial Councils	3
Human-Elephant conflict		
i. Prepare long term plans to address this emerging problem in the NWP: Identifying seriously affected areas, electric fencing, setting up new corridors etc. ii. Identification of "nutritional zones" within these forests away from human settlements: improve the water and fodder availability within these zones. iii. Teak plantations also attract elephants. Recommendation of species other than Teak for forest plantations. iv. Setting up an elephant corridor to connect Wilpattu NP and Tabbowa via Karuwalagaswewa	FD, DWLC, Universities	2
Over-exploitation of ground water resources Implementation of a mechanism to regulate the exploitation of ground water resources (tube wells, agricultural wells etc.).	DAg, UDA	3
Fragmentation of coconut lands i. Coconut lands have been categorized into suitability classes. Rules and regulations should be strictly imposed to conserve and protect coconut lands comes under high suitability classes (such as S1 and S2). ii. Strengthening the existing set of rules and regulations imposed on coconut land fragmentation through identifying the shortcomings of the present system.	CRI, CDD, UDA, Dept. Local Government	3

Classified Action	Responsible institutes	Time frame (number of years)
Traditional Knowledge and Cultural Biodiversity i. Prepare a provincial register for traditional knowledge profile. ii. Promote research in areas (traditional medicine, agriculture etc.) where traditional knowledge can apply. iii. Take initiative to preserve bio-archaeological and cultural sites.	Provincial Councils, DAyur, Universities	5
Lack of research initiatives		
i. Lack of university coordinated research initiative in the NWP is been acknowledged. Promote universities to conduct research on biodiversity –related issues in the NWP. ii. Strengthen the research capabilities within the province by establishing a body to mediate research initiatives between relevant institutes and involved information gathering and sharing followed by dissemination.	Universities, NSF	5
Utilization of Biodiversity for economic gains		
i. Identifying relevant places and practices with a interest in BD and link these into tourism (cultural sites, BD parks, handicrafts, agroforestry systems, Ayurvedic medicine, bird watching, hiking etc.) ii. Provide incentives to the private sector to promote ecotourism (aiming at both foreign and local tourists) through the development of infrastructural facilities (roads, lodging facilities, information centers etc..	DAyur, FD, DWLC, Department of Tourism,	3

REFERENCES

Anon, 1991. Natural resources of Sri Lanka. Conditions and trends. NARESA, Colombo, 280pp.

Amarasinghe U, and Perera (1995).A report on environmental degradation, resource management issues and options for their solution: The Puttalam/Mundel estuarine system and associated coastal water. 1997. Dayaratne, P, Linden, O. and De Silva, R. (eds.) NARA, SIDA, NARESA and University of Stockholm.

Amarasinghe, 1988. In Dayaratne, P., Linden, O., and De Sliva, R. (Editors) 1997. A report on environmental degradation, resource management issues and options for their solution: The Puttalam/Mundel Estuarine System and Associated Coastal Waters. NARA, Sida, NARESA, and Stockholm University.

Bambaradeniya, C.N.B., S.J. Perera, S.P. Ekanayake, N. Perera, M. Wickramasinghe, P. Samarawickrema, D. Chandranimal (2005a). Report on the Status of Biodiversity in Kandakuliya - Kalpitiya CRMP/SAM Site. (Unpublished Report). IUCN – The World Conservation Union, Sri Lanka.

Bambaradeniya, C.N.B., A. de Vos, and P. Samarawickrama. (2005b). Preliminary Observations on Marine Vertebrate Species (Reptiles, Birds and Mammals) in the Northern Maritime Zone (Palk Strait) of Sri Lanka. (unpublished report) IUCN – The World Conservation Union.

Bambaradeniya C.N.B., Ekanayake S.P. and Gunawardane J. 1999. *Preliminary observations on the status of alien invasive biota in natural ecosystems of Sri Lanka.* Report on alien invasive species, GBF-SSEA. Colombo. IUCN Regional biodiversity programme, Asia, Colombo, Sri Lanka.

Siriwarrdana, U. (2003). The 2003 waterbird census in Sri Lanka. Loris 23 (3&4): 32-35.

Senarath, R.M.U. (1998) Environmental Management of Brackishwater aquaculture systems in sri Lanka. MSc thesis. School of Environment, Resources and Development, Bangkok, Thailand.

Swan, B., 1983. *An Introduction to the Coastal Geomorphology of Sri Lanka,* National Museums of Sri Lanka., Colombo., 182p.

Rajasuriya, A and White, A.T. 1995. Coral Reefs of Sri Lanka: Review of Their Extent, Condition and Management Status. *Coastal Management,* Vol. 23, pp. 70 -90

De Silva, M.W.R.N., 1985. Status of the coral reefs of Sri Lanka. Proc. *5th Int. Coral Reef Congress,* Tahiti, Vol.6, 515-518.

Jayawardhana, RP. (1986) The mangroves of Asia and the Pacific: Status and management. RM Umali, PM Zamora, RR Gotera, RS Jara AS Camacho M. Vannucci (eds). Manila, Phillippines: UNESCO/UNDP, 219-230.

Jayatissa, L. P., Dahdouh-Guebas, F. and Koedam, N. 2002. The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2002, **138**, 29–43

Santiapillai.C., and Jakson P. (1990). The Asian Elephant: An Action Plan for its Conservation. IUCN. Gland.

Nanayakkara, HPLK, Gunaratne, LHP and Dayawansa, NDK (2005). A study on Human Elephant conflict in North-Western region of Sri Lanka: A spatially explicit approach. Proceedings of the Second National Symposium on Geo-Informatics - August 26, 2005

http://en.wikipedia.org/wiki/North_Western_Province,_Sri_Lanka (accessed on the 25th May 2006).

http://en.wikipedia.org/wiki/North_Western_Province,_Sri_Lanka (accessed on the 25th May 2006).

http://www.cri.lk/landextent_paperarticle.pdf (accessed on the 1st November 2007).

F.J. Murray & D.C Little (2000). The Nature of Small-Scale Farmer managed Irrigation Systems In North West Province, Sri Lanka and Potential for Aquaculture. Working Paper SL1.3. (Project R7064).

DAS (1986). Tabulated data presented by Wayamba Development Authority, Kurunegala.

UNEP/GPA (2003). *"Study on Better Practices for Shrimp Farming in Chilaw and Puttlam districts of Sri Lanka."*

http://www.oxfordjournals.org/.../graphics/egc056f1.gif (accessed on the 30th December 2006).

http://www.archaeology.gov.lk/explor.html

APPENDIX 1

Composition of different Forest types exist in the NW Province of Sri Lanka (Gap Analysis Report, 2006)

Dry Mixed Evergreen Forest (DMEF)

Emergents : Evergreen - *Manilkara hexandra* and *Scleichera oleosa.*
Emergents: Deciduous - *Chloroxylon swietenia* and *Berrya cordifolia*
Canopy: Evergreen – *Drypetes sepiaria, Dimocarpus longan, Diospyros ebenum, Alseodaphne semicarpifolia, Lepisanthes tetraphylla,* and *Strychnos nux-vomica.*
Canopy: Deciduous – *Mitragyna parvifolia* and *Vitex altissima*
Sub-canopy: Evergreen- *Diospyros ovalifolia, Pleurostylia opposita, Psydrax dicoccus, Discospermum sphaerocarpum, Diospyros ferrea, Eugenia willdenowii, Dimorphocalys glabellus, Walsura trifoliolata,* and *Pleiospermium alatum.*
Sub-canopy: Deciduous – *Lepisanthes tetraphylla, Cassia fistula, Sapium insigne Pteroispermum suberifolium* and *Premna tomentosa.*
Shrub – *Phyllanthus polyphyllus, Tarenna asiatica, Polyalthis korinti, Glycosmis mauritiana, Memecylon capitellatum, Memecylon umbellatum* and *Stenosiphonium cordifolium.*
Liânas & climbers – *Ventilago maderaspatana, Scutia myrtina, Derris scandens, Salacia reticulata* and *Derris parvifolia.*
Herb – *Scleria lithosperma, Justicia procumbens* and *Cyrtococcum trigonum.*

Moist Mixed Evergreen Forest (MMEF)

For example, a community with affinities to wet lowland flora exists in Kurunegala aspect of the intermediate zone. The elements such as *Artocarpus nobilis, Filicium decipiens, Pometia pinnata, Semecarpus nigroviridis,* and *Mangifera zeylanica* etc. indicate wet lowland sources of enrichment. There are also broad-range species such as *Vitex altissima* and *Dimocarpus longan* etc., while species such as *Chukrasia tabularis, Ficus callosa, Tetrameles nudiflora* and *Pterospermum suberifolium* are typical intermediate zone elements. This community is generally evergreen in character with only a few deciduous species.

Meanwhile, as evidenced from studies conducted in the Kala Oya Upper Basin (EML 2005d), a distinct community occurs in association with isolated hills in the dry zone that is dominated by canopy species such as *Dimocarpus longan, Pterospermum suberifolium, Diospyros oocarpa, Diospyros ovalifolia, Xylopia nigricans. Vitex altissima, Diospyros ebenum, Berrya cordifolia, Discospermum shaerocarpum, Lepisanthese senegalensis, Walsura trifoliolata, Drypetes sepiaria, Psydrax dicoccos, Cleistanthus patulus, Cleistanthus pallidus, Mischodon zeylanicus, Drypetes gardneri, Pleurostylia opposita* and *Alseodaphne semicarpifolia* etc. The emergents, although uncommon, consist of massive trees such as *Tetrameles nudiflora, Antiaris toxicaria* and *Pterygota thwaitesii.* The high shrubs consist of *Dimorphocalyx glabellus, Mallotus rhamnifolia* and *Mallotus eriocarpus* etc., while low shrubs consist of species such as *Polyalthia korinti, Streblus taxoides, Glycosmis pentaphylla and Memecylon capitellatum.* The lianas, although uncommon, consist of species such as *Ventilago maderaspatana, Reissantia indica* and *Salacia reticulata.* The scanty ground layer consist of herbaceous species,eg. , *Scleria lithosperma, Adiantum caudatum* and *Cyrtococcum trigonum* etc. Although many of these species have origins in the DMEF matrix, they distinctly differ quantitatively and furthermore, the MMEF is endowed with many characteristic and sometime unique species, eg. *Cleistanthus patulus, Xylopia nigricans, Mesua ferrea, Givottia rotteriformis, Artocarpus gomezianus* and *Celtis philippensis etc.*
Dry Riverine Evergreen Forest (DREF)

The canopy is close reaching 10 - 25 m high with all the layers of a tall forest represented in its profile. The profile dominated by massive evergreen trees and its luxuriance makes it more akin to a rain forest. *Terminalia arjuna* is apparently the most important tree species, in terms of density, frequency, girth and stature, and thus giving character to the DREF.

The main constituents of the DREF, based mainly on the studies conducted on the biodiversity of the Kala Oya Basin (EML 2005d) and Menik Ganga at Ruhuna National Park (IUCN and WCMC 1997) are as follows:
Canopy: *Terminalia arjuna, Berrya cordifolia, Polyalthia longifolia, Cassine glauca, vitex leucoxylon* and *Diospyros malabarica.*
High sub-canopy: *Diospyros ovalifolia, Aglaia eleagnoidea, Lepisanthes tetraphylla* and *Mischodon zelanicus.*
Low sub-canopy: *Nauclea orientalis, Pongamia pinnata, Garcinia spicata, Ficus hispida, Ficus racemosa, Dimorphocalyx glabellus,* and *Ixora pavetta.*
Shrubs: *Mallotus eriocarpus, Croton aromaticus* and *Polyalthia korinti.*
Lianas & climbers: *Reissantia indica, Salacia reticulata, Salacia oblonga, Derris parvifolia, Connarus monocarpus, Derris scandens* and *Caesapinia bonduc.*

Sparse and Open Forest (SPOF)

The general species composition of a dry zone SPOF, based on EML (2005d) and DWC (1996), is as follows:
Canopy - in remnant forests: Any of the characteristic canopy tree species of DMEF and MMEF, wherever appropriate.
Low canopy – in scrub: *Cassia fistula, Bauhinia racemosa, Azadirachta indica, Premna tomentosa, Pterospermum suberifolium, Syzygium cuminii, Mitragyna parvifolia, Grewia damine, Grewia helicterifolia, Alstonia scholaris, Ficus hispida* and *Macaranga peltata.*
Shrub: *Allophylus serratus, Murraya koenigii, Carmona retusa, Securenega leucopyrus, Phyllanthus polyphyllus, Lantana camara, Carissa spinarum, Croton laccifer, Atalantia ceylanica* and *Clausena indica.*
Climbers: *Derris scandens, Scutia myrtina, Asparagus racemosa, Ichnocarpus frutescens, Toddalia asiatica, Mussaenda frondosa, Ipomoea obscura* and *Gloriosa superba.*
Herb: *Aegeratum conyzoides, Evolvulus alsinoides, Leucas biflora, Ocimum basilicum, Sida acuta* and *Justicia procumbens.*

Mangrove Forest (MANF)

The common true mangrove species are: *Rhizophora* spp. , *Avicennia marina, Excoecaria agallocha, Lumnitzera racemosa, Sonneratia caseolaris, Bruguiera* spp. and *Aegiceras corniculatum.* The mangroves generally grow up to about 10 m in height, although in some localities trees could grow to a height of 15-20 m.

The important mangrove associates are: *Acrostichum aureum, Acanthus ilicifolius, Clerodendrum inerme, Thespesia populnea, Hibiscus tiliaceus, Cerbera odollam, Dolichandrone spathacea, Ardisia elliptica, Tamarix indica* and *Barringtonia racemosa.*

Dry Deciduous Thorn Scrub (DDTS)

The species composition of the DDTS, mainly based on the studies conducted in the Kala Oya Basin (EML 2005d) and Ruhuna National Park (IUCN and WCMC 1997), is as follows:
Deciduous trees: *Chloroxylon swietenia, Sapindus emarginata, Crateva adansonii, Cordia gharaf, Cordia monoica, Sapium insigne* and *Premna tomentosa.*
Evergreen trees: *Manilkara hexandra, Drypetes sepiaria, Strychnos potatorum, Lepisanthes tetraphylla, Limonia acidissima* and *Salvadora persica.*

Treelets/Shrubs/lianas/climbers – thorny species: *Carissa spinarum, Capparis sepiaria, Capparis zeylanica, Catunaregam spinosa, Securenega leucopyrus, Dichrostachys cinerea, Atalantia ceylanica, Azima tetracantha, Gymnosporia emarginata, Scutia myrtina* and *Zizyphus oenoplia.*
Treelets/Shrubs/ lianas/climbers – non-thorny species: *Allophylus serratus, Diospyros ferrea, Erythroxylon monogynum, Murraya koenigii, Mallotus eriocarpus, Phyllanthus pinnatus, Ochna obtusata, Memecylon umbellatum, Carmona retusa, Cassia auriculata, Reissantia indica, Cissus quadrangularis, Hugonia mystax* and *Vernonia zeylanica.*
Herbs: *Tephrosia purpurea* and *Ocimum tenuiflorum.*

Furthermore, the OTHS supports many salt-tolerant tree species such as Salvadora persica, Crateva adansonii, Thespesia populnea, Limonia acidissima and Manilkara hexandra and such shrubs/climbers/herbs like Azima tetracantha, Grewia tenax, Allophylus cobbe, Cissus vitiginea, Cissus quadragularis and Tylophora indica.

Savanna Grassland (SAVG)

The common species in a SAVG, based on NCR Survey (IUCN and WCMC 1995), are as follows:
Grassland: *Cymbopogon polyneuros, Cymbopogon nardus, Themeda triandra, Heteropogon triticeus, Aristida setacea, Imperata cylindrica* and *Panicum maximum* in disturbed places.
Tree/woodland: *Careya arborea, Terminalia chebula, Terminalia bellirica, Anogeissus latifolius, Pterocarpus marsupium, Phyllanthus emblica, Diospyros melanoxylon, Acacia chundra, Ficus arnottiana, Haldinia cordifolia, Pterospermum suberifolium, Bridelia retusa, Grewia damine* and *Zizyphus xylopyrus.*

Villu Grassland (VILG)

Based on a recent study conducted in the Kala Oya Basin (EML 2005d), the common plant species in VILG are:

Grasses: *Iseilema laxum, Paspalidium flavum* and *Cynodon dactylon.*
Other herbs: *Hygrophila schulli, Limnophyton obtusifolium, Crinum defixum, Sphaeranthus indicus, Cyperus* spp. and *Fimbristylis* spp.
Shrubs and climbers: *Calamus rotang, Caesalpinia bonduc, Asparagus racemosus, Phyllanthus reticulatus* and *Aeschynomene aspera.*
Trees: Bauhinia racemosa, Terminalia arjuna, Vitex leucoxylon, Phoenix pusilla, Pongamia pinnata, Barringtonia acutangula and Nauclea orientalis.

Sand Dune (SAND)

Some common species occurring in SAND, as noted in the southeastern coast, based on the NCR survey (IUCN and WCMC 1997), is as follows:
Sand: see above for herbs
Woodland – trees: *Drypetes sepiaria, Aglaia elaeagnoidea, Bauhinia racemosa, Salvadora persica, Crateva adansonii, Erythroxylon moonii, Cordia dichotoma* and *Cordia oblongifolia.*
Woodland – shrubs and lianas: *Azima tetracantha, Cassia auriculata, Capparia sepiaria, Capparis zeylanica, Scutia myrtina* and *Zizyphus oenoplia.*

APPENDIX 2

Categorization of irrigation systems depending on their extent of command areas.

Class	Size of command area	
	In acres	**In hectares**
Minor system	Less than 200	Less than 81
Medium System	200 to 1000	81 to 405
Major System	Above 1000	Above 405

Source: IWMI (Working Paper 58), 2003

Appendix 3

List of mangroves and mangrove associates in mangrove forests in the Pambala-Chilaw and Puttalam lagoon areas.

	Pambala-Chilaw	Puttalam
MANGROVE SPECIES		
Aegiceras corniculatum (L.) Blanco	x	x
Avicennia marina (Forsk.) Vierh.	x	x
Avicennia officinalis L.	x	
Bruguiera cylindrica (L.) Blume	x	x
Bruguiera gymnorrhiza (L.) Lamk.	x	x
Bruguiera sexangula (Lour.) Poir.	x	x
Ceriops tagal (Perr.) C.B. Robinson	x	x
Excoecaria agallocha L.	x	x
Excoecaria indica (Willd.) Muell.-Arg.	x	
Sapium indicum Willd.	x	
Heritiera littoralis Dryand.	x	x
Lumnitzera racemosa Willd.	x	x
Pemphis acidula Forst.		x
Rhizophora annamalayana Kathiresan		?
Rhizophora apiculata BL.	x	
Rhizophora mucronata Lamk.	x	x
Scyphiphora hydrophyllacea Gaertn.f.		x
Sonneratia alba J. Smith	x	x
Sonneratia caseolaris (L.) Engler	x	
Xylocarpus granatum König	x	
MANGROVE ASSOCIATES		
Acanthus ilicifolius L.	x	x
Acrostichum aureum L.	x	x
Annona glabra L.	x	
Callophyllum inophyllum L.	x	x
Cerbera manghas L.	x	x
Clerodendron inerme (L.) Gaertn.	x	x
Cynometra iripa Kostel		x
Derris spp.	x	x
Dolichandrone spathacea (L.f.) K. Schumann	x	
Hibiscus tiliaceus L.	x	x
Phoenix zeylanica Trim.*	x	
Premna integrifolia Lam. (= *P. foetida* Reinw.)	x	x
Sphaeranthus amaranthoides Burm. F.		x
Tamarix galica L.	x	x
Thespesia populnea (L.) Soland. ex.Corr.	x	x

* Endemic species.
? Occurrence still to be confirmed.
Source: Jayatissa *et al.*, 2002. The Linnean Society of London, *Botanical Journal of the Linnean Society*, 2002, **138**, 29–43

Appendix 4

List plants recorded from Anawilundawa wetland Sanctuary

Species	Local Name	Habit	TS	CS
Acanthaceae				
Acanthus ilicifolius	katu ikili	S	N	-
Barleria prionitis	katu karanda	S	N	-
Hygrophila schulli	niramulli	S	N	-
Justicia betonica	sudu puruk	S	N	-
Agavaceae				
Agave vera-cruz	hana	H	I	-
Alismataceae				
Limnophyton obtusifolium	Aq	H	N	-
Amaranthaceae				
Achyranthes aspera	gas karal heba	H	N	-
Aerva lanata	polpala	H	N	-
Alternanthera sessilis	mukunu wenna	H	N	-
Amaranthus viridis	kura thampala	S	N	-
Gomphrena celosioides		H	I	-
Amaryllidaceae				
Crinum asiaticum	tolabo	H	N	-
Crinum latifolium	goda manel	H	N	-
Anacardiaceae				
Anacardium occidentale	cadju	T	I	-
Lannea coromandelica	hik	T	N	-
Mangifera indica	amba	T	I	-
Apocynaceae				
Allamanda cathartica	wel ruk attana	S	I	-
Alstonia scholaris	ruk attana	T	N	-
Carissa spinarum	heen karamba	S	N	-
Cerbera odollam	gon kaduru	T	N	-
Ichnocarpus frutescens	grandi wel, priyawarna	C	N	-
Nerium oleander	kaneru	T	I	-
Tabernaemontana divaricata	watu sudda, nada wata	S	I	-
Thevetia peruviana		T	I	-
Aponogetonaceae				
Aponogeton natans	kekatiya	AqH	N	TR
Araceae				
Lasia spinosa	kohila, engili kohila	H	N	-
Pistia stratiotes	diya parandel	AqH	N	-
Arecaceae				
Areca catechu	puwak	T	N	-
Borassus flabellifer	thal	T	I	-
Caryota urens	kitul	T	N	-
Cocos nucifera	pol, thanbili, wewara	T	N	-
Phoenix pusilla	indi	T	N	-
Asclepiadaceae				
Calotropis gigantea	wara hele wara	S	N	-
Pergularia daemia	maha medahangu	C	N	-

Species	Local Name	Habit	TS	CS
Asclepiadaceae				
Wattakaka volubilis	aguna, kiri anguna	C	N	-
Asparagaceae				
Asparagus racemosus	hathawariya	C	N	-
Asteraceae				
Eclipta prostrata	kikirindi	H	N	-
Eupatorium odoratum		S	I	-
Mikania cordata	wathu palu, gam palu	C	N	-
Sphaeranthus indicus	mudumahana	H	N	-
Tridax procumbens		H	I	-
Vernonia cinerea	monarakudumbiya	H	N	-
Vernonia zeylanica	pupula, heen botiya	C	E	-
Wedelia chinensis	ranwan kikiridi	H	N	-
Xanthium indicum	urukossa, wal rambutang	S	I	-
Avicenniaceae				
Avicennia marina	kanna	T	N	-
Avicennia officinalis	kanna	T	N	-
Bignoniaceae				
Dolichandrone spathacea	diya danga	T	N	-
Bombacaceae				
Ceiba pentandra	pulun imbul, imbul	T	I	-
Boraginaceae				
Carmona retusa	heen thambala	S	N	-
Cordia monoica		T	N	-
Heliotropium indicum	ath-honda, dimi biya	H	N	-
Cactaceae				
Opuntia dillenii	katu pathok	S	I	-
Capparaceae				
Capparis sepiaria		S	N	-
Capparis zeylanica	welangiriya	S	N	-
Cleome viscosa	wal aba	H	N	-
Crateva adansonii	lunuwarana	T	N	-
Caricaceae				
Carica papaya	gas labu, papol	T	I	-
Casuarinaceae				
Casuarina equisetifolia	kasa	T	I	-
Celastraceae				
Maytenus emarginata		S	N	-
Ceratophyllaceae				
Ceratophyllum demersum		AqH	N	-
Chenopodiaceae				
Salicornia brachiata		H	N	-
Suaeda maritima		H	N	-
Suaeda monoica		S	N	-
Suaeda vermiculata		H	N	-
Clusiaceae				
Calophyllum inophyllum	domba, tel domba	T	N	-
Colchicaceae				
Gloriosa superba	niyangala	C	N	-
Combretaceae				
Lumnitzera racemosa	beriya	T	N	-
Terminalia arjuna	kumbuk	T	N	-
Terminalia catappa	kottan, kottamba	T	I	-

Species	Local Name	Habit	TS	CS
Commelinaceae				
Commelina sp.		H	N	-
Convolvulaceae				
Evolvulus alsinoides	visnu kranti	H	N	-
Ipomoea aquatica	kankung	AqH	N	-
Ipomoea obscura	tel kola	C	N	-
Ipomoea pes-caprae	mudu bin tamburu	C	N	-
Ipomoea pes-tigridis	divi adiya, divi pahuru	C	N	-
Crassulaceae				
Kalanchoe pinnata	akkapana	H	I	-
Cucurbitaceae				
Coccinia grandis	kowakka	C	N	-
Cyperaceae				
Cyperus arenarius	mudu kalanduru	H	N	-
Cyperus pilosus		H	N	-
Cyperus sp.1		H	N	-
Cyperus sp.2		H	N	-
Fimbristylis sp.		H	N	-
Schoenoplectus articulatus	maha geta pan	AqH	N	-
Actinoscirpus grossus		H	N	-
Dracaenaceae				
Sansevieria zeylanica	niyanda	H	N	-
Ebenaceae				
Diospyros ebenum	kaluwara	T	N	TR
Maba buxifolia		T	N	-
Diospyros malabarica	timbiri	T	N	-
Diospyros ovalifolia	kunumella, habara	T	N	-
Erythroxylaceae				
Erythroxylum monogynum	devadaram	T	N	-
Euphorbiaceae				
Acalypha indica	kuppameniya	H	N	-
Bridelia retusa	ketakala	T	N	-
Croton aromaticus	wel keppetiya	S	N	-
Croton bonplandianus		H	I	-
Croton hirtus	val tippili, gan veda	H	I	-
Croton laccifer	keppetiya, gas keppetiya	S	N	-
Drypetes sepiaria	wira	T	N	-
Euphorbia antiquorum	daluk	T	N	-
Euphorbia heterophylla		H	I	-
Excoecaria agallocha	tela kiriya, tala kiriya	T	N	-
Flueggea leucopyrus	heen katupila	S	N	-
Jatropha curcas	weta endaru, rata endaru	T	I	-
Jatropha gossypiifolia		T	I	-
Mallotus rhamnifolius	molabe	T	N	-
Manihot esculenta	maiokka	S	I	-
Mischodon zeylanicus	tammanna	T	N	-
Phyllanthus acidus	nelli	T	I	-
Margaritaria indicus	karaw	T	N	-
Phyllanthus polyphyllus	kuratiya	S	N	-
Phyllanthus reticulatus	gas dummala, kaila	S	N	-
Ricinus communis	beheth endaru	S	I	-
Tragia plukenetii	wel kahabiliya	H	N	-

Species	Local Name	Habit	TS	CS
Fabaceae				
Abrus precatorius	olinda	C	N	-
Acacia caesia	hinguru wel	C	N	-
Acacia eburnea		S	N	-
Acacia leucophloea	katu andara, maha andara	T	N	-
Acacia melanoxylon		T	I	-
Acacia planifrons		S	N	-
Adenanthera pavonina	madatiya	T	I	-
Samanea saman	para mara	T	I	-
Bauhinia racemosa	maila	T	N	-
Bauhinia tomentosa	petan, kaha petan	T	N	-
Caesalpinia bonduc	kumburu wel, kalu vavulatiya	C	N	-
Canavalia rosea	mudu awara	C	N	-
Cassia auriculata	ranawara	T	N	-
Cassia fistula	ehela	T	I	-
Cassia occidentalis	peni tora	S	N	-
Cassia spectabilis	kaha kona	T	I	-
Cassia tora	pethi tora	S	N	-
Clitoria ternatea	katurodu	C	N	-
Crotalaria laburnifolia	yak beriya	S	N	-
Crotalaria verrucosa	nil andanahiriya	S	N	-
Dalbergia candenatensis		C	N	-
Derris scandens	kala wel, ala wel	C	N	-
Derris trifoliata	kala wel	C	N	-
Desmodium triflorum	heen undupiyaliya	H	N	-
Dichrostachys cinerea	andara	S	N	-
Erythrina variegata	erabadu	T	N	-
Gliricidia sepium	kona	T	I	-
Leucaena leucocephala	ipil ipil	T	I	-
Mimosa pudica	nidikumba	H	I	-
Neptunia oleracea	diya nidikumba	AqH	N	-
Parkinsonia aculeata		T	I	-
Pithecellobium dulce		T	I	-
Pongamia pinnata	gal/magul karanda, karada	T	N	-
Prosopis juliflora	kalapu andara	T	I	-
Tamarindus indica	siyambala	T	I	-
Tephrosia purpurea	gam pila, pila	H	N	-
Goodeniaceae				
Scaevola plumieri	heen takkada	S	N	-
Scaevola taccada	takkada	S	N	-
Hippocrateaceae				
Salacia chinensis	heen himbutu	C	N	-
Hydrocharitaceae				
Halophila sp.		AqH	N	-
Ottelia alismoides		AqH	N	-
Lamiaceae				
Leucas zeylanica	geta thumba, thumba	H	N	-
Ocimum americanum	heen tala	H	N	-
Lauraceae				
Litsea glutinosa	bo mee, bombee	T	N	-
Persea americana	ali-pera	T	I	-
Lecythidaceae				
Barringtonia acutangula	ela midella	T	N	-

Species	Local Name	Habit	TS	CS
Lemnaceae				
Lemna sp.		AqH	N	-
Lentibulariaceae				
Utricularia aurea	diya pasi	AqH	N	-
Limnocharitaceae				
Limnocharis flava		AqH	I	-
Linaceae				
Hugonia mystax	bugetiya, watti weti	S	N	-
Loganiaceae				
Strychnos nux-vomica	goda kaduru	T	N	-
Strychnos potatotum	ingini	T	N	-
Loranthaceae				
Dendrophthoe falcata	pilila	Ep	N	-
Lythraceae				
Pemphis acidula	kiri maram	S	N	-
Malvaceae				
Abutilon indicum	anoda	S	N	-
Hibiscus rosa-sinensis	wada, sapaththumal	S	I	-
Hibiscus tiliaceus	beli patta	T	N	-
Hibiscus vitifolius	maha epala	S	N	-
Sida acuta	gas bevila	S	N	-
Sida sp.		S	N	-
Thespesia populnea	suriya	T	N	-
Marsileaceae				
Marsilea quadrifolia		AqH	N	-
Martyniaceae				
Martynia annua	naga darana	S	I	-
Melastomataceae				
Memecylon umbellatum	korakaha	S	N	-
Meliaceae				
Azadirachta indica	kohomba	T	N	-
Walsura trifoliolata	kirikon, mal petta	T	N	-
Xylocarpus granatum	mutti kadol	T	N	-
Menyanthaceae				
Nymphoides hydrophylla	kumudu,	AqH	N	-
Moraceae				
Artocarpus heterophyllus	kos	T	I	-
Ficus benghalensis	nuga, maha nuga	T	N	-
Ficus exasperata	bu thediya	T	N	-
Ficus hispida	kota dimbula	T	N	-
Ficus racemosa	attikka	T	N	-
Ficus religiosa	bo	T	I	-
Ficus tinctoria	Gas anguna/netul wal ehetu	T	N	-
Ficus sp.1		T	N	-
Ficus sp.2		T	N	-
Streblus asper	geta netul	T	N	-
Streblus taxoides	gongotu	T	N	-
Moringaceae				
Moringa oleifera	murunga	T	I	-
Musaceae				
Musa x paradisiaca	kehel	T	I	-
Myrsinaceae				
Aegiceras corniculata	heen kadol	T	N	-

Species	Local Name	Habit	TS	CS
Myrtaceae				
Syzygium cumini	madan, maha dan	T	N	-
Myrtaceae				
Psidium guajava	pera	T	I	-
Nelumbonaceae				
Nelumbo nucifera	nelum	AqH	N	-
Nymphaeaceae				
Nymphaea nouchali	manel	AqH	N	-
Nymphaea pubescens	olu	AqH	N	-
Oleaceae				
Jasminum angustifolium	wal pichcha	C	N	-
Jasminum auriculatum		C	N	-
Onagraceae				
Ludwigia adscendens	beru diyanilla	AqH	N	-
Orchidaceae				
Vanda tessellata		Ep	N	-
Pandanaceae				
Pandanus odoratissimus	wetakeyiya	S	N	-
Passifloraceae				
Passiflora foetida		C	I	-
Periplocaceae				
Hemidesmus indicus	iramusu, heen iramusu	C	N	-
Poaceae				
Bambusa vulgaris	kaha una	T	N	-
Cymbopogon nardus	mana, heen pengiri	H	N	-
Cynodon dactylon	ruha	H	N	-
Imperata cylindrica	iluk	H	N	-
Panicum maximum	rata tana	H	I	-
Phragmites karka	nala gas	S	N	-
Spinifex littoreus	maha ravana ravula	C	N	-
Polygonaceae				
Antigonon leptopus		C	I	-
Persicaria attenuata	Sudu-kimbul-wenna	AqH	N	-
Persicaria glabrum AqH N -				
Pontederiaceae				
Eichhornia crassipes	japan jabara	AqH	I	-
Monochoria vaginalis	diya habarala	AqH	N	-
Pteridaceae				
Acrostichum aureum	karen koku	H	N	-
Punicaceae				
Punica granatum	delum	T	I	-
Rhamnaceae				
Ziziphus mauritiana	masan, maha debara, dabara	T	N	-
Ziziphus oenoplia	heen-eraminiya	S	N	-
Rhizophoraceae				
Bruguiera cylindrica	mal kadol	T	N	-
Rhizophora mucronata	kadol	T	N	-
Rubiaceae				
Benkara malabarica	pudan	S	N	-
Canthium coromandelicum	kara	T	N	-
Catunaregam spinosa	kukurumanna	T	N	-
Hydrophylax maritima	mudu geta kola	H	N	-
Ixora coccinea	rathmbala	S	N	-

Species	Local Name	Habit	TS	CS
Rubiaceae				
Ixora pavetta	maha ratambala	T	N	-
Mitragyna tubulosa	helamba	T	N	-
Morinda coreia	ahu	T	N	-
Psydrax dicoccos	gal karanda, panduru	T	N	-
Tarenna asiatica	tarana	S	N	-
Rutaceae				
Aegle marmelos	beli	T	I	-
Atalantia ceylanica	yakinaran	S	N	-
Clausena indica	migon karapincha	S	N	-
Glycosmis mauritiana		S	N	-
Glycosmis pentaphylla	dpodan pana	S	N	-
Limonia acidissima	divul	T	N	-
Murraya koenigii	karapincha	S	N	-
Pamburus missionis	pamburu	T	N	-
Pleiospermium alatum	tumpat kurudu	T	N	-
Toddalia asiatica	kudumiris	C	N	-
Salvadoraceae				
Azima tetracantha		S	N	-
Salvedoraceae				
Salvadora persica	maliththan	T	N	-
Salviniaceae				
Salvinia molesta	salvinia	AqH	I	-
Sapindaceae				
Allophylus cobbe	bu kobbe	S	N	-
Cardiospermum halicacabum	penela wel	C	N	-
Lepisanthes senegalensis	galkuma	T	N	-
Lepisanthes tetraphylla		T	N	-
Schleichera oleosa	kon	T	N	-
Sapotaceae				
Madhuca longifolia	mi	T	N	-
Manilkara hexandra	palu	T	N	-
Mimusops elengi	munamal	T	N	-
Pouteria campechiana	rata lawulu	T	I	-
Scrophulariaceae				
Bacopa monnieri	lunu wila	H	N	-
Limnophila aquatica		AqH	N	-
Solanaceae				
Datura metel	attana, kalu attana	S	N	-
Physalis micrantha	mottu, nalal batu	H	N	-
Solanum trilobatum	wel tibbatu	C	N	-
Sonneratiaceae				
Sonneratia caseolaris	kirala	T	N	-
Sterculiaceae				
Heritiera littoralis	etuna	T	N	-
Pterospermum suberifolium	welan, valangu	T	N	-
Waltheria indica		S	N	-
Tamaricaceae				
Tamarix indica	kiri	T	N	-
Tiliaceae				
Berrya cordifolia	halmilla	T	N	-
Grewia damine	deminiya	T	N	-
Grewia orientalis	wel keliya	T	N	-

Species	Local Name	Habit	TS	CS
Tiliaceae				
Muntingia calabura	jam	T	I	-
Typhaceae				
Typha angustifolia	hambupan	H	N	-
Ulmaceae				
Holoptelea integrifolia	godakirilla	T	N	-
Ulmaceae				
Trema orientalis	gadumba	T	N	-
Verbenaceae				
Clerodendrum inerme	burenda, gulinda	S	N	-
Clerodendrum paniculatum		S	I	-
Gmelina asiatica	demata	S	N	-
Lantana camara	gandapana, katu hinguru	S	I	-
Phyla nodiflora	hiramanadetta	H	N	-
Premna tomentosa	seru	T	N	-
Premna sp.		C	N	-
Stachytarpheta jamaicensis	balu nakuta	H	I	-
Tectona grandis	Tekka	T	I	-
Vitex altissima	milla	T	N	-
Vitex leucoxylon	nabada	T	N	-
Vitex negundo	nika, helarika	T	N	-
Vitaceae				
Cayratia pedata	gerandi dul wel	C	N	-
Cayratia trifolia	wal rath diya labu	C	N	-
Cissus quadrangularis	heeressa, sirassa	C	N	-
Cissus vitiginea	wal niviti	C	N	-

T – Threatened

Summary	
Total no. of species	290
No. of families represented	95
Endemic species	1
Nationally threatned species	2

Source: Anawilundawa Occasional Paper (IUCN), 2003

Appendix 5

List of fish recorded from Anawilundawa wetland sanctuary

Family Species	Commom Name	Habit	CS
Anguillidae			
Anguillar bicolor	Level finned Eel	F, B	
Moringuidae			
Moringua sp	Worm eel	B	
Clupidae			
Nematolosa nasus	Bloch's gizzard shad	B	
Engraulidae			
Thryssa purava	Obliquejaw thryssa	B	
Encrasicholina spp.	Anchovy	B	
Cyprinidae			
Amblypharingodon meletinus	Green Carplet	F	
Chela laubuca	Blue Laubuca	F	
Danio malabaricus	Gaint Danio	F	
Esomus thermoicus	Flying Barb	F	*E, T*
Horadandia atukorali	Horadandiya	F	
Puntius amphibius	Scarlet banded Barb	F	
Puntius bimaculatus	Red-side Barb	F	
Puntius chola	Swamp Barb	F	
Puntius sinhala	Filamented Barb	F	*E*
Puntius vittatus	Silver Barb	F	
Rasbora carverii	Common Rasbora	F	
Cobitidae			
Lepidocephalicthes thermalis	Common spiny loach	F	
Ariidae			
Arius sp.	Sea Catfish	B	
Bagridae			
Mystes gulio	Long-whiskered Catfish	F	
Mystes keletius	Yellow Catfish	F	
Clariidae			
Clarias brachysoma	Walking Catfish	F	*E, T*
Heteropneustidae			
Heteropneustus fossilis	Stinging Catfish	F	
Belonidae			
Strongular strongular	Spot-tail needle fish	B	
Hemiramphidae			
Hemiramphus sp.	Halfbeak	B	
Oryziidae			
Oryzias melastigma	Blue eyes	B	
Aplocheilidae			
Aplocheilus parvus	Dwarf Panchax	F, B	
Ambassidae			
Ambassis commersoni	Common Glassfish	B	
Terapontidae			
Terapon jarbua	Jarbua terapon	B	
Charangidae			
Caranx sexfasiatus	Bigeye trevally	B	

Family Species	Commom Name	Habit	CS
Liognathidae			
Liognathus sp	Ponyfish	B	
Lutjanidae			
Lutjanus argentimaculatus	Red snapper	B	
Gerridae			
Gerrus abreatus	Deep body silverbiddy	B	
Monodactylidae			
Monodactylus argentius	Mono	B	
Chiclidae			
Oriochromis mossambicusI	Tilapia	F	I
Oriochromis niloticusI	Nile Tilapia	F	I
Etropus suratensis	Pearl Spot	F, B	
Etropus maculatus	Orange chromide	F	
Mugilidae			
Liza macrolepis	Larger Scale Mullet	B	
Gobiidae			
Glossogobius giuris	Bar-eyed Goby	F	
Anabantidae			
Anabas testudinus	Climbing perch	F	
Belontidae			
Pseudopremonus cupanus	Spiketailed paradisefish	F	
Trichogaster pectoralisI	Snakesking gourami	F	
Osphronemidae			
Osphronemus goramy	Gaint gourami	F	I
Channidae			
Channa striata	Murrel	F	
Channa puntata	Spotted snakehed	F	
Mystus vittatus	Striped dwarf Catfish	F	
Solidae			
Euryglossa sp.	Sole	B	

Summary	
Total no. of species	47
No. of families represented	28
Endemic species	3
Nationally Threatened species	2
Introduced species	4

E = Endemic
T = Threatened
I = Introduced

Appendix 6

List of amphibians recorded from Anawilundawa wetland sanctuary

Family Species	Common Name	CS
Bufonidae		
Bufo melanostictus	Common Toad	
Bufo fergusonii	Ferguson's Dwarf Toad	
Microhylidae		
Uperodon systoma	Baloon Frog	
Kaloula taprobanica	Common Bull Frog	
Ranidae		
Limnonectes limnocharis	Common Paddy Field Frog	
Hoplobatrachus crassus	Indian Bull Frog	
Rana gracilisT	Sri Lankan Wood Frog	E, T
Euphlyctis cyanophlyctic	Skipper Frog	
Euphlyctis hexadactyla	Six-toed Green Frog	
Microhylidae		
Rmanella variegata	White-bellied Pugsnout Frog	
Rhacophoridae		
Polypedates maculatus	Chunam Tree-Frog	

Summary	
Total no. of species	11
No. of families represented	5
Endemic species	1
Nationally Threatened species	1

Appendix 7

List of reptiles recorded from Anawilundawa wetland sanctuary

Family Species	Commom Name	CS
Trionychidae		
Lissemys punctata	Flapshell Turtle	T
Bataguridae		
Melanochelys trijuga	Parker's Black Turtle	*T*
Testudinidae		
Geochelone elegans	Star Tortoise	*T*
Crocodylidae		
Crocodylus porosus	Marsh Crocodyle	*T*
Varanidae		
Varanus salvator	Water Monitor	
Varanus bengalensis	Land Monitor	
Agamidae		
Calotes calotes	Green Garden Lizard	
Calotes versicolor	Commom Garden Lizard VC	
Gekkonidae		
Hemidactylus frenatus	Common House Gecko VC	
Hemidactylus brookii	Spotted House Gecko	
Hemidactylus triedrus	Termitehill Gecko	
Hemidactylus depressus	Kandyan Gecko	*E, T*
Scincidae		
Mabuya carinata	Common Skink	
Mabuya macularia	Bronzgreen Little Skink	
Lankascincus fallax	Commom Lanka Skink	*E*
Lygosoma punctata	Dotted Garden Skink	
Sphenomorphus rufogulus	Red Throat Little Skink	*E*
Typhlopidae		
Typhlops sp.	Blind Snake Species	
Ramphotyphlops braminus	Commom Blind Snake	
Boidae		
Python molurus	Indian Rock Python	*T*
Colubridae		
Ahaetulla nasuta	Green Vine Snake	
Amphiesma stolata	Buff-Striped Keelback	
Atretium schistosum	The Olive Keelback	
Boiga forsteni	Forsten's Cat Snake	
Dendrelaphis tristis	Common Bronzeback	
Elaphe helena	Trinket Snake	
Lycodon aulicus	The Commom Wolf Snake	
Oligodon arnensis	Kukri Snake	
Oligodon taeniolatus	Varigated Kukri Snake	
Ptyas mucosa	The Common Rat Snake	
Xenochrophis piscator	Checkered Keelback	
Elapidae		
Bungarus caeruleus	The Common Indian Krait	
Naja Naja	Cobra	
Viperidae		
Daboia russelii	Russell's Viper	

Summary	
Total no. of species	34
No. of families represented	13
Endemic species	3
Nationally Threatened species	6

Appendix 8

List of birds recorded from Anawilundawa wetland sanctuary

Family Species	Common Name	CS
Podicipedidae		
Tachybaptus ruficollis	Little Grebe	
Pelecanidae		
Pelecanus philippensis	Spot-billed Pelican	*T*
Phalacrocoracidae		
Phalacrocorax carbo	Great Cormorant	*T*
Phalacrocorax fuscicollis	Indian Cormorant (Indian Shag)	
Phalacrocorax niger	Little Cormorant	
Anhingidae		
Anhinga melanogaster	Oriental Darter	
Ardeidae		
Ardea cinerea	Grey Heron	
Ardea purpurea	Purple Heron	
Casmerodius albus	Great Egret	
Mesophoyx intermedia	Intermediate Egret	
Egretta garzetta	Little Egret	
Bubulcus ibis	Cattle Egret	
Ardeola grayii	Indian Pond Heron	
Butorides striatus	Striated Heron (Little Green Heron)	
Nycticorax nycticorax	Black-crowned Night Heron	
Ixobrychus sinensis	Yellow Bittern	
Ixobrychus cinnamomeus	Cinnamon Bittern (Chestnut Bittern)	
Ixobrychus flavicollis	Black Bittern	
Ciconiidae		
Mycteria leucocephala	Painted Stork	
Anastomus oscitans	Asian Openbill	
Ciconia episcopus	Woolly-necked Stork	
Threskiornithidae		
Threskiornis melanocephalus	Black-headed Ibis (White Ibis)	
Plegadis falcinellus	Glossy Ibis	*WV*
Platalea leucorodia	Eurasian Spoonbill	
Anatidae		
Dendrocygna javanica (Whistling Teal)	Lesser Whistling Duck	
Nettapus coromandelianus	Cotton Pygmy Goose	
Anas acuta	Northern Pintail	*WV*
Anas querquedula	Garganey	*WV*
Anas clypeata	Northern Shoveller	*WV*
Accipitridae		
Pernis ptilorhynchus	Oriental Honey-buzzard	
Elanus caeruleus	Black-winged Kite	
Haliastur indus	Brahminy Kite	
Haliaeetus leucogaster	White-bellied Fish Eagle	
Ichthyophaga ichthyaetus	Grey-headed Fish Eagle	
Spilornis cheela	Crested Serpent Eagle	
Circus pygargus	Montagu's Harrier	
Circus aeruginosus	Western Marsh Harrier	*WV*
Accipiter badius	Shikra	

Family Species	Common Name	CS
Hieraaetus pennatus	Booted Eagle	*WV*
Spizaetus cirrhatus	Changeable Hawk Eagle	
Falconidae		
Falco tinnunculus	Common Kestrel	*WV, T*
Phasianidae		
Francolinus pondicerianus	Grey Francolin	*T*
Gallus lafayettii	Sri Lanka Jungle Fowl	E
Pavo cristatus	Indian Peafowl	
Turnicidae		
Turnix suscitator	Barred Button Quail	
Rallidae		
Porzana fusca	Ruddy-breasted Crake	*T*
Amaurornis phoenicurus	White-breasted Waterhen	
Gallicrex cinerea	Watercock	
Gallinula chloropus	Common Moorhen	
Porphyrio porphyrio	Purple Swamp Hen (Purple Coot)	
Fulica atra	Common Coot (Black Coot)	*T*
Jacanidae		
Hydrophasianus chirurgus	Pheasant-tailed Jacana	
Rostratulidae		
Rostratula benghalensis	Greater Painted-snipe	
Recurvirostridae		
Himantopus himantopus	Black-winged Stilt	
Burhinidae		
Burhinus oedicnemus	Eurasian Thick-knee (Stone Curlew)	
Charadriidae		
Vanellus indicus	Red-wattled Lapwing	
Pluvialis fulva	Pacific Golden Plover	*WV*
Pluvialis squatarola	Grey Plover	*WV*
Charadrius dubius	Little Ringed Plover	
Charadrius alexandrinus	Kentish Plover	
Charadrius mongolus	Mongolian Plover	*WV*
(Lesser Sand Plover)		
Charadrius leschenaultii	Greater Sand Plover	*WV*
Scolopacidae		
Limosa limosa	Black-tailed Godwit	*WV*
Numenius phaeopus	Whimbrel	*WV*
Numenius arquata	Eurasian Curlew	*WV*
Tringa tetanus	Common Redshank	*WV*
Tringa stagnatilis	Marsh Sandpiper	*WV*
Tringa nebularia	Common Greenshank	*WV*
Tringa ochropu	Green Sandpiper	*WV*
Tringa glareola	Wood Sandpiper	*WV*
Actitis Hypoleucos	Common Sandpiper	
Gallinago stenura	Pintail Snipe	*WV*
Calidris minuta	Little Stint	*WV*
Calidris temminckii	Temminck's Stint	*WV*
Calidris ferruginea	Curlew Sandpiper	*WV*
Laridae		
Chlidonias hybridus	Whiskered Tern	
Childonias leucopterusWV	White-winged Tern	
Gelochelidon nilotica	Gull-billed Tern	
Sterna albifrons	Little Tern	
Columba livia	Rock Pigeon (Feral Pigeon)	

Family Species	Common Name	CS
Columbidae		
Streptopelia chinensis	Spotted Dove	
Treron bicincta	Orange-breasted Green Pigeon	
Treron pompadora	Pompadour Green Pigeon	
Psittacidae		
Psittacula krameri	Rose-ringed Parakeet	
Cuculidae		
Clamator coromandus	Chestnut-winged Cuckoo	*WV*
Oxylophus jacobinus	Pied Cuckoo (Pied Crested Cuckoo)	
Cuculus micropterus	Indian Cuckoo	
Cacomantis merulinus	Plaintive Cuckoo	
Eudynamys scolopacea	Asian Koel	
Rhopodytes viridirostris	Blue-faced Malkoha	
Centropus sinensis	Greater Coucal (Common Coucal)	
Strigidae		
Otus sunia	Oriental Scops Owl (Little Scops Owl)	
Otus bakkamoena (Indian Scops Owl)	Collared Scops Owl	
Bubo zeylonensis	Brown Fish Owl	
Strix leptogrammica	Brown Wood Owl	
Glaucidium radiatum	Jungle Owlet	
Ninox scutulata	Brown Hawk Owl	
Caprimulgidae		
Caprimulgus atripennis (Long-tailed Nightjar)	Jerdon's Nightjar	
Caprimulgus asiaticus	Indian Nightjar (Common Nightjar)	
Apodidae		
Aerodramus unicolor	Indian Swiftlet (Edible-nest Swiftlet)	
Cypsiurus balasiensis	Asian Palm Swift	
Hemiprocnidae		
Hemiprocne longipennis	Grey-rumped Treeswift	
Alcedinidae		
Ceryle rudis	Pied Kingfisher	
Alcedo atthis	Common Kingfisher	
Halcyon capensis	Stork-billed Kingfisher	
Halcyon smyrnensis	White-throated Kingfisher	
Meropidae		
Merops orientalis	Little Green Bee-eater	
Merops philippinus	Blue-tailed Bee-eater	*WV*
Merops leschenaultia	Chestnut-headed Bee-eater	
Coraciidae		
Coracias benghalensis	Indian Roller	
Bucerotidae		
Tockus gingalensis	Sri Lanka Grey Hornbill	*E,T*
Capitonidae		
Megalaima zeylanica	Brown-headed Barbet	
Megalaima rubricapilla (Small Barbet)	Crimson-fronted Barbet	
Megalaima haemacephala (Crimson-breasted Barbet)	Coppersmith Barbet	
Picoides moluccensis (Pygmy Woodpecker)	Brown-capped Woodpecker	
Dinopium benghalense (Red-backed Woodpecker)	Black-rumped Flameback	

Family Species	Common Name	CS
Picidae		
Chrysocolaptes festivus	White-naped Woodpecker	*T*
Pittidae		
Pitta brachyura	Indian Pitta	*WV*
Alaudidae		
Mirafra assamica	Rufous-winged Lark	
Alauda gulgula	Oriental Skylark	
Eremopterix grisea	Ashy-crowned Sparrow Lark	
Hirundinidae		
Hirundo rustica	Barn Swallow (East Asian Swallow)	*WV*
Motacillidae		
Dendronanthus indicus	Forest Wagtail	*WV*
Motacilla cinerea	Grey Wagtail	*WV*
Anthus rufulus	Paddyfield Pipit (Indian Pipit)	
Campephagidae		
Coracina macei	Large Cuckooshrike	
Coracina melanoptera	Black-headed Cuckooshrike	
Pericrocotus cinnamomeus	Small Minivet (Little Minivet)	
Tephrodornis pondicerianus	Common Woodshrike	
Pycnonotidae		
Pycnonotus cafer	Red-vented Bulbul	
Pycnonotus luteolus	White-browed Bulbul	
Irenidae		
Aegithina tiphia	Common Iora	
Chloropsis cochinchinensis (Jerdon's Chloropsis)	Jerdon's Leafbird	
Chloropsis aurifrons (Gold-fronted Chloropsis)	Golden-fronted Leafbird	
Laniidae		
Lanius cristatus	Brown Shrike	*WV*
Turdidae		
Copsychus saularis (Southern Magpie Robin)	Oriental Magpie Robin	
Copsychus malabaricus	White-rumped Shama	
Saxicoloides fulicata (Ceylon Black Robin)	Black-backed Robin	
Timaliidae		
Dumetia hyperythra (White-throated Babbler)	Tawny-bellied Babbler	
Turdoides affinis (Common Babbler)	Yellow-billed Babbler	
Sylviidae		
Locustella certhiola	Pallas's Grasshopper Warbler	*WV*
Acrocephalus dumetorum	Blyth's Reed Warbler	*WV*
Cisticola juncidis (Streaked Fantail Warbler)	Zitting Cisticola	
Prinia sylvatica	Jungle Prinia (Ceylon Large Prinia)	
Prinia socialis	Ashy Prinia	
Prinia subflava (Ceylon White-browed Prinia) Green Tree Warbler)	Plain Prinia	
Muscicapidae		
Muscicapa dauurica	Asian Brown Flycatcher	*WV*
Monarchidae		
Terpsiphone paradisi	Asian Paradise-flycatcher	

Family Species	Common Name	CS
Sylviidae		
Orthotomus sutorius	Common Tailorbird	
Phylloscopus nitidus	Bright-green Warbler	*WV*
(		
Sittidae		
Sitta frontalis	Velvet-fronted Nuthatch	
Dicaeidae		
Dicaeum erythrorhynchos (Samll Flowerpecker)	Pale-billed Flowerpecker	
Nectariniidae		
Nectarinia zeylonica	Purple-rumped Sunbird	
Nectarinia lotenia (Loten's Sunbird)	Long-billed Sunbird	
Nectarinia asiatica	Purple Sunbird	
Estrildidae		
Lonchura punctulata (Spotted Munia)	Scaly-breasted Munia	
Lonchura malacca	Black-headed Munia	
Ploceidae		
Passer domesticus	House Sparrow	
Ploceus philippinus	Baya Weaver	
Sturnidae		
Sturnus pagodarum (Brahminy Myna)	Brahminy Starling	*WV*
Acridotheres tristis	Common Myna	
Oriolidae		
Oriolus xanthornus	Black-hooded Oriole	
Dicruridae		
Dicrurus macrocercus	Black Drongo	
Dicrurus leucophaeus	Grey Drongo (Ashy Drongo)	*WV*
Dicrurus caerulescens	White-bellied Drongo	
Artamidae		
Artamus fuscus (Ashy Swallow-shrike)	Ashy Woodswallow	
Corvidae		
Corvus splendens (Grey-necked Crow)	House Crow	
Corvus macrorhynchos (Jungle / Black Crow)	Large-billed Crow	

Summary	
Total number of species	168
No. of families represented	56
Endemic species	2
No of wintor visitors	37
Nationally threatened speceis	8

WV = Winter visitor
E = Endemic
T = Nationally threatened

Appendix 9

List of mammals recorded from Anawilundawa wetland Sanctuary

Family Species	Commom Name	Relative Habitat
Soricidae		
Suncus murinus	Musk Shrew	
Hipposideridae		
Hipposideros speoris	Schneider's Leaf-nosed Bat	
Pteropodidae		
Cynopterus sp.	Fruit-Bat species	
Pteropus giganteus	Common Flying Fox	
Cercopithecidae		
Macaca sinica	Toque Monkey	*E*
Lorisidae		
Loris lydekkerianus	Grey Slender Loris	*T*
Canidae		
Canis aureus	Sri Lanka Jackal	
Felidae		
Prionailurus rubiginosus	Rusty Spotted Cat	*T*
Prionailurus viverrinus	Fishing Cat	*T*
Herpestidae		
Herpestes edwardsii	Grey Mongoose	
Herpestes smithii	Ruddy Mongoose	
Mustelidae		
Lutra lutra	Otter	T
Viverridae		
Viverricula indica	Small Civet Cat	
Paradoxurus hermaphroditus	Indian Palm Cat	
Tragulidae		
Tragulus meminna	Mouse Deer	
Hystricidae		
Hystrix indica	Indian Crested Porcupine	
Muridae		
Tatera indica	Gerbil	
Rattus rattus	House Rat	
Sciuridae		
Funambulus palmarum	Palm Squirrel	
Ratufa macroura	Giant Squirrel	
Leporidae		
Lepus nigricollis	Black Naped Hare	

Summary	
Total number of species	21
No. of families represented	15
Endemic species	1
Nationally threatened speceis	4

Appendix 10

List of butterflies recorded from Anawilundawa wetland Sanctuary

Family Species	Commom Name	CS
Papilionidae		
Troides darsius	Common Birdwing	*E,T*
Pachliopta hector	Crimson Rose	
Pachliopta aristolochiae	Common Rose	
Papilio demoleus	Lime Butterfly	
Papilio polytes	Common Mormon	
Papilio polymnestor	Blue Mormon	
Graphium agamemnon	Tailed Jay	
Pieridae		
Leptosia nina	Psyche	
Delias eucharis	Jezebel	
Belenois aurota	Pioneer	
Cepora nerissa	Common Gull	
Appias libythea	Striped Albatross	*T*
Appias paulina	Lesser Albatross	*T*
Ixias pyrene	Yellow Orange Tip	
Hebomoia glaucippe	Great Orange Tip	
Catopsilia pyranthe	Mottled Immigrant	
Catopsilia pomona	Lemon Migrant	
Pareronia ceylanica	Dark Wanderer	
Colotis amata	Small Salmon Arab	
Colotis etrida	Little Orange Tip	
Eurema brigitta	Small Grass Yellow	
Eurema hecabe	Common Grass Yellow	
Nymphalidae		
Tirumala limniace	Blue Tiger	
Tirumala septentrionis	Dark Blue Tiger	
Parantica aglea	Glassy Tiger	
Danaus chrysippus	Plain Tiger	
Danaus genutia	Common Tiger	
Euploea core	Common Crow	
Euploea sylvester	Double-banded Crow	
Euploea klugii	Brown King Crow	
Ariadne ariadne	Angled Castor	
Byblia ilithyia	Joker	
Phalanta phalanta	Common Leopard	
Junonia lemonias	Lemon Pansy	
Junonia atlites	Grey Pansy	
Junonia iphita	Chocolate Soldier	
Junonia almanac	Peacock Pansy	
Hypolimnas bolina	Great Eggfly	
Hypolimnas misippus	Danaid Eggfly	
Neptis hylas	Common Sailor	
Ewthalia aconthea	Baron	
Polyura athamas	Nawab	
Orsotriaena medus	Nigger	
Mycalesis persius	Common Bushbrown	

Family Species	Commom Name	CS
Ypthima ceylonica	White Four-ring	
Charaxes psaphon	Tawny Rajah	*T*
Acraea violae	Tawny Coster	
Melanitis leda	Common Evening Brown	
Elymnias hypermnestra	Common Palmfly	
Lycaenidae		
Spalgis epews	Apefly	*T*
Curetis thetis	Indian Sunbeam	
Arhopala amantes	Large Oakblue	*T*
Zesius chrysomallus	Redspot	*T*
Amblypodia anita	Purple Leafblue	*T*
Spindasis vulcanus	Common Silverline	*T*
Tajuria cippus	Peacock Royal	
Raphinda amor	Monkey-puzzle	
Jamides celano	Common Cerulian	
Jamides bochus	Dark Cerulean	
Catochysops strabo	Forget-me-not	
Lamides boeticus	Pea Blue	
Syntrucus plinius	Zebra Blue	
Castalius rosimon	Common Pierrot	
Tarucus callinara	Butler's Spotted Pierrot	*DD*
Zizeeria karsandra	Dark Grass Blue	*T*
Zizina otis	Lesser Grass Blue	
Zizula hylax	Tiny Grass Blue	*T*
Azanus jesous	African Babul Blue	*T*
Chilades lajus	Lime Blue	
Hesperiidae		
Hasora chromus	Common Banded Awl	
Suastus gremius	Indian Palm Bob	
Ampittia dioscorides	Bush Hopper	
Iambrix salsala	Chestnut Bob	
Spalia galba	Indian Skipper	
Sarangesa dasahara	Common Small Flat	*T*
Taractrocera maevius	Common Grass Dart	
Pelopidas sp.	Swift sp.	
Potanthus sp.	Dart sp.	

Summary	
Total number of species	78
No. of families represented	5
Endemic species	1
Nationally threatened speceis	13
Data deficient in nationally threatened species	1

E = Endemic
T = Nationally threatened
DD= Data deficient

Appendix 11

List of dragonflies & damselflies recorded from Anawilundawa wetland sanctuary

Family Species	Commom Name
Platycnemididae	
Copera marginipes	Rimmed Featherleg
Coenagrionoidae	
Ceriagrion coromandelianum	Yellow Damselfly
Ischnura aurora	Dawn Bluetail
Pseudagrion malabaricum	Malabar Sprite
Gomphidae	
Ictinogomphus rapax	Asian Tiger
Libelluloidae	
Orthetrum sabina	Sombre Skimmer
Potamarcha congener	
Rhodothemis rufa	Spine-legged Reedling
Diplacodes trivialis	Little Blue darter
Neurothermis tullia	Black Velvet-wing
Rhyothemis variegate	Variable Glider
Aethriamanta brevipennis	Black-headed Basker
Brachythemis contaminata	Orange-winged Groundling

Summary	
Total number of species	13
No. of families represented	4
Endemic species	0
Nationally threatened speceis	0

Appendix 12

Checklist of some aquatic molluscs recorded from Anawilundawa wetland sanctuary

Family	Species
Veneridae	*Meretrix casta*
Corbiculidae	*Geloina coaxans*
Ampullariidae	*Pila globosa*
Lymnaeidae	*Lymnaea luteola*
Potamididae	*Cerithidea cingulata*
Planorbidae	*Gyraulus convexiusculus*

Summary	
Total number of species	6
No. of families represented	6
Endemic species	0
Nationally threatened speceis	0

APPENDIX 13

Marine and/or brackish water fish species recorded from the Kalpitiya North marine area
Source: Bambaradeniya *et al.*, 2005

Family	Species	Common name	Region
Hemiscyllidae	*Chiloscyllium griseum*	Grey bamboo shark	North-west
Carcharhinidae	*Carcharhinus sp.*	Shark species	North-west
Myliobatididae	*Aetobatus narinari*	Spotted eagle ray	North-west
	Rhinoptera javanica	Javanese cownose ray	North-west
Dasyatididae	*Himantura sp.*	Stingray species	North-west
Ariidae	*Arius sp.*	Sea Catfish species	North-west
Belonidae	*Strongular strongular*	spottail needlefish	North-west
Chanidae	*Chanos chanos*	Milkfish	North-west
Charangidae	*Alectis ciliaris*	African pompano	North-west
	Caranx sexfasiatus	Bigeye Travally	North-west
	Caranx sp.	Travally species	North-west
	Crangoides sp	Travally species	North-west
	Scomberroides sp.	Queenfish species	North-west
Clupidae	*Nematolosa nasus*	Bloch's gizzard shad	North-west
	Amblygaster clupeoides	Bleeker's smoothbelly sardinella	North-west
	Sardinella gibbosa	Goldstripe sardinella	North-west
	Sardinella sp.		North-west
Drepanidae	*Drepane punctata*	Spotted sicklefish	North-west
Engraulidae	*Thryssa hamiltoni*	Hamilton's thryssa	North-west
	Trysa sp.		North-west
	Stolephorus indicus	Indian anchovy	North-west
	Stolephorus sp.		North-west
Gerridae	*Gerrus abbreviatus*	Deepbody silverbiddy	North-west
Hemiramphidae	*Hemiramphus sp.*		North-west
Hippocamphidae	*Hippocamphus sp.*	Sea Horse sp.	North-west
Leiognathidae	*Leiognathus equulus*	Common Ponyfish	North-west
	Leiognathus berbis	Berber Ponyfish	North-west
	Gazza minuta	Toothpony	North-west
Lutjanidae	*Lutjanus argentimaculatus*	Mangrove red snapper	North-west
	Lutjanus ehrenbergii	Ehrenberg's snapper	North-west
Monodactylidae	*Monodactylus sp*		North-west
Mullidae	*Parupeneus indicus*	Indian Goatfish	North-west
Muraenidae	*Uropterygius marmoratus*	Marbled moray	North-west
Scatophagidae	*Scatophagus argus*	Spotted scat	North-west
Siganidae	*Siganus javus*	Streaked spinefoot	North-west
Sillaginidae	*Sillago sihama*	Silver sillago	North-west
Soleidae	*Solea elongate*	Elongate sole	North-west
	Zebrias sp.	Zebra sole species	North-west
Sphyraenidae	*Sphyraena barracuda*	Great barracuda	North-west
Stromateidae	*Pampus chinensis*	Chinese silver pompret	North-west
Terapontidae	*Terapon jarbua*	Jarbua Terapon	North-west
	Terapon puta	Smallscaled terapon	North-west
Triacanthidae	*Triacanthus biaculeatus*	Shortnosed tripodfish	North-west

Appendix 14

List of birds occurring in the northern and north-western marine and coastal area
Sources: Siriwardena, 2003; Bambaradeniya *et al,* 2005a; Bambaradeniya *et al.*, 2005b

Family & Species	Area
Podicipediformes: Podicipedidae	
Little Grebe - *Tachybaptus ruficollis*	Mannar Region
Pelecaniformes: Phalacrocoracidae	
Little Cormorant - *Phalacrocorax niger*	Mannar Region; North of Kalpitiya area
Indian Shag (Indian Cormorant) - *Phalacrocorax fuscicollis*	Mannar Region; North of Kalpitiya area
Pelecaniformes: Anhingidae	
Indian Darter (Oriental Darter) - *Anhinga melanogaster*	Mannar Region
Pelecaniformes: Pelicanidae	
Spot-billed Pelican - *Pelecanus philippensis*[T]	North of Kalpitiya area
Ciconiiformes: Ardeidae	
Median Egret (Intermediate Egret) - *Mesophoyx intermedia*	North of Kalpitiya area; Northern region
Little Egret - *Egretta garzetta*	North of Kalpitiya area; Northern region
Large Egret (Great White Egret) - *Casmerodius albus*	North of Kalpitiya area
Grey Heron - *Ardea cinerea*	North of Kalpitiya area;
Purple Heron - *Ardea purpurea*	Mannar Region
Indian Pond Heron - *Ardeola grayii*	North of Kalpitiya area; Northern region
Little Green Heron (Striated Heron) - *Butorides striatus*	North of Kalpitiya area
Night Heron - *Nycticorax nycticorax*	Mannar Region
Ciconiiformes: Ciconiidae	
White-necked Stork - *Ciconia episcopus*	
Asian Openbill Stork - *Anastomus oscitans*	Mannar Region
Painted Stork - *Mycteria leucocephala*	Mannar Region
Lesser Adjutant Stork - *Leptoptilus javanicus*[T]	Mannar Region
Ciconiiformes: Threskiornithidae	
White Ibis - *Threskiornis melanocephalus*	Mannar Region
Glossy Ibis - *Plegadis falcinellus*[M]	Mannar Region
Eurasian Spoonbill - *Platalea leucorodia*	Mannar Region
Phoenicopteriformes: Phoenicopteridae	
Greater Flamingo - *Phoenicopterus ruber*[M]	Mannar Region

Family & Species	Area
Anseriformes: Anatidae	
Lesser Whistling Teal - *Dendrocygna javanica*	Mannar Region
Northern Pintail - *Anas acuta*[M]	Mannar Region
Garganey - *Anas querquedula*[M]	Mannar Region
Northern Shoveller - *Anas clypeata*[M]	Mannar Region
Spot-billed Duck – *Anas poecilorhyncha*	Mannar Region
Gadwall	Mannar Region
Common Teal	Mannar Region
Eurasian Wigeon	Mannar Region
Falconiformes: Accipitridae	
Brahminy Kite - *Haliaster Indus*	North of Kalpitiya area
Black-winged Kite - *Elanus caeruleus*	
White-bellied Sea Eagle - *Haliaeetus nipalensis*	North of Kalpitiya area
Charadriiformes: Haematopodidae	
Eurasian Oystercatcher - *Haematopus ostralegus*[V]	Mannar Region
Charadriiformes: Recurvirostridae	
Black-winged Stilt - *Himantopus himantopus*	Mannar Region; North of Kalpitiya area
Pied Avocet - *Recurvirostra Avosetta*[V]	Mannar Region
Charadriiformes: Burhinidae	
Stone Curlew (Eurasian Thick-knee) - *Burhinus oedicnemus*	Mannar Region
Great Stone Plover (Great Thick-knee) - *Esacus recurvirostris*[T]	Mannar Region
Charadriiformes: Glareolidae	
Collared Pratincole – *Glareola pratincola*[V]	Mannar Region
Little Pratincole - *Glareola lacteal*	Mannar Region
Oriental Pratincole - *Glareola maldivarum*	Mannar Region
Charadriiformes: Charadriidae	
Little ringed Plover - *Charadrius dubius*	North of Kalpitiya area
Ringed Plover (Common ringed Plover) - *Charadrius hiaticula*[V]	Mannar Region
Kentish Plover - *Charadrius alexandrinus*[V]	North of Kalpitiya area
Lesser Sand Plover (Mongolian Plover) - *Charadrius mongolus*[M]	North of Kalpitiya area
Large Sand Plover (Great Sand Plover) - *Charadrius leschenaultii*[M]	Mannar Region
Caspian Plover - *Charadrius asiaticus*[V]	Mannar Region
Asiatic Golden Plover (Pacific Golden Plover) - *Pluvialis fulva*[M]	Mannar Region
Grey Plover - *Pluvialis squatarola*[M]	Mannar Region
Crab Plover	Mannar Region (Adam's Bridge Islands)
Eurasian Curlew - *Numenius arquata*[M]	Mannar Region; North of Kalpitiya area

Family & Species	Area
Black-tailed Godwit - *Limosa limosa*[M]	Mannar Region
Bar-tailed Godwit - *Limosa lapponica*[V]	Mannar Region
Common Redshank - *Tringa totanus*[M]	North of Kalpitiya area
Marsh Sandpiper - *Tringa stagnatilis*[M]	Mannar Region
Common Greenshank - *Tringa nebularia*[M]	Mannar Region
Green Sandpiper - *Tringa ochropus*[M]	Mannar Region
Wood Sandpiper - *Tringa glareola*[M]	Mannar Region
Terek Sandpiper - *Tringa cinerea*[M]	Mannar Region
Common Sandpiper - *Actitis Hypoleucos*[M]	North of Kalpitiya area
Broad-billed Sandpiper - *Limicola falcinellus*[M]	Mannar Region
Curlew Sandpiper - *Calidris ferruginia*[M]	Mannar Region
Great Knot - *Calidris tenuirostris*[V]	Mannar Region
Sanderling - *Calidirs alba*[M]	Mannar Region
Red Knot	Mannar Region
Little Stint - *Calidris canutus*[M]	Mannar Region
Temmininck's Stint - *Calidris temminickii*[M]	Mannar Region
Ruff - *Philomachus pugnax*[M]	Mannar Region
Red-necked Phalarope – *Phalaropus lobatus*[V]	Mannar Region
Ruddy Turnstone - *Arenaria interpres*[M]	Mannar Region
Charadriiformes: Laridae	
Brown-headed Gull - *Larus brunnicephalus*[M]	Mannar Region
Heuglin's Gull – *Larus heuglini*	Northern region
Charadriiformes: Sternidae	
Large Crested Tern (Great Crested Tern) - *Sterna bergii*	Mannar Region (Adam's Bridge Islands); North of Kalpitiya area, Northern region
Caspian Tern - *Sterna caspia*[M]	North of Kalpitiya area; Northern region
Little Tern - *Sterna albifrons*	North of Kalpitiya area; Northern region
Gull-billed Tern - *Sterna nilotica*[M]	North of Kalpitiya area; Northern region
Lesser Crested Tern - *Sterna bengalensis*[M]	Mannar Region (Adam's Bridge Islands); North of Kalpitiya area; Northern region
Roseate Tern - *Sterna dougallii*[M]	Mannar Region; Northern region
Common Tern - *Sterna hirundo*[M]	North of Kalpitiya area; Northern region
Whiskered Tern - *Chlidonias hybridus*[M]	North of Kalpitiya area; Northern region
White-winged Black Tern - *Chlidonias leucopterus*[M]	Mannar Region
Saunder's Tern (Black-shafted Little Tern) - *Sterna saundersi*	Mannar Region
Sandwich Tern	Mannar Region (Adam's Bridge Islands)
Yellow-legged Gull	Mannar Region (Adam's Bridge Islands)
Brown Noddy – *Anous stolidus*	North of Kalpitiya area; Northern region

APPENDIX 15

Invasive fauna in forest ecosystems represented in the NW province of Sri Lanka

Species	Mode/source of introduction	Distribution	Affected habitats/ecosystems
Bubalus bubalis (Domestic/feral buffalo)	Deliberate; animal husbandry	Island-wide	Forests
Chitala chitala (Clown knife fish)	Negligence; ornamental fish trade	Lowland wet zone	Ponds, slow-flowing rivers, marshes
Hypostomus plecostomus (Plectosomus catfish)	Negligence; ornamental fish trade	Lowland wet zone	Ponds, slow-flowing rivers, marshes
Clarias batrachus (Walking cat fish)	Negligence; ornamental fish trade	Lowland wet zone	Marshes, streams
Gambusia affinis (Mosqito fish)	Deliberate; mosquito control	Lowland wet zone	Marshes, ditches, streams
Poecilia reticulata (Guppy)	Deliberate; mosquito control	Lowland wet zone	Marshes, ditches, streams
Oreochromis mossambicus (Tilapia)	Deliberate; commercial fishery	Island-wide	Rivers, marshes, lagoons and estuaries

APPENDIX 16

Invasive flora in forest ecosystems represented in the NW province of Sri Lanka

Species	Mode/source of introduction	Distribution	Affected habitats/ecosystems
Weldelia triloba(runner)	Negligence; ornamental plants	Wet and intermediate zone	Forest edges
Opuntia stricta(shrub)	Negligence; ornamental plants	Arid zone	Thorn scrublands
Lantana camara(shrub)	Negligence; ornamental plants	Island-wide	Scrublands, degraded open forests
Eupatorium odoratum(shrub)	Negligence; ornamental plants	Lowland dry and wet zone	Forest edges and pathways
Mikania calvescens(shrub)	Negligence; ornamental plant	Submontane zone	Disturbed forests
Dillenia suffruticosa(shrub)	Negligence; horticulturists	Lowland wet zone, Riparian areas	Marshes, low lying areas
Millingtonia hortens(shrub)	Negligence; ornamental plant	Southern dry and intermediate zone	Disturbed forests and scrublands
Prosopis juliflora(small tree)	Deliberate; afforestation	Arid zone	Thorn scrublands
Annona glabra (small tree/shrubs)	Unknown	Lowland wet zone	Coastal lagoons, marshes
Swietenia macrophylla(large tree)	Deliberate; forestry/ timber	Lowland wet zone	Disturbed forests
Leucaena leucocephala(small tree)	Deliberate; fodder plant, soil rehabilitation	Intermediate zone	Dry mixed evergreen forests
Myroxylon balsamum(tree)	Deliberate; forestry	Wet and Intermediate zone	Forest edges
Alstonia macrophylla(tree)	Deliberate; forestry	Wet and Intermediate zones	Secondary forests
Mimosa pigra(small tree)	Unknown	Mid country wet and intermediate zones	Wastelands, along river banks
Imperata cylindrica(grass)	Unknown	Island-wide	Disturbed forests and scrublands
Panicum maximum(grass)	Deliberate; fodder	Island-wide	Disturbed forests and scrublands
Bambusa bambos(bamboo)	Unknown	Mid country areas	Disturbed forests and scrublands
Ochlandra stridula(bamboo)	Unknown	Wet zone	Disturbed forests
Acrostichum aureum(fern)	Unknown	Lagoon areas	Mangrove forests
Najas marina(submerged plant)	Unknown	Coastal areas	Lagoons and estuaries

Source: http://www.fao.org/docrep/008/ae944e/ae944e09.htm

Appendix 17

Forest Plantations in the Kurunegala district and their extent and species planted.

Location	Tree species established	Year Established	Extent (ha)
Mahawa/Herathgama	Teak	1973	48.8
Mahawa/Herathgama	Teak	1975	80.0
Mahawa/Herathgama	Teak	1975	34.5
Mahawa/Horowkele	Teak	1974	2.0
Mahawa/Horowkele	Teak	1974	11.8
Mahawa/Horowkele	Teak	1974	8.0
Mahawa/Horowkele	Teak	1974	5.5
Mahawa/Horowkele	Teak	1974	1.5
Mahawa/Siyabalangamuwa	Teak	1975	9.0
Mahawa/Siyabalangamuwa	Teak	1975	3.5
Mahawa/Siyabalangamuwa	Teak	1975	8.0
Mahawa/Kiriula	Mixed	1981	20.0
Mahawa/Dambe	Kohomba/Kaya	1993	35.0
Polpitigama/Talakolawewa	Teak	1969	40.0
Polpitigama/Madagalla	Teak	1967	8.0
Polpitigama/Rekewula	Teak	1969	20.0
Polpitigama/Rajakandayaya	Kohomba	1991	4.0
Polpitigama/Galpothuyaya	*Acacia*	1990	20.0
Polpitigama/Galpothuyaya	*Acacia*	1991	20.0
Polpitigama/Galpothuyaya	*Acacia*	1991	20.0
Polpitigama/Galpothuyaya	*Acacia*	1991	10.0
Polpitigama/Andagalayaya	Kohomba/Godakirilla	1994	12.0
Polpitigama/Aludeniyaya	*Acacia*	1992	15.0
Polpitigama/Potuwila	Kohomba	1994	13.0
Polpitigama/Galpothuyaya	*Acacia*, Kohomba	1994	7.0
Polpitigama/Arawpolayaya	Kohomba, Kaya	1994	20.0
Polpitigama/Rekawula	Kohomba, *Acacia*	1994	26.0
Polpitigama/Rekawula	Kaya, Kohomba	1994	17.0
Polpitigama/Aludeniyaya	Kohomba, Kaya, *Acacia*	1994	12.0
Polpitigama/Potuwila	Kohomba, Kaya, *Acacia*	1993	20.0
Polpitigama/Galpothuyaya	Kaya	1995	10.0
Polpitigama/Rekawula	*Acacia*	1995	10.0
Mahawa/Nettipolagama	Teak	1959	1.5
Dambuwa	Teak	1959	5.0
Nikaweratiya/Dewanagama	Teak	1993	5.0
Kurunegala/Alawwa/Viharakanda	Teak	1960	68.0
Kurunegala/Alawwa/Kendahena	Nedun, Mahogany, Jak	1978	68.4
Kurunegala/Alawwa/Dawatagolla	Mahogany, Jak	1929-1930	40.4 49.2
Alawwa/Badapeliyagoda	Mahogany, Jak	1937	
Kurunegala/Alawwa/Polkatukanda	Mahogany, Jak	1960	60.0

Location	Tree species established	Year Established	Extent (ha)
Kurunegala/Badagamuwa	Mahogany, Teak	1885-1940	216.0
Kurunegala/Kumbalpola	Mahogany, Teak	1924	33.6
Kurunegala/Mudunpita	Mahogany, Teak, mixed	1940-1975	24.0
Kurunegala/Iriminna	Teak	1968-1969	52.8
Kurunegala/Moragolla	Teak	1926-1968	18.4
Maspotha/Athgala	Teak	1964	40.0
Maspotha/Sundarapola	Mahogany, Jak, mixed	1920-1927	57.2
Maspotha/Wewagedara	Mahogany, Jak, mixed	1924-1947	23.2
Maspotha/Aweniyawa	Mahogany, Jak, mixed	1924-1942	50.0
Maspotha/Palugama	Mahogany, Jak, mixed	1924-1947	20.8
Polgahawela/Dewalakanda	Mahogany, Jak, mixed	1921-1922	112.0
Polgahawela/Pogolla	Mahogany, Jak, mixed	1928-1935	52.8
Polgahawela/Habbelikanda	Mahogany, Jak, mixed	1930-1959	176.8
Polgahawela/Mee Ambakanda	Teak	1960	52.0
Polgahawela/Maragalkanda	Teak	1960	12.0
Weerambugedara/Talgamuwa	Teak/Athdemata	1960-1972	80.0
Weerambugedara/Nawagantha	Teak/Athdemata	1960-1963	62.0
Weerambugedara/Gonagama	Teak/Athdemata	1960	16.0
Weerambugedara/Kadawtkelaya	Teak/Athdemata	1960	8.0
Kuliyapitiya/Nakkawatta/Deegalla	Mahogany strip planting	1950,1959,1962,	18.0
Kuliyapitiya/Nakkawatta/Beminigalla	Teak	1964	42.0
Kuliyapitiya/Banhedaweka	Mahogany	1957	141.0
Kuliyapitiya/Deegalla	Mahogany	1969	31.0
Pannala/Dikkele	Mahogany	1961	60.0
Hidiyamulla	Mahogany, mixed	1962	14.0
Galagedara/Kankaniyamulla	Mahogany	1935-1954	272.0
Pannala/Kankaniyamulla	Mahogany	NS	9.6
Pannala/Kankaniyamulla	Mahogany	NS	3.6
Pannala/Kankaniyamulla	Mahogany	NS	48.0
Pannala/Kankaniyamulla	Mahogany	NS	104.0
Pannala/Kankaniyamulla	Mahogany	NS	165.0
Kuliyapitiya/Dikkele	Mahogany, mixed	1960	271.5
Medikele/Horakele	Mahogany, mixed	1940	75.0
Horakele	Mahogany, mixed	1940	338.0
Kuliyapitiya/Deegalla	Teak	1973	8.0
Barigoda	Teak	1976	16.0
Medikele/Narangamuwakanda	Eucaylptus	1984	10.0
Galagedara/Manawela	Eucaylptus	1984	14.0
Kuliyapitiya/Paragaharuppa	Eucaylptus, Lunumidella	1985	10.0
Kuliyapitiya/Medikele	Mahogany,strip planting	1986	50.0
Dikkele agroforesty plantation	*Acacia*, Mee, Nedun, mixed	1987- 1988	8.0
Kuliyapitiya/Kankaniyamulla	Mahogany, Strip planting	1987	40.0
Kuliyapitiya/Paragaharuppa	Mahogany, Strip planting	1989	12.0
Kuliyapitiya/Paragaharuppa	Mahogany, Strip planting	1989	12.0

Location	Tree species established	Year Established	Extent (ha)
Kuliyapitiya/Deegalla	Kaya, Waldel, mixed	1990	10.0
Kuliyapitiya/Medikele	Mahogany	1990	20.0
Pannala/Kankaniyamulla	Acacia, Kaya	1991	4.0
Pannala/Medikelle	Mahogany,strip planting	1992	51.0
Pannala/Medikelle	Kaya, Mahogani,strip planting	1993	20.0
Deegalla/ Paragaharuppa	Kaya	1993	16.0
Melsiripura/Udangarekanda	Acacia	1989	28.0
Udangarekanda	Acacia, Mixed	1994	4.0
Pallekelle	Acacia, Mixed	1991	34.0
Pallekelle	Teak	1968	14.4
Pallekelle	Teak	1965	15.6
Pallekelle	Teak	1960	23.5
Pallekelle	Teak	1965	37.5
Pallekelle	Teak	1965	15.6
Pallekelle	Teak	1965	43.7
Pallekelle	Teak	1965	45.0
Pallekelle	Teak	1965	28.1
Pallekelle	Teak	1965	15.6
Pallekelle	Teak	1965	12.5
Pallekelle	Teak	1964	63.7
Pallekelle	Teak	1965	13.1
Pallekelle	Teak	1965	7.5
Melsiripura/Pallekelle	Teak	1965	11.8
Pallekelle	Teak	1965	13.7
Pallekelle	Teak	1965	26.5
Pallekelle	Teak	1965	11.3
Dodamgaslanda,/Degalla	Jak, Mahogany	1942	170.0
Welikanda	Jak, Mahogany	1935-1952	158.0
Kalugalkanda	Jak, Mahogany	1933-1954	92.7
Gorakadola	Jak, Mahogany	1937	19.2
Kanugolla	Jak, Mahogany	1934-1942	120.6
Angurukanda	Jak, Mahogany	1933-1953	62.4
Ganewatta/Dolukanda	Kohomba, Bulu	1987	10.1
Ganewatta/Milla Golla	Teak	1970	9.0
Maeliya	Teak	1976	9.5
Melsiripura/ Henegedaralanda	Mahogany, Jak	1935	181.3
Omaragolla	Mahogany, Jak	1935	72.0
Kandumulla	Acacia	1992	14.5
Kandumulla	Acacia, Kohomba,Mixed	1993	25.0
Humbuluwa	Teak	1985	10.0
Madahapola/Halmelgolla	Jak, Teak	1965, 1992	43.3
Madahapola/Katupota	Teak	1962	42.0
Madahapola/Kimbulwanawewa	Eucaylptus, Teak	1986	20.0
Madahapola/Madahapola	Eucaylptus, Mixed	1987	25.0

Location	Tree species established	Year Established	Extent (ha)
Madahapola/ Pallekelle	Teak	1965	18.8
Madahapola/ Pallekelle	Teak	1965	25.0
Madahapola/ Pallekelle	Teak	1965	25.8
Madahapola/ Pallekelle	Teak	1965	25.0
Madahapola/ Pallekelle	Teak	1960	32.0
Madahapola/ Pallekelle	Teak	1965	36.8
Madahapola/ Pallekelle	Teak	1965	9.6
Madahapola/ Pallekelle	Teak	1965	37.5
Madahapola/ Angulgamuwa	Kaya, Godakirilla, ixed	1994	20.0
Madahapola/ Angulgamuwa	Teak, Mixed	1995	70.0
Madahapola/ Dummeyakanda	Acacia	1995	15.0
Madahapola/ Angulgamuwa	Teak	1994	20.0
Madahapola/ Angulgamuwa	Kohomba	1994	30.0
Madahapola/ Dummeyakanda	Acacia	1992	15.5
Galgamuwa/Sangappala	Eucaylptus	1983	34.0
Galgamuwa/Sangappala	Eucaylptus	1983	6.0
Galgamuwa/Sangappala	Eucaylptus	1983	3.0
Galgamuwa/Sangappala	Eucaylptus	1983	1.0
Galgamuwa/Sangappala	Eucaylptus	1983	41.0
Galgamuwa/Sangappala	Eucaylptus	1983	36.0
Galgamuwa/Sangappala	Eucaylptus	1983	40.0
Galgamuwa/Sangappala	Eucaylptus	1983	16.0
Galgamuwa/Sangappala	Eucaylptus	1983	12.0
Galgamuwa/Sangappala	Eucaylptus	1983	34.0
Galgamuwa/Sangappala	Eucaylptus	1983	6.5
Galgamuwa/Sangappala	Eucaylptus	1983	35.0
Galgamuwa/Sangappala	Eucaylptus	1983	7.0
Galgamuwa/Sangappala	Eucaylptus	1983	1.0
Galgamuwa/Sangappala	Eucaylptus	1983	12.0
Galgamuwa/Sangappala	Eucaylptus	1983	1.1
Galgamuwa/Sangappala	Teak	1983	2.0
Galgamuwa/Sangappala	Teak	1983	100.0
Galgamuwa/Sangappala	Teak	1983	37.0
Galgamuwa/Sangappala	Teak	1983	28.0
Galgamuwa/Sangappala	Teak	1983	114.0
Galgamuwa/Sangappala	Eucaylptus	1983	10.5
Galgamuwa/Sangappala	Eucaylptus	1983	260.0
Galgamuwa/Sangappala	Eucaylptus	1983	15.0
Galgamuwa/Sangappala	Eucaylptus	1983	150.0
Galgamuwa/Sangappala	Eucaylptus	1983	170.0
Galgamuwa/Sangappala	Eucaylptus	1983	198.0
Galgamuwa/Sangappala	Eucaylptus	1983	160.0
Galgamuwa/Sangappala	Teak	1983	180.0
Galgamuwa/Sangappala	Teak	1983	103.0
Galgamuwa/Sangappala	Teak	1985	55.0

Location	Tree species established	Year Established	Extent (ha)
Galgamuwa/Sangappala	Teak	1980	66.5
Galgamuwa/Sangappala	Teak	1980	8.0
Galgamuwa/Sangappala	Teak	1980	270.0
Sangappla/ Uswewa	Teak	1970	370.0
Sangappla/ Mesibagama	Teak	1969	300.0
Sangappla	Acacia	1991	50.0
Giribawa/Sangappala	Acacia, Mixed	1994	50.0
Giribawa/Gampola/Sangappala	Teak	1972	400.0
Galgamuwa	Teak	1984	130
Galgamuwa/Waragodayaya	Teak	1982	200.0
Pahalagama	Teak	1974	90.0
Bongamuwa	Teak	1975	20.0
Ranorawa/Sabarangalawa	Teak	1977	5.9
Ranorawa/Sabarangalawa	Teak	1977	17.5
Ranorawa/Sabarangalawa	Teak	1972	7.6
Ranorawa/Sabarangalawa	Teak	1978	4.6
Ranorawa/Sabarangalawa	Teak	1972	6.3
Ranorawa/Sabarangalawa	Teak	1973	3.9
Ranorawa/Sabarangalawa	Teak	1980	26.5
Ranorawa/Sabarangalawa	Teak	1978	5.7
Ranorawa/Sabarangalawa	Teak	1977	11.7
Ranorawa/Sabarangalawa	Teak	1974	19.7
Ranorawa/Sabarangalawa	Teak	1978	31.9
Ranorawa/Sabarangalawa	Teak	1982	15.3
Ranorawa/Sabarangalawa	Teak	1978	46.3
Ranorawa/Sabarangalawa	Teak	1976	8.4
Ranorawa/Sabarangalawa	Teak	1976	5.7
Ranorawa/Sabarangalawa	Teak	1973	2.5
Ranorawa/Sabarangalawa	Teak	1968	5.2
Ranorawa/Sabarangalawa	Teak	1969	4.0
Ranorawa/Sabarangalawa	Teak	1970	14.8
Ranorawa/Sabarangalawa	Teak	1971	3.5
Ranorawa/Sabarangalawa	Eucaylptus	1977	16.0
Ranorawa/Sabarangalawa	Teak	1972	4.0
Ranorawa/Sabarangalawa	Teak	1973	6.2
Ranorawa/Sabarangalawa	Acacia	1993	30.0
Galgamuwa/Ambanpola/Getadivula	Teak	1965	15.2
Ambanpola/Getadivula	Teak	1969	2.5
Ambanpola/Getadivula	Teak	1965	6.7
Ambanpola/Getadivula	Teak	1965	1.6
Ambanpola/Getadivula	Teak	1965	1.2
Galgamuwa/Ambanpola/Getadivula	Teak	1965	9.5
Galgamuwa/Ambanpola/Getadivula	Teak	1963	18.5
Galgamuwa/Ambanpola/Getadivula	Teak	1965	5.6
Galgamuwa/Ambanpola/Getadivula	Teak	1965	3.5

Location	Tree species established	Year Established	Extent (ha)
Galgamuwa/Ambanpola/Getadivula	Teak	1965	7.7
Galgamuwa/Ambanpola/Getadivula	Teak	1965	3.1
Galgamuwa/Ambanpola/Getadivula	Teak	1965	2.8
Galgamuwa/Ambanpola/Getadivula	Teak	1965	1.6
Galgamuwa/Ambanpola/Getadivula	Teak	1969	9.9
Galgamuwa/Ambanpola/Getadivula	Teak	1961	1.9
Galgamuwa/Ambanpola/Getadivula	Teak	1958	11.9
Galgamuwa/Ambanpola/Getadivula	Teak	1958	35.6
Galgamuwa/Ambanpola/Getadivula	Teak	1958	6.8
Galgamuwa/Ambanpola/Getadivula	Teak	1961	5.7
Galgamuwa/Ambanpola/Getadivula	Teak	1960	32.5
Galgamuwa/Ambanpola/Getadivula	Teak	1959	35.2
Galgamuwa/Ambanpola/Getadivula	Teak	1961	20.3
Galgamuwa/Ambanpola/Getadivula	Teak	1960	15.5
Galgamuwa/Ambanpola/Getadivula	Teak	1958	11.6
Galgamuwa/Ambanpola/Getadivula	Teak	1958	35.7
Galgamuwa/Ambanpola/Getadivula	Teak	1960	30.8
Galgamuwa/Ambanpola/Getadivula	Teak	1957	57.9
Galgamuwa/Ambanpola/Getadivula	Teak	1960	13.9
Galgamuwa/Ambanpola/Getadivula	Teak	1960	16.1
Galgamuwa/Ambanpola/Getadivula	Teak	1961	4.5
Galgamuwa/Ranorawa/Swarangalawa	Acacia	1994	20.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1995	43.5
Galgamuwa/Ranorawa/Swarangalawa	Teak	1996	55.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1994	20.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1995	5.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1991	35.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1992	50.0
Swarangalawa	Teak	1993	30.0
Giribawa/Sangappala	Teak, Mixed	1994	50.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1996	55.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1994	20.0
Galgamuwa/Ranorawa/Swarangalawa	Teak	1995	5.0

Source : Biodiversity Profile – Kurunegala district (2002), Central Environmental Authority, Sri Lanka.

Appendix 18

List of endemic species within the Kurunegala and Puttalam districts and their localities.

Species	Locality
Kurunegala	
Aerangis hologlottis	Aluthgama, between Matale and Galewela
Aidia gardneri	Arankele; Doluwa Kande, 15km from Kurunegala; Weuda Kanda; Barigoda
Antidesma walkeri	Kabaragala Estate
Aporusa lanceolata	Badagama forest reserve; Doluwa Kanda
Calophyllum calaba	Kurunegala
Canarium zetlanicum	Barigoda
Cassipourea ceylanica	Kurunegala
Chionanthus albidiflora	Kurunegala rock; Weuda kanda
Cleistanthus ferrugineous	Gonagama
Cleistanthus pallidus	Belligama, 244m; Weuda kanda, 400m
Cleistanthus robustus	Weuda kanda, 400m
Crossandra infundibuliformis	Kurunegala
Croton persimilis	Gonagama
Cryptocoryne wendtii	Galgamuwa, mi oya; Uhumiya (between Kurunegala and Negambo); 8 km from Nikaweratiya (between Kurunegala and Puttalam); Talgalla (between Maho and Padeniya); Attan wewa (between Kurunegala and Puttalam); Kuda oya (tributary of Deduru Oya); Ridibendi ela (canal off Deduru Oya).
Dimocarpus gardneri	Near Kolegala, Kurunegala Road
Drypetes gardneri	Kurunegala, 100m
Erythrospermum zeylanicum	Weudakanda
Erythroxylum zeylanicum	Ganewatta medicinal plant garden, 100m
Eugenia rotundata	Doluwa kanda; Arankele
Euonymus walkeri	Galagama
Exacum trinervium subsp. Ritigalensis	Ibbagamuwa, summit of Doluwakanda, grassy pockets
Garnotia scoparia	Doluwa Kanda
Glenniea unijuga	Kurunegala hills, 50m; Between Nekatunuwewa and Seepukulama wewa, mile post 4/5
Glochidion stellatum	Badagamuwa forest reserve
Habenaria acuminate	Doluwa Kanda
Hopea brevipetiolarris	Doluwa kanda; Dunkande, Arankele, Kurunegala
Hydnocarpus venenata	Kurunegala; Kurunegala rock; Barigoda
Lsianthus strigosus	Badagama forest reserve
Lepisanthes tetraphylla	Omaragolla, Kurunegala – Dambulla road, 25 mile post
Macaranga digyna	
Memecylon gracillimum	Doluwakanda
Memecylon rhinophyllum	Kurunegala; Kurunegala rock
Memecylon royenii	Badagomuwa forest reserve; Barigoda
Oberonia quadrilateral	Doluwakanda

Species	Locality
Painteria natida	Dunkande, Arankele
Palaquium hinmolpedda	Summit of Doluwakanda 15 miles from Kurunegala
Pavetta gleniei	Dolu Kande
Petchia ceylanica	Badagama forest reserve, 140m
Podochilus falcatus	Doluwakanda
Podochilus saxatilis	Doluwakanda
Pouzoizia walkeriana	Hiripitiya, 110m; Wariyapola
Pterygota thwaitesii	Dunkanda, Arankele; Kurunegala hills; Yapahuwa
Sageraea thwaitesii	Doluwakanda
Sauropus rigidus	Gonagama
Schoenorchis tortifolia	Doluwa Kanda
Stachyphrynium zeylanicum	Doluwa Kanda
Strychnos trichocalyx	Doluwa Kanda, 305m
Syzigium makul	Kurunegala
Tetracera sarmentosa	Weudakanda, 400m
Uvaria semecarpifolia	Weudakanda
Vernonia zeylanica	Hettipola
Ziziphus lucida	Hettipola; Erankeliya Eraniya forest
Ziziphus napeca	Erankeliya Eraniya forest
Puttalam	
Allophylus zeylanicus	Kulu Mookalana off Lihiriyagama
Cassia kleinii	West of Kala Oya
Cassina glauca	Manampuri, alt. sea level
Cassipourea ceylanica	Wilpattua National Park, Kollanakanata; Between Weerakuti and Maduru Odai; Occapu Kallu; Manikepola Uttu; Puttalam
Crossandra infundibuliformis	Vannathivillu; Wilpattu National Park, Kudapatessa; Roadside from Kali Villu to Marikaram Villu
Cryptocoryne wendtii	Dematapitiya NE Chilaw; Mahauswewa, Mi Oya
Derris parviflora	Wilpattu National Park, from Talawila on the Puttalam- Mannar road
Dicliptera neesii	Jungle under-growth, Eluwankulam Kala oya road
Dimocarpus agrdneri	Puttalam, holotype
Drypetes gardneri	Puttalam
Emilia baldwinii	Chilaw
Fahrenheitia minor	Mellawa, Lihiriyagama; Kalu Mookalana, Lihiriyagama
Glenniea unijuga	Puttalam
Ischaemum muticum	Pallugaturai
Magnifera indica	Wilpattu National Park, Moderagam Aru stream
Location	**Tree species established**
Mallotus eriocarpus	Kumuttu villu; Kalu mookalana, Lihiriyagama; Wilpattu National Park; Kudapatessa, sea level; Between Kali villu and Kanjuran villu; Madampe villu
Mallotus fuscescens	N of Wellandura near Madampe

Species	Locality
Murdannia dimorphoides	Colombo-Puttalam road, near 72 mile post
Oberonia thwaitesii	Puttalam
Pavetta gleniei	Wilpattu National Park m Occuppu Kallu
Pterygota thwaitesii	19 miles from Puttalam, Mukalan forest
Scolopia pusilla	Puttalam
Strychnos tetragona	Between Kokkare Villu and Kurutu Pandi Villu
Strychnos trichoclayx	Wilpattu National Park, near Manikepola Uttu; Between Dangaha Uraniya and Occupu Kallu
Tetracera sarmentosa	Puttalam
Triumfetta glabra	Wilpattu National Park, Occapu Kallu, in plot 32, small woody perennial, up to 75 cm tall; in plot W34, open scrub; near Sadpuda Kallu, 2 miles east of Kattnakandal Kulam, semi open spaces in shrub forest
Ziziphus napeca	Puttalam-Kurunegala road, Anamaduwa Teak Plantation, 10 km mark

Source: Endemic Flowering Plants of Sri Lanka (Part II A), Ministry of Environment and Natural Resources, 2007).

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