1   **STATUS OF WETLANDS IN THE COIMBATORE DISTRICT, TAMILNADU, INDIA**

2 **ABSTRACT**

The present investigation was carried out to study the status of wetlands in the Coimbatore district in the TamilNadu, for the period of November 2016 to March 2017. Out of 49 wetlands, less than10 acres occupies 26%, between 11-100 acres represent 51%, 101-250 acres occupies 17% and above 250 acres contain 6% of wetlands. Compare with previous records, 51% wetlands are being used, 32% of wetlands vanished before six years and 17% of wetlands gone within 5 years. During every summer season, 53% of wetlands get dried out, 19% were partially dried up and 28% of wetlands remain as such water holding throughout the year. In Coimbatore district, 55% of wetlands were polluted by degradable and non degradable waste, 15% degradable waste, 11% non degradable waste and 19% of wetlands were out of waste dumping. According to the usage of wetlands, 20 wetlands used for irrigation, 13 wetlands used for fishing, 7% of wetlands were used for washing clothes and cleaning cattle and 2.2% of wetland used as drinking source. Presently 28 wetlands were usable and the rest of 19 wetlands were non usable. The results represented that decline of wetlands in Coimbatore district is due to waste dumping, construction nearby wetlands, lack of desilting and dredging, blocking water channel and lack of strict law.

3 *Keywords: {Wetlands, Status, Wetland, Pollution, Anthropogenic activities, Conservation, Coimbatore}*

4   **1. INTRODUCTION (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)**
5
6 Wetlands are areas of land that are either temporarily or permanently covered by water which means that a

7 wetland is neither truly aquatic nor terrestrial; it is possible that wetlands can be both and at the same time

8 depending on seasonal variability. India, with its annual rainfall of over 130 cm, varying topography and climatic

9 regimes, supports diverse and unique wetland habitats (Prasad et al., 2002). These wetlands are distributed in

10 different geographical regions ranging from Himalayas to Deccan plateau. Indian wetlands are mostly

11 associated with river systems distributed from the cold, arid zone of Ladakh, and the warm, arid zone of

12 Gujarat-Rajasthan to the tropical monsoon of central India and the wet, humid zone of the southern

13 peninsula.(Bharath H Aithal et al., 2012).

14 Based on the Country report of Directory of Asian Wetlands (Woistencroft et al., 1989); and the Directory of

15 Indian Wetlands 1993 (WWF and AWB, 1993), the areal spread of wetlands in India was around 58.3 m ha. The

first scientific mapping of wetlands of the country was carried out using satellite data of 1992–1993 by Space Applications Centre (SAC), Ahmedabad. The exercise classified wetlands based on the Ramsar Convention definition. This inventory estimated the areal extent of wetlands to be about 7.6 m ha (Garg et al., 1998) As per the National Wetland Atlas (2011), 61% of Tamil Nadu's wetlands are classified under lakes, ponds and tanks. As noted above 24684 wetlands have been mapped in the state. In addition, 18294 small wetlands (< 2.25 ha) have also been identified. Total wetland area estimated is 902534 ha, which is around 6.92% of the total geographic area. Of this, the major wetland types are lake (316091 ha), tank (237613 ha), river / stream (136878 ha), and reservoir / barrage (56419 ha). Area under mangrove is around 7315 ha. Coral Reef (3899 ha) exists mainly in Ramanathapuram district. Proportionately, among the 30 districts in the state, the Ramanathapuram district has as high as 18.05% of geographic area under wetlands while it is as low as 1.08% in Coimbatore. In terms of total wetland area, Kancheepuram is the leading district (80445 ha, 8.91%) and Chennai is trailing (917 ha, 0.10 %)(Goldin Quadros et al., 2014). In India, wetlands were increasingly facing several anthropogenic pressures. Thus, the rapidly expanding human populations, large scale changes in land use/land cover, burgeoning development projects and improper use of watersheds have all caused a substantial decline of wetland resources of the country. Lack of good governance and management are also major reasons (Kumar et al., 2013a). Introduction of exotic species like water hyacinth (*Eichornia crassipes*) and salvinia (*Salvinia molesta*) have threatened the wetlands and clogged the waterways competing with the native vegetation. In a recent attempt at prioritization of wetlands for conservation, (Samant 1999) noted that as many as 700 potential wetlands do not have any data to prioritize. Many of these wetlands are threatened (Prasad et al., 2002). Hence, the demand for wetland products (e.g., water, fish, wood, fiber, medicinal plants etc.) will increase with increase in population. The wetlands of Coimbatore are known to have served the society for over 800 years and continue to do so despite serious setbacks and pressures. The lakes that were aimed at flood control, ground water recharge and irrigation were indiscriminately exploited for industrial and agricultural purposes in due course of time. The main objectives of the present study is to record the present status of wetlands in Coimbatore district and influenced based on the anthropogenic activities on wetlands.

2. MATERIAL AND METHODS
STUDY AREA

Coimbatore is the second largest city in the Indian state of TamilNadu, it is located at 11°00′58″N 76°58′16″E11.0161°N 76.971°E, surrounded by the Western Ghats of mountains range to the west and north. Administratively district is divided into six tehsil and twelve blocks fig1 .the district head quarters is located in the north central part of the region. The temperature ranges between 18.32 °C in the month of

48   January and 36.42℃ in the month of April. The area is bounded by the Western Ghats on the west, Nilgiri

49   hills in the North West and anaimalai and palani hill in the south. Coimbatore emerged as one of the state's

50   business hubs in post-colonial India.   The city's economy is now dominated by the manufacturing,

51   information technology, and textile industries. Two Special Economic Zones (SEZs) attract domestic and

52   international investment into the city, and Coimbatore continues to rank highly in surveys of business

53   atmosphere and potentials.

54   The city is part of a wealthy and highly industrialized belt on the western part of Tamil Nadu state.

55   Coimbatore is an important producer of textiles, leather, automotive components, and other manufactured

56   goods. The area under the jurisdiction of the Corporation increased from 105 square kilometers to 257

57   square kilometers. The city is now administratively governed by being separated into five zones - North,

58   South, East, West, and Central - and has 100 wards that are split between the zones. Coimbatore,

59   considered as South Indian Manchester is gifted with a unique spread of a number of wetland water bodies

60   that store rain water, recharge groundwater and provide shelter for a vast array of biodiversity. The river

61   gets flooded only during monsoons. Rest of the days it is almost dry. The Coimbatore forest range is spread

62   over an area of 700 sq. km. (or nearly 10 per cent of the total district area) and flanked by

63   Sathyamangalam, Erode, and Nilgiris Forest Division in the north and Palghat Forest Division of Kerala in

64   the south. Located within the core zone of the Nilgiri Biosphere Reserve (NBR), Coimbatore forest division

65   is divided into six administrative sub-divisions, namely Bolampatty, Coimbatore, Perianaichenpalayam,

66   Karamadai, Mettupalayam and Sirumugai(WWF–INDIA, 2011).

67   **Fig1.** The study area of wetland in Coimbatore district

68
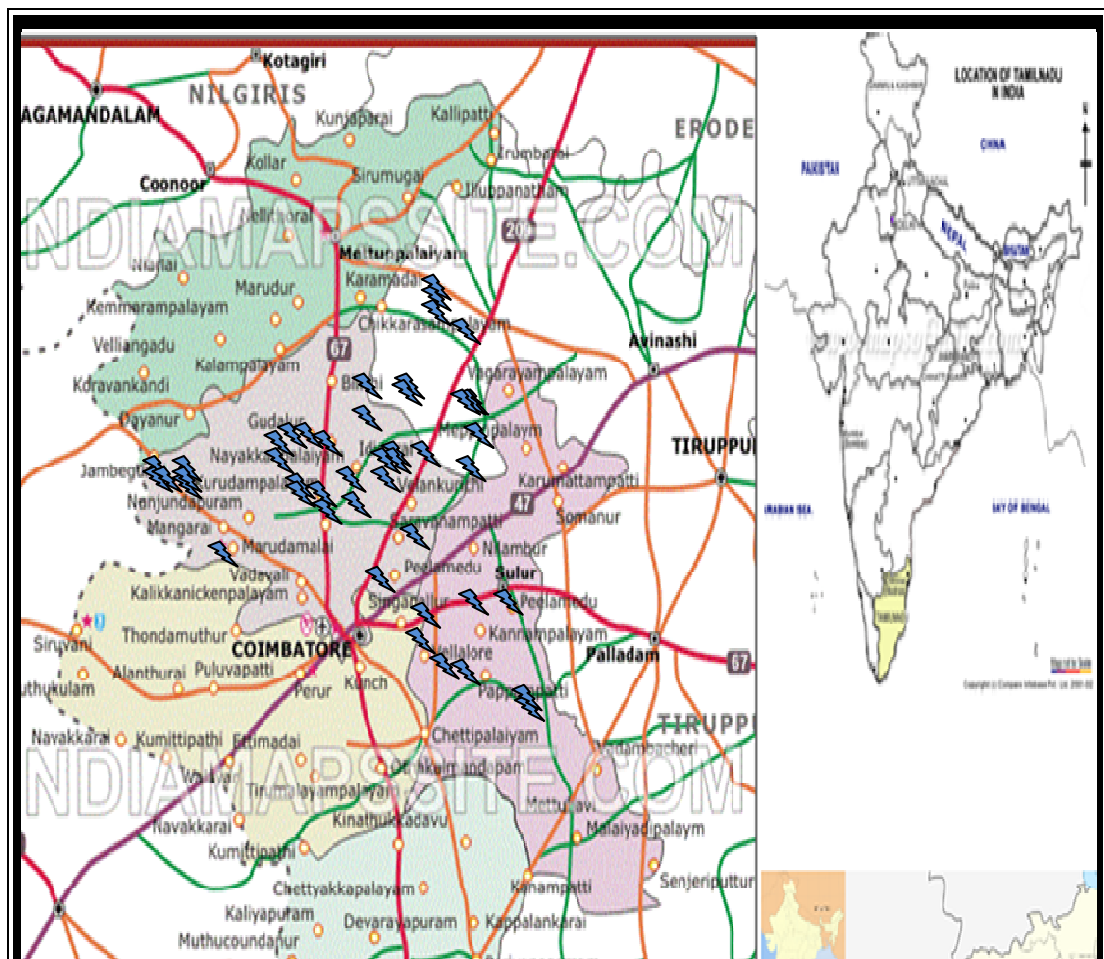
Scale 1:25000 map info.

METHODS

The present study was conducted by means of a questionnaire survey. The study assessed the status of the wetlands in Coimbatore, from November 2016 to March 2017. Before the start of the actual data collection, preliminary survey was conducted during mid-October 2016. A total of 47 wetlands were surveyed in 40 villages. The questionnaire was designed to collect data on the situation of wetlands towards the conservation challenges in Coimbatore district. Data on wetland status in Coimbatore in previous years from 2000 to 2016 were collected from local NGO's and Government record which were used to make comparative studies on wetland status in Coimbatore district. The data were analyzed using SPSS (Statistical Package for Social Sciences) 17 version computer software program.

3. RESULTS
Table 1. Wetlands status in Coimbatore district.

Wetland name	Dryness	Condition	Usage	Waste	Anthropogenic Impacts

Agrahara Samakulam, ★★★	GII	Usable	Irrigation	IV	Farmland
Avalappampatti pond, ★	GI	Usable	Irrigation	III	Farmland
Belladhi lake, ★★	GV	Usable	Irrigation, Fishing	IV	Farmland
Chinnakulam, ★★	GV	Non Usable	-	III	Farmland
Chinnakulam, ★★	GI	Non Usable	Fishing	III	Companies/Factories
Chinnavedampatti lake, ★★★	GIII	Usable	Irrigation	I	Farmland
Devarayapuram pond, ★★	GII	Usable	Irrigation	IV	Farmland
Ganga Narayana Samudram,★★	GI	Usable	-	II	Companies/Factories, Farmland
Gramakulam, ★	GII	Non Usable	Other purpose	III	Farmland
Irugur lake, ★★	GV	Non Usable	-	III	Farmland
Jakkarpalayam lake, ★★	GV	Usable	Irrigation, Other purpose	I	Farmland
Kadathur lake,★★★	GIV	Usable	Irrigation	III	Companies/Factories, Farmland
Kalapatti lake, ★★	GV	Non Usable	-	II	Companies/Factories
Karamadai pond 1, ★	GV	Non Usable	-	III	Residential area
Karamadai pond 2, ★	GV	Non Usable	-	III	Farmland
Karatupadi kuttai, ★	GV	Usable	Irrigation	III	Farmland
Katakaran kuttai, ★	GII	Usable	Irrigation	I	Farmland
Kondayampalaym lake, ★★	GII	Usable	Other purpose	III	Farmland
Kothavadi kulam★★★★	GIII	Usable	Irrigation	IV	Farmland
Kottaipalayam lake, ★★	GII	Usable	Other purpose	III	Farmland
Krishna pond, ★★	GV	Non Usable	-	III	Farmland
Krishnampathy lake, ★★	GV	Non Usable	Fishing	III	Farmland
Kurichi lake, ★★★	GV	Non Usable	Fishing	III	Residential area

Muthannan lake, ★★	GV	Non Usable	Fishing	III	Companies/Factories, Residential area
Narasampathy lake, ★★	GV	Non Usable	-	III	Farmland
Perur big lake, ★★★	GV	Usable	Irrigation, Fishing	I	Farmland
Pudukulam, ★★	GV	Usable	Other purpose	II	Farmland
Samathur pond, ★★★	GI	Usable	Fishing	IV	Farmland
Selambanur kuttai, ★	GIV	Usable	Irrigation	I	Farmland
Sellapampalayam lake 2, ★★	GII	Usable	Irrigation	III	Farmland
Sellappampalayam lake, ★★	GII	Usable	Irrigation	III	Farmland
Selvampathy lake, ★★	GV	Non Usable	Fishing	III	Farmland
Selvasinthamani lake, ★★	GV	Non Usable	-	III	Residential area
Sengulam, ★★	GV	Usable	Irrigation, Fishing	I	Farmland
Senguttampalayam pond, ★	GI	Usable	Irrigation	III	Farmland
Singanallur lake, ★★★★	GV	Non Usable	Fishing, Other purpose	III	Companies/Factories
Sottayandi kuttai, ★★	GV	Usable	Other purpose	II	Companies/Factories, Farmland
Sundakamuthur lake, ★	GI	Usable	Other purpose	III	Farmland
Theppakulam, ★	GV	Non Usable	-	III	Residential area
Ukkadam big lake, ★★★	GV	Non Usable	Fishing	III	Residential area
Valankulam lake, ★★	GI	Non Usable	-	II	Companies/Factories
Valasu kulam, ★★	GI	Usable	Irrigation	IV	Farmland
Vellalore lake, ★★	GII	Non Usable	-	III	Farmland
Vellerukampalayam lake, ★	GII	Usable	Irrigation	IV	Farmland
Vettaikarankulam, ★★★	GV	Usable	Fishing, Drinking, Other purpose	IV	Farmland

Viraliyur kuttai, ★	GIII	Usable	Irrigation	I	Farmland
Walayar reservoir, ★★★★	GV	Usable	Irrigation, Fishing	IV	Farmland

81

82   ★ 0-10 Acres, ★★ 11-100 Acres, ★★★ 101-250 Acres, ★★★★ more than 250 Acres.

83   GI: >5years, GII: 6-10 years, GIII: 11-15 Years, GIV: above 15years, GV: Never dried

84   I: Degradable, II: Non Degradable, III: Both waste, IV: No Waste

85 Based from this study, recorded 47 wetlands in Coimbatore district. According to the area of the wetlands they

86 were classified them under four groups. The Group I (n=12), which is less than 10 acres in size and occupies

87 about 26% of total wetlands, whereas wetlands under Group II (n=24), is between 11-100 acres represent 51%

88 of wetlands, Group III (n=8), wetlands are large in size (101-250 acres) occupies 17% and Group IV (n=3), are

89 largest in size (more than 250 acres) which occupies 6% were recorded. Compare with past data's, the

90 wetland were recorded into five categories (n=8) less than 5 years, (n=10) between 6 to 10 years, (n=3) 11 to

91 15 years, (n=2) above16 years and   (n=24) wetlands never dried. From the total of 47 wetlands, 51% wetlands

92 are being used, 4% of wetlands vanished before fifteen years,22% of wetlands left before 10 years,17% of

93 wetlands disappeared within 5 years and 6% of wetlands dried more than 16 years ago. Among the wetland

94 status in Coimbatore district represent that 53% of wetlands (n=25) were dried up, 4% of the wetlands were

95 partially dried, 15% wetlands (n=13) in stagnant water and 28% of wetlands remain as such water holding

96 throughout the year were observed.

97 Different types of wastes were recorded dumped in and around the Wetlands of Coimbatore district. The waste

98 materials were classified as I. Degradable (Food waste, Wooden waste, Clothes, Glass bottles), II. Non

99 degradable (Plastic, Polythene products), III. Absence of waste, IV. Degradable/ Non degradable wastes

100 observed. Out of (forty seven) wetlands, 55% of wetlands in Coimbatore district were polluted by degradable

101 and non degradable waste including food waste, wood waste, clothes, glass products, plastic and polythene

102 products. 15% of wetlands containing degradable waste, Non degradable waste dumped in 5 wetlands which

103 represent 11% and 19% of wetlands were out of pollution were observed.

104 We have recorded based on the usage of Wetlands in Coimbatore district including villages and urban areas.

105 The usages were subdivided into I. Irrigation, II. Fishing, III. Drinking, IV. Other uses, V. Not used. According to

106 the usage of wetlands in Coimbatore district which represent, 20 wetlands (36%) were used for irrigation

107 purposes, 13 wetlands (24%) were used for fishing, and 7% of wetlands were used for other purpoese like

108   washing clothes and cleaning cattles and 2% of wetland used as drinking source in Coimbatore district. Based

109   on the present condition of wetland in Coimbatore district were categorised into two subdivisions. I. Usable

110   condition, II. Non usable condition. Among 47 Wetlands (n=28) represent 60% which were usable and the rest

111   of (n=19) wetlands represent 40% were non usable (sewage, effluent mixed). The usable wetlands accounted

112   28 wetlands and mentioned in Table 1. The depths of various wetlands were recorded in Coimbatore district.

113   According to the category wise were divided into four types. Six wetlands had a depth of (0-10 feet) which has

114   13%, (n=20) wetlands which contain 11-20 feet in depth, which represent 17(43%) wetlands depth about 21-30

115   feet represent 36% and 4 wetlands above 30 feet depth were observed. Based on the colour of wetlands we

116   differentiate (n=11) Green in color, (n=2) Black in color, (n=3) Colourless, (n=6) Greenish black in color. From

117   the total wetlands, 50% of the Wetlands are green in colour, 9% of the Wetlands are black in colour, 27% of the

118   Wetlands are greenish black in colour, 14% of the wetlands are colourless which were recorded during the

119   study period.

120   The following anthropogenic were observed in and around the wetlands in Coimbatore district.

121   I.Companies / factories (coir mills, automobile workshop, industrial manufacturing companies), II. Farm land, III.

122   Building construction (residential home, slums, government office, private companies).The study showed that

123   72% wetlands were surrounded by farmland, 16% are covered by companies or factories, 12% wetlands are

124   occupied by residential area. Under subdivision I, 8 Wetland were recorded (Singanallur pond, Valankulam,

125   Kalapatti lake, Ganga narayana samudram, Sottayandi kuttai, Muthannan kulam, Kadathur lake, Chinnakulam)

126   during the present study. The recent changes in wetlands were within the last 5 years to identify the various

127   anthropogenic activities. Based on the changes the wetlands were classified the wetlands into I. changes

128   occurred in the area of the Wetland, II. Changes occurred in water quality, III. No changes etc. Under these

129   categories (n=28), 57% of Wetlands have never changed its characteristics in recent times, the water quality

130   have been changed in (n=18) 37% of wetlands and the area have been occupied in (n=3) 6% of the total

131   wetland. The area have been occupied in 3 Wetlands (Valankulam, Muthannan kulam, Kothavadi kulam) in the

132   form of slums, constructions and farmlands which were observed during the present study period.

133   **DISCUSSION**

134   Entire regions of india's land surface were altered through long term human use and manipulation (e.g intensive

135   cropping, deforestation, intensive grazing and alteration of water flows).(Lee Foote et al., 1996). The study also

136   revealed that fifty percentage (50%) of wetlands vanished in Coimbatore district due to decline water holding

137   capacity, lack of desilting, building construction, dredging, blocking water channels and spreading of *Vachelia*

138   *nilotica* species influence the decline of wetlands status in Coimbatore district. Earlier investigations have

139   revealed that nearly 30% of lakes are used for irrigation. Fishing is being carried out in 25% of lakes surveyed.

140   About 36% of the lakes were used for washing purpose and only 3% are used for drinking. Agriculture along

141   drying margins is practiced in 21% of lakes. Approximately 35% of lakes are used for grazing by cattle. Mud

142   lifting was recorded in 30% and brick making in 38% of the lakes (Krishna et al., 1996). Throughout India the

143   landscape development pattern shows that wetland adjacent areas provide excellent dry season foraging

144   opportunities for grazers and irrigation. The study observed that twenty five of wetlands were dried up during

145   summer time due to poor water holding capacity and without desilting process. the dried out wetlands are use

146   for cattle grazing and dumping of waste materials all over Coimbatore district.

147   Water in most Asian rivers, lakes, streams and wetlands has been heavily degraded, mainly due to agricultural

148   runoff of pesticides and fertilizers, and industrial and municipal wastewater discharges, all of which cause

149   widespread eutrophication (Liu and Diamond, 2005; Prasad et al., 2002). More than 50,000 small and large

150   Indian lakes are polluted to the point of being considered as dead wetlands. The primary sources of pollution

151   are human sewage, industrial pollution and agricultural runoff which contain pesticides, fertilizers and herbicide

152   (Gopal, 1995). The study supported that 81% of wetlands in Coimbatore district were polluted by degradable

153   and non degradable waste material. According to Scott and Pole's (1989) listing, 45% of all Indian wetlands are

154   considered moderately to highly threatened. No single effort is going to protect these wetlands(Lee Foote et al.,

155   1996). The present study showed that twenty wetlands were used for irrigation purposes, thirteen wetlands

156   used for fishing, (7%) of wetlands were used for washing clothes and cleaning cattles and two percentage (2%)

157   of wetland used as drinking source in Coimbatore district. Overall in Coimbatore district twenty eight wetlands

158   were usable and the rest of nineteen wetlands were non usable. Silt deposit had reduced the water storage

159   capacity in major wetlands by 30 -40 %. The study observed that wetlands in Coimbatore district reduced due to

160   silting and dredging.

161   The colour of the polluted water bodies were mostly greenish indicating eutrophication mainly due to algal blooms

162   followed by the contribution of effluents from domestic and industrial sources. Nearly 23% of lakes show

163   eutrophication due to inflow of sewage (Chakrapani et al., 1996). The study also supports that wetlands colour in

164   Coimbatore contain Green, Black, Greenish Black and Colourless. Many wetlands are used as dumping yards

165   for either municipal solid waste or building debris. The surrounding of these lakes have illegal constructions of

166   buildings and most of the times, slum dwellers occupy the adjoining areas (Ramachandra et al.,2012). Lack of

167   conformity among government policies in the areas of economics, environment, nature conservation,

168   development planning is one reason for the deterioration of these water bodies (Turner et al., 2000).The study

169 showed that seventy two percentage (72%) wetlands were surrounded by farmlands, 16% are covered by

170 companies or factories, twelve percentage (12%) wetlands are occupied by residential areas.

171 The river and the river-fed wetlands support a large number of plants (Chandrabose and Nair, 1988)

172 and animals including migratory species of birds. Wetlands in India support around 2400 species and

173 subspecies of birds. But losses in habitat have threatened the diversity of these ecosystems (Mitchell & Gopal

174 1990). Most of these wetlands get dried in summer and serves as a dumping yard for garbage and industrial

175 wastes.(Mohan raj et al., 2000). From the study it is observed that the wetlands supports the presence of

176 eleven(11) birds species in and around wetlands in Coimbatore district.

177 **4. CONCLUSION**
178
179 In Coimbatore district forty nine percent (49%) of wetlands vanished within 20 years of time due to

180 anthropogenic activities. Apart from government regulation, better monitoring mechanism are needed to

181 increases the knowledge of the physical, chemical and biological characteristic of wetlands resources.

182 Awareness implemented through government and NGO for popularization of the importance of the lakes,

183 wetlands and their role in aquatic biodiversity and sustenance of human civilization.

184 **CONSENT**
185 Authors may use the following wordings for this section: "All authors declare that 'written informed consent was
186 obtained from the patient (or other approved parties) for publication of this case report and accompanying
187 images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board
188 members of this journal."
189
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FIG 2 -WETLAND PHOTO

1. Sellapampalayam big lake, 2.Sellapampalayam Lake, 3.Chinnavedampatty Lake, 4.Devarayapuram pond,

5. Vellerukampalyam lake, 6. Belladhi lake, 7. Karamadai pond, 8.Karamadai pond, 9.Singanallur lake,

10.Valankulam, 11. Aavalappampatti lake, 12. Karattupadi lake, 13. Senguttampalayam pond, 14. Walayar,

15. Kalapatti pond

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Continued

16. Ganga Narayana Samudram, 17. Narasampathy lake, 18. Perur Big lake, 19. Sottayandi kuttai

20. Vedapatti lake, 21. Krishnampathy lake, 22. Muthannan lake, 23,24. Selvampathy lake,

25.Krishna pond, 26.Samathur pond, 27. Theppakulam, 28. Jakkarpalayam pond, 29. Kothavadi lake,

30. Irugur lake

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Continued

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269   31.Malumichampatty pond, 32.Valasukulam, 33.Vettaikaranpudur lake, 34.Agraharasamakulam,

270   35.Kadathur lake, 36.Chinnakulam, 37.Selvasinthamanilake, 38.Sengulam, 39.Sundakamuthurlake,

271   40.Vellalorelake, 41. Kondayampalayam lake, 42. Kottaipalayam pond, 43. Chinnakulam,

272   44. Kattakaran kuttai, 45. Kurichi lake

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Continued

46. Selambanur kuttai, 47. Viraliyur kuttai, 48. Ukkadam lake

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280 **WETLAND SURVEY DATA SHEET**

281 Dates Surveys Performed: Team Name:

282 Team Members: 1. 2.   Wetland name:

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Colour	size (hectares)	Depth	Condition	Usage	Dumping waste	Anthropogenic impacts	Wetland type/Plant species
Comments							

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