MANAGEMENT PLAN

FOR

Kazhuveli Wetland Birds Sanctuary (2023 TO 2033)

By

District Forest Officer,

Villupuram Forest Division, Villupuram

Under the direction of

THE CONSERVATOR OF FORESTS,
Villupuram

Introduction

Kazhuveli wetland is a brackish shallow lake located on the Coromandel Coast in Villupuram district, North of Pondicherry. The lake is connected to the Bay of Bengal by the brackish Uppukalli creek and the Edayanthittu Estuary. Kazhuveli is one of the significant and biodiversity rich wetlands in the Coromandel Coast.

The term Kaluveli relates to the word “kaḻimukam” that refers to backwaters or estuary. It appears that “kaḻi” means “to subtract, to drain” while “veli” may have two meanings: “space” (veḻi) or “fence” (vēli). Thus “Kaluveli” is not a proper noun, but a generic term referring to wetlands that can be found in other areas. Numerous authors emphasized the importance of Kaluveli wetland as feeding, resting and breeding area for migratory birds in the Central Asian Flyway; especially for ducks, herons, storks, waders and for the Spot-billed pelican.

In due recognition of the tremendous biological potential, the area was declared as Kazhuveli birds sanctuary during 2021. A Management plan for the conservation, development and better management of flora and fauna is necessary for Kazhuveli Wetland Birds Sanctuary. In view of the above facts, the management plan is prepared for ten years from 2023-2024 to 2032-2033

District Forest Officer,
Villupuram Forest Division

The Executive Summary

The Kazhuveli Birds Sanctuary (12.16643 N - 12.072351N to 79.912297 E - 79.827553 E) is a brackish water wetland with about 205 avifaunal species including 10 species of waterfowls including Northern Pintail, Shovller, Gadwal etc. recorded from the sanctuary. It has been one of the wintering area for the migratory birds as well as resident population of waterbirds in the Central Asian Flyway, globally. It is one of the most important heronry sites in southern India. About seven species of herons, storks, and egrets' nest in the sanctuary every year during the monsoon season. These include Pond Heron, Black-crowned Night Heron, Grey Heron, Purple Heron, Little Egret, Intermediate Egret, Large Egret, Darter, Pelicans, Ibis, etc.the sanctuary supports about 14 species of raptors, a significant population of globally threatened Spot-billed Pelican. The Pond Heron, Black-crowned Night Heron, Grey Heron, Purple Heron, Little Egret, Intermediate Egret, Large Egret, Darter, Pelicans, Ibis nests in the sanctuary. This management plan is aimed at conserving this natural resource and to develop such facilities that will enhance the non-consumptive utilization of the sanctuary such as eco-tourism, education and research. The objectives of management can be briefly summarized as:

1. To conserve and protect the habitat, so that endangered and endemic flora and fauna inhabiting the area are adequately protected and propagated.

2. To maintain and wherever necessary restore the physical integrity of the area in addition to restoring the degraded portion of the sanctuary.

3. To create awareness among the people in general and the children in particular about nature and wildlife with particular emphasis on the ecological role of the sanctuary area.

4. To maintain and develop tourism for recreation, education and scientific exploration without affecting the sensitive ecosystem adversely.

5. To reduce the dependence of people on forest-based resources in the zone of influence, with sensitivity to cultural and economical well being of the communities, through Eco-development activities

6. To provide for capacity building for efficient management of the sanctuary through better training of staff and infrastructure.

7. To promote scientific and ecological research or studies that will help the sanctuary management in assessing the physical and biological resources, planning for conservation of these resources and monitoring the health of the habitat.

The major hurdles faced in the sanctuary management, which adversely affect the achievement of these objectives include, inadequate staff, lack of basic infrastructural facilities and limited funding.

The present management plan has been compiled following the manual for planning wildlife management in protected areas and managed forests by Wildlife Institute of India.

It comprises of three parts; Part One dealing with four chapters: Chapter 1- Introduction to the area, Chapter 2- Background information & attributes, Chapter 3- History of management & present practices and Chapter 4- The Protected Area & the interface Land use situation. Part Two deals with the rest of the seven Chapters namely: Chapter 5- Vision, objectives and issuses, Chapter 6- The Strategies, Chapter 7- Eco-tourism, interpretation and Conservation Education, Chapter 8- Eco-development, Chapter 9- Research, Monitoring & Training, Chapter 10- Organization and Administration, Chapter 11- The Budget and Chapter 12- The Schedule of operations and Miscellaneous Regulations. Part three comprises of various Annexures to the management of the sanctuary.

Acknowledgment

I express my sincere gratitude to Shri. M. Srinivas Reddy I.F.S, Principal Chief Conservator of Forests and Chief Wildlife Warden Chennai, for his keen interest and support for the compilation of the plan.

I thank Shri. N.Satheesh, I.F.S., Conservator of Forests, Villupuram Circle, for his advice throughout the process of compilation of the plan.

The process of writing the Management Plan started with Shri. Sumesh Soman, I.F.S.,DFO , Villupuram Forest Division. The draft documents were of great help and I duly acknowledge his contribution.

I duly acknowledge the inputs from field, particularly by D. Aswini, Forest Range Officer, **"Kazhuveli Wetland Bird Sanctuary"** and also from other field staff including the Forester, the Guards and other staff, which greatly helped in prioritizing the strategies in the management plan. I also thank my office staff for their help in preparing the management plan.

I express my sincere thanks to all local people, officers of various departments whose ideas and suggestions in one form or another have helped in framing some of the strategies of this plan.

District Forest officer,
Villupuram Forest Division,

Villupuram

CONTENTS

PART-I

The Protected Area: Existing Situation

PART–II

Part III
Appendix and Maps
Table of Contents

Maps

CHAPTER I

INTRODUCTION TO THE PROTECTED AREA

1.1.Name, Location, Constitution and Extent

"Kazhuveli Wetland Bird Sanctuary"

Kazhuveli Birds Sanctuary comprises a area of 5151.60 ha and Kazhuveli is a brackish water lake in Nadukuppam, Seyyankuppam, Chettikuppam, Anumandai, Urani, Keelputhupattu, Koonimedu, Thirukkanur villages of Marakkanam Taluk and Kilapakkam, Kozhuvari, Kazhuperumpakkam, Karattai and Devanandal villages of Vanur taluk in Villupuram district (Location Map 1). Recognizing the ecological, faunal, floral and geo-morphological value for the purpose of protecting, propagating and developing wildlife and its environment of the fragile and distinct of the coastal region of the Villupuram district. The State Government in order to protect and to conserve the floral and faunal diversity and to maintain the ecological integrity of this coastal region, notified vide G.O.(Ms) No.123 notification No. WLS/28221/2017, dated 29.04.2019 and 24.12.2020 under sub section (1) of section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972).The Sanctuary is surrounded by agricultural fields. The area consists of two blocks and 13 villages under Marakkanam and Vanur taluk in Villupuram district.

Location

Kazhuveli Birds Sanctuary situated in coramandal coast of Villupuram district (12.16643 N - 12.072351N to 79.912297 E - 79.827553 E) covers the following villages , namely, Nadukuppam, Seyyankuppam, Chettikuppam, Anumandai, Urani, Keelputhupattu, Koonimedu, Thirukkanur villages of Marakkanam Taluk and Kilapakkam, Kozhuvari, Kazhuperumpakkam, Karattai and Devanandal villages of Vanur taluk.

Constitution:

a) Notification under Section 18(1)

An intention to constitute the area of 5151.60 ha as 'Sanctuary' was declared under G.O.(Ms) No.123 , notification No. WLS/28221/2017, dated 29.04.2019 and 24.12.2020 under sub section (1) of section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972).

Out of the total area of 74 sq km, 4722 ha, has been declared under section 26 of Tamil Nadu Forest Act, 1882 during the year 2001 Action is being taken to declare the remaining area also under the TN Forest Act, 1882 (**Annexure I & IA).**

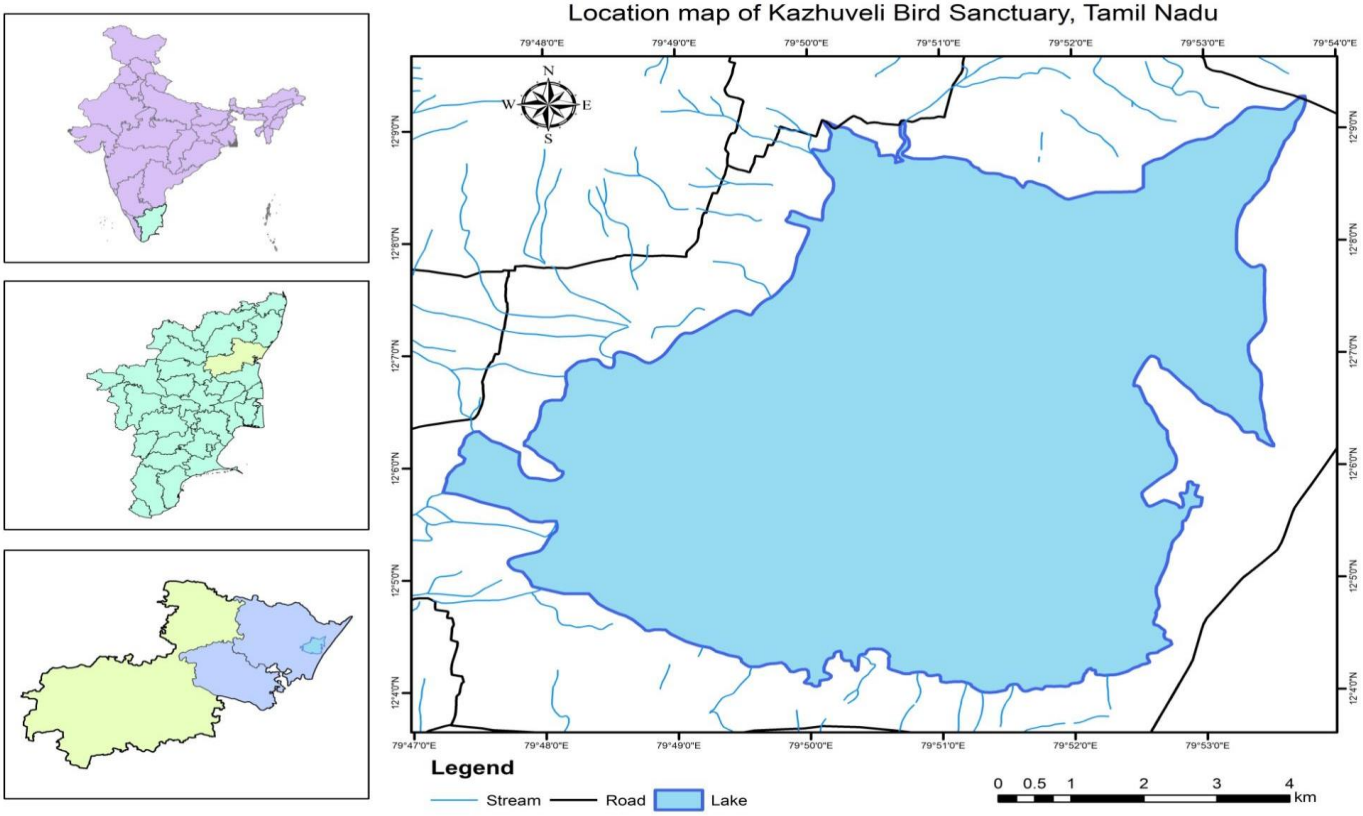
The proceedings on settlement under section 19 to 25 of the wildlife Protection Act,1972 is yet to be completed by the District Collector, Villupuram. Besides the final notification and declaration of the sanctuary under section 26A remains to be done. This will be pursued during the plan period.

Extent:

The sanctuary is in between 70° 45' to 70° 55' longitude and in between 12° lº 12° 10, latitude. The tank lies adjacent to Bay of Bengal along the east coast. The sanctuary is sutuated, partly in Marakkanam and in Vanur taluk of Villupuram district'

Name of Taluk	Name of villages	Extent (in hectares)
Marakkanam Taluk	38 Nadukuppam	1277.22.0
	53 Seyyankuppam	48"44.5
	54 Chettikuppam	152.93.5
	52 Anumandai	75.89.5
	47 Urani	109"46.0
	56 Keelputhupattu	349.22.0
	55 Koonimedu	98'1.16.0
	46 Thirukkanur	32.91"5
		3027.25.0
Vanur Taluk	14 Kilapakkam	382.12.5
	16 Devanandal	123"03.5
	17 Karallai	426.65.5
	36 Kozhuvari	900"23.5

	35 Kazhuperumpakkam	292.30.0
		2124.35.0
	Grand Total	**5151.60.0**



1.2 Approach and Access

Kazhuveli Birds Sanctuary is situated on the extreme eastern edge of the Bay of Bengal, 35 Kilometres south east of the Tindivanam town. 120 km west of Chennai and 23 km south of Pondicherry. It is well connected by road and is directly approachable by road throughout the year. The taluka head quarter, Marakkanam and Vanur taluk is located at about 4 Kms and 20 Kms from the Sanctuary area; while the district head quarter, Villupuram is situated 70 Kms away from the Sanctuary. Marakkanam and Vanur is well connected with district

place by State transport and is having medical facilities, good communication services. Lodging and boarding facilities are not well developed at Marakkanam and Vanur. However, the nearest adjoining taluka Tindivanam has the facilities. Diesel and petrol distribution points are available at Marakkanam and Vanur.

Office address:

District Forest Office, Master plan complex, behind collectorate,

Villupuram 605602,Phone Number:04146-290744

Email ID: dfovpm@yahoo.com

1.2.1The following approaches are there to reach the Sanctuary.

Sl.No	Approach	Place and Reach
1.	Nearest Highway	Pondicherry –Chennai ECR Road (5 km E)
2	Nearest Railway Station	Pondicherry(30 km, SE)
3	Nearest Airport	Lawspet, Pondicherry (30 km,SE)
4	Nearest Port	Chennai (125 km, N)

1.2.2 Amenities

Nearest Fuel Sation	Marakkanam
Accommodation	Marakkanam
Hospitals	Marakkanam
Postal Service	Marakkanam
Local Transport Services (Bus, Taxi, auto) From	Marakkanam
Historically Important Places	(Auroville, 25 km), Pondicherry Museum and Library and Arikamedu (28 km), Sri Aurobindo Ashram (28 km), Lighthouse near the sea (20 km)**.**

1.3 The Statement of Significance

The lake presently notified as a Sanctuary is significant for the following reasons

- *Ornithologically*, the sanctuary assumes significance in two respects - One because of its strategic location; it is a staging ground for migratory waterfowl arriving in the Indian subcontinent before dispersing to various regions. It is also a site where waterfowl converge before departing to breeding grounds in the western Palearctic region (Hussain 1992). In addition, the wetland is a wintering area for massive congregations of shorebirds and waterfowls. Two, it has been one of the regular wintering area in southern India for significant population of the rare and endangered waterbirds. .
- Internationally important wetland site for massive congregation of water birds making it an important wintering ground on the Central Asian Flyway for migratory shorebirds and waterfowl from the Palearctic region. Around 205 avifaunal species including 10 species of waterfowls including Northern Pintail, Shovller, Gadwal etc. are the attraction of the sanctuary. It has been the one of the wintering area for the migratory birds as well as resident population of waterbirds in the Central Asian Flyway globally. It is one of the most important heronry sites in southern India. About seven species of herons, storks, and egrets nest in the sanctuary every year during the monsoon season. These include Pond Heron, Black-crowned Night Heron, Grey Heron, Purple Heron, Little Egret, Intermediate Egret, Large Egret, Darter, Pelicans, Ibis, etc. supporting about 14 species of raptors, and a significant population of globally threatened Spot-billed Pelican. The Pond Heron, Black-crowned Night Heron, Grey Heron, Purple Heron, Little Egret, Intermediate Egret, Large Egret, Darter, Pelicans, Ibisnests in the sanctuary. About 56 species of butterflies, 50 species of fish, 10 species of amphibians, 37 species of reptiles and mammals are recorded from Kazhuveli Birds Sanctuary.
- The area serves as an important stopover for the migratory birds which move to Point Calimere during winter.
- It contributes to the ground water level in the surrounding agriculture land.

CHAPTER–II

BACKGROUND INFORMATION AND ATTRIBUTES

2.1. Boundaries:

Kazhuveli – Chennai ECR National Highway No.32 towards the Chennai and Pondicherry demarcates the boundary of the sanctuary. The sanctuary is covered by 13 villages (**Map 3**) and agricultural fields so there is no physical contiguity of the forested areas. However, as the significance of this sanctuary is essentially due to is avifaunal diversity, a network of habitat is provided to the avifauna in the form of wetlands that these birds utilize. The district shares borders with Bay of Bengal in the east, Pondicherry in the southeast and the districts Chengalpattu and Tiruvannamalai in the north, Cuddalore in the south and Kallakurichi in the west. The area contains metamorphic rocks formed by pressure and heat belonging to the granite-like gneiss family. There are also three major groups of sedimentary rocks, layers of particles that settled in different geological periods. Kalrayan Hills is located 116 kilometres to the west and Gingee Hills 50 kilometres to the north. The Thatagiri Murugan Temple is about 191 kilometres to the southeast in Senthamangalam with the Lord Siva temple in Koppampatti 153 kilometres southwest of the town

East: Pondicherry to Chennai East Coast road; Village boundaries of Urani village No.47, Anumandai village No.52, Seyyankuppam village No.53, Chettikuppam village No.54 and Koonimedu village No.55.

West: Village boundaries of Aruvadi village No.223, Karattai village No.17 and Devanandal village No.16.

South: Village boundaries of Keelputhupattu village No'56, Kozhuvari village No.36 and Kazhuperumpakkam village No'35'

North: Village boundaries of Kilapakkam village No.14, Nadukuppam village No.38 and Thirukkanur village No'46.

The Sanctuary in situated between 70º 45' to 70º 55' longitude and in between 12º lº 12º 10, latitude. The Sanctuary lies adjacent to Bay of Bengal along the east coast. The tank is partly in Marakkanam and in Vanur taluk of Villupuram district'

2.2 Geology, Rock and Soil:

Geologically the sanctuary area exposes following formations.

Rock and Soil

Studies in the region suggest that the total nutrient load carried into the lake in this way is onsiderable and that the land use pattern in the larger watershed dictates the nutrient inflow into the

wetlands and hence influences its ecology.

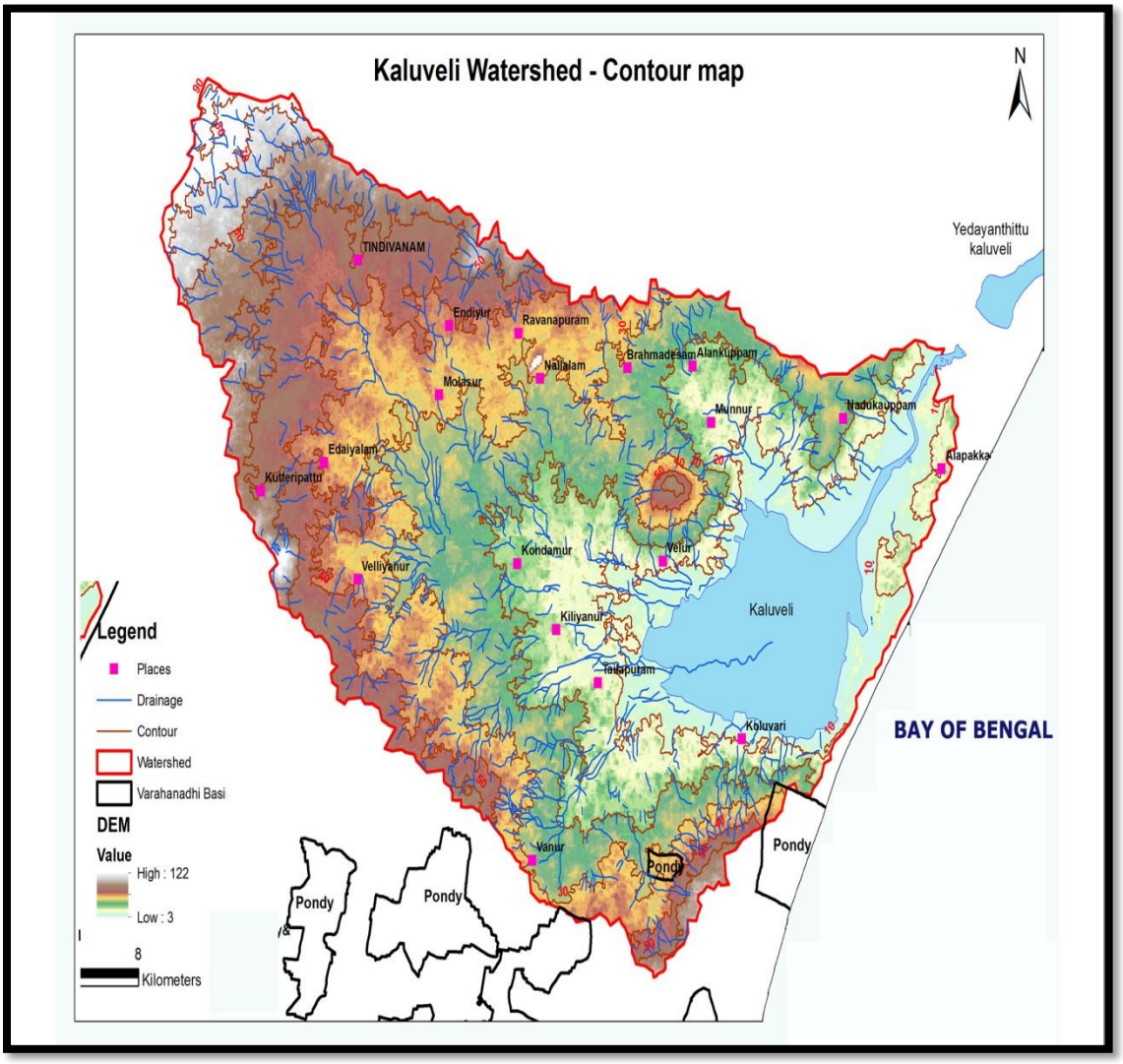
soil

The soil of the tank bed, foreshore and ayacuts on the west are sandy loamy and clayey in nature. pH varies widely in the bed (4.5 – 8.4) and to a far less extent in the agricultural fields. Electrical conductivity also varies widely in the bed (0.1 – 5.3mS/cm) and foreshore (0.1 – 3.2mS/cm), but was consistently low showing an increasing trend from south to north. The nutrients also varies more widely in the foreshore (N:30-135; P:1.2-62 and K:29-378) and in tank bed (N:65-88; P:1.9-129 and K:34-600) and to a far less extent in (N:65-88; P:0.8-11; and .0-105).

2.3 Terrain

The terrain is almost flat with elevations varying from 172 to 175 m, and a gentle slope towards a central depression. The submersible area of about 900 ha is divided into various compartments by earthen dykes in which sluice gates are built at strategic locations to regulate water supply. The wetland compartments are surrounded by terrestrial habitats of about 2000 ha except in a small area on the northwest, which is contiguous with the agricultural fields of nearby villages.

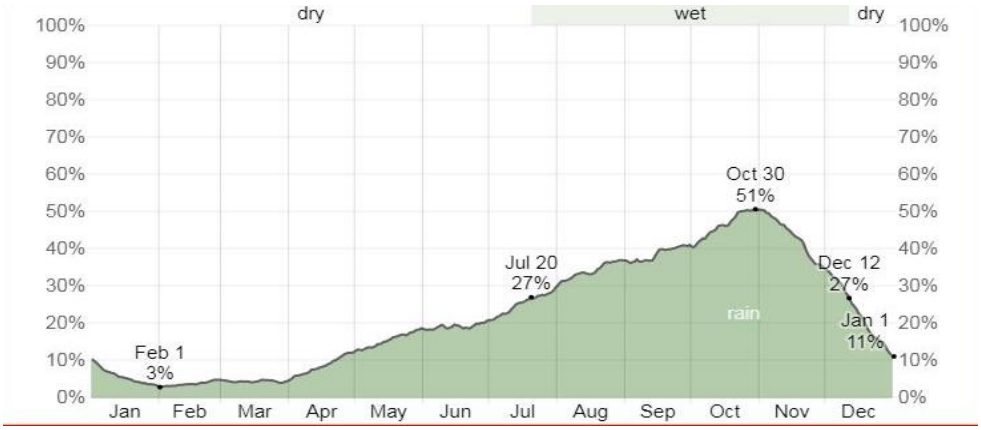
Contour map



2.4 Climate:

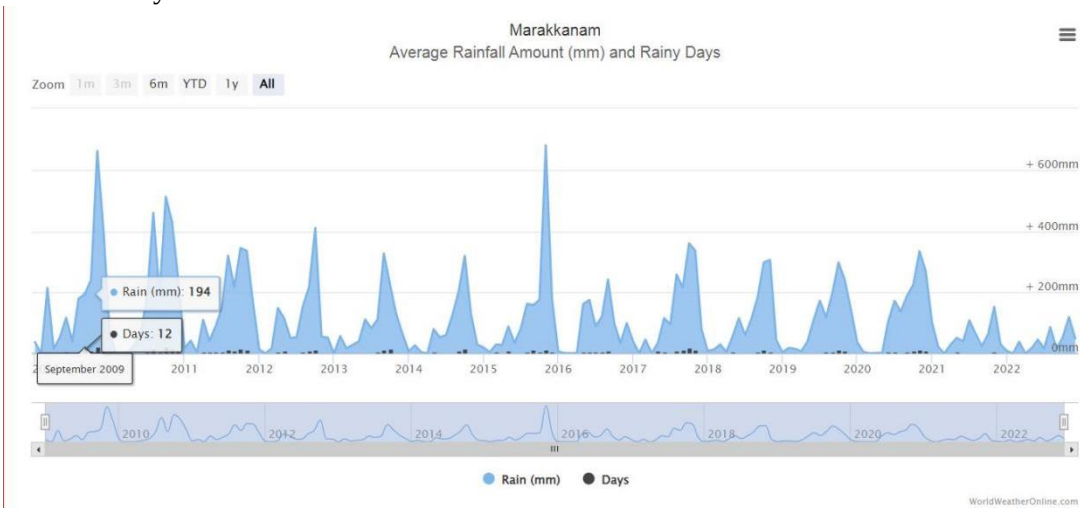
Kazhuveli experiences climatic extremes from hot, dry summer (April to June) to a cold winter (January to March) and monsoon (October to December) and post monsoon (July to September) seasons. Since the town is landlocked, the weather in Viluppuram is generally humid and hot. It relies on the monsoon for rain during October, November and December. Summers are very hot, and temperatures can get up to 40 °C (104 °F). Winters are moderate with temperatures ranging between 30 and 35 °C (86 and 95 °F) Viluppuram has a tropical climate. In winter, there is much less rainfall in Viluppuram than in the summer. This climate is considered to be *Aw* according to the *Köppen-Geiger climate*

classification. The average annual temperature is 28.4 ℃ (83.1 °F) in Viluppuram with average annual rainfall of 1,046 millimetres. With an average of 222 millimetres (8.7 in) per annum, the most precipitation falls in October. The warmest month of the year is May, with an average temperature of 32.0 °C (89.6 °F). January has the lowest average temperature of the year at 24.6 °C (76.3 °F)



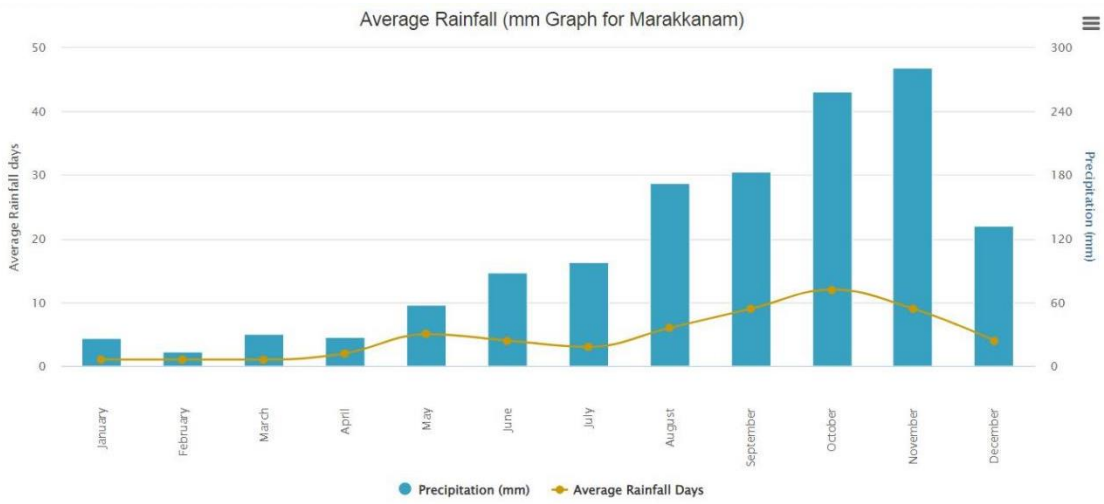
2.4.1. Rainfall:

The climate of Kazhuveli watershed is humid. It is a monsoonal lake. The Lake flooded during the winter monts and go partially dry during summer months. The mean number of annual rainy days is 55. The period between October – January constitutes the so called Northeast or retreating or winter monsoon. Over 50% of the rainfall is received during October and November and about 60% from October to January.



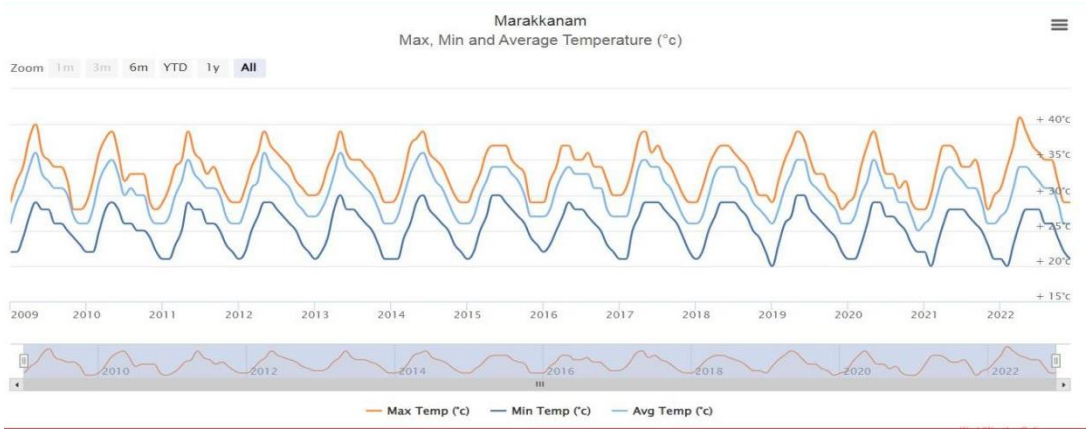
Rainfall pattern and distribution

The Northeast monsoon, which sets in towards the mid of October, extends up to December with occasional slight showers in June-July. It rains mainly during October-December. The mean annual rainfall is about 1029.4 mm over a period of 72 days. The average rainfall in the area during the past 25 years is 986.8 mm, but averaged only 629.5mm, on the beginning of data (2022) during (1980s) with occasional droughts than in the other decades of the second half of this century.



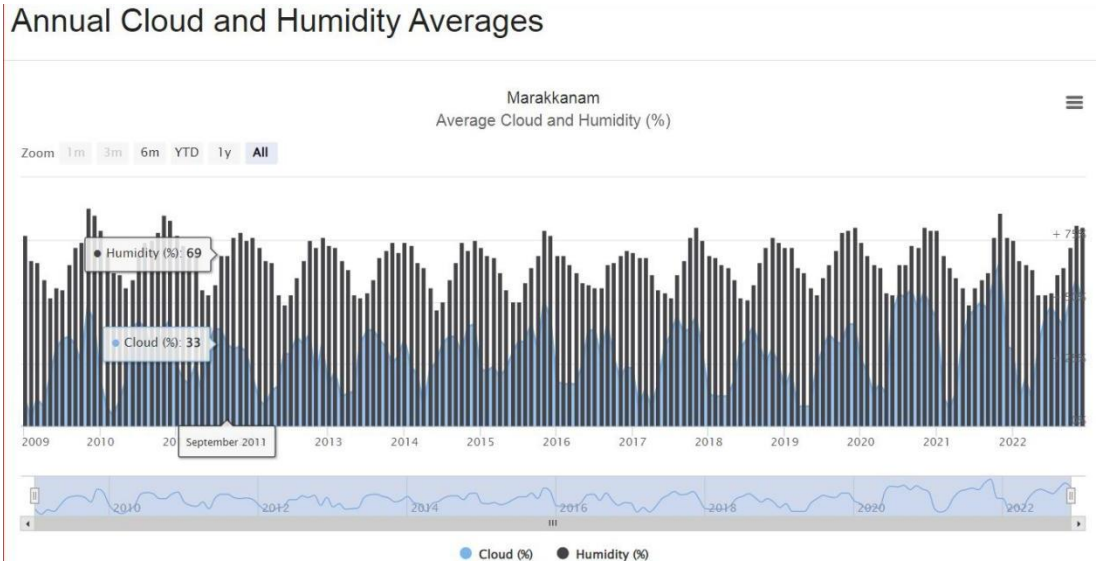
2.4.1. Temperature:

The temperature ranges from a minimum of 27.1°C to 32.0°C in winter to a maximum of 37.8°C to 28.2°C in summer.



2.4.3. Humidity

Humidity increases with the beginning of the monsoon making the climate muggy and remains high after the incidence of rain. Humidity is lowest in the summer months and highest in the middle of the monsoon season

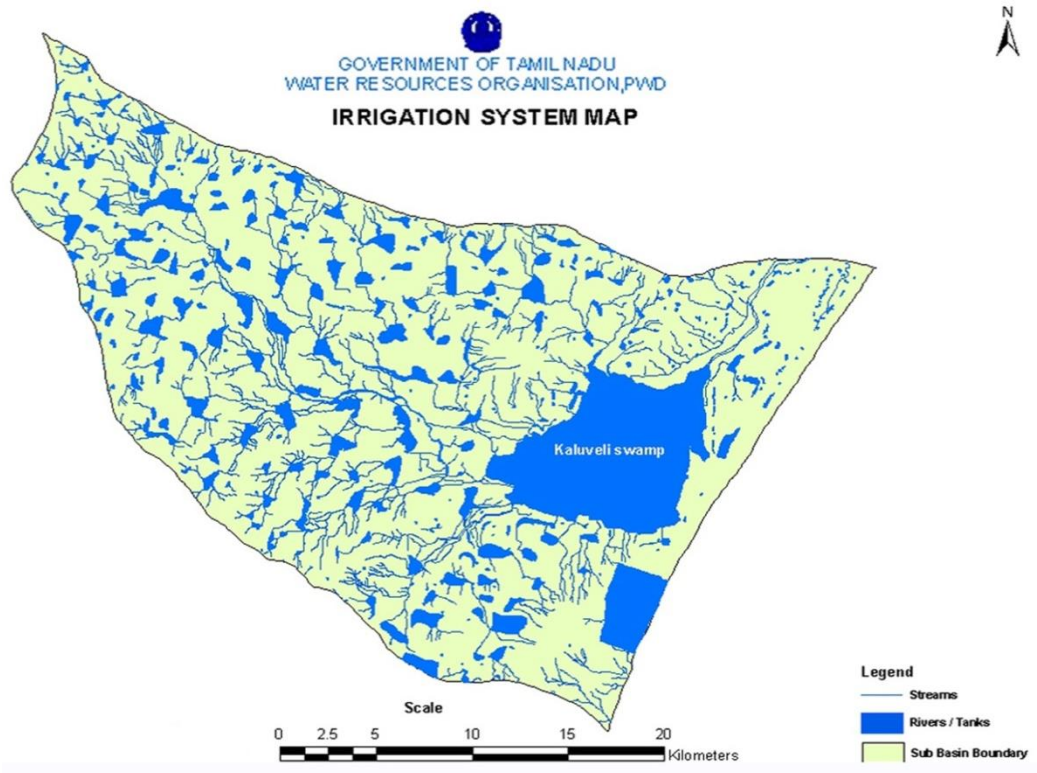


2.4.4. Wind speed

Wind is generally high to moderate with some increase in speed during the summer and monsoon period. Being in the coastal belt experiences stronger wind especially during the monsoon. Thunderstorms occur mainly during the monsoon. Occasionally, cyclonic storms of 25 to 30 km per hour velocity also hit the area.

2.5. Water Source

Watershed map of Kazhuveli Birds Sanctuary



2.6Range of wildlife

Species	Total
Birds	204
Plants	242
Butterflies	56
Mammals	14
Fishes	48
Amphibians	10
Reptiles	37

2.6.1 Vegetation
Landscape attributes

It falls along the Central Asian flyway and it is a wintering and breeding ground for migratory birds from artic region.

SUBJECT	DESCRIPTION
Topography	Flat
Elevation above MSL	Sanctuary elevation upto 15m MSL
Orientation	Inland

Ecosystem	Wetland
Bio-geographic zone (as defined by the Wildlife Institute of India)	No.6 Deccan Plateau Zone
Agro-ecological zone (as defined by the Indian Council of Agricultural Research)	East Coast Plain Zone in Tamil Nadu
Predominant vegetation	*1.Accacia nilotica* *2.Albizia lebbeck* *3. Prosopis juliflora* *4.Azadirachta indica* *5.Bombax malabaricum* *6.Thespesia populnea ,* *7.Madhuca longifolia.*
Whether individual entity or part of a wetland complex	Individual wetland

2.6.1.1. Biogeographic classification

For the classification and analysis, the Birds Sanctuary has been divided into three zones for floral documentation determinations *viz.* Peripheral zone, Marshy zone and Aquatic zone. Plants were collected in all these zones and identified to know the plant diversity. The identified plants are tabulated zone wise for easy recognition.

Plants those grow in littoral zones are classified into three group *viz*. Emergent plants, Floating-leaved plants and submerged plants.

1. **Emergent plants** inhabit the shallowest water and are rooted in the sediment with their leaves extending above the water‘s surface *e.g.Polygonum* spp., *Typha* sp. etc.
2. **Floating-leaved plants** grow at intermediate depths. Few species are rooted in the sediment; some are free- floating with roots that hang unanchored (*Lemna* sp.). The leaves of floating-leaved plants float more or less flat on the surface of the water *e.g*. *Nymphaea* spp. (Water-lily).
3. **Submerged plants** are rooted in the soil and where they get sufficient light to support their life cycle.

2.6.1.2. Forest types, Cover and food for wild animals

The lake though, small contains diverse flora and fauna that includes nearly 242 plant species are seen. The major trees recorded around the lake are *Dalbergia paniculata, Acacia*

auriculiformis, Terminalia arjuna,Thespesia populnea,Tamarindus indicus, Khaya senegalensis, Ficus benghalensis, F.religiosa, Azadirachta indica, Borassus flabellifer, Samanea saman, Gemlina arborea, Pongamia pinnata, Prosopis juliflora, Morinda tinctoria, Peltophorum pterocarpum, syzygium cuminii, Sapthodea campanulata, Launnea coromandelica, Phoenix syvestre, Bombax ceiba,Ceiba pentandra etc. The palm, *Borassus flabellifer* is commonly seen in all sides of the lake.

The shrub such as *Ficus hispida, Fluggea leucopyrus, Cassia auriculata, Rauvolfia tetraphylla, Plumbago zeylanica, Phoenix laurierii, Lantana camara, Abutilon hirtum, A.indicum, Pavetta indica, Randia malabarica, Calotropis giganteanm C.procera, Barleria cristata, jatropha gossypifolia, J.tanjoresis, Ziziphus oenoplia* etc. are commonly seen all around the lake. pseudarthria viscid etc. are the major herbaceous plants recorded in the lake area.

The herbs like *Acalypha indica, borreria ocymoides, Commelina benghalensis, C.longifolia, Cyerus rotundus, Ruellia patula, Alysicarpus monilifer,Achyranthes aspera, Phyllanthus maderaspatensis, Corchorus tridens, Desmodium triflorum, Euphorbia hirta,Justicia procumbens, Clitoria ternatea, Parthenium hysterophorus, Pupalia lappacea, Tridax procumbens, pseudarthria* viscid etc. are the major herbaceous plants recorded in the lake area.

The common climbers/stragglers recorded in and around the study area are *Cissus trifolia, C. vitigenea, Cardiospermum halicacabum, Tragia involucrate, T.plukenetii, Toddalia asiatica, Passidlora foetida, Oxystelma esulentum, Tiliacora acuminate, Tylophora benthamii, Pergularia daemia, Wattakaka volubilis etc. The following grasses viz.,Andropogon pumilus, Apluda mutica, Arundo donax, Bothriochloa pertusa, Chloris Barbata, Cynodon dactylon, Eleusine Indica, Eragrostis amabilis, Saccharum spontaneum, Setaria pumila, Oplismenus composites, Chrysopogon asper are commonly seen in the lake area. The major hydrophytes recorded were Nelumbo nucifera, Nymphaea nouchalii, Ceratophyllum demersum, Hydrilla verticillata, Najas ninor, Ipomoea carnea, Salvinia molesta, Pistia stratoides, lemna minor, Aponogeton natans, Ottelia alismoides, Ceratopteris thalictroides, Eichornia crassipes, Vallisneria spiralis, Polygonum glabrum, P. hydropiper, Typha angustata, Vetiveria zizanioides, Cuperus spp. Fimbristylis spp*. Etc.

Among them, species such as *Hydrilla verticillata, Ceratophyllum demersum, Najas minor and Nelumbo nucifera* were the **major aquatic weeds** and they are distributed throughout the lake and the rest are seen along the margins of the lake only(**Annexure II).**

2.6.2Fauna

2.6.2.1. Icthyofauna

Nearly 48 fish species are recorded from the Kazhuveli Wetland lake including *pseudeutropius atherinoides and Etroplusmaculates, Catla Catla, Mystus Vittatus, Heteropneustes fossilis, Channa orientalis, Clarias batrachus, Etroplus suratensis, Mystus gulio, Channa striatus and Gambusia affinis*. Three species viz., *Oreochromis mossambica, Cyprinus carpio and Hypophthalmichthys molitrix* are exotic and are found in the lake(**ANNEXURE – II).**

2.6.2.2. Butterflies

A total number of 56 butterfly species falling under 46 genera and spread over 5 families were recorded in various surveys conducted over time. Grass Yellow, Zebra Bule, Common Cerulean, Banded Blue Parrot, Common Sergeant, Tiny Grass Blue, Crimson Tip, Common Jay, Common Bush Brown, Great Orange Tip, Yellow Orange Tip, Dark Cerulean, Plains Cupid, African Babul Blue, Southern Birdwing, Small Orange Tip, Chestnut Bob, Peacock Pansy, Tailed Jay and Great Eggfly are the variety of butterflies reported from the Kazhuveli Wetland lake area (**ANNEXURE – III).**

2.6.2.3.Avi-Fauna

A total of 204 species of birds belonging to 60 families were recorded from the Kazhuveli Wetland lake and its environs which included 75 aquatic species. Of these birds, Darter, Spot – billed Pelican, Great white Pelican, Painted Stock, Eurasian Spoon Bill and Pallid Harrier are coming under near Threatened category. Notable species such as Great – White pelican, White – browed Fantail, Franklin's Prinia, Dunlin, Ruff, Crested Serpent Eagle, Blank – Headed Oriole, Common Iora, Indian Silverbill, Grey Headed Lapwing, White – bellied Sea Eagle, Osprey, Stork – billed kingfisher, Black – capped kingfisher, jungle Babbler, Tawny – bellied Babbler, Rosy Starling, Black – rumped Flameback, Southern Grey Shrike, Crested Tree Swift, etc. are recorded in the lake.

Among aquatic birds, Little Egret, Cotton Pygmy Goose, Eurasian wigeon, Little Cormorants, Spot billed Pelican, Darter, Black Bittern, Purple Heron, Night Heron and Grey Heron, Painted Stock, Northern Shovelor, Northern Pintail, Mallard, Common Teal, Gargany, Black headed Ibis, Bronze – winged Jacanam Great white Pelican, and Woolly – Necked Stork and Common Pochard are reported from the lake area.

Among the terrestrial birds, Asian Palm Swifts, White Headed Babbler, Common Myna Jungle

Crow, Black Drongo, House Crow, Red – vented Bulbul and Blue – tailed Bea eater, Asian Paradise Flycatcher, Jungle Grow, Black – shouldered kite, Black Headed Oriole, Creste Serpent Eagle, Black p Capped Kingfisher, Stork – billed Kingfisher, White – browed Fantail, Ruff, Dunlin, Grey – headed Lapwing, Rufous – winged Bushlark and Bay – backed Shrike are found in the lake area.

The lake is known for the migratory water fowl as the globe – trotting waterbird take refuge at Kazhuveli Wetland from the chilling winters of North Asia. Some birds like fantail snipe, stints, plovers, lapwing, and sandpipers come to Kazhuveli Wetland from as far as Africa and Northern Europe. Kazhuveli Wetland attracts variety of birds as the lake supports diverse habitats such as agri- fields, scrubs, opern scrub sand grass lands. Habitat wise it was found that the Kazhuveli Wetland atleast 70 percent of the birds belong to a single exclusive habitat, 4% share atleast 2 habitats, and 2% share atleast 3 different habitats. About 32 % birds, especially geese and ducks, depend exclusively on the lake for its water. The deep – water are as of the lake seem to be suitable for the birds that feed on fish such as cormorants and the coots.

2.6.2.4. Mammals

A total of 14 species of mammals were recorded including Spotted deer, Jackal, Jungle cat, Common mongoose, Black naped hare, Bonnet macaque, Indian porcupine, Bandicoot rat, Three – striped palm squirrel, Indian pangolin, Asian Palm Civet, Mice, Short – nosed Fruit Bat and Flying fox. Apart from this, a total number of 63 butterfly species falling under 46 genera and spreading over 5 families were recorded in lake area (**ANNEXURE – VI).**

CHAPTER-III

HISTORY OF MANAGEMENT AND PRESENT PRACTICES

3.1 General

Kazhuveli Wetland Bird Sanctuary the area of Kazhuveli brackish water lake wetland in Nadukuppam, Seyyankuppam, Chettikuppam, Anumandai, Urani, Keelputhupattu, Koonimedu, Thirukkanur villages of Marakkanam Taluk and Kilapakkam, Kozhuvari, Kazhuperumpakkam, Karattai and Devanandal villages of Vanur taluk in Villupuram district (Location Map 1). Recognizing the ecological, faunal, floral and geo-morphological value for the purpose of protecting, propagating and developing wildlife and the environment of the fragile and distinct of the coastal region of the Villupuram district

This sanctuary is newly formed and hence this management Plan is the pioneer for the management of the sanctuary

3.2 Timber operation including Bamboo and Firewood harvest

3.2.1 Silvicultural systems and tending operations

There are no Silvicultural systems and tending operations in the Sanctuary.

3.2.2 Even aged systems and tending operations

There is no Even aged systems and tending operations in the Sanctuary.

3.2.3 Bamboo Working

There is no Bamboo Working in the Sanctuary.

3.2.4 Firewood Harvest and Collection

There is no timber operation or firewood harvest in the Sanctuary.

3.3 Non-wood Forest Produce collections

There is no NTFP Collection

3.4 Lease

There is no land given as lease from Kazhuveli Birds Sanctuary.

3.5. Other progammes and activities

3.6 Sanctuary Protection

The Kazhuveli and adjoining areas are fully protected from bird trapping, encroachment and other illegal activities. There is a significant awareness among the people on the importance of conservation of birds and the legal protection they have. Also the field staff maintain constant vigil and carryout surveillance to ensure the protection of birds and their habitat.

3.6.1 Legal Status

The total area of the bird sanctuary is 5,151. ha and was declared under G.O.(Ms) No.123 notification No. WLS/28221/2017, dated 29.04.2019 and 24.12.2020 under sub section (1) of section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972).

3.6.2 Hunting

The Kazhuveli Lake is visited by large number of migratory and resident birds of varying diversity during December to February. The birds such as Egrets, Pond heron, Black Ibis, cormorants, Darters, Asian koel,Great bittern, Common moorhen, White – breasted water hen, common mynah, Common coot etc., are very common birds hunted by these groups. The hunters generally use poisoning and shooting by contry made weapons. The birds are sold as bush meat in the local markets in Villiyanur. Most of these tribes are illiterates and school dropouts. It is largely believed that hunting of birds is activated by these tribes residing both in Tamil Nadu and Pondicherry. Addressing this issue is complex as it involves tribal people who are predominantly semi nomadic. Regular patrolling and initiating efforts to intervene their daily activities especially providing employment and education to the youth and children can help transform these people apart from reducing their detrimental impact on the lake.

3.6.3 Poaching and Other Illegal Activities

3.6.3.1. Poaching

The birds recorded in the sanctuary will also visit nearby agricultural fields for foraging of insects and grains. In such case the local people who have very low livelihood opportunities and lack of awareness leads to poaching of the birds using country made weapons, Bird nets and Poisoning of food materials. In order to solve these issues, strict vigil involving temporary Anti- Poaching watchers outside the sanctuary areas is required.

3.6.3.2 Illegal Cutting of Trees

Illegal cutting of trees is not reported from the Sanctuary area.

3.6.3.3 Illegal removal of NWP encroachment and other illegal activities

3.6.3.3.1. Illegal Fishing

Kazhuveli Birds Sanctuary is closed to fishing. Fishing in Kazhuveli is by local people or unauthorized fishermen and it leads to connected threats especially poaching. Tools like fishing rods with hooks and nets are used for catching the fishes. Unbridled fishing activity using fishing nets has led to the killing of water snakes, Tortoises and several aquatic bird species (Pelicans, Coots, Darters). Aquatic birds, especially the heron species visit the lake for foraging and breeding.

3.6.3.3.2. Solid waste dumping

The Kazhuveli Birds Sanctuary has a very vast boundary and wetlands those which dry, seasonally become dump yard of solid wastes and untreated sewage. This practice of solid waste dumping in wetlands leads to fall in ecological/ conservation value, species richness or species distribution of the system/area. Apart from shallowing/shrinking of the wetland, dumping of municipal wastes can seriously affects the water bodies by releasing noxious chemicals during decomposition. It is possible to see large quantities of solid wastes in and around the Kazhuveli lake embankments. Solid waste dumped in different parts of the wetland is major environmental and public health threat and is also a management issue. Preventing entry of trespassers, preventing discharge of sewage and ensuring disposal by municipality can help reduce dumping inside the lake area.

3.6.3.3.3.Waste water discharge

The ponniyar basin is the only major canal that empties into Kazhuveli lake. This canal is essentially the only means of water movement/discharge of sewage and storm water to the lake. It is currently a channel into which considerable quantity of municipal and fugitive effluents flow in. Several industries situated in the pudhucherry region of tank bed such as rubber and glass industries and the agricultural lands, release runoff water with various chemicals into the Kazhuveli lake. Several colleges/ Hospitals, Housing / residential projects and commercial / business centers, etc. are also coming up in the vicinity of Kazhuveli lake. This will further deteriorate the quality of water coming to the wetland.

it is a common practice that industries located around the Kazhuveli keep their effluent in large tanks / containers for long period and during the rainy season they release the effluent with flood/runoff which reaches the coastal ecosystem.

3.6.3.3.4. Eutrophication

The discharging waste water into the lake leads to the major issue of eutrophication. The influencing factors of water eutrophication include: (1) excessive TN and TP, (2) slow current velocity, (3) adequate temperature and favorable other environmental factors, and (4) microbial activity and biodiversity (Li and Liao, 2002). Many of agricultural water overflow into the tank in parts of the sanctuary were identified whichcause direct discharge of runoff into the wetland.

Water in this sanctuary tank is fully controlled by PWD. So nutrient content is maintained by releasing water for irrigation purpose. Water velocity is high. Hence occurrence of eutrophication in this sanctuary is not noticed till date.

The manifested problems are highly detrimental which can totally alter the course of the ecological function of the lake ecosystem.

3.6.3.3.5. Weed Invasion

Prosophis juliflora present in open scrub areas. This weed species has to be removed. The sanctuary bunds can be replaced with native water tolerant species which will aid in birds roosting and nesting

3.6.3.3.5 Livestock Grazing

The lakes periphery is used by surrounding villagers for grazing cattle, especially during summer. The feral cattles preset in the bounderies of the village use Kazhuveli as a grazing ground. This intensive cattle grazing could result in breaking the nutrient cycle of the lake.

The large numbers of cattles could not be controlled with the current staff strength. Cattle proof trenches were created in the past around the Sanctuary in Karattai and other areas with high grazing pressure. Chainlink fencing can be created around the sanctuary in selected areas, which will free the Kazhuveli lake from grazing pressure.

3.6.5. **Wildfire**

The Kazhuveli Lake receives north east and south west monsoon and the water filled in tank is not released for the purpose of agriculture for about past 6 years. Hence, the lake may not remains without water. The problem of occurance of fire is very minimum.

3.6.6. **Insect attack and pathological problem**

Neither any incidence of insect attacks nor any pathological problems were noticed in the Sanctuary.

3.6.7. Wildlife Health

There is no evidence of diseases like bird flu and pathological problems recorded in the avifaunal population.

3.6.8. Inter agency Programmes and Problems

The Police department staffs help the forest department in protection of illegal poaching of birds and illegal fishing in the sanctuary.

The NGOs are supporting forest department in implementation of awareness programmes and trainings to field staffs etc.

3.7 Tourism

Eco Tourism is the best tool for educating the people and providing livelihood to the local population. Eco tourism can be encouraged in the tourism zone without disturbing the habitat of wild life. Visitors can be attracted towards eco-tourism with a well-knitted package. Despite the huge potential, organised wildlife eco-tourism is yet to be evolved in the Kazhuveli Bird Sanctuary.

This Sanctuary offers the following tourism activities to attract tourists.

Binoculars and Spotting Scope are available for the visitors at Sanctuary.

Following facilities can be made available in the Sanctuary

1. Watch towers and elevated bund/walkways for observing birds and protection purpose.
2. Trekking shed/ Dormitory.
3. Ecoshops.
4. Developing the website for the Sanctuary to promote Eco-tourism.
5. Constructing Interpretation Centre, and Providing Library and audio-video interpretation facilities in the Interpretation Centre
6. Providing nature trail and camping facilities for visitors and Students from schools and colleges.
7. To attract more visitors, advertisement boards about the Sanctuary to be placed in and around the villages, cities.
8. Introducing an ecotourism vehicle to support school and college students to visit and explore the Sanctuary.
9. Souvenir shop of temporary construction and space for parking of visitors vehicles near the road.
10. Purchasing of Boats to carryout patrolling along the edge of the lake to prevent fishing, poaching etc.

3.8. Research Monitoring and Training

3.8.1. Research and Monitoring

There is huge gap in research in Kazhuveli. Higher order investigations can be developed through consultancy programmes with Universities, specialist Institutions and through contractual arrangements. A portion of the land may be utilized to study population dynamics, seasonal migration and also bio-diversity etc.,

There is no permanent Research Assistant/ field biologist to conduct research on management subjects which is highly wanted for the Sanctuary. However, permission is accorded to willing scientists and research scholars to carry out research on long term/short term/consultancy works in the Sanctuary.

The practice of monitoring water birds during migratory seasonstarted in 2019. All the information collected on hydrology is mainly focused on water use for irrigation or flood control. The baseline data and information is absent or grossly inadequate. Inventorization, assessment of hydrological processes, biodiversity and socio-economic aspects are critical to planning and management of sanctuary.

3.8.2. Training

The training programs are pre-requisite for the managerial staff for efficient management of resources. Currently staff working in the Sanctuary has undergone very few training programmes regarding bird identification and census techniques during previous management plan period. Training to the staff would improve their efficiency and would equip them to provide proper information along with guidance to the people. Promising and willing staff can be deputed for training on bird identification and related works.

The following skill development is needed for the front line staff

1. Annual refresher course on census methods and techniques.
2. Capacity building training to front line staff involving various Wildlife Institutions.
3. Exposure visit for front line staff and wildlife managers.
4. Preparation and supply of bird and vegetation identification guide of this Sanctuary.
5. Building capacity of front line staff on resource governance.

3.9. Eco systems, Habitats and Wildlife Conservation Strategies and their Evaluation

Residential and Migratory water birds are the main Avi-fauna of the Sanctuary. Birds visit to the Sanctuary depends upon the availability of water in the tank and habitat management. When water in the Sanctuary tank is not sufficient, they visit nearby agricultural fields for feeding. Engaging Anti- Poaching Watchers for protecting the birds outside of the Sanctuary

area during peak months is highly essential. Every year necessary action is being taken for the removal of the invasive weeds.

Reducing the prolific growth of exotic aquatic plant species and also mitigating proliferation of introduced invasive fish species (eg: Tilapia sp) should be the focus for managing Invasive Alien Species.

3.10 Administrative setup

District Forest Officer	Villupuram Division
Forest Range Officer	Tindivanam Range
Section Forester	Marakkananam Section
One Special Duty Forest Guard	Tindivanam Range
Team of 5 anti – poaching watchers	Section

The sanctuary comprises 5151.60Ha; it is presently within the territorial jurisdiction of Villupuram Division headed by the District Forest Officer. It falls within the Tindivanam range jurisdiction headed by Forest Range Officer, Tindivanam. With a view to ensure timely intervention in protection and management, adequate front line staff to be deployed exclusive to the sanctuary.

The team shall be engaged in protection, management and scientific organization of the sanctuary.

3.11 Communication

The staffs are using **t**heir personal phones for their field works and it is working well. In current plan wireless communication system existing in the division is to be improved and extended to the Sanctuary.

3.12 Summary of Threats

3.12.1 Major Threats

Despite its importance as a unique coastal ecosystem of significance along India's coast, degradation of Kazhuveli'snatural environment through anthropogenic activities (such as pollution) is on the rise. The various threats to the biodiversity and the ecosystem are as follows:

- Siltation leading to the chocking and death of the biota.

- Intense fishing activities leading to decrease in fishery productivity of the wetland.
- Illegal prawn farming leading to over-exploitation of the prawn resources.
- Declining mangroves which act as natural bio-shields during extreme events of flooding.
- Fast spreading invasive alien *Prosopisjuliflora* in the natural forests which threaten the existence of the native species.
- Very rapid industrial development leading to unsustainable practices.
- Salt PAN
- Construction of Dams and Roads leads to destruction of the Habitat

Pollution from domestic and industrial sources which add solid wastes, chemicals and heavy metals to the wetland

a) Hunting

The Sanctuary is visited by a large number of migratory and resident birds of varying diversity during December to February. The lake is at full tank level during this period in most of the years. Adjoining the lake has a settlement of traditional hunting communities who are primitively hunter gatherers and at present hunting of birds had become their chief source of livelihood. Most of these tribes are illiterates and school dropouts. It is largely believed that hunting of birds is largely resorted to by these tribes residing both in Tamil Nadu and Pondicherry. Addressing this issue is complex as it involves tribal people who are predominantly semi nomadic. Initiating efforts to intervene in their daily activities especially providing employment and education to the youth and children can help transform these people apart from reducing their detrimental impact on the lake.

b) Illegal Fishing

Illegal Fishing – Fishing is by local people or unauthorized fishermen and it leads to connected threats especially poaching. Unbridled fishing activity using fishing nets has led to the killing water sankes and several aquatic bird species (Pelicans, Coots, Darters). Aquatic birds, especially the heronry species visit the lake for foraging and breeding and several of them would be threatened if untamed fishing activities are not controlled/ regulated. Efforts when initiated to control fishing shall bring in multiple problems under control thereby ensuring protection to the diversity of the lake.

c) Solid waste dumping

This practice of solid waste dumping in wetlands leads to fall in ecological/ conservation value, species richness or species distribution of the system/area. Apart from shallowing/shrinking of the wetland, dumping municipal wastes can seriously affects the water bodies by releasing noxious chemicals during decomposition.

d) Salt Pan

There are Excessive Salt pan areas which detoriates the creek of kaluveli and the soil /

e) **Eutrophication**

The consequence of discharging waste water into the lake leads to the major issue of eutrophication. The influencing factors of water eutrophication include: (1) excessive TN and TP, (2) slow current velocity, (3) adequate temperature and favorable environmental factors, and (4) microbial activity and biodiversity (Li and Liao, 2002). The agricultural water overflow into the tank in parts of the sanctuary were identified, which causes direct discharge of runoff into the wetland.

Water in this sanctuary tank is fully controlled by PWD. So the nutrient content is maintained by releasing water for irrigation purpose. Water velocity is high. Hence occurrence of eutrophication in this sanctuary is not noticed till date.

The manifested problems are highly detrimental which can totally alter the course of the ecological function of the lake ecosystem.

f) Weed Invasion

During previous management plan the operations of Clearing Ipomea sp., present in mudflats around the sanctuary was done. Though this species is considered as weed, the birds like Common coot, Moorhens, White breasted waterhen and Egrets use this vegetation as Nesting, breeding and roosting cover.

Prosophis juliflora present in open scrub areas. This weed species has to be removed. The sanctuary bunds can be replaced with native water tolerant species which will act as birds roosting and nesting purpose.

g) **Cattle Grazing**

The lake periphery is used by surrounding villagers for cattle grazing especially during summer. The feral cattles preset in oranai, Vandipalayam use santuary area as grazing ground. This intensive cattle grazing could result in breaking the nutrient cycle of the lake.

CHAPTER – IV

THE PROTECTED AREA AND THE INTERFACE LAND USE SITUATION

4.1 The existing situation in the zone of influence

Kaluveli Bird Sanctuary land cover after 2020

Land cover	**Area (ha)**
Abandoned Shrimp farms	168.63
Reed beds	815.8
Scattered reed beds	25.7
Agriculture fields	63.8
Abandoned paddy fields	77.5
Grass lands	1311
Grass land with Prosopis	563.29
Grass land with Prosopis and Acacia	314
Mudflats	395
Mudflats with sparse grass and Acacia	87.21
Plantations	
Mangroves	292.09
Open land plantations + Acacia	218.6
Mixed species plantations	64.98
Bund and pond plantations	279
Water body	532.4
Total surface area	5151.60

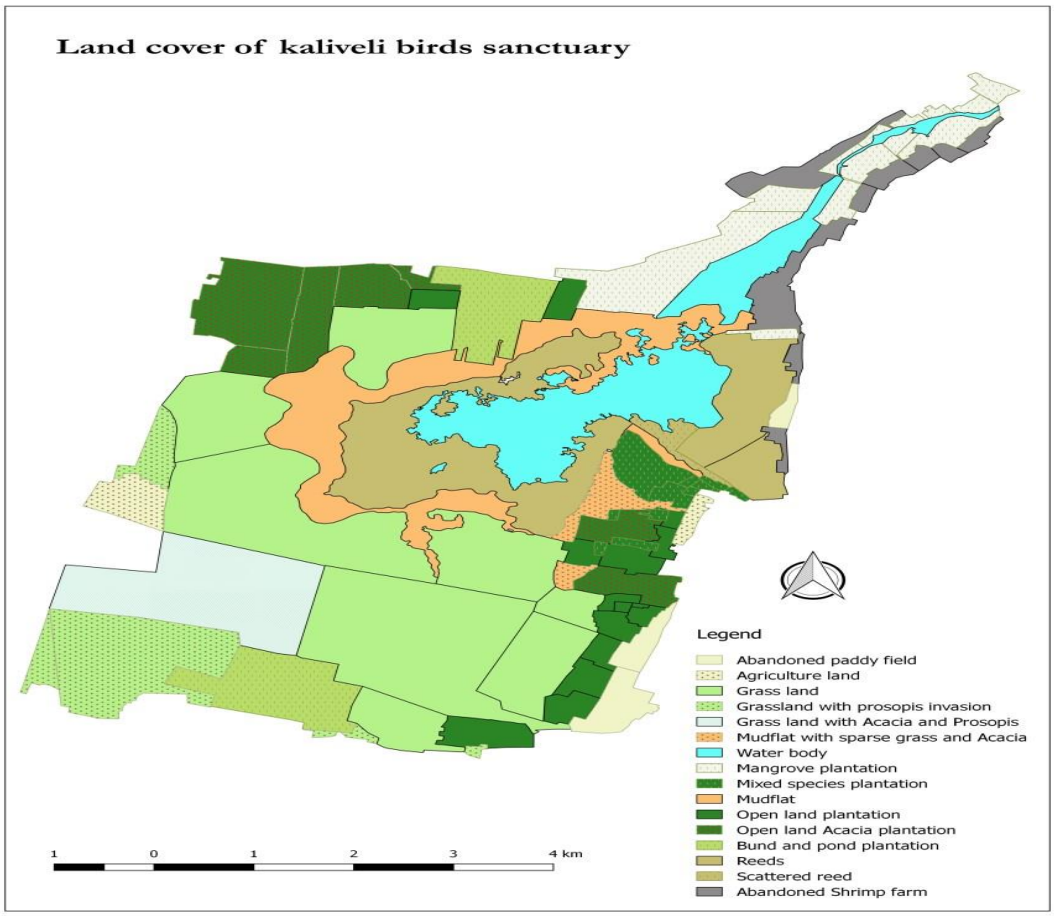
4.1.1 The Location, extent,boundaries and natural Attributes of the Z1

Name of Taluk	**Name of villages**	**Extent (in hectares)**
Marakkanam Taluk	38 Nadukuppam	1277.22.0
	53 Seyyankuppam	48"44.5
	54 Chettikuppam	152.93.5
	52 Anumandai	75.89.5
	47 Urani	109"46.0
	56 Keelputhupattu	349.22.0
	55 Koonimedu	98'1.16.0
	46 Thirukkanur	32.91"5

		3027.25.0
Vanur Taluk	14 Kilapakkam	382.12.5
	16 Devanandal	123"03.5
	17 Karallai	426.65.5
	36 Kozhuvari	900"23.5
	35 Kazhuperumpakkam	292.30.0
		2124.35.0
	Grand Total	**5151.60.0**

4.1.2. Villages inside and outside of the protected area

The tank lies adjacent to Bay of Bengal along the east coast. The tank is partly in Marakkanam and in Vanur taluk of Villupuram district'



4.1.2.1. Demographic Details of the Landscape

S.No.	Village Name	Taluk	No of Family	Human Population	Male	Female
1	2	3	4	5	6	7
1	Nadukuppam	Marakkanam	560	1650	845	805
2	Seyyankuppam	Marakkanam	361	1378	664	714
3	Chettikuppam	Marakkanam	237	1256	617	639
4	Anumandai	Marakkanam	1320	8760	3345	4415
5	Urani	Marakkanam	936	3400	1682	1718
6	Keelputhupattu	Marakkanam	560	1650	845	805
7	Koonimedu	Marakkanam	3005	4769	2273	2496
8	Thirukkanur	Marakkanam	410	1671	824	847

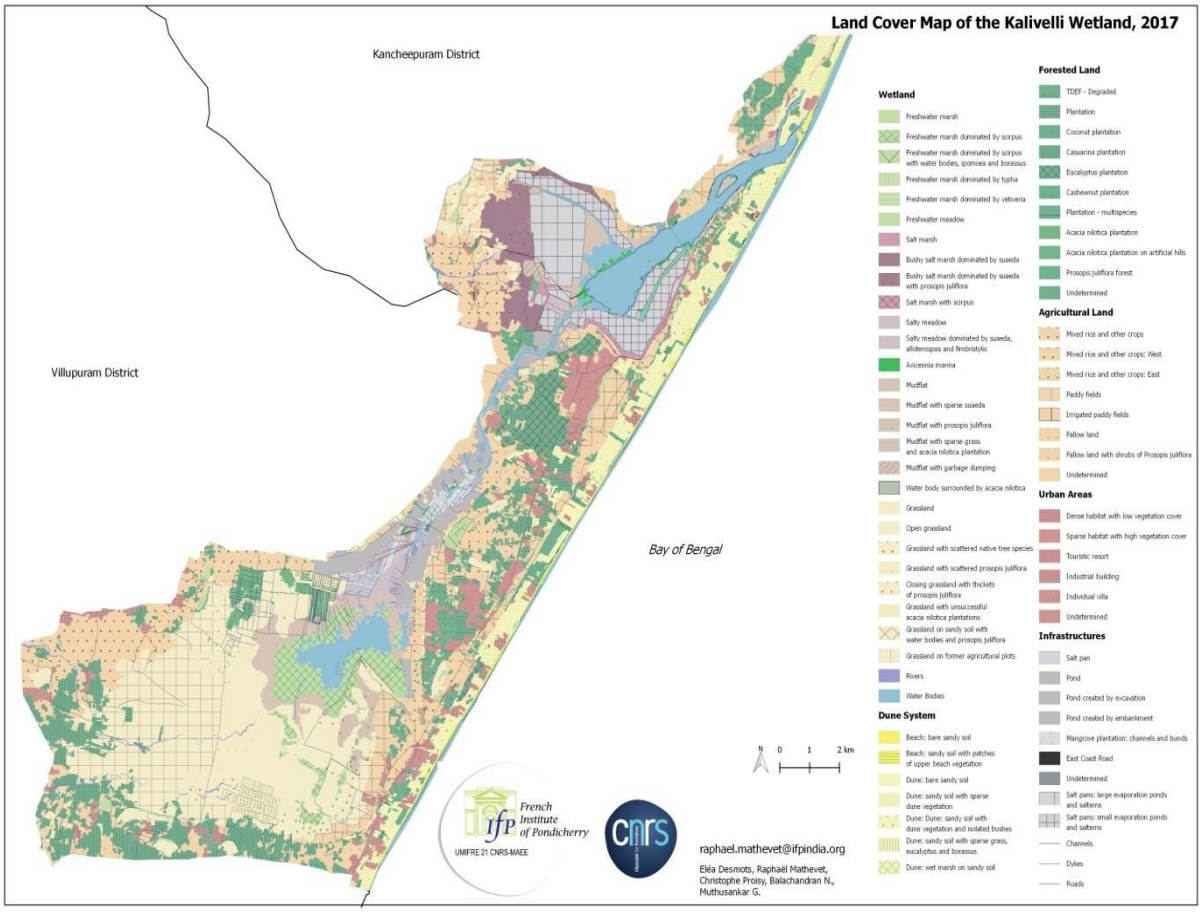
9	Kilapakkam	Vanur	165	1220	603	617
10	Devanandal	Vanur	128	705	380	325
11	Karattai	Vanur	450	1671	824	847
12	Kozhuvari	Vanur	316	573	285	288
13	Kazhuperumpakkam	Vanur	645	2560	1120	1440

Occupational categories	**Farmers**
Livelihood categories	Cattle, Domestic Buffalo, Cows and Dogs
Social infrastructure in the landscape(for example: PHCs,Schools etc.)	1 Government hospital 2 Government Health Centre 3 School Bulidings

Land use Land cover pattern

4.1.3. Implications of Land use and resource dependency for the conservation of PA

The available land cover map was made using a 2017 satellite image available on the Google Earth platform (Figure 1). The map shows that the Kazhuveli wetland as we understand it (our Region of interest, of 22,858 ha) is composed with 41% of wetland (9,422 ha), i. e. regularly flooded land and open water bodies (Figure 2). However, if we add to this the surface of rice paddies (approximately 3,210 ha), which can be considered as surrogate wetland habitats for waterbirds and insects, the surface of wetland comes to approximately 55% of the ROI. Agricultural land including paddy fields cover 21% of the study area, and forested land 17%. Dunes cover 7% of the ROI, while urban areas cover 6% and infrastructures 9%.



The abandoned and active shrimp farm ponds are shown in Figures Most of the abandoned ponds are located in the north of the bird sanctuary. Inventory at the wetland scale shows that 110 ponds are still operating but only a few of themin the perimeter of the Bird Sanctuary are still operating. The total surface area of shrimp farms in the area is about 678 ha and is composed of 661 abandoned ponds more or less covered by grass, small water bodies, *Typha* and *Prosopis*. Few of them are restored and transformed to agriculture land. Most of the dykes are degraded, eroded by cattle that are freely rooming in this part of the wetland, but also wind and rain. Some ponds and embankments are interesting nesting places for bee-eaters, black-winged stilts, reed warblers and lapwings and feeding grounds for marsh harriers, waders, herons and ducks. The abandoned shrimp farms in the perimeter of the Bird sanctuary cover 168 ha and could be the place where implementing an ambitious project of ecological restoration to reshape the landscape for water storage, providing breeding and feeding grounds for waterbirds and organize ecotourism activities.

4.2. Development Programmes and Conservation issues

4.2 SWOT Analysis

4.2.1 Strengths:

- The Sanctuary attracts more than 204 bird species and congregation of water bird can be seen from October to March
- Ecosystem services rendered through ground water recharge, aesthetic beauty.
- Birds release organic manure in the form of guano. This can enrich the water with nitrogen, phosphorus and potassium, which in turn boost the yield of agricultural crops. Thus the economic security of the farmer is assured.
- Insectivorous birds feed on insects thereby improving agricultural crop yield.
- The scenic beauty of the bird sanctuary can provide a huge scope for ecotourism activities which can help to uplift the economic status of the local communities.

4.2.2 Weaknesses:

- Siltation of lake is due to dumping of loads of soil hence, deepening of tank in certain areas is needed
- Weed infestation and Eutrophication make the shrinkage of area of lake available for other flora and fauna

  Infrastucture pertinent to protection, tourism are yet to be established
- Poor staff strength and lack of trained man power.

4.2.3 Opportunities:

- Eco development committees can be formed. Ecotourism concept can provide scope for environmental protection and community development programs.
- There is a wide scope for research in the sanctuary. Thrust area of research includes Patterns of seasonal migratory connectivity, Life history variation and seasonal interactions, Determining regulatory mechanisms of migration phenology, Timing of migration through stopover sites, Effects of human land use and management on migrant distribution and survival, etc.

4.2.4 Threats:

- Prosopis and Ipomea invasion into the sanctuary pose a great threat.

➢ Increased demographic pressure around the lake area create detrimental effect on watershed, vegetation and bird population

4.2.5 Critical review and result of the past intervention:

- Protection staff (Anti-poaching watchers) strength has been increased from five to ten, for the effective protection of the sanctuary.
- Planting of tree species around the lake is carried out. The established vegetation act as a perching ground.

- Purchase of equipment to assist bird watching for example spotting scope and Binoculars are procured and given to front line staff for bird watching and census methods.
- During 2021-22, nearly 50 ha of exotic weeds majorly *Prosopis juliflora* was removed as a part of habitat improvement activities.
- Information Board and sign board were erected around the sanctuary for creating awareness among the people.
- Awareness camps for local villagers were organized by forest department for the benefit of conservation of Kazhuveli Wetland Lake.
- Fishing is prohibited in the Sanctuary limit.
- Bird census is conducted every year for monitoring of birds and species count. Every year during the month of January to February estimation by direct count is done scientifically.

5.2 Objectives of Management

1. To ensure adequate protection to the migratory and local birds those visit the Sanctuary and to carry out habitat improvement and restoration activities for providing maximum opportunity to the birds for feeding, breeding and roosting.

2. To undertake ecological, social and interface assessment of the Sanctuary and its surroundings and to effectively bring about change in farming pattern of the surrounding villages from inorganic to organic for augmenting favorable agro habitat for birds.

3. To promote low impact sustainable ecotourism with the participation from local community and create awareness on bird conservation.

4. To elicit public participation for effective management and maintenance of the protected area through participatory decision making and adoption of best eco-development models evolving proper benefit sharing mechanism with the fringe villagers.

5. To equip and upgrade the protected area as upscale conservation education center with state-of-the-art facilities and trained staff.

6. To expand research on areas requiring knowledge for futuristic management intervention.

7. Capacity building of staffs to improve the protection and excellence in delivering their duty.

PART – II

CHAPTER – V

THE VISION, OBJECTIVES, ISSUES AND PROBLEMS

5.1 The Vision

Protection, restoration and conservation of wetland for the cause of biodiversity conservation and socieitial wellbeing. Conservation of habitat of Kazhuveli Wetland Bird Sanctuary as a critical breeding and nesting ground for migratory birds and resident birds, while also providing opportunities for local people.

5.2 Objectives of Management

1. To ensure adequate protection to the migratory and local birds those visit the Sanctuary and to carry out habitat improvement and restoration activities for providing maximum opportunity to the birds for feeding, breeding and roosting.
2. To undertake ecological, social and interface assessment of the Sanctuary and its surroundings and to effectively bring about change in farming pattern of the surrounding villages from inorganic to organic for augmenting favorable habitat for birds.
3. To promote low impact sustainable ecotourism with the participation from local community and create awareness on bird conservation.
4. To elicit public participation for effective management and maintenance of the protected area through participatory decision making and adoption of best eco-development models evolving proper benefit sharing mechanism with the fringe villagers.
5. To equip and upgrade the protected area as upscale conservation education center with state of the art facilities and trained staff.
6. To expand research on areas requiring knowledge for futuristic management intervention.
7. Capacity building of staffs to improve the protection and excellence in delivering their duty.

5.3 Problems and Strategies in achieving the objectives

S. NO	OBJECTIVES	PROBLEMS IN ACHIEVING OBJECTIVES	STRATEGIES TO ACHIEVE OBJECTIVES
1	To protect the visiting migratory and local birds, their habitat improvement and restoration.	• Illegal Fishing • Encroachment • Unorganized and unauthorized entry into the Sanctuary area through the porous borders, accumulation of waste etc., • Hunting of birds.	• Patrolling and perambulation of the Sanctuary as well as adjoining agricultural fields by field staff and Anti-poaching watchers. • Erection of High gauge wire mesh fencing.
		• Invasion of Weeds and Alien species.	• Removal of invasive species at regular intervals.
2	To promote low impact sustainable eco-tourism for awareness creation within buffer zone of the Sanctuary	Lack of awareness regarding the importance of wetlands and birds as an ecological indicator.	• Conducting sensitization programmes to nearby villagers and educational institutions involving NGOs and industries as a part of environmental Corporate Social Responsibility. • Involvement of public volunteers in bird counting, census activities, etc., • Conservation education for public through Interpretation and Learning center, bird watching exercises, nature trials, creation of website etc., with active involvement of local people.

3	To promote eco-development activities in the fringe villages and Reducing the dependence on bird habitats.	Dependence of local people on the bird's habitat is often seen through occasional trespass for grazing and cultivation activities in the surrounding areas.	Peoples participation in management and creating livelihood opportunities. Form New Eco-Development Committees.
4	To bring about change in farming pattern of the surrounding villages for augmenting favorable habitat for birds	The land use changes from paddy cultivation to sugarcane, banana and real estate developments will adversely affect the feeding grounds for the birds in the Sanctuary.	Providing awareness to the farmers in the surrounding areas to shift towards organic cultivation practices and importance of feeding grounds for birds.
5	Capacity building training to improve capacity of the staff for efficient Protective Area management.	Inadequate capacity of field staff	Equip the field staff with recent advanced field techniques, GPS and improved habitat management practices through adequate training.
6.	To carry out researches to decide on management interventions.	Lack of research findings, inadequate data availability on birds population and health of the habitat.	Scientific biodiversity estimation; Prophylactic field veterinary care; • Preventive disease control operations in and around the Sanctuary.

7.	Water level manipulation and control	Higher water level in lake leads to permanent flooding of potential bird habitats during the migratory season	Studying the depth profile of the lake. Controlled release of water Maintaining water inflow from potential water sources such as Veedur reservoir (which brings seasonal flooding) Preventing siltation which will potentially alter the water level and storage potential of the lake.

CHAPTER – VI
THE STRATEGIES

6.1 Boundaries

The boundaries of Kazhuveli wetland are as follows:

North: The boundary starts from the South-East corner and the bodering village is Devanandal Village, Kilappakkam Village; Omipper Village; Tirukkanur Village and Urani Village

East: The boundary generally towards and South west and South East and then South west along the Western boundaries of Urani Village; Anumanthai;Seyyamkuppam Village; Chettikuppam Village, Koonimedu Village and Keelputhupattu Village,

South: The boundary generally runs towards South East and South West along the Eastern and Southern boundary of Keelputhupattu Village, and reaches the bijunction points of Marakkanam and VanurTaluk, then runs generally towards North West boundaries of Kozhuvari Village. Along the Northern boundary KazhuPerumpakkam Village and reaches the bijunction point at Kazhuperumpakkam Village.

West: The boundary generally runs bijunction of Kazhuperumpakkam Village and the boundary generally runs bijunction point of Kazhuperumpakkam, Kozhuvarai Village and Karattai Village and reaches the starting point Devanadal Village.

6.2 Zonation

A zone is an area of specific management category distinguishable on account of its objectives. Separate zones need to be created because some of the management objectives may not necessarily be compatible. In the finite area of a Bird sanctuary different uses can be accommodated through separation of functions by area. This is accomplished through area specific objectives and activities. There is no standardized list of zones that each and every PA must have.

6.2.1 Core Zone

The core zone which is the habitat abundantly used by the birds is well protected from all sorts of human threats. Habitat restoration and habitat improvement programs are being carried out in the core zone for the scientific management of the Sanctuary. Research works are permitted in the core zone with the prior approval of the Chief Wildlife Warden.

6.2.2 Buffer Zone

This is the zone of influence and major interventions shall be focused in this area. But, activities to be permitted/prohibited/regulated in these areas will be based on the changes which it will have on the bird population apart from other flora and fauna.

6.2.3 Restoration Zone

Strategies will depend on the kind and magnitude of degradation. It may involve measures such as periodic closures, soil conservation planning, special planting efforts, control of weeds, management of water sources etc. A restored zone can be reallotted to any of the other zones after attainment of the restoration objectives.

6.2.4 Administrative Zone

All administrative facilities fall within this zone. These will be many and scattered over various locations. Delimit and describe location, extent, constitution and functions. Physical infrastructure and communication facilities need to be planned e.g. design and location of buildings, aesthetic blending with surrounds, network of pathways etc. Care needs to be taken that all infrastructure is away from ecologically sensitive and key sites.

6.3. ZONE PLAN

The plans can be developed based on zonal requirement of sanctuary. the total area of sanctuary is 5151.60 ha, makes difficult to segregate into different zone. Based on vegetation existing in watershed area the management strategies can be formed.

The Kazhuveli lake consist following habitats :

- Open scrub
- Water area
- Mudflats
- Weed infested area
- Mangroves
- Irrigation tank

The management strategies are unique for each habitat areas. The lake is deeper in its southeast portion

and shallower towards northwest. The lake supports grasses and a variety of reeds towards north . The practice of agriculture on the boundaries of the Wetland contributes fertilizers and pesticides in the form of runoff apart from disrupting the roosting grounds of birds.

The Habitat protection plan shall comprise the following :

- Preventing encroachment of areas in thewetland forShirm forming, and agriculture involving pesticide use, areas around the wetlandwhich are identified as buffer zones and are open scrub and grassy areas.
- Creation of mounds using silted material thereby exercising check over the silt load on one side and making mound areas available for roosting and basking..
- Eco friendly organic agriculture avoiding chemical fertilizers and pesticides.

Preventing solid waste dumping, sewage draining, debris accumulation etc., affecting quality of the wetland.

6.3.1. Control of Invasive Species

Control of invasive species is a priority for sustainable habitat management to sustain water holding capacity, enhancement of water depth and water spread area. Invasive flora comprise *Prosopis juliflora, Parthenium* (Terrestrial*), Ipomea (*Aquatic) whereas African Giant cat fish and Tilapia forms major invasive fish fauna. Integrated control measures using mechanical and biological methods should be adopted.

6.3.2. Watch Tower

A new watch tower will be proposed which would facilitate the birds eye view of the sanctuary. This may serve the twin purpose of bird watching and protection.

6.3.3. Enhancing habitat and species diversity

The *Acacia nilotica* and other species plantations have been raised and regular monitoring is being carried out by the Department. Release of native fish fingerlings at regular intervals will be carried out for ensuring food availability to the birds. Periodical water health monitoring will be undertaken.

6.3.2.Improving Peripheral and Nearby Terrestrial Habitats for Birds:

Sanctuary is surrounded by agricultural fields. The birds those frequently visit the agricultural fields are Ibis, Storks, and Egrets, which occasionally ends in conflict with farmers. Hence, to minimize the conflict between farmers and the management, fruit bearing trees will be planted on the peripheral area of the Sanctuary e.g – Banyan, Ficus, Jamun etc.,

6.3.3 Control of Illegal Fishing

The Anti-poaching watchers be engaged in regular patrolling and monitoring in sanctuary area and patrolling boats be purchased.

6.4 Control of illegal grazing

Since, the Sanctuary is surrounded by villages and irrigated fields, during summer cattle are driven inside the Sanctuary for meeting their requirements of grazing and drinking water. To check this chain link fencing is proposed at all sensitive points along the boundary.

6.5 Other aspects

- The sanctuary area be closed to dumping of waste by surrounding fringe villages.
- To create infrastructure facility to Anti-poaching Watchers.
- Immunization of livestock on the fringe villages of Sanctuary area.
- CCTV camera facilities with all supporting equipment's will ensure round the clock surveillance of the Sanctuary premises.

6.4. Theme Plans

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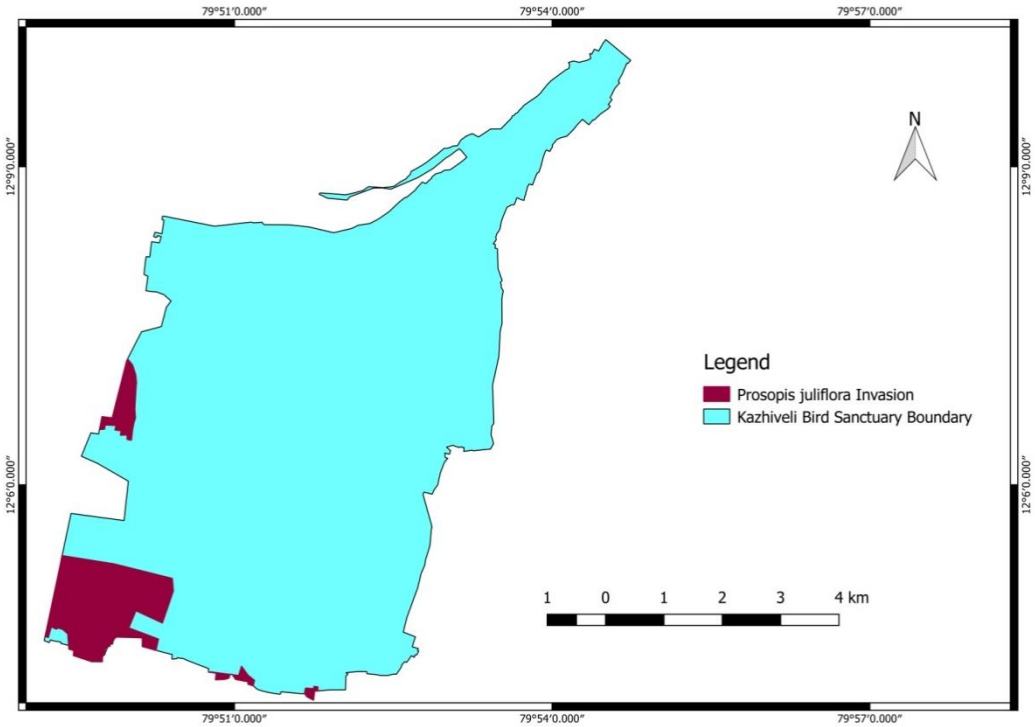

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- Immunization of livestock on the fringe villages of Sanctuary area.
- CCTV camera facilities with all supporting equipment's will ensure round the clock surveillance of the Sanctuary premises.

Chapter VII

ECO-TOURISM, INTERPRETATION AND CONSERVATION EDUCATION

7.1 General

Kazhuveli Birds Sanctuary is a unique sanctuary actively protected and managed by the forest department and the local community. This one of the largest breeding water bird reserves in Tamil Nadu and attracts more than Forty thousand birds annually. It is significant that the local people have taken keen interest in protecting this sanctuary and live with the birds in a total symbiotic relationship.

Sivan kovil is a major temple, workshiped by the fisherman and local people. Throubathiamman temple in Kazhuperumbakkam is famous temple in this area. During the month of May the local peoples and the surrounding villages celebrate it has a major festival. There is no disturbance for the birds by the local people. KeelputhupattyAiyanar sacred groves comes under the southern side of wetland. Where restriction of tree felling, hunting of animals and birds, collection of fire woods exists.

depict the immense tourism potential of the sanctuary. The rugged yet serene landscapes of sanctuary offer tourists the rare sighting of some of the globally threatened birds and faunal species.

The concept of Eco-tourism has emerged in the late 1980s and is now catching up rapidly with the various policy initiatives.

Eco tourism is defined as responsible travel to natural areas that conserves the environment and improves the well-being of local communities. Such tourism is low impact, educational, and protects the environment, while directly benefiting the economic growth of the local communities. The concept of the ecotourism can very well fit into the Kazhuveli Wetland Bird Sanctuary which is surrounded by agricultural and aquacultural villages.

7.2 Objectives

1. To promote and strengthen the cause of conservation in general and of management perspective of the Protected Area (PA) in particular through conservation oriented Eco-tourism.
2. To provide informed wilderness experience to domestic as well as foreign tourists and thus promote the stakeholder group for sustainable conservation of Kazhuveli Wetland Bird Sanctuary (KWBS).
3. To provide local communities alternative source of income through non-consumptive values of the biodiversity of Kazhuveli Wetland Bird Sanctuary (KWBS).
4. To promote regulated eco-tourism with better awareness and exposure.

7.3 Issues and problems

Inclination and aspirations of tourist coming from the different strata of the society vary widely. Many of them want freedom of action inside the controlled area and want to see spectacular wild animals and birds within the limited time. Unavailability of an animal or bird at a particular site or time, may adversely affect the morale of tourist. Unregulated tourism may cause accidents, law and order situation and administrative problems also. Consistent with above general problems, other specific problems of the Kazhuveli Wetland Bird Sanctuary (KWBS) can be derived as follow.

1. The main species of this Protected Area are birds which are very shy. Human activities in close vicinity disturbs them resulting in the abandonment of the area.
2. Increased human presence in general and vehicular traffic in particular may jeopardize the seasonal activities like displays, nuptial dances, rearing of young ones/offspring's etc. disrupting the new recruitment of the particular species.

On considering the above problems, a detailed eco-tourism plan is needed. Eco-tourism area are proposed in such a way that disturbance to wildlife is from the tourists is minimal. While formulating the strategies, utmost care and precautions should be taken so that the natural habits and activities of the species are not disturbed. The Eco development committee is so far not formed for Kazhuveli Wetland lake. Hence, the awareness about ecotourism should be created among the local people.

7.4 Strategies

7.4.1. Identification of Zone

Tourism should not be allowed in the wilderness zone of the PA. In management as well as in restoration zone, existing ideal habitats should be marked for the tourist activities. These habitats should be

away from the villages. Habitat improvement works shall be carried out to supplement the existing habitats. Domestic cattle must be kept away from these habitats. At least two habitats, each covering area not less than 100 hectares, will be demarcated for tourist purpose. As the terrain of the management zone is almost flat, viewing of the bird or animal will be much more easier. On the periphery of these areas, watchtowers may be constructed to facilitate the observation. These watchtowers should be camouflaged properly.

7.4.2. Proposed Eco Tourism Activities and the Infrastructure Requirements

For eco-tourism development purpose, following aspects are considered.

1. Development of Tourists Complexes.
2. Maintenance of Tourist Facilities
3. Development and maintenance of visitor centers.
4. Development of a library and its maintenance.
5. Purchase and maintenance of a Tourist-vehicle (Mini-Bus).
6. Development of Tourist handouts, brochures etc.
7. Development and maintenance of hoarding, sign board, etc.
8. Remuneration to tourist-guides.
9. Development and maintenance of Nature Education Camp sites.
10. Organization of Nature Education Camps (NECs).

Construction and maintenance of watch towers at observation points.

a) Watch Tower

A new watch tower (15 m height) with binoculars, telescope as to be constructed for monitoring the birds, protection , Anti-poaching activities and using for Eco tourism.

7.4.2.1. Capacity development of frontline staffs and awareness creation and creation of livelihood opportunities for the local Traditional fishing communities.

The proposed ecotourism model is local community linked. The Eco-Tourism activities will be linked with the Traditional fishing communities in an effort to wear them from such activities. The trained youth from such community will be engaged as field guides/bird watchers to run the show. Management staff need to communicate the wide-ranging ecosystem services and biodiversity values to the visitors for which adequate training is a prerequisite.

Bird Watching

Eco Tourism for Kazhuveli Wetland Bird Sanctuary focus on bird watching and nature trail along Kazhuveli Wetland buffer area.The local Traditional fishing community in Marakannam region may be involved Ecotourism activitiesas a measure of wearing them hunting and other illegal activities.

Conservation Education

Students from nearby schools and colleges are regularly visiting the Sanctuary during the season as part of environmental education programme. Environmental education activities are not in full swing right now owing to various constraints. However a planned community linked eco-tourism model in place will address these short comings.

The following strategies will be helpful in achieving awareness among the public:

- For satisfying the information needs of the visitors to the Sanctuary, pamphlets and posters needs to be prepared.
- Students and local people must be made aware about the importance of wildlife conservation.
- Eco education camps have to be organized in the Sanctuary to impart conservation education to these target groups.
- An Eco-Education package can be developed aiming at plethora of education institutions that are prevalent in Villupuram and neighboring districts.

7.7.1 Publicity Awareness

To spread the message of conservation of wildlife, publicity material like brochures, are to be prepared and distributed to the tourists, general public, school children and the people of surrounding villages to create awareness regarding the importance of conserving wildlife. Education awareness materials will be preferably in local languages to improve the level of awareness of the stakeholders and general public with regards to the value of wetlands and other habitats and the needs for protecting wetlands and water birds.

7.7.2 Interpret and display research findings in multimedia for the benefit of the visitors (Tamil & English)

Every year students visit the Sanctuary from various colleges on educational and recreational visits. Many of them participate in water bird census too. The management may prepare video documentaries on Kazhuveli Wetland water birds with good multimedia hardware to the visitors in interpretation centre. Further, interactive programs like quiz, bird calls identification etc., will be organized for the benefit of the visitors to create awareness and incite love for the birds and Kazhuveli Wetland Bird Sanctuary.

7.7.3 Eco-awareness

Among the various management activities, eco-awareness program on various themes for various stakeholders would be a crucial management step for conservation of the Kazhuveli Wetland Bird Sanctuary. The stakeholders include the various line departments and agencies, educational and research institutes, local population, tourists and NGOs. Separately and laterally combined eco-awareness programs and nature camps for each of them will be conducted to evolve and promote better management strategies for the Sanctuary.

The activities associated with eco-awareness programs are:

1. Building a cadre of trained eco-guides to assist the visitors.
2. Generating Publicity materials for identification of Birds (Nesting/Roosting/Feeding sites) critical resources.

CHAPTER – VIII

ECO-DEVELOPMENT

Eco development means development that is ecologically, socially and economically sustainable. It involves village level planning to achieve sustainable development of local resources.

8.1 Objectives

i) To involve the fringe villagers in and around the Sanctuary, in Protected Area planning, protection and conservation by educating them on appropriate action oriented awareness programs with values of the protected area.

ii) To develop site specific eco-development micro-plans with the participation of the villagers.

iii) To develop alternate sources of bio-mass and income, to divert pressure on the protected area while strengthening the economic condition of the villagers.

iv) Wean villagers away from the traditional dependence of protected area by providing alternate sources of livelihood and training.

8.2 Specific Issues

The local population is under the impression that consequent to the declaration of Kazhuveli Wetland Birds Sanctuary, they have been deprived of certain rights.

i.Traditionally the villagers surrounding the Sanctuary have been dependent on some part of the protected area for fuel-wood, fishing and grazing to a limited extend.

ii. With no grazing grounds in the villages, they were mainly dependent on the lake during summer to graze their animals.

iii. It will be very difficult to ensure protection and better management of the Sanctuary without winning the confidence of local people. It is essential that their active co-operation is sought, maintained and sustained in the management of Kazhuveli Wetland Birds Sanctuary.

8.3 Broad Strategies

Dependence of villagers for fishing , grazing grounds on Protected Area has to be addressed properly. Kazhuveli Wetland Bird Sanctuary is surrounded by 13 villages. The new EDC will be created in fringe villages.

Following activities are planned as a strategy for lessening the dependency of neighbouring/fringe village community on lake area and ensure cordial relationship with them

1. To take up certain entry point activities as per enlisted/prioritized felt needs in the region. The entry point activities will include providing threshing floor, improvement of existing approach road, construction of bus shelters and community hall, etc. as required by the local people.
2. To draw up a goal oriented micro plan enlisting priorities of the community and management priorities of the sanctuary.
3. To address basic needs of the community by providing alternate income generation options.
4. To discourage the farmers from applying chemical.
   fertilizers/pesticides on their farms which are feeding grounds for many birds and actively promote organic farming.
5. To supply fruit yielding, medicinal and agroforestry species of plants to attain self sustainability and generate income in course of time.
6. Encouraging stall feeding of cattle through introduction of improved fodder varieties for milch cattle so as to reduce the grazing pressure on the protected area.

8.4 Village level site specific strategies

Village level site specific activities not yet carried out in the sanctuary area.

8.5 Monitoring and evaluation:

The monitoring of eco-development activities are important to achieve the annual physical and financial targets until the beneficiaries reach a position of maintaining and continuing the programmed activities. The evaluation of the impact of eco-development on the Sanctuary and surrounding areas will be given importance in next level of planning.

The people in the adjoining villages should be empowered and involved in monitoring and evaluation activities.

Participatory Management:

The general principles of Participatory Management are agreed to be the following:-

- Incentives, both monetized and non-monetized, for local people‘s involvement and prudent use of resources are essential and everyone must benefit in the long term.
- Local people benefits from participatory management arrangements through the maintenance of sustainable livelihoods, including activities such as: recreational uses, ecotourism.
- Other benefits of participatory management for local and indigenous people include:-
- Maintaining spiritual and cultural values associated with a wetland
- More equitable access to wetland resources
- Increased local capacity and empowerment
- Reduced conflicts among stakeholders
- Maintaining ecosystem functions (e.g., improved water quality, etc.).

CHAPTER – IX

RESEARCH, MONITORING AND TRAINING

9.1 Research

Conservation research is a tool for a better understanding of the Kazhuveli Wetland Bird Sanctuary and for its sustainable management. Here the forest department is not fully occupational with conservation research and hence there are no in-house researchers due to lack of resources. Currently linkages are being established with research organizations such as The Universal Eco foundation, French Institute which needs to be strengthened.

The Water inflows and outflows of the lake should be estimated with the help of hydrological experts for individual assessment of water holding capacity of Kazhuveli Wetland lake during north-east and south-west monsoon seasons.

The forest department engages with the academic institutions for carrying out research studies. Every year students visits the Sanctuary from French Institute and participate in water bird census.

The permission is accorded to willing scientists and colleges for carrying out research. Census of water bird is conducted seasonally as per financial allotments. The practice of assessing daily water bird count during migratory season was introduced since the declaration of the Sanctuary.

9.1.1.Topics for Research:

The following topics can be considered for research in the Sanctuary, priority wise

i) Assessment of bio-diversity of lesser known and functionally important groups.

ii) Microbial ecology of lentic/lotic aquatic bodies.

iii) Survey of fodder availability for resident and migratory birds.

iv) Floristic diversity and regeneration studies.

v) Communicable disease and health monitoring in both migratory birds and surrounding village and commercial poultry birds.

vi)Eco-tourism strategy, visitor management interpretation Centre, publicity and propaganda.

vii) Assessment of bird diversity in the Sanctuary.

viii) Impact of use of chemical fertilizers in the adjacent farm land.

ix) Habitat degradation and infestation of exotic weeds.

x) Migration and seasonal movement patterns of birds.

xi) Carrying capacity of the Sanctuary for migratory birds.

xii) Monitoring prey population in the forage grounds.

xiii) Investigate how changing sizes and patterns of distinct wetlands affect their use by a variety of wetland birds.

xiv) Assessing the surrounding wetlands for bird supporting habitat.

9.1.2 Objectives

The following are the objectives identified:

i) To better understand the resources and their inter links to develop quantitative population estimates for selected key species, their current distribution and habitat use.

ii) To establish and maintain a checklist of all flora, fauna, migratory and resident birds species for assessing their current abundance, distribution, and functional relationship among biotic communities.

iii)To identify priority research and monitoring topics and conduct scientific assessments and evaluations that would support the development of Sanctuary‘s management program.

iv)To measure and assess the ecosystem health of the Sanctuary with various parameters representing/ indicating aquatic and terrestrial biodiversity.

Proposed research activities

S.No.	Research studies	Duration (years)
1	Population and habitat utilization by major avifaunal species	3
2	Avifaunal ecological and community studies	3
3	Ecological study on Reptiles	2
4	Status of prey and predator species and their inter relation	2
5	Evaluation of Vegetation- Environment - Human Interactions	2
6	Ecological evaluation of wetland system	2.5
7	Socio-economic and ecological evaluation of grazing with special reference to livestock pressure	3
8	Assessment and evaluation of ecosystem services	3
9	Creation of GIS Database on above aspects	1

Proposed monitoring activities

S.No.	Monitoring activities	Frequency
1	Status of aquatic and terrestrial avifauna	Annual
2	Wetland assessment	Annual
3	Census	Annual
4	Land use/Land cover changes using satellite data	Every 3rd year
5	Update of GIS database	Annual

9.1.3 Requirements of Staff:

9.1.3.1 One Biologist to be appointed for the Sanctuary with the following specific responsibilities:

Assisting the District Forest Officer in all technical matters in conducting short research, report generation writing research reports, coordination with research institutes, organizing census operations, GIS mapping, data collection, documentation and analysis, monitoring the ecosystem, conducting eco-awareness programs, etc.,

9.1.3.2 One Field Assistant to be engaged for supporting the wildlife research team

One Field assistant possessing knowledge of plants, ecology of birds, etc has to be engaged for primary data collection who will also assist the biologist.

Intervention

Various immunization components to be taken into account by the veterinary personnel and wildlife experts to prevent dissemination of diseases to water fowls in the tank.

1. Maintain proper hygiene in the vicinity of Sanctuary
2. More care and management in maintaining livestock during the dry spell of the year
3. Try to identify initial symptoms of diseases among domestic livestock
4. Care to be taken while purchasing new animals
5. Call for a veterinarian immediately for any suspected diseases in livestock.
6. Livestock drinking from contaminated rivers and streams may be avoided
7. Do not bury or burn died animals in the open, other than in exceptional circumstances Awareness creation will lead to better management of livestock and will create most effective ways of eliminating disease from cattle.

The main benefits of the awareness programme are:

a) improved farm expansion

b) improved farm sustainability

c) better stock health and welfare and

d) a farmer/veterinarian relationship ensured

9.2 Monitoring

The monitoring exercise should be done by the field staff with support from biologist, field assistant with reference to various development activities in the bird habitats. Ideally monitoring and evaluation works are to be done by conducting a mechanism of feedback dialogues with field staff and local communities regarding the works done on various management activities. An integrated monitoring mechanism involving all stakeholders such as local people, panchayats, Public Welfare Department, Pollution control board, NGO's, Students, researchers, etc., for assisting field staffs is needed for effective foolproof management.

9.2.1 Monitor/ Document biodiversity:

Documentation of the flora (including aquatic vegetation) and fauna (Birds, Mammals, Reptiles, Fishes, Amphibians, Dragonflies, Damselflies, Butterflies etc.,) of the Sanctuary will be validated by interacting with experts through the photographs taken from the Sanctuary. The check list will be made by the biologist engaged by the department.

9.2.2 Monitor Bird Diversity and Abundance

Annual census of water birds is carried out in the month of December-February when species diversity and population are high. The latest census methodology and techniques will be adopted.

9.2.3 Surveillance against contagious diseases (e.g. bird flu)

The staff concerned will be provided basic training in routine checking for outbreaks of avian flu and any other disease transmitted by birds. However, the local veterinary services will be engaged to periodically assess the health and hygiene of the wetland and a register for this will be maintained by the management. Quarantine measures as and when advocated during disease outbreaks will be scrupulously complied.

9.2.4 Weather Station

Monitoring the weather, downloading the information in a database and interpreting the findings will provide inputs for management. In addition to a hand held weather station, a permanent rain gauge station will be set up and used for the analysis. Frequent maintenance will also be

undertaken.

9.3 Training

Like research and monitoring, training is a neglected area, though it is critical in improving capability of the staffs who play major role in management of the sanctuary. There is no specific training schedule available for the staff as part of management courses to conserve the bird habitats. Conducting short-term training modules (3 to 5days) not only for staffs but also all the stakeholders related to species identification, habitat management, eco-friendly practices, public relations, wetland conservation and management Rules, data enumeration, scientific observation of species movement, health of the sanctuary, etc,. needs to be regularized. It is worthwhile if study tours are conducted for the staff of Kazhuveli Wetland Bird Sanctuary to visit other PAs within and outside the State to learn how other PAs are managed.

9.3.1 On the Job Training

9.3.1.1 Application Law and Regulation Training

Several offence cases fail in the courts for reasons of inadequate processing, faulty procedures, wrong interpretation of legal provisions etc. There is hardly any feedback for improvement. A few examples of success and failures can be selected by the sanctuary control forest Range Officer to discuss these with the field staff, at least once a year. Cooperation of appropriate resource persons can be enlisted periodically to update knowledge of staff on fundamentals of laws and legal procedures.A written summary of practical approach to ‘do’s’ and ‘do nots’ will prove useful like help processing cases including investigations, adducing evidence and material, dealing with offenders, and leading a case to conclusion through appropriate steps.

9.3.1.2 Postmortem of Wild Animal Carcasses and Other Wildlife Health Care Matters

The local disease investigation unit of animal husbandry department mat be periodically engaged with Kazhuveli Wetland Birds sanctuary. They may provide training for the sanctuary field staff deal with matter of postmortem, collection of samples of vital organs for histopathological, viral and bacterial examination, their preservation and despatch; signs and symptoms of common wildlife diseases, external indicators of health to be used for gross periodic health assessment can be among the important aspects that field staff can effectively deal with. Such kind of training cannot be a onetime effort but needs to be repeated from time to time.

9.3.1.3 Wildlife Evidences, Collection of Biological Material and Their Interpretation

To conduct the Wildlife Evidences, Collection of Biological Material and Their Interpretation training program for all field staff in every year depending upon financial status.

9.3.2 Formal Training courses:

Rangers	**:**	**Certificate in wetland Management (3 days)**
Forester/Forest Guard	**:**	**Certificate in wetland Management (3 days)** **Certificate in Drone Handling (1 day)** **Certificate in Disaster Management (1 day)**

9.3.3. Establishing a Learning Centre

There is a newly ongoing ornithology conservation centre Marakkanam Agaram RF in the sanctuary area (**Appendix XI)**

CHAPTER – X

ORGANIZATION AND ADMINISTRATION

10.1 Structure and Responsibilities

The Kazhuveli Wetland Bird Sanctuary is under the administrative control of the Villupuram Forest Division and is directly managed by the Tindivanam Forest Range Officer under the guidance of the District Forest Officer, Villupuram District. The field level administration is vested with the Forest Range Officer, Tindivanam (HQ-Tindivanam) who is assisted by Forester, Forest Guards and Watchers besides Anti-Poaching Watchers. The Sanctuary falls under the Villupuram Circle with the Conservator of Forests, Villupuram as the administrative head for the Kazhuveli Wetland Bird Sanctuary.

The existing administrative set up of the Kazhuveli Wetland Bird Sanctuary is as follows:

District Forest Officer	Villupuram Division
Forest Range Officer	Tindivanam Range
Section Forester (1)	Marakkanam
Special Duty Forest Guard (5)	Tindivanam Range
Anti – poaching watchers (5)	TindivanamRange

10.2 Additional support staff, staff amenities and allied infrastructure

The birds visiting here move to the neighboring agricultural fields for feeding and some birds nest and perch. Hence, it is necessary to employ more support staff to give protection to these birds. At present 1 Forester and 5 special duty Forest Guards are employed in the Sanctuary. Besides Four anti-poaching watchers are available to support the uniformed staff. This strength is insufficient to control illicit grazing, fishing, but also to conduct awareness programs, to carry out developmental activities etc. Hence it is proposed to engage 5 Forest Watcher and interpretation center personnel's are also in need to manage the infrastructures.

10.3 Patrolling paths and allied infrastructure:

Patrolling is highly essential to ensure better protection. On foot patrolling is the only possibility inside the Sanctuary. For effective and speedy movements, exisiting patrolling paths may be improved in Sanctuary area . Hence there is a proposal for two motorcycles to be provided to patrolling staffs with 40 litres of petrol per month for each motor cycle. The patrolling paths will be maintained annually and would double up as fire lines.

Additional fuel for night patrol in Puducherry boundary areas and adjoining agricultural lands and coastal lands regularly to prevent hunting is required.

CHAPTER XI

11.1 The Budget Plan

Perspective Plan for Oussudu Lake Bird Sanctuary for the year from 2023-24 - 2032-2033																																
Sl.No	Activites	2023-2024			2024-2025			2025-2026			2026-2027			2027-2028			2028-2029			2029-2030			2030-2031			2031-2032			2032-2033		
		Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs	Quantity	Unit cost in Rs	Amt in Lakhs
Core Activities																																
I	Survey, Research and Planning																															
1	Conducting hydrological study of the region by monitoring of water levels and preparing floodplain map to aid in future planning by engaging resource person	1	400000	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	800000	8.00
2	Periodical study of resident, migratory birds and their flyway.	LS	LS	1	LS	LS	1.10	LS	LS	1.2	LS	LS	1.30	LS	LS	1.40	LS	LS	1.50	LS	LS	1.60	LS	LS	1.70	LS	LS	1.80	LS	LS	1.90
3	Document and monitor the aquatic vegetation present in and around Kazhuveli wetland lake	LS	LS	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	LS	LS	2.00

4	Developing a comprensive data base using remote sensing and GIS including mapping	LS	LS	6	_	_	_	_	_	_	_	_	_	LS	LS	8.00	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_
5	Conducting bird census	1 time	100000	1	1 time	110000	1.10	1 time	120000	1.2	1 time	130000	1.30	1 time	140000	1.40	1 time	150000	1.50	1 time	160000	1.60	1 time	170000	1.70	1 time	180000	1.80	1 time	190000	1.90
6	Engaging research biologist (1 No) and field assistant (1 No) for periodical research and monitoring	1 No.	30000/ month	3.6	1 No.	30000/ month	3.60	1 No.	30000/ month	3.6	1 No.	33000/month	3.96	1 No.	33000/ month	3.96	1 No.	33000/month	3.96	1 No.	36000/month	4.32	1 No.	36000/month	4.32	1 No.	36000/month	4.32	1 No.	39000/month	4.68
				16.6			**5.80**			**6**			**6.56**			**14.76**			**6.96**			**7.52**			**7.72**			**7.92**			**18.48**
II	**Habitat Management**																														
1	Removal of Invasive weeds in and around the sanctuary area	10 Ha	49500/Ha.	4.95				10 Ha	60000/Ha	6				10 Ha	72000/Ha.	7.20				10 Ha	84000/Ha.	8.40				10 Ha	96000/Ha	9.60			
2	Maintenance of earlier weed removal areas by re-eradication of new growth especially prosopis.				10 Ha	15000/Ha	1.50				10 Ha	16500/Ha	1.65				10 Ha	18000/Ha	1.80				10 Ha	19500/Ha	1.95				10 Ha	21000/Ha	2.10

3	Painting of existing boundary pillars and erection of new pillars	LS	LS	1	LS	LS	1.20	LS	LS	1.4	LS	LS	1.60	LS	LS	1.80	LS	LS	2.00	LS	LS	2.20	LS	LS	2.40	LS	LS	2.60	LS	LS	2.80
4	Formation of cattle proof trenches and bunding followed by planting	2 Km	3.00/ Km	6.000	2 Km	3.3/ Km	6.600	2.0 km	3.63/ Km	7.26	2 Km	4/Km	8.00	2 km	4.44/km	8.80	2 km	4.88/ km	9.76	2 Km	5/km	10.00	2 km	5.25/ km	10.50	2 km	5.55/ km	11.10	2 km	5.75/km	11.50
5	Desilting of existing cattle proof trenches	2 Km	0.601 /Km	1.26	2 Km	0.7/ Km	1.400	2 km	0.77/ Km	1.54	2 Km	0.85/ Km	1.70	2 Km	0.94/km	1.88	2 km	1.0/km	1.10	2 km	1.25/ km	2.50	2 km	1.4/km	2.80	2 km	1.6/km	3.20	2 km	1.80/km	3.60
6	Creation of perches like branches and large logs inside waterspresd area and around the sanctuary at verying heights	LS	LS	1							LS	LS	1.50							LS	LS	2.00						LS	LS	2.50
7	Planting of fruit trees used for birds food as well as nesting habitat taller seedlings				1000 Nos.	-	2.50	-	-	-	1000 Nos.	-	4.25	-	-	-	1000 Nos.		6.50	-	-	-	-	-	-	1000 Nos.	-	8.50	-	-	-
8	Construction of boundary pillars around the sanctuary area				LS	LS	5.000							LS	LS	7.00														
9	Painting and maintenance of existing boundary pillars							LS	LS	1	LS	LS	1.00							LS	LS	1.00	LS	LS	1.00					
10	Planting palmyrah trees around the lake for creation of green cover	1500	100/ No.	1.00	1500	100/ No.	1.00	1500	100/ No	1	1500	120/ No.	1.80	1500	120/No	1.80	1500	150/ No	2.25	1500	150/ No	2.25	1500	170/ No	2.55	1500	170/ No	2.55	1500	190/No	2.85

11	Leveling of existing Shrimp -Farm Structures	LS	LS	3	LS	LS	5.00																									
12	Raising of suitable species and planting in the abandoned shrimp farm bunds.	1000 Nos	Rs.350/- per No.	3.500				1000 No's	Rs.385/ No	3.85				1000 No	Rs.423.5/No	4.23																
13	Creation of nut grass patches (Typha latifolia) in potential water logged areas for Migratory birds and Baya weaver birds for nesting propose	LS	LS	3	-	-	-	LS	LS	3	-	-	-	LS	LS	3.00	-	-	-	LS	LS	3.00	-	-	-	LS	LS	3.00	-	-	-
14	Olive ridley turtle egg-collection and release activity including creation of a temporary hatchery.	LS	LS	1	LS	LS	1.5	LS	LS	2	LS	LS	2.50	LS	LS	3.00	LS	LS	3.00	LS0	LS	3.50	LS	LS	3.50	LS	LS	4.00	LS	LS	4.50
	Total			**25.71**			**25.70**			**27.05**			**24.00**			**38.71**			**26.41**			**34.85**			**24.70**			**44.55**			**29.85**
III	**Protection**																															
1	Engaging Anti poaching watchers for protection of bird sanctuary @ 10 No's	10	12500	15	10	12500	15.00	10	12500	15	10	12500	15.00	10	12500	15.00	10	12500	15.00	10	12500	15.00	10	12500	15.00	10	12500	15.00	10	12500	15.00
2	Additional fuel for patrolling around water bodies to prevent poaching	LS	0.050/month	0.6	LS	0.050/month	0.60	LS	0.070/month	0.84	LS	0.070/month	0.84	LS	0.080/month	0.96	LS	0.080/month	0.96	LS	0.080/month	0.96	LS	0.080/Month	0.96	LS	0.090/month	1.08	LS	0.090/month	1.08

3	Providing Uniform, Field gear, bionocular Torch light to Antipoaching Watchers	10 sets	20000/person	2	10 sets	20000/year	2.00	10 sets	20000/year	2	10 sets	20000/year	2.00	10 sets	20000/year	2.00	10 sets	20000/	2.00	10 sets	20000/year	2.00	10 sets	20000/year	2.00	10 sets	20000/year	2.00	10 sets	20000/year	2.00
4	Purchase of Camera traps for monitoring of wildlife				2 Nos	50000/nos	1.00																								
5	Purchase of sample collection kid, instruments required for handling of carcass of birds				3 nos	5000/kit	0.15	3	5000/kit	0.15	2	6000/kit	0.15	3	6000/kid	0.15	3	6000/kid	0.15	3	6000/kid	0.15	3	0.15	0.15	3	0.15	0.15	3	5000/No.	0.15
6	Purchase of engine boat	-	-	-	-	-	-	1	1000000/No	10				1	1000000/ No	10.00	-	-	-	-	-	-	1	1000000/No	10.00				1	1000000/No	10.00
7	Construction of floating Jetty for placing the boats	-	-	-	-	-	-	LS	1000000/No	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Maintenance of boat, Jetty engaging driver and additional fuel requirments.										1	300000	3.00	1	300000	3.00	2	300000	6.00	2	300000	6.00	2	300000	6.00	3	300000	9.00	3	300000	9.00
9	Purchase of All Terrain vehicle (ATV) for patrolling	-	-	-	2	1.8/No	3.60										-	-	-										1	1.8/ no	1.80
10	Maintenance of ATV and additional fuel requirments.							2	0.5/No	1	2	0.5/No	1	2	0.5/No	1.00	2	0.5/No	1.00	2	0.5/No	1.00	2	0.5/No	1.00	2	0.5/No	1.00	2	0.5/No	1.00

11	Swamp Air Boat With Engine							1	4000 000/ No	40																						
12	Maintainance of Swamp Air Boat With Engine and additional fuel requirments										1	0.50/ no	0.5	1	0.50/no	0.50	1	0.50/ No	0.50	1	0.50/ No	0.50	1	0.50/ no	0.50	1	0.50/ No	0.50	1	0.50/No	0.50
13	Purchase of spotting scopes	LS	LS	1				L S	LS	1				L S	LS	1.00							L S	LS	1.00				L S	LS	1.00
14	Purchase of Binoculars	LS	LS	1				L S	LS	1				L S	LS	1.00							L S	LS	1.00				L S	LS	1.00
15	Construction of Anti-poaching shed				LS	LS	12.50				LS	LS	15.00													L S	LS	20.00			
16	Errection of check point at vandipalayam, karattai area of kazhuveli wetland birds sanctuary							L S	LS	1. 5							L S	LS	2.00												
	Total			**19 .6**			**34.85**			**82 .4 9**			**37.49**			**34.61**			**27.61**			**25.61**			**37.61**			**48.73**			**42.53**
B	**Ancillary Activities**																															
I V	**Awareness Creation and Monitoring**																															
1	Conducting eco awareness programmes to school and college students regarding Birds conservation and its importance	5 No s	0.25/ No	1. 25	5 Nos	0.25/ No	1.25	5 N os	0.25/ No	1. 25	5 Nos	0.25/ No	1.25	5 N os	0.25/ No	1.25	5 N os	0.25/ No	1.25	5 N os	0.25/ No	1.25	5 N os	0.25/ No	1.25	5 N os	0.25/ No	1.25	5 N os	0.25/ No	1.25

2	Conducting eco awareness programme to near by fringe villages about optimum resource utilization	2 Nos	0.50/ No	1	2 Nos	0.50/ No	1.00	2 Nos	0.50/	1	2 Nos	0.50/	1.00	2 Nos	0.50/No	1.00	2 Nos	0.50/ No	1.00	2 Nos	0.50/ No	1	2 Nos	0.50/	1.00	2 Nos	0.50/	1.00	2 Nos	0.50/No	1.00
3	Celebration of importance days with a national level conference by inviting resource persons as well as other department officials. The days like Wetland Day, World Forestry Day, Earth day, Ozone day and Wildlife Week can be celebrated with awareness creation	LS	LS	1	LS	LS	1.00	LS	LS	1	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00
4	Preparation of publicity materials like pamphlets and books to spread the importance of the lake ecosystem.	LS	50000	0.5	LS	50000	0.50	LS	50000	0.5	LS	50000	0.50	LS	50000	0.50	LS	50000	0.50	LS	50000	0.50	LS	50000	0.50	LS	50000	0.50	LS	50000	0.50
5	Erection of display boards or signage boards etc., to create awareness about conservation and prevention of hunting activities.	5 Nos	10000/	0.5	5 Nos	30000/ Nos	1.50	5 Nos	35000/ Nos	1.65	5 Nos	40000/ Nos	2.00	5 Nos	45000/No	2.25	5 no's	50000/No	2.50	5 Nos	55000	2.75	5 no's	60000	3.00	5 no's	65000	3.25	5 no's	70000	3.50

6	Maintenance of signages, Old board.				5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25	5 No's	12500/no	6.25	5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25	5 Nos	12500/ Nos	6.25
7	Capacity building training on Birds identification and census techniques. I addtion staffs can be equiped with the knowledge of judicial laws involved in protection of sanctuary.	1 No	100000	1	1 No	100000	1.00	1 Nos	100000/No.	1	1 no	100000/No	1.00	1 Nos	100000/No.	1.00	1 No	100000/no	1.00	1 No	100000/no	1	1 No.	100000/No	1.00	1	100000/Nos	1.00	1	100000/No.	1.00
8	Exposure visit for front line staff and wildlife managers.	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25	LS	25000	0.25
9	Providing documentation facilities like Purchase of computer and accessories, Stationeries and Printing	LS	LS	1.5	LS	LS	1.00	LS	LS	1	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00	LS	LS	1.00
10	Creation of Website about the Kazhuveli wetland bird sanctuary and maintainance				LS	LS	1.00																								
	Total			**7**			**14.75**			**13.9**			**14.25**			**14.50**			**14.75**			**15.00**			**15.25**			**15.50**			**15.75**

V	**Eco tourism and Infrastructure Development**																															
1	Construction and maintainance of Eco-hut in sanctuary area for bird watching	-	-	-	2	500000/Nos	10.00				2	500000/No	10																1	600000/No	6.00
2	Constrution of Watch Tower with Anti Poaching watcher shed	-	-	-	1	20.00/ no	20.00	-	-	-	-	-	-	1	20.00/No	20.00		-	-	-	-	-				1	25.00 /No	25.00	-	-	-
3	Creation of visitors resting place at selected locations of sanctuary boundaries. In addition rest room and other refreshment amenities creation	-	-	-	-	-	-	-	-	-	LS	LS	10.00	-	-	-	-	-	-	-	-	-	-	-	-	LS	LS	10.00	-	-	-
4	Improvement of Office buildings and frontline staff Quarters	-	-	-	-	-	-	-	-	-	-	-	-	LS	LS	20.00	-	-	-	-	-	-	-	-	-	-	-	-	LS	LS	20.00
5	Creation of visitors amenities and waiting area vehicle area	-	-	-				LS	LS	5							-	-	-												
6	Formation of EDC by engaging local village peoples and Preparation of microplan for selected villages.	LS	LS	2				.	.	0							-	-	-				LS	LS	1.00						

7	Construction of Souvenir shop with Canteen				LS	LS	3										L S	LS	3.00													
	Total	-	-	2			**33.00**			**5**			**20.00**			**40.00**			3.00			**0.00**			**1.00**			**35.00**			**26.00**

11.2 Financial Forecasting:

Chapters	Name of chapters	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	Total
I	Survey, Research and Planning	16.6	5.80	6.00	6.56	14.76	6.96	7.52	7.72	7.92	18.48	**98.32**
II	Habitat Management	25.71	25.70	27.1	24.00	38.71	26.41	34.85	24.70	44.55	29.85	**301.53**
III	Protection	19.6	34.85	82.50	37.49	34.61	27.61	25.61	37.61	48.73	42.53	**391.13**
IV	Awareness Creation and Monitoring	7.00	14.75	13.9	14.25	14.50	14.75	15.00	15.25	15.50	15.75	**140.65**
V	Eco tourism and Infrastructure Development	2.00	33.00	5.00	20.00	40.00	3.00	0	1.00	35.00	26.00	**165.00**
	Total	**70.91**	**114.10**	**134**	**102.30**	**142.58**	**78.73**	**82.98**	**86.28**	**151.70**	**132.61**	**1096.63**

CHAPTER XII

THE SCHEDULE OF OPERATIONS AND MISCELLANEOUS REGULATIONS

12.1. The Schedule

The schedule of operations for various management issues have been dealt in different chapters of the plan namely; chapter VI-The strategies, chapter VII-Eco Tourism Interpretation and Conservation Education, chapter -VIII Eco-development, Chapter-IX Research and Monitoring and training.

Protection activities, Eco tourism & Eco development activities, Research, wildlife Rescue will go on round the year and will not have any bar of calendar period. Conservation Education programmes, Aquatic Migratory Birds monitoring will be conducted during the birding period while certain habitat management works like desilting of lake, channels, formation of mounds,etc will be carried out prior to monsoon as they are time bound management works.

Following table will broadly specify other important management activities round the year for effective management of the National Park.

S. No	Month/ period	Management Activities/Interventions
1	April, May, June	Desilting of lake, formation of mounds, formation of bunds, formation of linear bunds for ducks and other birds Desilting of water channels leading to the lake Forest fire control activities Removal of invasive species vegetation in the lake and invasive climbers on nesting trees, removal of invasive cat fish, etc. Preliminary Nursery works for raising seedings
2	July, August & September	Monitoring of S.W. Monsoon rain if any and monitoring of desilted water channels blockage or any blockage structures in other water tanks in the upstream Gap Plantation preliminary works if any, maintenance of visitor amenities. Biannual Ring vaccination for cattle around 1km zone of the lake strictly and also in the remaining 4km buffer zone localities & EDC activities. Monitoring of water inflow to the lake from S.W. Monsoon.
3	October, November, December, January	Monitoring of water level in the lake, checking of drainage/ water channels & strict protection & patrolling of birds.

		Monitoring of aquatic migratory nesting birds, roosting birds, their behaviour, health monitoring. Monitoring of young ones, prey birds' movements, release of fingerlings, monitoring of adjoining feeder and supporting lakes, etc. Hands on exposure on handling of nesting birds rescue, flood-cyclone situations, disaster management equipment readiness. Other Scheme works implementation, EDC activities, conducting of nature education and eco camps, exposure visit to staff.
4	February	• Synchronized bird census, bird monitoring, conducting of students Camps, monitoring of young ones and the adults fly back migration and recording, scheme works implementation.
5	March	Last nesting birds monitoring, water level monitoring, completion of scheme works, fire prevention works in the peripheral areas and formation of fire-breaks.

12.2. Record of Deviations and Implemented targets

The physical and financial targets have been compiled in chapter-XI namely the Budget. The annual physical and financial target and achievement should be maintained in a register form. For any additional work (not prescribed in management plan) or any omission not carried out as per management plan prescription, deviation proposals are to be sent to competent authority.

12.3. The Record of Employment Potential

Since there is no employment generation activity is carried out in the sanctuary. In future, register can be maintained to keep a record of income generation.

12.4. The control Forms

The control forms and control maps are to be maintained. At present the system of maintaining control forms and control maps do not exist in the office of this area. This may be as maintained as described in TamilNadu Forest Department code section 44.

12.5. Maintenance of Compartment Histories

In Tamil Nadu, forest management is not compartment based. The reserved forest area management can be done only by posting the details of work carried out in form of control maps. This is the only method to regulate the works prescribed in management plan and also those works carried out under various schemes not covered by management plan. In Kazhuveli Wetland birds' sanctuary so far regulations documents viz., control map or the control forms are not maintained.

12.6 A Pocket field guide for plan implementers

It is a field action document meant to be carried by all field personnel and therefore must be written with economy to the point. The guide is meant to present all technical strategy details with modalities of application. The field guide will have

i) A preamble to state its purpose and utility

ii) The objectives listed by their priority

iii) A map of administrative unit

(iv) The all-important section on strategy details and application. The field guide shall be prepared by the District Forest Officer and supplied to all staff concerned.

ABBREVIATION

ABBREVIATION	EXPANSION
PA	Protected Area
KWBS	Kazhuveli Wetland birds sanctuary
WII	Wildlife Institute of India
SE	South East
NE	North East
SW	South West
LULC	Land use and land Cover
WWF	World Wide Fund for Nature
BNHS	Bombay Natural History Society
SACON	Salim Ali Centre for Ornithology and Natural History
CAF	The Central Asian Flyway
NGO	Non Governmental Organization
MSL	Mean Sea Level
ha	Hectare
Sq.km	Square kilometer

Km	Kilometer
PWD	Public Works Department
EDC	Eco-Development Committee
ESZ	Eco-Sensitive zone

Reference

1) Annual census conducted by our TamilNadu forest department at 2021 to 2023

ANNEXURE – I

ABSTRACT

Forests – Wildlife – Declaration of Kazhuveli Swamp / Wetland situated in Vanur and Marakkanam Taluks of Villupuram District as Kazhuveli Birds Sanctuary – Notification under section 18 (1) of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972) – Published.

ENVIRONMENT, CLIMATE CHANGE AND FORESTS (FR.5) DEPARTMENT

G.O.(Ms) No.123

Dated: 06.12.2021
பிலவ, கார்த்திகை -20
திருவள்ளுவர் ஆண்டு- 2052
Read:

From the Principal Chief Conservator of Forests and Chief Wildlife Warden letter No.WL5/28221/2017, dated 29.04.2019 and 24.12.2020 .

ORDER: -

In the letter read above, the Principal Chief Conservator of Forests and Chief Wildlife Warden has sent a draft notification for declaration of an extent of 5151.60 hectares in Vanur and Marakkanam Taluks of Villupuram District situated in Kazhuveli Swamp / Wetland as Kazhuveli Birds Sanctuary under sub section (1) of section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972).

2. The Government, after careful examination of the proposal of the Principal Chief Conservator of Forests and Chief Wild Life Warden have intention to declare the area to an extent of 5151.60 hectares in Vanur and Marakkanam Taluks of Villupuram District as Kazhuveli Birds Sanctuary under sub section (1) of section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972). Accordingly, the notification appended to this order will be published both in English and Tamil in Tamil Nadu Government Gazette and in Tamil in the District Gazette of the Villupuram District.

3. The Works Manager, Government Central Press, Chennai is requested to send 25 copies of each of the notification to Government, the Principal Chief Conservator of Forests / Principal Chief Conservator of Forests and Chief Wild Life Warden and the Collector of Villupuram District as soon as the notification is published.

4. The Tamil Development and Information Department is requested to send immediately a tamil translation of the Notification to the Works Manager, Government Central Press, Chennai for publication in the Tamil Nadu Government Gazette and in the District Gazette of Villupuram District.

(BY ORDER OF THE GOVERNOR)

SUPRIYA SAHU
PRINCIPAL SECRETARY TO GOVERNMENT

To
The Works Manager,
Government Central Press, Chennai-01.(we)
The Principal Chief Conservator of Forests,
(Head of Department) Chennai-15.
The Principal Chief Conservator of Forests and
Chief Wildlife Warden, Chennai-15.
The Secretary to Government of India,
Ministry of Environment, Forests and Climate Change,
(CS.I Division), 5th Floor, Vayu Wing,
Indira Paryavaran Bhawan, Jor Bagh Road,
New Delhi – 110 003.

Copy to:-

The Special Personal Assistant to Hon'ble Minister (Forests),
Chennai-9.
Office of the Hon'ble Chief Minister, Chennai-9.
The Private Secretary to Principal Secretary to Government,
Environment, Climate Change and Forests Department,
Chennai – 9.
The Tamil Development and Information Department,
Chennai – 9.
The Law Department, Chennai – 9.
The Collector, Villupuram District .
The District Forest Officer, Villupuram .
SF/SCs.

/FORWARDED BY ORDER/

B. Subachana
SECTION OFFICER

APPENDIX

NOTIFICATION

Whereas, the Government of Tamil Nadu considers that the area of Kazhuveli brackish water lake wetland in Nadukuppam, Seyyankuppam, Chettikuppam, Anumandai, Urani, Keelputhupattu, Koonimedu, Thirukkanur villages of Marakkanam Taluk and Kilapakkam, Kozhuvari, Kazhuperumpakkam, Karattai and Devanandal villages of Vanur taluk in Villupuram district described in the Schedule below is of adequate ecological, faunal, floral and geomorphological significance, for the purpose of protecting, propagating and developing wildlife and its environment.

Now, therefore, in exercise of the powers conferred in sub section (1) of section 18 of the Wildlife (Protection) Act, 1972 (Central Act 53 of 1972), the Governor of Tamil Nadu hereby declares his intention to constitute the said area as **Kazhuveli Wetland Birds Sanctuary**.

THE SCHEDULE

1. Name of the District : Villupuram
2. Name of the Taluk : 1. Marakkanam
   2. Vanur

Name of the Revenue villages and Resurvey number (Taluk wise)

Name of villages	Resurvey numbers	Extent (in hectares)
Marakkanam Taluk		
38.Nadukuppam	593	9.40.0
	655	24.38.0
	662/3	1.62.0
	663	3.27.0
	666	0.70.0
	674/2	1.24.5
	678/2	2.15.5
	682	1234.45.0
		1277.22.0
53 .Seyyankuppam	1/1	48.24.0
	15/4	0.20.5
		48.44.5
54. Chettikuppam	1	152.93.5
		152.93.5
52.Anumandai	1 / 1	75.89.5
		75.89.5

47. Urani	1	102.87.0
	5/9	0.41.5
	6/10	0.33.5
	7/1	0.79.0
	13	5.05.0
		109.46.0
56. Keelputhupattu	1	349.22.0
		349.22.0
55. Koonimedu	1/1	981.16.0
		981.16.0
46. Thirukkanur	75/1	4.08.5
	75/9	28.83.0
		32.91.5
Vanur Taluk		
14. Kilapakkam	195	382.12.5
		382.12.5
16. Devanandal	80/2	0.01.0
	91/1	0.56.0
	91/3	1.35.0
	92/1	2.96.0
	93/2	1.94.0
	94/3	3.88.0
	95/1	3.36.0
	96/1	2.02.0
	97/1	1.70.0
	98/1	1.72.0
	99/1	1.94.0
	102/3	0.84.0
	103	2.05.0
	104	1.50.0
	105	1.48.0
	106	1.52.5
	107/1	1.42.0
	108//1	1.32.0
	109/1	1.70.0
	110/1	2.10.0
	111	1.76.0
	112	2.40.0
	113	1.66.0
	114	1.90.0

	115	79.94.0
		123.03.5
17. Karattai	205	426.65.50
		426.65.50
36. Kozhuvari	1	900.23.5
		900.23.5
35. Kazhuperumpakkam	1	292.30.0
		292.30.0

Extract
Villupuram District

Name of Taluk	Name of villages	Extent (in hectares)
Marakkanam Taluk	38 Nadukuppam	1277.22.0
	53 Seyyankuppam	48.44.5
	54 Chettikuppam	152.93.5
	52 Anumandai	75.89.5
	47 Urani	109.46.0
	56 Keelputhupattu	349.22.0
	55 Koonimedu	981.16.0
	46 Thirukkanur	32.91.5
		3027.25.0
Vanur Taluk	14 Kilapakkam	382.12.5
	16 Devanandal	123.03.5
	17 Karattai	426.65.5
	36 Kozhuvari	900.23.5
	35 Kazhuperumpakkam	292.30.0
		2124.35.0
	Grand Total	**5151.60.0**

4. **Name of the Sanctuary**

Kazhuveli Wetland Birds Sanctuary

BOUNDARY DESCRIPTION

East	:	Pondicherry to Chennai East Coast road; Village boundaries of Urani village No.47, Anumandai village No.52, Seyyankuppam village No.53, Chettikuppam village No.54 and Koonimedu village No.55.
West	:	Village boundaries of Aruvadi village No.223, Karattai village No.17 and Devanandal village No.16.
South	:	Village boundaries of Keelputhupattu village No.56, Kozhuvari village No.36 and Kazhuperumpakkam village No.35.
North	:	Village boundaries of Kilapakkam village No.14, Nadukuppam village No.38 and Thirukkanur village No.46.

The tank is in between 70° 45' to 70° 55' longitude and in between 12 ° to 12 ° 10' latitude. The tank lies adjacent to Bay of Bengal along the east coast. The tank is partly in Marakkanam and in Vanur taluk of Villupuram district.

SUPRIYA SAHU
PRINCIPAL SECRETARY TO GOVERNMENT

//True Copy//

B. Subachana.
SECTION OFFICER

ANNEXURE – IA

LIST OF BIRDS SPECIES IN KAZHUVELI WETLAND BIRD SANCTUARY

Sl.No.	Order	Family	Common Name	Scientific Name	IUCN Status
1	Accipitriformes	Accipitridae	Shikra	*Accipiter badius*	LC
2	Accipitriformes	Accipitridae	White-eyed Buzzard	*Butasturteesa*	LC
3	Accipitriformes	Accipitridae	Black-Winged Kite	*Elanus caeruleus*	LC
4	Accipitriformes	Accipitridae	Brahminy Kite	*Haliasturindus*	LC
5	Accipitriformes	Accipitridae	Black Kite	*Milvus migrans*	LC
6	Accipitriformes	Accipitridae	Oriental Honey Buzzard	*Pernis ptilorhynchus*	LC
7	Accipitriformes	Accipitridae	Crested Serpent-eagle	*Spilornischeela*	LC
8	Accipitriformes	Accipitridae	Booted Eagle	*Hieraaetuspennatus*	LC
9	Accipitriformes	Accipitridae	Greater spotted eagle	*Clanga clanga*	VU
10	Accipitriformes	Accipitridae	Western Marsh harrier	*Circus aeruginosus*	LC
11	Accipitriformes	Accipitridae	Montagu's Harrier	*Circus pygargus*	LC
12	Accipitriformes	Accipitridae	Pallid Harrier	*Circus macrourus*	NT
13	Accipitriformes	Accipitridae	Pied Harrier	*Circus melanoleucos*	LC
14	Accipitriformes	Pandionidae	Osprey	*Pandion haliaetus*	LC
15	Anseriformes	Anatidae	Northern pintail	*Anas acuta*	LC
16	Anseriformes	Anatidae	Common teal	*Anas crecca*	LC
17	Anseriformes	Anatidae	Indian Spot-billed duck	*Anas poecilorhyncha*	LC
18	Anseriformes	Anatidae	Lesser whistling duck	*Dendrocygnajavanica*	LC
19	Anseriformes	Anatidae	Fulvous whistling duck	*Dendrocygna bicolor*	LC
20	Anseriformes	Anatidae	Knob-billed Duck	*Sarkidiornissylvicola*	LC
21	Anseriformes	Anatidae	Tufted duck	*Aythya fuligula*	LC
22	Anseriformes	Anatidae	Common Pochard	*Aythya ferina*	VU
23	Anseriformes	Anatidae	Gadwall	*Mareca strepera*	LC
24	Anseriformes	Anatidae	Red -crested Pochard	*Netta rufina*	LC
25	Anseriformes	Anatidae	Northern Shoveler	*Spatula clypeata*	LC
26	Anseriformes	Anatidae	Garganey	*Spatula querquedula*	LC
27	Anseriformes	Anatidae	Bar-headed Goose	*Anser indicus*	LC
28	Anseriformes	Anatidae	Cotton pygmy Goose	*Nettapuscoromandelianus*	LC
29	Anseriformes	Anatidae	Eurasian Wigeon	*Marecapenelope*	LC
30	Caprimulgiformes	Apodidae	House Swift/Little Swift	*Apus affinis*	LC
31	Caprimulgiformes	Apodidae	Asian palm swift	*Cypsiurusbalasiensis*	LC
32	Charadriiformes	Burhinidae	Indian Thick-knee	*Burhinus indicus*	LC
33	Charadriiformes	Charadriidae	Kentish Plover	*Charadrius alexandrinus*	LC
34	Charadriiformes	Charadriidae	Little ringed Plover	*Charadrius dubius*	LC
35	Charadriiformes	Charadriidae	Greater Sandplover	*Charadrius leschenaultii*	LC
36	Charadriiformes	Charadriidae	Pacific golden plover	*Pluvialis fulva*	LC
37	Charadriiformes	Charadriidae	Grey-headed Lapwing	*Vanellus cinereus*	LC
38	Charadriiformes	Charadriidae	Red-wattled Lapwing	*Vanellus indicus*	LC
39	Charadriiformes	Charadriidae	Yellow-wattled Lapwing	*Vanellusmalabaricus*	LC

40	Charadriiformes	Glareolidae	Collared Pratincole	*Glareolapratincola*	LC
41	Charadriiformes	Glareolidae	Indian Courser	*Cursoriuscoromandelicus*	LC
42	Charadriiformes	Jacanidae	Pheasant-tailed Jacana	*Hydrophasianuschirurgus*	LC
43	Charadriiformes	Jacanidae	Bronze-winged Jacana	*Metopidius indicus*	LC
44	Charadriiformes	Laridae	River Tern	*Sterna aurantia*	VU
45	Charadriiformes	Laridae	Whiskered Tern	*Chlidoniashybrida*	LC
46	Charadriiformes	Laridae	Gull -billed Tern	*Gelochelidon nilotica*	LC
47	Charadriiformes	Laridae	Caspian tern	*Hydroprognecaspia*	LC
48	Charadriiformes	Laridae	Little tern	*Sternulaalbifrons*	LC
49	Charadriiformes	Laridae	Lesser crested tern	*Thalasseus bengalensis*	LC
50	Charadriiformes	Laridae	Greater crested tern	*Thalasseusbergii*	LC
51	Charadriiformes	Laridae	Brown headed Gull	*Larus brunnicephalus*	LC
52	Charadriiformes	Laridae	Black headed Gull	*Larus ridibundus*	LC
53	Charadriiformes	Recurvirostridae	Black winged Stilt	*Himantopus himantopus*	LC
54	Charadriiformes	Recurvirostridae	Pied Avocet	*Recurvirostraavosetta*	LC
55	Charadriiformes	Rostratulidae	Greater Painted-snipe	*Rostratulabenghalensis*	LC
56	Charadriiformes	Scolopacidae	Common Snipe	*Gallinagogalllinago*	LC
57	Charadriiformes	Scolopacidae	Pintail Snipe	*Gallinagostenura*	LC
58	Charadriiformes	Scolopacidae	Blyth's Reed Warbler	*Acrocephalus dumetorum*	LC
59	Charadriiformes	Scolopacidae	Little stint	*Calidris minuta*	LC
60	Charadriiformes	Scolopacidae	Ruff	*Calidris pugnax*	LC
61	Charadriiformes	Scolopacidae	Asian Dowitcher	*Limnodromussemipalmatus*	NT
62	Charadriiformes	Scolopacidae	Bar-tailed Godwit	*Limosalapponica*	NT
63	Charadriiformes	Scolopacidae	Black-tailed Godwit	*Limosalimosa*	NT
64	Charadriiformes	Scolopacidae	Eurasian Curlew	*Numenius arquata*	NT
65	Charadriiformes	Scolopacidae	Eurasian whimbrel	*Numenius phaeopus*	**LC**
66	Charadriiformes	Scolopacidae	Common Sandpiper	*Actitis hypoleucos*	LC
67	Charadriiformes	Scolopacidae	Wood Sandpiper	*Tringaglareola*	LC
68	Charadriiformes	Scolopacidae	Green Sandpiper	*Tringaochropus*	LC
69	Charadriiformes	Scolopacidae	Marsh Sandpiper	*Tringastagnatilis*	LC
70	Charadriiformes	Scolopacidae	Terek Sandpiper	*Xenus cinereus*	LC
71	Charadriiformes	Scolopacidae	Common Greenshank	*Tringanebularia*	LC
72	Charadriiformes	Scolopacidae	Common Redshank	*Tringatotanus*	LC
73	Charadriiformes	Scolopacidae	Spotted Redshank	*Tringaerythropus*	LC
74	Charadriiformes	Scolopacidae	Ruddy turnstone	*Arenaria interpres*	LC
75	Charadriiformes	Scolopacidae	Temminck's Stint	*Calidris temminckii*	LC
76	Cisticolidae	Cisticolidae	Zitting cisticola	*Cisticola juncidis*	LC
77	Columbiformes	Columbidae	Blue Rock Pigeon	*Columba livia*	LC
78	Columbiformes	Columbidae	Spotted Dove	*Spilopelia chinensis*	LC
79	Columbiformes	Columbidae	Asian Emerald Dove	*Chalcophaps indica*	LC
80	Columbiformes	Columbidae	Eurasian Collared Dove	*Streptopeliadecaocto*	LC
81	Columbiformes	Columbidae	Laughing Dove	*Spilopelia senegalensis*	LC
82	Columbiformes	Columbidae	Pompadour Green Pigeon	*Genus treron*	LC
83	Coraciiformes	Alcedinidae	Common Kingfisher	*Alcedo atthis*	LC
84	Coraciiformes	Alcedinidae	Pied kingfisher	*Cerylerudis*	LC
85	Coraciiformes	Alcedinidae	White -breasted Kingfisher	*Halcyon smyrnensis*	LC
86	Coraciiformes	Coraciidae	Indian Roller	*Coracias benghalensis*	LC

87	Coraciiformes	Meropidae	Green Bee-eater	*Meropsorientalis*	LC
88	Coraciiformes	Meropidae	Blue-tailed Bee-eater	*Meropsphilippinus*	LC
89	Cuculiformes	Cuculidae	Asian Koel	*Eudynamysscolopaceus*	LC
90	Cuculiformes	Cuculidae	Blue-faced Malkoha	*Phaenicophaeusviridirostris*	LC
91	Cuculiformes	Cuculidae	Greater Coucal	*Centropus sinensis*	LC
92	Cuculiformes	Cuculidae	Common Cuckoo	*Cuculuscanorus*	LC
93	Cuculiformes	Cuculidae	Chestnut-winged Cuckoo	*Clamatorcoromandus*	LC
94	Cuculiformes	Cuculidae	Common Hawk Cuckoo	*Hierococcyxvarius*	LC
95	Cuculiformes	Cuculidae	Pied crested Cuckoo	*Clamatorjacobinus*	LC
96	Falconiformes	Falconidae	Common kestrel	*Falco tinnunculus*	LC
97	Falconiformes	Falconidae	Peregrine Falcon	*Falco peregrinus*	LC
98	Galliformes	Megalaimidae	Coppersmith Barbet	*Psilopogonhaemacephalus*	LC
99	Galliformes	Megalaimidae	Brown-headed Barbet	*Psilopogonzeylanicus*	LC
100	Galliformes	Phasianidae	Indian Peafowl	*Pavo cristatus*	LC
101	Galliformes	Phasianidae	Grey Francolin	*Francolinuspondicerianus*	LC
102	Galliformes	Phasianidae	Jungle Bush-quail	*Perdicula asiatica*	LC
103	Gruiformes	Rallidae	White-breasted Waterhen	*Amaurornisphoenicurus*	LC
104	Gruiformes	Rallidae	Common/Eurasian Coot	*Fulicaatra*	LC
105	Gruiformes	Rallidae	Common Moorhen	*Gallinula chloropus*	LC
106	Gruiformes	Rallidae	Grey-headed swamphen	*Porphyriopoliocephalus*	LC
107	Gruiformes	Rallidae	Slaty-breasted rail	*Lewinia striata*	LC
108	Gruiformes	Rallidae	Watercock	*Gallicrex cinerea*	LC
109	Passeriformes	Aegithinidae	Common Iora	*Aegithinia tiphia*	LC
110	Passeriformes	Alaudidae	Oriental skylark	*Alauda gulgula*	LC
111	Passeriformes	Alaudidae	Ashy-crowned Sparrow-lark	*Eremopterix griseus*	LC
112	Passeriformes	Alaudidae	Jerdon’s Bushlark	*Mirafraaffinis*	LC
113	Passeriformes	Artamidae	White-breasted Woodswallow	*Artamusleucorynchus*	LC
114	Passeriformes	Artamidae	Ashy Woodswallow	*Artamusfuscus*	LC
115	Passeriformes	Campephagidae	Small Minivet	*Pericrocotuscinnamomeus*	LC
116	Passeriformes	Chloropseidae	Blue-winged Leafbird	*Chloropsismoluccensis*	LC
117	Passeriformes	Cisticolidae	Common Tailorbird	*Orthotomussutorius*	LC
118	Passeriformes	Cisticolidae	Grey-breasted Prinia	*Priniahodgsonii*	LC
119	Passeriformes	Cisticolidae	Ashy Prinia	*Priniasocialis*	LC
120	Passeriformes	Cisticolidae	Plain Prinia	*Priniainornata*	LC
121	Passeriformes	Corvidae	Large-billed Crow	*Corvus macrorhynochos*	LC
122	Passeriformes	Corvidae	House Crow	*Corvus splendens*	LC
123	Passeriformes	Corvidae	Rufous Treepie	*Dendrocittavagabunda*	LC
124	Passeriformes	Dicaeidae	Thick-billed/Pale-billed Flowerpecker	*Dicaeum agile*	LC
125	Passeriformes	Dicaeidae	Tickell's flowerpecker	*Dicaeumerythrorhynchos*	LC
126	Passeriformes	Dicruridae	Ashy Drongo	*Dicrurusleucophaeus*	LC

127	Passeriformes	Dicruridae	Black Drongo	*Dicrurusmacrocercus*	LC
128	Passeriformes	Emberizidae	Grey-necked bunting	*Emberizabuchanani*	LC
129	Passeriformes	Estrildidae	Indian Silverbill	*Euodicemalabarica*	LC
130	Passeriformes	Estrildidae	Tricoloured Munia	*Lonchuramalacca*	LC
131	Passeriformes	Estrildidae	Scaly-breasted munia	*Lonchurapunctulata*	LC
132	Passeriformes	Estrildidae	White-rumpedMunia	*Lonchura striata*	LS
133	Passeriformes	Hirundinidae	Barn Swallow	*Hirundo rustica*	LC
134	Passeriformes	Laniidae	Long-tailed Shrike	*Lanius schach*	LC
135	Passeriformes	Laniidae	Bay-backed Shrike	*Lanius vittatus*	LC
136	Passeriformes	Laniidae	Brown Shrike	*Lanius cristatus*	LC
137	Passeriformes	Leiotrichidae	White-headed Babbler	*Turdoidesleucocephala*	LC
138	Passeriformes	Leiotrichidae	Jungle Babbler	*Turdoides striata*	LC
139	Passeriformes	Monarchidae	Asian Paradise-Flycatcher	*Terpsiphone paradisi*	LC
140	Passeriformes	Monarchidae	Black-naped Monarch	*Hypothymisazurea*	LC
141	Passeriformes	Motacillidae	Forest Wagtail	*Dendronanthus indicus*	LC
142	Passeriformes	Motacillidae	Grey Wagtail	*Motacilla cinerea*	LC
143	Passeriformes	Motacillidae	Citrine Wagtail	*Motacillacitreola*	LC
144	Passeriformes	Motacillidae	Western Yellow Wagtail	*Motacilla flava*	LC
145	Passeriformes	Motacillidae	White-browed Wagtail	*Motacillamaderaspatensis*	LC
146	Passeriformes	Motacillidae	Paddyfield Pipit	*Anthusrufulus*	LC
147	Passeriformes	Muscicapidae	Indian Robin	*Saxicoloidesfulicatus*	LC
148	Passeriformes	Muscicapidae	Oriental magpie-Robin	*Copsychussaularis*	LC
149	Passeriformes	Muscicapidae	Tickell's Blue Flycatcher	*Cyornistickelliae*	LC
150	Passeriformes	Muscicapidae	White-rumped Shama	*Kittacinclamalabarica*	LC
151	Passeriformes	Muscicapidae	Pied Bushchat	*Saxicola caprata*	LC
152	Passeriformes	Nectariniidae	Purple-rumped Sunbird	*Leptocomazeylonica*	LC
153	Passeriformes	Nectariniidae	Purple Sunbird	*Cinnyris asiaticus*	LC
154	Passeriformes	Oriolidae	Eurasian Golden Oriole	*Oriolusoriolus*	LC
155	Passeriformes	Passeridae	House Sparrow	*Passer domesticus*	LC
156	Passeriformes	Oriolidae	Black-headed Oriole	*Orioluslarvatus*	LC
157	Passeriformes	Pitidae	Indian Pitta	*Pitta brachyura*	LC
158	Passeriformes	Ploceidae	Baya Weaver	*Ploceusphilippinus*	LC
159	Passeriformes	Pycnonotidae	Red-vented Bulbul	*Pycnonotuscafer*	LC
160	Passeriformes	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotusjocosus*	LC
161	Passeriformes	Pycnonotidae	White-browed Bulbul	*Pycnonotusluteolus*	LC
162	Passeriformes	Rhipiduridae	White-browed Fantail	*Rhipidura aureola*	LC
163	Passeriformes	Sturnidae	Common Myna	*Acridotheres tristis*	LC
164	Passeriformes	Sturnidae	Brahminy Starling	*Sturniapagodarum*	LC
165	Passeriformes	Sturnidae	Rosy Starling	*Pastor roseus*	LC
166	Passeriformes	Turdidae	Orange-headed Thrush	*Geokichlacitrina*	LC
167	Passeriformes	Vangidae	Common Woodshrike	*Tephrodornispondicerianus*	LC
168	Passeriformes	Zosteropidae	Oriental white-eye	*Zosteropspalpebrosus*	LC
169	Pelecaniformes	Anhingidae	Oriental Darter	*Anhinga melanogaster*	LC
170	Pelecaniformes	Ardeidae	Little Egret	*Egrettagarzetta*	LC
171	Pelecaniformes	Ardeidae	Cattle Egret	*Bubulcus ibis*	LC
172	Pelecaniformes	Ardeidae	Intermediate Egret	*Ardea intermedia*	LC
173	Pelecaniformes	Ardeidae	Great white Egret	*Egretta alba*	LC
174	Pelecaniformes	Ardeidae	Black-crowned Night-heron	*Nycticoraxnycticorax*	LC

175	Pelecaniformes	Ardeidae	Grey heron	*Ardea cinerea*	LC
176	Pelecaniformes	Ardeidae	Purple heron	*Ardea purpurea*	LC
177	Pelecaniformes	Ardeidae	Indian-Pond Heron	*Ardeolagrayii*	LC
178	Pelecaniformes	Ardeidae	Striated heron	*Butorides striata*	LC
179	Pelecaniformes	Ardeidae	Western Reef-egret	*Egrettagularis*	LC
180	Pelecaniformes	Ardeidae	Black bittern	*Ixobrychusflavicollis*	LC
181	Pelecaniformes	Ardeidae	GreatBittern	*Botaurus stellaris*	LC
182	Pelecaniformes	Ardeidae	Yellow bittern	*Lxobrychus sinensis*	LC
183	Pelecaniformes	Ciconiidae	Lesser adjutant	*Leptoptilosjavanicus*	VU
184	Pelecaniformes	Ciconiidae	Open billed stork/Asian Openbill	*Anastomusoscitans*	LC
185	Pelecaniformes	Ciconiidae	Painted stork	*Mycteria leucocephala*	NT
186	Pelecaniformes	Ciconiidae	White stork	*Ciconia ciconia*	LC
187	Pelecaniformes	Pelicanidae	Grey Pelican	*Pelecanusphilippensis*	NT
188	Pelecaniformes	Phalacrocoracidae	Little Cormorant	*Microcarboniger*	LC
189	Pelecaniformes	Phalacrocoracidae	Large Cormorant	*Phalacrocorax fuscicollis*	LC
190	Pelecaniformes	Phalacrocoracidae	Great Cormorant	*Phalacrocorax carbo*	LC
191	Pelecaniformes	Threskiornithidae	Eurasian Spoonbill	*Platalealeucorodia*	LC
192	Pelecaniformes	Threskiornithidae	Glossy Ibis	*Plegadisfalcinellus*	LC
193	Pelecaniformes	Threskiomithidae	Red-naped Ibis	*Pseudibispapillosa*	LC
194	Pelecaniformes	Threskiornithidae	Black-headed Ibis	*Threskiornismelanocephalus*	NT
195	Phoenicopteriformes	Phoenicopteridae	Greater Flamingo	*Phoenicopterus roseus*	LC
196	Phoenicopteriformes	Podicipedidae	Little Grebe	*Tachybaptus ruficollis*	LC
197	Piciformes	Picidae	Rufous Woodpecker	*Micropternusbrachyurus*	LC
198	Psittaciformes	Psittacidae	Rose- ringed Parakeet	*Alexandrinuskrameri*	LC
199	Strigiformes	Strigidae	Spotted Owlet	*Athene brama*	LC
200	Strigiformes	Strigidae	Indian eagle-Owl	*Bubo bengalensis*	LC
201	Strigiformes	Strigidae	Collared Scops Owl	*Otus lettia*	LC
202	Strigiformes	Strigidae	Short-eared Owl	*Asioflammeus*	LC
203	Strigiformes	Tytonidae	Barn Owl	*Tyto alba*	LC
204	Strigiformes	Upupidae	Common Hoopoe	*Upupa epops*	LC

LC- Least Concern, VU-Vulnerable, NT-Near Threatened

ANNEXURE – II

PLANTS OF KAZHUVELI WETLAND BIRDS SANCTUARY

S.No.	Family	Common Name	Scientific Name	IUCN Status
1	Leguminosae	Necklace-Pod Alyce Clover	*Alysicarpusmonilifer*	
2	Euphorbiaceae	Bellyache Bush	*Jatropha gossypiifolia*	LC
3	Cyperaceae	Kudiravallipullu	*Lipocarphasquarrosa*	LC
4	Acanthaceae	false waterwillow	*Andrographisechioides*	LC
5	Rubiaceae	Coromandel Boxwood	*Canthiumcoromandelicum*	LC
6	Leguminosae	Pig's senna	*Chamaecristaabsus*	LC
7	Euphorbiaceae	Ban Tulsi	*Croton bonplandianus*	LC
8	Cyperaceae	Haspanflatsedge	*Cyperushaspan*	LC
9	Leguminosae	Pearl wattle	*Leucaena leucocephala*	LC
10	Passifloraceae	Bush passion fruit	*Passiflorafoetida*	LC
11	Hippocrateaceae	Yellow Flax	*Reissantia indica*	LC
12	Acanthaceae	Creeping Rungia	*Rungiarepens*	LC
13	Leguminosae	Rosary Pea	*Abrusprecatorius*	LC
14	Malvaceae	Indian mallow	*Abutilon indicum*	LC
15	Leguminosae	Tanner's Cassia	*Acacia auriculata*	LC
16	Leguminosae	Babul tree	*Acacia nilotica*	LC
17	Leguminosae	White Bark Acacia	*Acacia leucophloea*	LC
18	Euphorbiaceae	Indian acalypha	*Acalypha indica*	LC
19	Amaranthaceae	Prickly Chaff Flower	*Achyranthesaspera*	LC
20	Acoraceae	Sweet flag	*Acoruscalamus*	LC
21	Cyperaceae	Greater club-rush	*Actinoscirpusgrossus*	LC
22	Poaceae	Mangrove grass	*Aeluropuslagopoides*	LC
23	Leguminosae	Pith plant	*Aeschynomeneaspera*	LC
24	Leguminosae	Siris tree	*Albizia lebbeck*	LC
25	Poaceae	Bug-seed grass	*Alloteropsiscimicina*	LC
26	Leguminosae	Alyce clover	*Alysicarpus vaginalis*	LC

27	Amaranthaceae	Slender amaranth	*Amaranthusviridis*	LC
28	Lythraceae	Monarch redstem	*Ammanniabaccifera*	LC
29	Lythraceae	Redstem	*Ammanniaoctandra*	LC
30	Lamiaceae	Malabar Catmint	*Anisomelesmalabarica*	LC
31	Poaceae	Mauritian Grass	*Apludamutica*	LC
32	Aponogetonaceae	Floating Lace Plant	*Aponogetonnatans*	LC
33	Poaceae	Common needle grass	*Aristidaadscensionis*	LC
34	Acanthaceae	Creeping foxglove	*Asystasiagangetica*	LC
35	Rutaceae	Indian Atalantia	*Atalantiamonophylla*	LC
36	Acanthaceae	White mangrove	*Avicennia officinalis*	LC
37	Meliaceae	Neem	*Azadirachta indica*	LC
38	Poaceae	Giant Thorny Bamboo	*Bambusabambos*	LC
39	Acanthaceae	Philippine violet	*Barleriacristata*	LC
40	Lecythidaceae	Indian Oak	*Barringtoniaacutangula*	LC
41	Rubiaceae	Bili kaaremullu	*Benkaramalabarica*	LC
42	Elantiaceae	White water fire	*Bergiacapensis*	LC
43	Nyctaginaceae	Red hogweed	*Boerhaviadiffusa*	LC
44	Cyperaceae	Sea clubrush	*Bolboschoenusmaritimus*	LC
45	Arecaceae	Palmyra Palm tree	*Borassusflabellifer*	LC
46	Poaceae	Browntop Millet	*Brachiariaramosa*	LC
47	Poaceae	Signalgrass	*Brachiariaremota*	LC
48	Poaceae	Creeping Panic Grass	*Brachiariareptans*	LC
49	Phyllanthaceae	Spinous Kino Tree	*Brideliaretusa*	LC
50	Cyperaceae	Water grass	*Bulbostylisbarbata*	LC
51	Cyperaceae	Caribbean hairsedge	*Bulbostylisjunciformis*	LC
52	Apocynaceae	Crown flower	*Calotropisgigantea*	LC
53	Acanthaceae	Giant Aqua Rose Plant	*Cardantherabalsamica*	LC
54	Sapindaceae	Lesser balloon vine	*Cardiospermumhalicacabum*	LC
55	Apocynaceae	Conkerberry	*Carissa spinarum*	LC
56	Leguminosae	Golden shower tree	*Cassia fistula*	LC

57	Rubiaceae	Mountain pomegranate	*Catunaregamspinosa*	LC
58	Amaranthaceae	Red Fox	*Celosia argentea*	LC
59	Poaceae	swollen fingergrass	*Chloris barbata*	LC
60	Poaceae	windmill grass	*Chloris montana*	LC
61	Poaceae	Feathered finger grass	*Chloris virgata*	LC
62	Euphorbiaceae	Suryavarti	*Chrozophorarottleri*	LC
63	Poaceae	Vetivergrass	*Chrysopogonzizanioides*	LC
64	Vitaceae	Winged treebine	*Cissusquadrangularis*	LC
65	Vitaceae	South Indian Treebine	*Cissusvitiginea*	LC
66	Cleomaceae	Spiderflower	*Cleome tenella*	LC
67	Cleomaceae	Asian spiderflower	*Cleome viscosa*	LC
68	Cucurbitaceae	Ivy Gourd	*Coccinia grandis*	LC
69	Boraginaceae	Creeping coldenia	*Coldenia procumbens*	LC
70	Commelinaceae	False Water Willow	*Commelinaattenuata*	LC
71	Commelinaceae	Bengal Dayflower	*Commelinabenghalensis*	LC
72	Commelinaceae	Scurvy Grass	*Commelinaensifolia*	LC
73	Convulvaceae	Littoral bind weed	*Cressacretica*	LC
74	Amaryllidaceae	Sheshore Lily	*Crinum asiaticum*	LC
75	Leguminosae	Prostrate Rattlepod	*Crotalaria prostrata*	LC
76	Convulvaceae	Giant dodder	*Cuscutareflexa*	LC
77	Commelinaceae	Creeping Cradle Plant	*Cyanotisaxillaris*	LC
78	Asteraceae	Little Ironweed	*Cyanthilliumcinereum*	LC
79	Poaceae	Kachi Grass	*Cymbopogoncaesius*	LC
80	Poaceae	Lemon grass	*Cymbopogoncitratus*	LC
81	Cyperaceae	Poorland Flat Sedge	*Cyperuscompressus*	LC
82	Cyperaceae	Variable flatsedge	*Cyperusdifformis*	LC
83	Cyperaceae	Slender Sedge	*Cyperusdistans*	LC
84	Cyperaceae	Pygmy Sedge	*Cyperusmichelianus*	LC

85	Cyperaceae	nut grass	*Cyperus procerus*	LC
86	Cyperaceae	Purple flat sedge	*Cyperusrotundus*	LC
87	Cyperaceae	Bearded flatsedge	*Cyperus squarrosus*	LC
88	Cyperaceae	Nut Sedge	*Cyperusstoloniferus*	LC
89	Cyperaceae	Slender spiked sedge	*Cyperustenuispica*	LC
90	Poaceae	Crow foot grass	*Dactyloctenium aegyptium*	LC
91	Loranthaceae	Honey Suckle Mistletoe	*Dendrophthoefalcata*	LC
92	Rubiaceae	Monkey brush vine	*Dentellarepens*	LC
93	Leguminosae	Creeping tick	*Desmodiumheterophyllum*	LC
94	Poaceae	Angleton Bluestem Grass	*Dicanthiumaristataum*	LC
95	Leguminosae	Sicklebush	*Dichrostachyscinerea*	LC
96	Poaceae	Asian Crabgrass	*Digitariabicornis*	LC
97	Scrophulariaceae	Leafless Dopatrium	*Dopatriumnudicaule*	LC
98	Poaceae	Jungle rice	*Echinochloacolona*	LC
99	Asteraceae	False daisy	*Ecliptaprostrata*	LC
100	Cyperaceae	Chinese water chestnut	*Eleocharisdulcis*	LC
101	Asteraceae	Purple Sow Thistle	*Emilia sonchifolia*	LC
102	Asteraceae	Narrow-Leaf Epaltes	*Epaltesdivaricata*	LC
103	Poaceae	Lovegrass	*Eragrostisviscosa*	LC
104	Myrtaceae	Tasmanian blue gum	*Eucalyptus globulus*	LC
105	Myrtaceae	Cherry of the Rio Grande	*Eugenia involucrata*	LC
106	Euphorbiaceae	Asthma Weed	*Euphorbia hirta*	LC
107	Cyperaceae	Flatspike sedge	*Fimbristylis ovata*	LC
108	Cyperaceae	GrasslikeFimbry	*Fimbristylisquinquangularis*	LC
109	Cyperaceae	Glossy Abelia	*Fimbristylistriflora*	LC
110	Phyllanthaceae	Bushweed	*Flueggealeucopyrus*	LC
111	Cyperaceae	cape jasmine	*Gahniajavanica*	LC
112	Molluginaceae	Indian chickweed	*Glinusoppositifoliu s*	LC
113	Leguminosae	Mexican Lilac	*Gliricidiasepium*	LC
114	Colchiaceae	Glory lily	*Gloriosasuperba*	LC

115	Rutaceae	Gin berry	*Glycosmispentaphylla*	LC
116	Verbenaceae	Asian Bushbeech	*Gmelina asiatica*	LC
117	Acanthaceae	Prostrate Gomphrena	*Gomphrenacelosioides*	LC
118	Acanthaceae	Globe amaranth	*Gomphrenaglobosa*	LC
119	Boraginaceae	Seaside heliotrope	*Heliotropiumcurrassavicum*	LC
120	Boraginaceae	Dwarf Heliotrope	*Heliotropiumsupinum*	LC
121	Boraginaceae	Bracted Heliotrope	*Heliotropiumbracteatum*	LC
122	Boraginaceae	Indian heliotrope	*Heliotropiumindicum*	LC
123	Apocynaceae	Indian sarsaparilla	*Hemidesmusindicus*	LC
124	Malvaceae	Kenaf	*Hibiscus cannabinus*	LC
125	Violaceae	Spade Flower	*Hybanthusenneaspermus*	LC
126	Acanthaceae	Marsh Barbel	*Hygrophilaauriculata*	LC
127	Lamiaceae	Pignut	*Hyptissuaveolens*	LC
128	Apocynaceae	Black creeper	*Ichnocarpusfrutescens*	LC
129	Convulvaceae	Swamp cabbage	*Ipomoea aquatica*	LC
130	Convulvaceae	Pink Morning Glory	*Ipomoea carnea*	LC
131	Convulvaceae	Egyptian Morning Glory	*Ipomoea coptica*	LC
132	Convulvaceae	Tiger's paw	*Ipomoea pes-tigridis*	LC
133	Convulvaceae	Cypress vine	*Ipomoea quamoclit*	LC
134	Cyperaceae	Floating scirpus	*Isolepisfluitans*	LC
135	Cyperaceae	Sierra Leone	*Kyllingabulbosa*	LC
136	Verbenaceae	Common Lantana	*Lantana camara*	LC
137	Poaceae	Swamp rice grass	*Leersiahexandra*	LC
138	Leguminosae	Pearl wattle	*Leucaena leucocephala*	LC
139	Lamiaceae	Common Leucas	*Leucasaspera*	LC
140	Lamiaceae	Leucas lavender	*Leucaslavandulifolia*	LC
141	Plantaginaceae	Indian Marshweed	*Limnophilaheterophylla*	LC
142	Plantaginaceae	Asian marshweed	*Limnophilasessiliflora*	LC
143	Linderniaceae	Hairy Slitwort	*Linderniaciliata*	LC
144	Linderniaceae	Riceweeds	*Linderniasp*	LC

145	Linderniaceae	tenuifolia	*Linderniatenuifolia*	LC
146	Linderniaceae	Malaysian false pimpernel.	*Linderniacrustacea*	LC
147	Onagraceae	Perennial Water Primrose	*Ludwigiaperennis*	LC
148	Onagraceae	Creeping Water Primrose	*Ludwigiaprostrata*	LC
149	Leguminosae	Horse gram	*Macrotylomauniflorum*	LC
150	Euphorbiaceae	Climbing liana	*Mallotusrepandus*	LC
151	Poaceae	Manisuris	*Manisurismyurus*	LC
152	Malvaceae	Chocolateweed	*Melochiacorchorifolia*	LC
153	Melastomataceae	Ironwood	*Memecylonumbellatum*	LC
154	Convulvaceae	Chinese moon creeper	*Merremiatridentata*	LC
155	Leguminosae	Sensitive Plant	*Mimosa pudica*	LC
156	Molluginaceae	Naked-Stem Carpetweed	*Mollugonudicaulis*	LC
157	Pontederiaceae	Heart shape false pickerelweed	*Monochoria vaginalis*	LC
158	Rubiaceae	Indian Mulberry	*Morindacoreia*	LC
159	Cucurbitaceae	Madras pea pumpkin	*Mukiamaderaspatana*	LC
160	Commelinaceae	Doveweed	*Murdannianudiflora*	LC
161	Hydrocharitaceae	Indian Oxygen-Weed	*Nechamandra alternifolia*	LC
162	Nelumbonaceae	Sacred lotus	*Nelumbonucifera*	LC
163	Leguminosae	Water mimosa	*Neptuniaoleracea*	LC
164	Nymphaeaceae	Tropical royalblue waterlily	*Nymphaea elegans*	LC
165	Nymphaeaceae	Blue water lily	*Nymphaea nouchali*	LC
166	Nymphaeaceae	White water lily	*Nymphaea pubescens*	LC
167	Nymphaeaceae	Red water lily	*Nymphaea rubra*	LC
168	Lamiaceae	holy basi	*Ocimumtenuiflorum*	LC
169	Rubiaceae	Two-flowered Oldenlandia	*Oldenlandiacorymbosa*	LC
170	Rubiaceae	Snake-needle Grass	*Oldenlandiadiffusa*	LC
171	Rubiaceae	Diamond Flower	*Oldenlandiastricta*	LC

172	Rubiaceae	Twoflowermillegraines	*Oldenlandiatenelliflora*	LC
173	Rubiaceae	Chay root	*Oldenlandiaumbellata*	LC
174	Cactaceae	Erect picklypear	*Opuntiadillenii*	LC
175	Poaceae	Indica rice	*Oryza sativa*	LC
176	Hydrocharitaceae	Duck Lettuce	*Otteliaalismoides*	LC
177	Apocynaceae	Rosy Milkweed Vine	*Oxystelmaesculentum*	LC
178	Pandanaceae	Fragrant screw-pine	*Pandanus odorifer*	LC
179	Poaceae	Panicum	*Panicumcurviflorum*	LC
180	Poaceae	Torpedo Grass	*Panicumrepens*	LC
181	Leguminosae	Barbados flower-fence	*Parkinsoniaaculeata*	LC
182	Asteraceae	Whitetop weed	*Partheniumhysterophorus*	LC
183	Poaceae	Knotgrass	*Paspalumdistichum*	LC
184	Poaceae	Kodo millet	*Paspalumscrobiculatum*	LC
185	Pedaliaceae	Large Caltrops	*Pedalium murex*	LC
186	Apocynaceae	Bullock	*Pentatropiscapensis*	LC
187	Poaceae	Indian Comet Grass	*Perotis indica*	LC
188	Verbenaceae	Frog fruit	*Phyla nodiflora*	LC
189	Phyllanthaceae	Black-Honey Shrub	*Phyllanthus reticulatus*	LC
190	Phyllanthaceae	Virgate Leaf-flower	*Phyllanthusvirgatus*	LC
191	Solanaceae	Pygmy Groundcherry	*Physalis minima*	LC
192	Leguminosae	Manila Tamarind	*Pithecellobiumdulce*	LC
193	Asparagaceae	Tuberose	*Polianthestuberosa*	LC
194	Caryophyllaceae	Oldman's Cap	*Polycarpaeacorymbosa*	LC
195	Portulacaceae	Seashore Purslane	*Portulacatuberosa*	LC
196	Lamiaceae	Bastard Guelder	*Premnaserratifolia*	LC
197	Leguminosae	Mesquite	*Prosopisjuliflora*	LC
198	Malvaceae	Kanak Champa	*Pterospermumsuberifolium*	LC
199	Cyperaceae	Manyspikeflatsedge	*Pycerussp*	LC
200	Cyperaceae	Manyspikeflatsedge	*Pycreuspolystachyos*	LC

201	Celastraceae	mopane paddle-pod	*Reissantia indica*	LC
202	Rhizophoraceae	Asiatic Mangrove	*Rhizophoramucronata*	LC
203	Leguminosae	Kali-y-an-tuvarai	*Rhynchosia minima*	LC
204	Convulvaceae	Midnapore Creeper	*Riveahypocraterifo rmis*	LC
205	Lythraceae	roundleaf toothcup	*Rotala indica*	LC
206	Poaceae	Wild Sugarcane	*Saccharumspontaneum*	LC
207	Phyllanthaceae	star gooseberry	*Sauropusbaccifor mis*	LC
208	Cyperaceae	Jointed Sedge	*Schoenoplectiellaarticulata*	LC
209	Cyperaceae	Reclining Club-Rush	*Schoenoplectiellas upina*	LC
210	Pedaliaceae	Benniseed	*Sesamumalatum*	LC
211	Leguminosae	Egyptian riverhemp	*Sesbaniasesban*	LC
212	Malvaceae	Common Wireweed	*Sidaacuta*	LC
213	Malvaceae	country mallow	*Sidacordifolia*	LC
214	Solanaceae	Indian Nightshade	*Solanum violaceum*	LC
215	Rubiaceae	Jointed Buttonweed	*Spermacocearticul aris*	LC
216	Rubiaceae	Shaggy button weed	*Spermacocehispid a*	LC
217	Asteraceae	East Indian globe thistle	*Sphaeranthusindic us*	LC
218	Sphenocleaceae	gooseweed	*Sphenocleazeylani ca*	LC
219	Lamiaceae	lamb's ears	*Stachysbyzantina*	LC
220	Verbenaceae	Brazilian Tea	*Stachytarpheta indica*	LC
221	Scrophulariaceae	Sticky Blue Rod.	*Stemodiaviscosa*	LC
222	Orobanchaceae	Denseflower Witchweed	*Strigadensiflora*	LC
223	Leguminosae	shrubby pencil-flower	*Stylosanthesfrutico sa*	LC
224	Amaranthaceae	seepweeds	*Suaedanodiflora*	LC
225	Amaranthaceae	herbaceous seepweed	*Suaedamaritima*	LC
226	Amaranthaceae	South-Indian Seepweed	*Suaedamonoica*	LC
227	Myrtaceae	Java Plum	*Syzygiumcumini*	LC

228	Talinaceae	flameflower	*Talinumportulacifolium*	LC
229	Leguminosae	tamarind	*Tamarindus indica*	LC
230	Rubiaceae	Asiatic Tarenna	*Tarennaasiatica*	LC
231	Leguminosae	wild indigo	*Tephrosiapurpurea*	LC
232	Combretaceae	arjuna	*Terminalia arjuna*	LC
233	Malvaceae	portia tree	*Thespesiapopulne*	LC
234	Apocynaceae	Cynanchum indicum	*Tylophora indica*	LC
235	Typhaceae	narrowleaf cattail	Typhaangustifolia	LC
236	Lentibulariaceae	Star Bladderwort	Utricularia stellaris	LC
237	Leguminosae	African gram	Vignatrilobata	LC
238	Leguminosae	cowpea	Vignaunguiculata	LC
239	Lamiaceae	Chinese chaste tree	Vitexnegundo	LC
240	Lamiaceae	Indian Privet	Volkameriainermis	LC
241	Malvaceae	sleepy morning	Waltheria indica	LC
242	Rhamnaceae	jackal jujube	Ziziphusoenopolia	LC

Annexure – III

List of Butterflies in Kazhuveli Wetland Birds Sanctuary

Sl.No.	Common Name	Scientific Name	Subfamily	IUCN status
1	Common Rose	Atrophaneuraaristolochiae	Papilioninae	LC
2	Tailed Jay	Graphiumagamemnon	Papilioninae	LC
3	Common Mormon	Papilio polytes	Papilioninae	LC
4	Crimson Rose	Pachliopta hector	Papilioninae	LC
5	Lime Butterfly	Papilio demoleus	Papilioninae	LC
6	Mottled Emigrant	*Catopsiliapyranthe*	Coliadina	LC
7	Common Emigrant	*Catopsilia Pomona*	Coliadina	LC
8	Common Grass Yellow	*Euremahecabe*	Coliadina	LC
9	Pioneer	*Anaphaeisaurota*	Pierinae	LC
10	Striped Albatross	*Appiaslibythea*	Pierinae	LC
11	Common Gull	*Ceporanerissa*	Pierinae	LC
12	Small Salmon	*Colotisamata*	Pierinae	LC
13	Crimson Tip	*Colotisdanae*	Pierinae	LC
14	Little Orange Tip	*Colotisetrida*	Pierinae	LC
15	Plain Orange Tip	*Colotis eucharis*	Pierinae	LC
16	Common Jezebel	*Delias eucharis*	Pierinae	LC
17	Great Orange Tip	*Hebomoiaglaucippe*	Pierinae	LC
18	Common Wanderer	*Pareroniavaleria*	Pierinae	LC
19	Psyche	*Leptosianina*	Pierinae	LC
20	Yellow Orange Tip	*Ixias pyrene*	Pierinae	LC
21	Common Castor	*Ariadne merione*	Biblidinae	LC
22	Plain Tiger	*Danaus chrysippus*	Danainae	LC
23	Striped Tiger	*Danaus genutia*	Danainae	LC
24	Common Crow	*Euploea core*	Danainae	LC
25	Blue Tiger	*Tirumala limniace*	Danainae	LC
26	Dark Blue Tiger	*Tirumala septentrionis*	Danainae	LC
27	Tawny Coster	*Acraea violae*	Heliconiinae	LC
28	Common Leopard	*Phalantaphalantha*	Heliconiinae	LC
29	Common Sailer	*Neptishylas*	Limenitidinae	LC
30	Great Eggfly	*Hypolimnasbolina*	Nymphalinae	LC
31	Danaid Eggfly	*Hypolimnasmisippus*	Nymphalinae	LC
32	Blue Pansy	*Junoniaorithya*	Nymphalinae	LC
33	Chocolate Pansy	*Junoniaiphita*	Nymphalinae	LC
34	Grey Pansy	*Junoniaatlites*	Nymphalinae	LC
35	Lemon Pansy	*Junonialemonias*	Nymphalinae	LC
36	Peacock Pansy	*Junoniaalmana*	Nymphalinae	LC
37	Yellow Pansy	*Junoniahierta*	Nymphalinae	LC
38	Painted Lady	*Cynthia cardui*	Nymphalinae	LC
39	Common Evening Brown	*Melanitisleda*	Satyrinae	LC
40	Common Bush Brown	*Mycalesisperseus*	Satyrinae	LC
41	Indian Sunbeam	*Curetis thetis*	Curetinae	LC
42	Bright Babul Blue	*Azanusubaldus*	Polyommatinae	LC
43	Common Pierrot	*Castaliusrosimon*	Polyommatinae	LC
44	Forget Me Not	*Catochrysopsstrabo*	Polyommatinae	LC
45	Lime Blue	*Chiladeslajus*	Polyommatinae	LC
46	Indian Cupid	*Evereslacturnus*	Polyommatinae	LC
47	Common Cerulean	*Jamidesceleno celeno*	Polyommatinae	LC
48	Zebra Blue	*Leptotesplinius*	Polyommatinae	LC
49	Pale Grass Blue	*Pseudozizeeriamaha*	Polyommatinae	LC
50	Lesser Grass Blue	*Zizinaotis*	Polyommatinae	LC
51	Large Oakblue	*Arhopalaamantes*	Theclinae	LC
52	Common Silverline	*Spindasisvulcanus*	Theclinae	LC
53	Common Straight Swift	*Parnara guttata*	Hesperiinae	LC
54	Indian Palm Bob	*Suastusgremius*	Hesperiinae	LC
55	African Mallow Skipper	*Gomaliaelma*	Pyrginae	LC

56	Indian Grizzled Skipper	*Spialia galba*	Pyrginae	LC

LC-Least Concern.

Annexure – IV

List of Fishes in Kazhuveli Wetland Birds Sanctuary

S.No.	Order	Common Name	Scientific Name	IUCN Status
1	Anguiliformes	Indian Short finned Eel	*Anguilla bicolor*	LC
2	Anguiliformes	Snake Eel	*Pisodonophis sp.*	LC
3	Clupeiformes	Indian Shad	*Hilsa ilisha*	LC
4	Clupeiformes	Bloch's Gizzard Shad	*Nematalosa nasus*	LC
5	Clupeiformes	Gizzard Shad	*Nematalosagalatheae*	LC
6	Clupeiformes	Sardine	*Clupea sp.*	LC
7	Clupeiformes	Anchovy	*Thryssa sp.*	LC
8	Clupeiformes	Anchovy	*Coilia sp.*	LC
9	Gonorynchiformes	Milkfish	*Chanoschanos*	LC
10	Cypriniformes	Spotfin Barb	*Puntius sophore*	LC
11	Siluriformes	Giant River Catfish	*Aorichthysseenghala*	LC
12	Siluriformes	Long-whiskered Catfish	*Mystusgulio*	LC
13	Siluriformes	Striped Dwarf Catfish	*Mystusvittatus*	LC
14	Siluriformes	Stinging Catfish	*Heteropneustes fossilis*	LC
15	Siluriformes	Marine Catfish	*Tachysurussubrostratus*	LC
16	Siluriformes	Gaint Catfish	*Tachysurusthassinus*	LC
17	Siluriformes	Sea cat fish	*Tachysurusarius*	LC
18	Siluriformes	Black Walking Catfish	*Clariusbatrachus*	LC
19	Muguliformes	Common Mullet	*Mugil cephalus*	LC
20	Tetraodontiformes	Puffer	*Tetrodonfluviatilis*	LC
21	Mugiliformes	Largescale mullet	*Liza macrolepis*	LC
22	Mugiliformes	Gold-spot mullet	*Liza parsia*	LC
23	Beloniformes	Congaturi Halfbeak	*Hyporhamphuslimbatus*	LC
24	Beloniformes	Fullbeak Gar	*Strongylurastrongylura*	LC
25	Beloniformes	Estuarine *Ricefish*	*Oryziasmelastigma*	LC
26	Cyprinodontiformes	Dwarf Minnow	*Aplocheilusparvus*	LC
27	Unranked	Glassy Perchlet	*Ambassiscommersoni*	LC
28	Perciformes	NorthernWhiting	*Sillagosihama*	LC
29	Carangiformes	Horse Mackerel	*Caranx para*	LC
30	Perciformes	Splendidponyfish	*Leiognathus splendens*	LC
31	Perciformes	Short silverbelly	*Gerres abbreviatus*	LC
32	Perciformes	Target Perch	*Therapon jarbua*	LC
33	Perciformes	BandedGrunter	*Therapon theraps*	LC
34	Perciformes	BlackspotSnapperr	*Lutjanus fulvivlammus*	LC
35	Perciformes	Spotted Scat	*Scatophagus argus*	LC
36	Perciformes	Streaked Spinefoot	*Siganusjavus*	LC
37	Cichliformes	Pearl Spot/Gree Chromide	*Etroplussuratensis*	LC
38	Cichliformes	Orange Chromide	*Etroplus maculatus*	LC
39	Cichliformes	Egyptian Mouth Breeder	*Oreochromis mossambica*	LC
40	Gobiiformes	Tank Goby	*Glossogobiusgiurus*	LC
41	Anabantiformes	Climbing Perch	*Anabas testudineus*	LC
42	Anabantiformes	Indian Paradise Fish	*Macropoduscupanus*	LC
43	Cypriniformes	Blackline Rasbora	*Parluciosomadaniconius*	LC
44	Cypriniformes	Malabar Loach	*Lepidocephalusthermalis*	LC
45	Anabantiformes	Spotted Snakehead	*Channa punctatus*	LC
46	Anabantiformes	Striped Snakehead	*Channa striatus*	LC
47	Pleuronectiformes	Flounder	*Pseudorhombusarius*	LC
48	Tetraodontiformes	Tripod Fish	*Triacanthusbrevirostris*	LC

Annexure – V

List of Mammals in Kazhuveli Wetland Birds Sanctuary

Sl.No	Common name	Scientific name	IUCN Status
1	Spotted deer	*Axis axis*	LC
2	Jackal	*Canis aureus*	LC
3	Jungle cat	*Felis chaus*	LC
4	Common mongoose	*Herpestes edwardsii*	LC
5	Black naped hare	*Lepus nigricollis*	LC
6	Bonnet macaque	*Macaca radiate*	VU
7	Indian porcupine	*Hystrix indica*	LC
8	Bandicoot rat	*Bandicota indica*	LC
9	Three-striped palm squirrel	*Funambulus palmarum*	LC
10	Indian pangolin	*Manis crassicaudata*	EN
11	Asian Palm Civet	*Paradoxurus hermaphrodites*	LC
12	Mice	*Mus* sp.	LC
13	Short-nosed Fruit Bat	*Cynopterus brachyotis*	LC
14	Flying fox	*Pteropus giganteus*	LC

LC-Least Concern, VU-Vulnerable, EN-Endangered.

Annexure – VI

List of Amphibians in Kazhuveli Wetland Birds Sanctuary

Sl.No.	Family	Common Name	Scientific Name	IUCN Status
1	Bufonidae	Common Indian Toad	*Bufo melanostictus*	LC
2	Bufonidae	Ferguson's toad	*Bufo scaber*	LC
3	Microhylidae	Painted Kaloula	*Kaloulataporbanica*	LC
4	Microhylidae	Marbled Balloon Frog	*Uperodonsystoma*	LC
5	Rhacophoridae	Common Tree Frog	*Polypedates maculatus*	LC
6	Dicroglossidae	Skittering Frog	*Euphlyctiscyanophlyctis*	LC
7	Dicroglossidae	Indian Pond Frog	*Euphlyctishexadactylus*	LC
8	Dicroglossidae	Indian Bull Frog	*Hoplobatrachustigerinus*	LC
9	Brevicipitidae	Indian burrowing Frog	*Brevicepsbreviceps*	LC
10	Brevicipitidae	Southern burrowing frog	*Brevicepsrolandae*	LC

Annexure – VII

List of Reptiles in Kazhuveli Wetland Birds Sanctuary

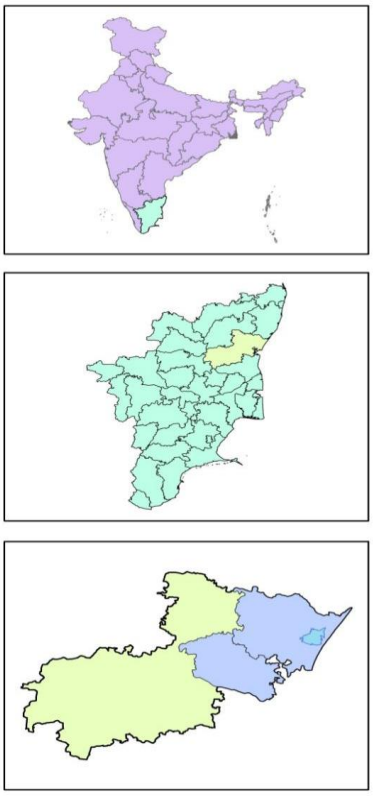
Sl.No.	Order	Family	Common Name	Scientific Name	IUCN Status
Turtles & Tortoises					
1	Testudines	Geoemydidae	Indian Pond Terrapin	*Melanochelystrijuga*	LC
2	Testudines	Trionychidae	Indian Flapshell Turtle	*Lissemys punctata*	VU
3	Testudines	Testudinidae	Indian star tortoise	*Geochelone elegans*	VU
Lizards and Geckos					
4	Squamata	Gekkonidae	Southern House Gecko	*Hemidactylusfrenatus*	LC
5	Squamata	Gekkonidae	Bark Gecko	*Hemidactylus leschenaulti*	LC
6	Squamata	Gekkonidae	Brook's Gecko	*Hemidactylus brooki*	LC
7	Squamata	Gekkonidae	Termite Hill Gecko	*Hemidactylus triedrus*	LC
8	Squamata	Agamidae	Peninsular Rock Agama	*Psammophilus dorsalis*	LC
9	Squamata	Agamidae	Common Garden Lizard	*Calotes versicolor*	LC
10	Squamata	Agamidae	Southern Green Lizard	*CalotesCalotescalotes*	LC
11	Squamata	Agamidae	Fan-throated Lizard	*Sitanaponticeriana*	LC
12	Squamata	Chamaeleonidae	Indian Chameleon	*Chameleozeylanicus*	LC
13	Squamata	Scincidae	Brahminy Skink	*Mabuyacarinata*	LC
14	Squamata	Scincidae	Little Skink	*Mabuyamacularius*	LC
15	Squamata	Scincidae	Snake Skink	*Riopa punctata*	LC
16	Squamata	Varanidae	Bengal Monitor	*Varanus bengalensis*	LC
Snakes					
17	Squamata	Typhlopidae	Common Worm Snake	*Ramphotyphlopsbraminus*	LC
18	Squamata	Typhlopidae	Beaked Worm Snake	*Grypotyphlopsacutus*	LC
19	Squamata	Boidae	Common Sand Boa	*Eryx conica*	NT
20	Squamata	Boidae	Red Sand Boa	*Eryx johnii*	NT
21	Squamata	Colubridae	Common Trinket Snake	*Coelognathushelena*	LC
22	Squamata	Colubridae	Common Rat Snake	*Ptyasmucosus*	LC
23	Squamata	Colubridae	Common Kukri Snake	*Oligodonarnensis*	LC
24	Squamata	Colubridae	Russell's Kukri Snake	*Oligodontaeniolatus*	LC
25	Squamata	Colubridae	Barred Wolf Snake	*Lycodon striatus*	LC
26	Squamata	Colubridae	Common Wolf Snake	*Lycodonaulicus*	LC
27	Squamata	Colubridae	Common Indian Bronzeback	*Dendrelaphis tristis*	LC
28	Squamata	Colubridae	Common Vine Snake	*Ahaetulla nasutus*	LC
29	Squamata	Colubridae	Indian Cat Snake	*Boiga trigonatus*	LC
30	Squamata	Colubridae	Olivaceous Keelback	*Atretiumschistosum*	LC
31	Squamata	Colubridae	Buffstriped Keelback	*Amphiesma stolata*	LC
32	Squamata	Colubridae	Checkered Keelback	*Xenochrophis piscator*	LC
33	Squamata	Elapidae	Slender Coral Snake	*Callophismelanurus*	LC
34	Squamata	Elapidae	Common Indian Krait	*Bungarus caeruleus*	LC
35	Squamata	Elapidae	Indian Cobra	*Naja naja*	LC
36	Squamata	Viperidae	Saw-scaled Viper	*Echiscarinatus*	LC
37	Squamata	Viperidae	Russell's Viper	*Daboia russelli*	LC

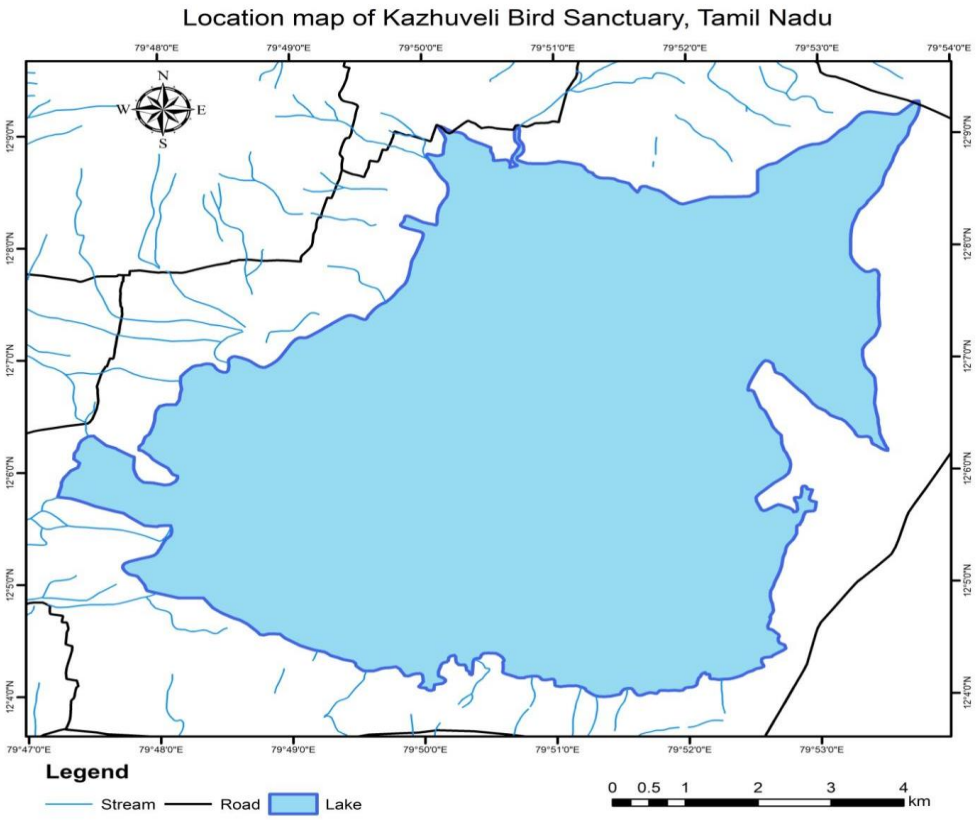
Wetland Bird Census data at Kazhuveli Landscape, Tindivanam Range, Villupuram Division 2023

S.No	Transact place / Birds order	Kazhuveli Birds Sanctuary	Attikuppam lake	Edivanthittu	K-Salt pan	Erimedu lake	Acharampattu	Total
1	Anseriformes	5409	314	0	68	30	14	5835
2	Galliformes	12	1	0	0	0	0	13
3	Phoenicopteriformes	0	0	0	30	0	0	30
4	Podicipediformes	10	18	0	0	1	2	31
5	Columbiformes	22	0	0	0	0	5	27
6	Pterocliformes	0	0	0	0	0	0	0
7	Cuculiformes	5	0	0	0	0	0	5
8	Caprimulgiformes	0	0	0	0	0	0	0
9	Apodiformes	186	45	0	17	0	10	258
10	Gruiformes	381	66	0	0	18	20	485
11	Charadriiformes	2108	410	144	240	67	22	2991
12	Procellariiformes	0	0	0	0	0	0	0
13	Ciconiiformes	1498	295	0	109	0	2	1904
14	Suliformes	766	674	5	23	10	5	1483
15	Pelecaniformes	4723	1790	84	114	38	41	6790
16	Accipitriformes	1	0	0	0	0	0	1
17	Strigiformes	0	1	0	0	0	0	1
18	Trogoniformes	0	0	0	0	0	0	0
19	Bucerotiformes	0	0	0	0	0	0	0
20	Coraciiformes	171	36	7	13	6	4	237
21	Piciformes	3	0	0	0	0	0	3
22	Falconiformes	0	0	0	0	0	0	0
23	Psittaciformes	20	3	0	4	0	0	27
24	Passeriformes	771	336	79	120	19	13	1338
		16086	3989	319	738	189	138	**21459**

MAP I

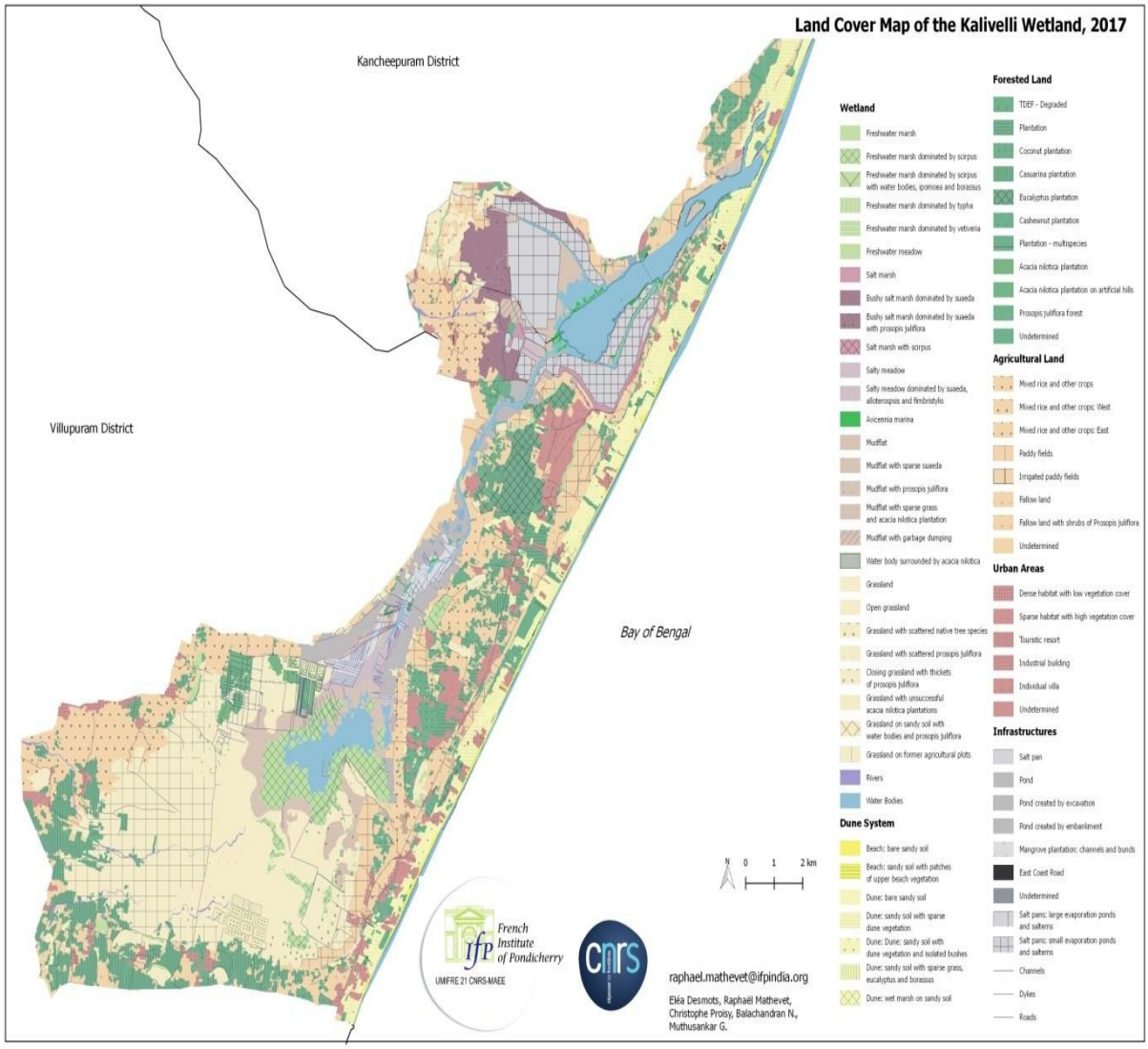
KAZHUVELI WETLAND BIRD SANCTUARY LOCATION MAP





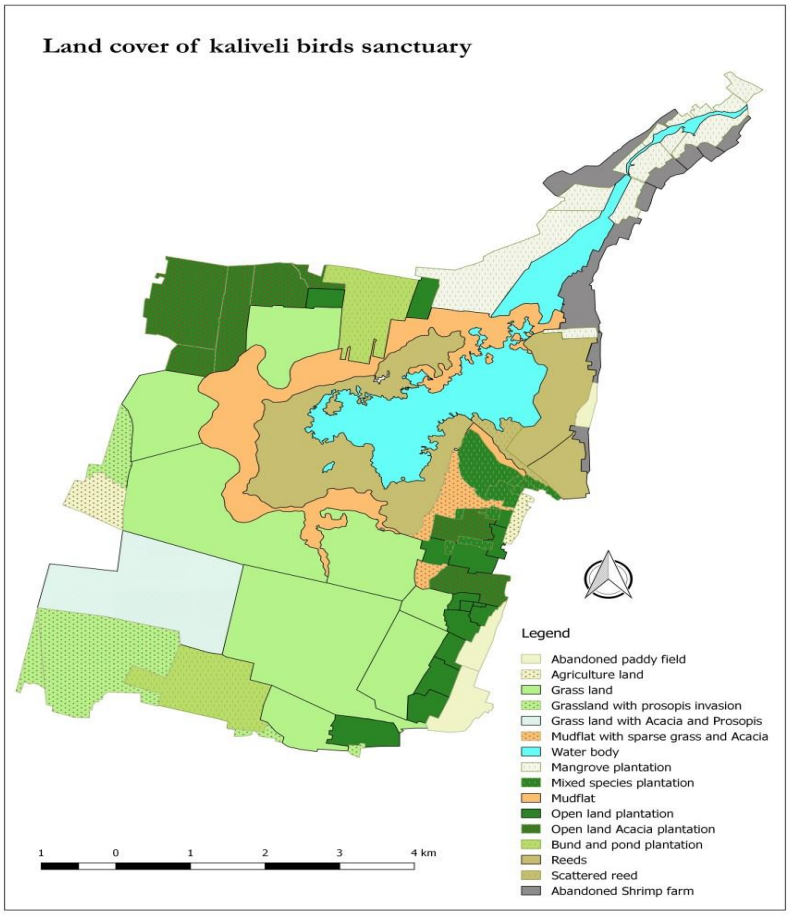
MAP II

KAZHUVELI WETLAND BIRD SANCTUARY LULC MAP



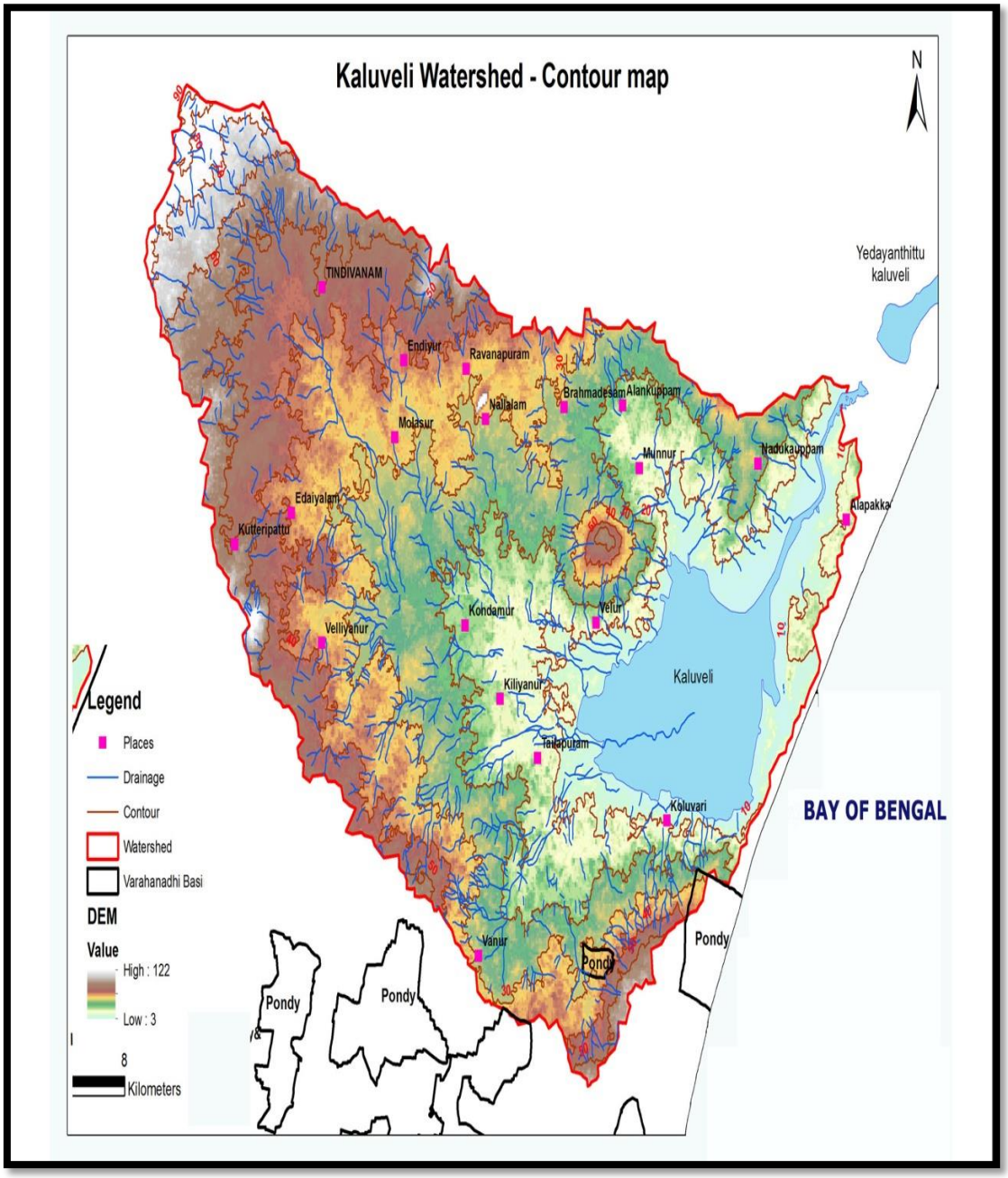
MAP III

KAZHUVELI WETLAND BIRD SANCTUARY LAND COVER MAP



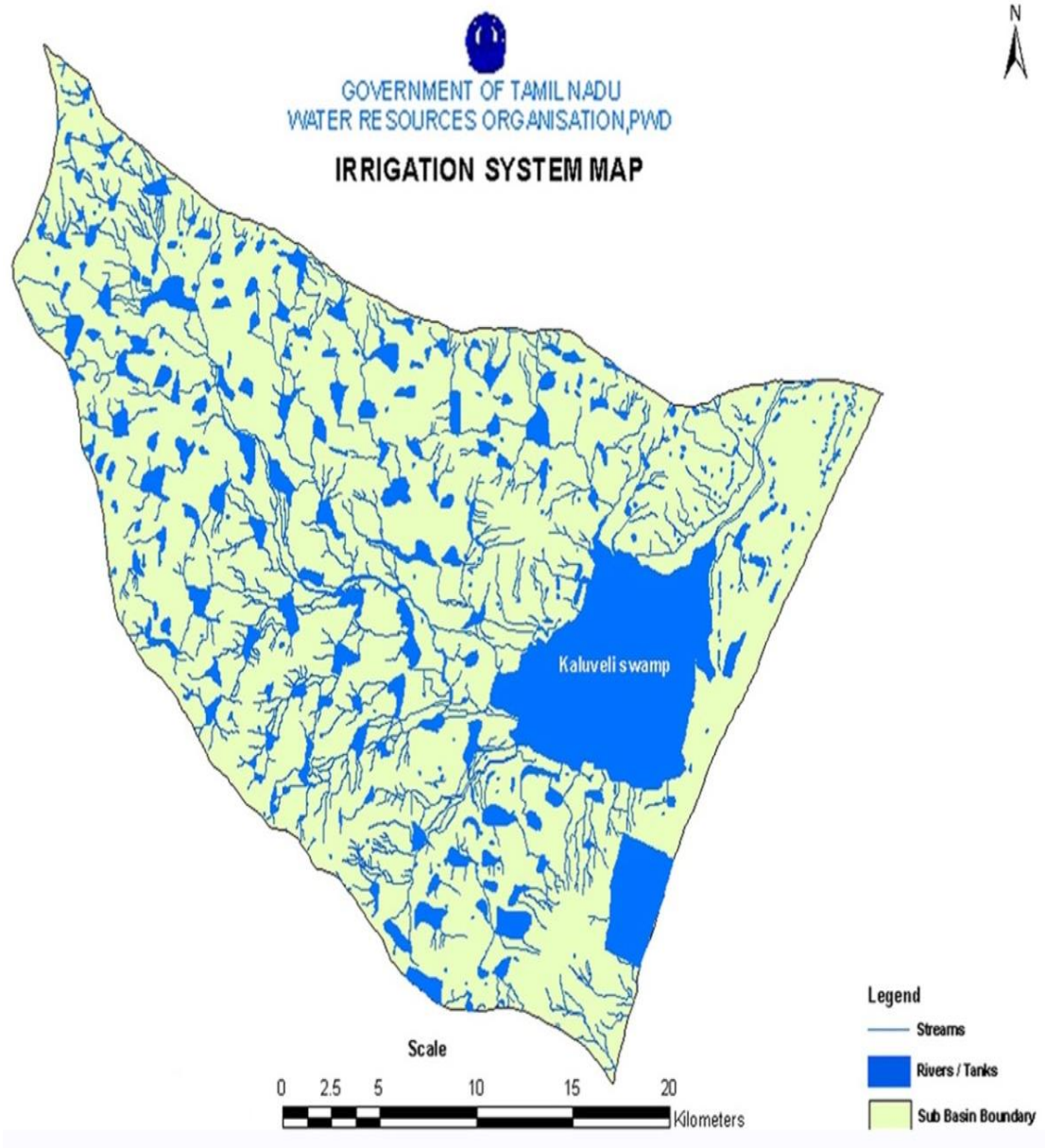
MAP IV

KAZHUVELI WETLAND BIRD SANCTUARY CONTOUR MAP



MAP V

KAZHUVELI WETLAND BIRD SANCTUARY WATERSHED MAP



Annexure – VIII

Details of Tourist visiting the Kazhuveli Wetland Bird Sanctuary from 2015 to 2023

NIL

Appendix IX

Details of Forest Offences detected and compounding fees collected in KAZHUVELI WETLAND BIRD SANCTUARY from 2021 to 2023

Sl No	Year	No. of Offences detected	Compounding fees collected	Remarks
1.	2020-21	3	55000	
2.	2021-22	NIL	NIL	
3.	2022-23	3 nos	38000	

Appendix X

LIST OF BUILDINGS		
Sl.No	**Name of buildings**	
1	Resthouse	1
2	Single Forest GuardWatcher Quarters	-
3	Toilet	-
4	Watch tower	-
5	Observation platform	-
6	Interpretation centre **Ornithology conservation centre (under construction)**	1
7	Information Centre Old	-
8	Anti-poaching shed	-
9	Entrance Arch	-
10	Rest Room (Including that for differently abled)	-

MARAKKANAM REST HOUSE

List of Buildings

Vandipalayam Road

Watch Tower

Ornithology conservation centre