सत्यमेव जयते

Thol Wildlife Sanctuary
Management Plan

Thol

FOREST DEPARTMENT
GUJARAT STATE

2014-15 to 2023-24

सत्यमेव जयते

Management Plan

for

Thol Wildlife Sanctuary

2014 - 2024

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Dr. K. Sasikumar, IFS

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Thol Wildlife Sanctuary

1.1 Introduction

Thol Wildlife Sanctuary is situated in Mehsana district of Gujarat state, India between 23° 15' to 23° 30' N latitudes and 72° 30' to 72° 45' E longitudes. It is situated 25 km northwest of Ahmedabad city and a well known birding place near Ahmedabad after Nalsarovar Bird Sanctuary which is about 50 km far from Thol Wildlife Sanctuary. Thol Sanctuary is a shallow water reservoir and feeling like predominant open water areas, devoid of islands, reed beds give it a distinct ambience. Geographically Thol Wildlife Sanctuary falls in the Kadi taluka of Mehsana district, North Gujarat region. Kadi the taluka head quarter of the district is just 22 km away from the Sanctuary.

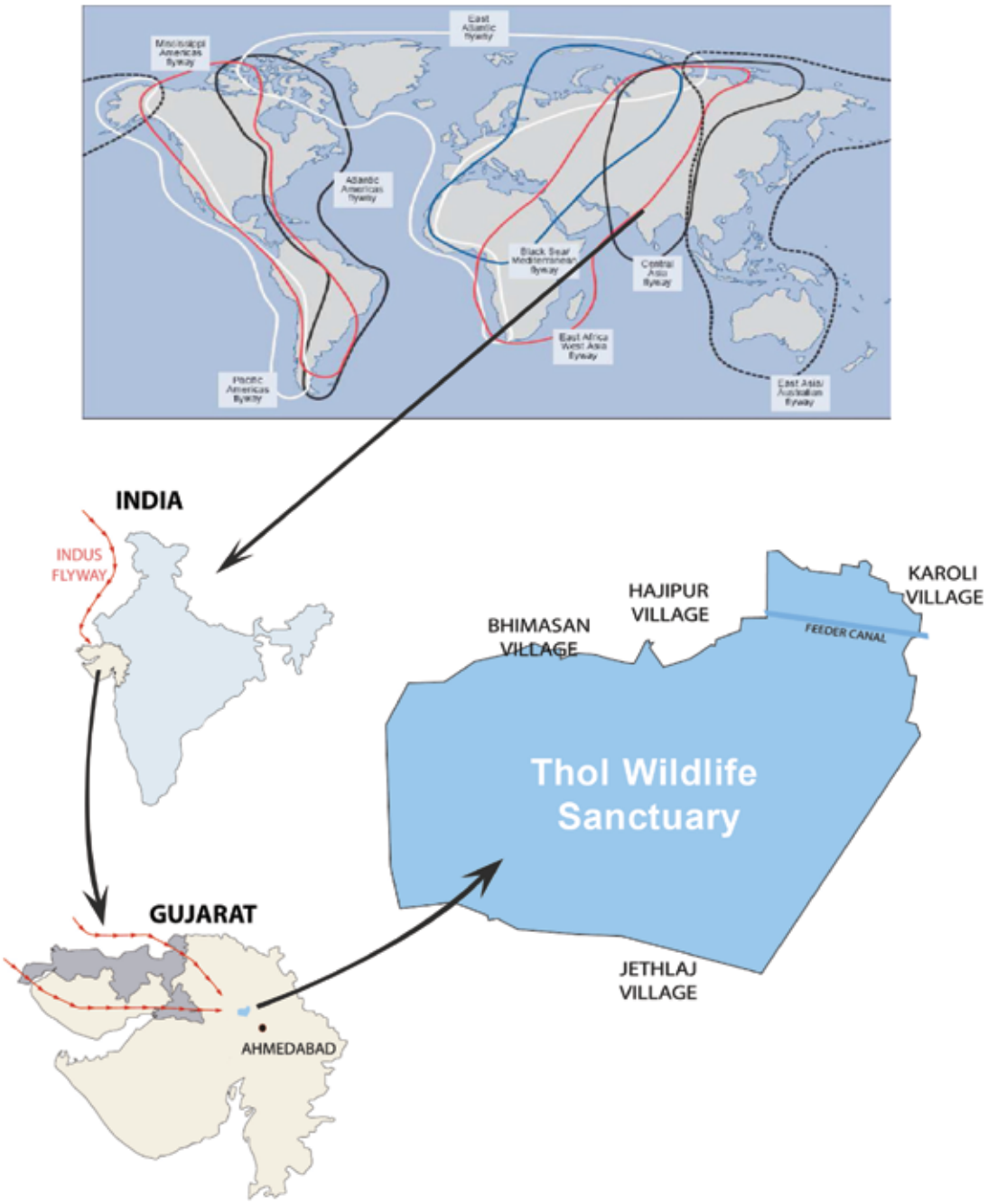
Originally Thol tank was constructed for irrigation purposes by the Gayekwadi State Rulers during the reign of the then Baroda State in the year 1912. It was built to prevent erosion and flooding and to store rainwater for irrigation purposes (Vaghela, 1993). Initially the area was declared as "Game Reserve" vide Government notification dated 29th May 1986 by Forest and Environment Department. Later on due to its popularity amongst the bird fraternity the area was notified as Wildlife Sanctuary through the notification GVN-53-88-WLP-1386-162-V.2 dated 18th November, 1988 under Section 18 of Wildlife (Protection) Act, 1972 (Anno. 2001). Thol Wildlife Sanctuary is among the eight national wetland sites which has been identified and declared for conservation. Thol Wildlife Sanctuary is a man-made irrigation tank spread on west to east line built in 1912 with water storage capacity of 84 MCM. Shallow water reservoir and predominantly open water areas, without island, reed beds give it a distinct ambience. This sanctuary is home to a rich variety of Wildfowl, Flamingos, Grey Pelicans, Black Ibis and other wetland birds. The wetland is predominated by the open water habitat, which is surrounded by cropland, fallow and scrub land.

There are five villages in the periphery of the sanctuary; namely Bhimasan, Hajipur, Karoli, Jethlaj and Thol. There are no villages and settlements inside the sanctuary. The main communities of people living in these villages are Patels, Thakors, Rabaries, etc. where as others like Kumbhar, Brahmin, Darji, Vaghari, Bharwad, Harijan and Muslims also live in nearby areas. Majority of the population is engaged in farming either as landholders or labourers. Others practice animal husbandry or are employed as labourers in industry. Of all the peripheral villages, Thol and Jethalaj is beneficiary of irrigation from the water body.

The Rabari and Bharwad communities are engaged in animal husbandry. The livestock includes cattle, buffaloes, goats and sheep. Other communities also own livestock (mainly cattle and buffaloes) though in less number. The livestock grazes in fallow lands and gauchers (common lands). A considerable number of people are now engaged in

industrial and agricultural labour, while few are employed in the Government as well as private sector.

There are oil wells belonging to the public sector company Oil and Natural Gas Corporation Ltd. (ONGC) within the sanctuary area. There are total 21 number of wells out of which 13 are functional, polymer injection wells are 3 in number and Chase water wells are 5 in number (Map 2). The total oil production from Thol area wells is 102 tpd.



Location Map of Thol Sanctuary with Indus Flyway

1.2. Importance of Thol

Thol water body occupy total area of 699 ha (6.99 sq. km.) and its periphery is 5.62 km long. Thol wetland provides water for agriculture to the six villages i.e. Thol, Jethlaj, Adhana, Vayana, Chandanpura, Jhaloda which spreads 55.95 sq. km It had well-developed canal based irrigation system, there are four head regulators at the water body to control the flow of water. The canals and their distributaries / sub-distributaries are about 19.97 km long.

The tallest flying bird of the world Sarus crane inhabits this area and is found in good number. There are large number of waterfowls which gets attracted to this site due to the agricultural fields surrounding the lake, providing sufficient food to them. The lake is also surrounded by good tree covers. There are about 92 species of waterfowls reported at Thol.

Thol Wildlife Sanctuary (TWS) is center of many small ponds spread around, which supports waterfowl and creates a regime of wetland. Looking to the surrounding terrain, vegetation and proximity to the main city of Gujarat, Ahmedabad, TWS has got tremendous potential to be an important Nature Education Site.

The Wetland consists of characteristic assemblages of species that interact with each other and the environment. These interactions within and between the biotic and abiotic components of wetland ecosystems lead to a flow of ecological functions that provide ecosystem services to the human society. Some of the ecological functions provide direct economic benefits whereas others provide indirect support and protection to an economic activity. Thol Wetlands is positioned in the ecotonal or transitional zones between terrestrial and aquatic ecosystems where the water table is usually at or near the surface of the land, which is covered by the shallow water. Due to these characteristics, the Thol wetlands provide opportunities for adaptations to different plant and animal species leading to high diversity of life-forms. These Thol Wetlands are among the most biologically diverse and productive ecosystems on earth. The interaction of man with Thol Wetlands has been of concern largely due to the rapid population growth – accompanied by intensified industrial, commercial and residential development further leading to pollution of Thol Wetlands by domestic, industrial sewage, and agricultural run-offs as fertilizers, insecticides and feedlot wastes. The fact that these wetland values are overlooked has resulted in threat to the source of these benefits. Apart from the above the absence of reliable and updated information and data on extent of wetlands, conservation values and socioeconomic importance has greatly hampered development of policy, legislation and administrative interventions by the state.

Thol Sanctuary is providing significant ecosystem services in terms of groundwater recharge, erosion control, recreational values, educational value and aesthetic values. It performs important functions of a wetland amidst of metropolitan cities with the presence of more than 92 species and some of them hold the status of globally threatened bird species. It is recognized as an important bird area and a centre for conservation education and recreation. The Sanctuary serves as the educational centre for the surrounding schools and colleges. The Sanctuary serves as one of the important sites for the bird watching, especially during migratory season. Because of its location in the urban landscape, it attracts tourists with a wide range of interests.

Time Line of Thol

Timeline	**Development**
1912	Gaekwad Rulers Baroda State
Before independence	Man made Irrigation tank
	Purpose stop erosion, flooding and store water
27.05.1986	'Game Reserve' Notification
18.11.1988	Sanctuary Notification
14.12.1984	No private rights DM
1999	Gandhinagar to Ahmedabad (SF)
1.12.2000	Ahmedabad (SF) to Sub division
2003	Check post for Tourism
2003	The Government to maintain the water level between 3 feet to 6 feet in the interest of Birds.
30.8.2007	ACF to DCF
Location	Dist-Mehsana, Taluka-Kadi, About 25 km northwest of A'bad between 23 – 15' to 23 – 30' North Latitudes and 72 – 30' to 72 – 45' East Longitudes. Area : Sanctuary area - 6.99 km^2 Catchment area - 320 km^2 Command area - 55.95 km^2
O.N.G.C. well	22 oil Wells of O.N.G.C within the sanctuary per day 105 tan crud oil provide

2

Natural Resources and their attributes

2.1 Location and Boundaries

Thol Sanctuary is located about 25 km northwest of Ahmedabad between 23^0 15' to 23^0 30' N. and 72o 30' to 72 45' E. It is 22 km away from the town of Kadi in district Mehsana.

The legal boundary notification is as follows :

North : Radar Station of Air Force at Village Hajipura, survey nos. 1004, 1006, 8, 7, 9, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78

East : O.N.G.C. Buildings, Jethalajpur and Jethalaj village Survey nos. 615, 35, 36, 46, 1, 2, 48

South : Jethalaj village Survey nos. 451, 459, 410, 461, 462, 1, 2, 463, 491, 1, 495, 49, 2, 500, 1, 2, 3, 499, 1, 2, 508, 509, 510, 1, 2, 512, 513, 1, 2, 514, 526, 531, 533, 534, 537, 1, 2, 3, 538, 539, 540, 541, 542, 1, 2, 543, 544, village forest 385/1.

West : Nasmed village Survey nos. 49, 2, 50, 51, 70, 1, 2, 71, 1, 2, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 1, 2, 83, 84, 85, 86, 1, 2, 93, 94, 95, 96, 97, 99.

2.2. Approach and Access

The nearest city is Ahmedabad, about 25 Kms. The sanctuary is connected by air and railway. Nearest towns are Kadi and Sanand which are Taluka Head Quarters too. The sanctuary is connected through road by State Highway from Sanand-Kadi. State Transport bus services are available, connecting Thol to different locations. Telephone and Post Office facilities are available at Thol village which is just 2 kms away.

2.3. Biodiversity

Thol sanctuary is an important Inland Wetland. The pond and the surroundings area provide excellent habitat to the waterfowl during post monsoon to winter season. 92 Bird Species are reported here. It is a potential Ramsar site as it supports more than 20,000 waterfowl. 15 bird species which are reported here are identified as rare, vulnerable, threatened or endangered globally by various agencies worldwide.

Thol Wildlife Sanctuary (hereinafter mentioned as TWS) also is an important focal wetland for pre-breeding congregation of the Sarus Crane (*Grus antigone*) as well as for its nesting. TWS has got a unique distinction of having one of the highest congregations of Ruffs (*Philomachus pugnax*) in India.

2.3.1 Flora

Emergent and floating aquatic plants are there at Thol Wildlife Sanctuary along with some terrestrial trees and herbs such as *desi baval, bor, neem, vad, pilu, gando baval, kerdo* etc.

2.3.2 Fauna

High species diversity of water birds is the main attraction for an eco-tourist.

List of Important Mammals found in TWS

Scientific name	English name	Local name
Flying Mammals		
Pteropus giganteus	Indian Fruit Bat	Chamachidiyu
Pipistrellus coromandra	Indian Pipistrelle	-
Large Mammals		
Presbytis entellus	Hanuman Langur	Bander
Canis aureus	Jackal	Shiyal
Baselaphus tragocamelus	Blue bull	Nilgai
Small Mammals		
Suncus murinus	Musk Shrew	Chhachhunder
Herpetes edwardsi	Common Mongoose	Noliyo
Paraechinus misfopus	Pale Hedgehog	Shelo
Felis Chaus	Jungle Cat	Jangali Biladi
Lepus nigricollis	Indian Hare	Sasalu
Sus scrofa	Feral Pig	Jungli Bhund

Important birds: Bird communities are often referred as an ideal indicator to monitor the ecological condition of any wetlands as they impact on all the tropic levels of an aquatic ecosystem. On the other hand aquatic ecosystems have significant impact on migratory birds. Birds are the best studied class of organism and various investigations have established their significance as important mobile links (active movement and connect habitats in space and time) in the dynamics of natural and human dominated ecosystems. Birds are one of the diverse ranges of ecological functions among vertebrates. As consumers, they help regulate populations of smaller animals they prey upon, disperse plant seeds, and pollinate flowering plants. Cranes, geese, flamingos, pelicans, egrets, herons, spoonbills, ducks, whistling teals etc. are some of the wetland birds.

Thol Wetlands being fresh water ecosystem are dominated by birds. The birds will be on the highest tropic level. Thol water body has two flagship species such as Sarus Crane (*Grus antigone*) and Osprey (*Pandion haliaetus*) since they represent the present ecosystem which is in need of conservation. They are distinctive in order to engender

support and acknowledgement from the public. It can be appreciated from records that large number of Sarus congregations were seen. It has presence of over 50 birds' which were often seen feeding in the farmlands neighbouring Thol; bird has remained the integral part of this territory (Singh & Tatu, 2000).

Sarus Crane (*Grus antigone*)

Sarus Crane is a large crane that is a resident breeding bird with *disjunct* populations that are found in parts of the Indian Subcontinent, Southeast Asia and Australia. Having height up to 1.8m, it is tallest of the flying birds; they are conspicuous and iconic species of open marshlands. As a species, the Sarus crane is classified as vulnerable this means that the global population has declined by about a third since 1980, and is expected to continue to do so until the late 2010s.

Estimates of the global population suggest that the population in 2000 was at best about 10% and at the worst just 2.5% of the numbers that existed in 1850. Unlike many cranes which make long migrations, the Sarus Crane does not; they may however make short-distance dispersal movements.

Invertebrates: - In freshwater sediments, benthic invertebrates are diverse and abundant, but they are often patchily distributed and relatively difficult to sample, especially when they live in deep subsurface sediments. Therefore, benthos can give us reliable information on stream and lake water quality. Their long life cycles allow studies conducted by aquatic ecologists to determine any decline in environmental quality. Benthos represents an extremely diverse group of aquatic animals, and the large number of species possesses a wide range of responses to stressors such as organic pollutants, sediments, and toxicants. Many benthic macro invertebrates are But there is insufficient information about how individual zoo benthic species interact with one another under the dynamic range of natural conditions in freshwater sediments. The spatial and temporal distributions suggest that benthic species have different preferences for particular ranges of temperature, pH, current velocity, and types of substrata. Colonization suggests that there are important differences which preferred us of microhabitats. Thol Wetlands had presence of 10 species of macro fauna within sanctuary and among them the dominating was *Chironomous* larvae and site 6 had abundance. Chironomidae members are also broadly dispersed and often the most abundant insect species in freshwater ecosystems (Pinder, 1986). Their ecological diversity is proved by their physiological tolerance to environmental stress, such as modifications of salinity or temperature and reduced levels of dissolved oxygen

(Rasmussen, 1984). The larvae are an important food item for fish such as trout, amphibians and insectivorous birds such as swallows and martins. These groups of birds are present in the study area, indicating the species importance in Thol wetland As no study is carried out on micro and macro invertebrates detailed information is not available. Some zooplanktons found in the study by GEER Foundation team are as follows :

Phylum : Protozoa

1. Volvox Spp.
2. Ophryoglenu spp.
3. Amoeboid froms.

Phylum : Rotifera

4. Platyias spp.
5. Hydra – egg.

Phylum : Arthropoda

6. Daphnia spp.
7. Cyclops spp.
8. Cypris spp.
9. Beetle - nymph

Vertebrates :- Although this is a more visible group, available information on vertebrates of TWS is sketchy. The GEER Foundation team observed following animals.

Fishes : Four species of fish have been reported from TWS (Vaghela 1993.) These have been listed below :

1. Ophiocephalus punctatus
2. Heteropheustes fossillis
3. Chela bucaila
4. Barbus stigma

Surprisingly, common species of carps such as Mrigal, Rohu and Catla found in most freshwater reservoirs have not been recorded. The District Gazetteer has recorded eight species of fish in Mehsana (Rajyagor 1975). These are Padi, Nagra, Marel, Kar, Bam, Singie, Dhebar, Supta and Chall (all local names). Ichthyologic studies at Thol Wildlife Sanctuary listed 19 species of fish (Anon. 1998) It is felt that a detailed documentation of the fish fauna of TWS is needed.

Amphibians: Bull frog (*Hoplobatrachus tigerinus*), Marbled Toad (*Bufo stomaticus*).

Reptiles: Rat snake (*Ptyas mucosus*), Cobra (*Naja naja*), Garden Lizard (*Calotes versicolor*), Bengal Monitor (*Varanus bengalensis*), Indian Flapshell Turtle (*Lissemys punctata*).

Mammals: Eight species of mammals have been listed by (Rajyagor 1975) such as Common Langur *(Presbytis entellus)*, Jungle Cat *(Felis chaus)*, Common Mongoose *(Herpestes edwardsi),* Jackal *(Canis aureus)*, Pale Hedgehog *(Parachinus micropus)*, Grey Mask Shrew *(Suncus murinus)*, Indian Flying fox *(Pteropus giganteus) and* Nilgai *(Boselaphus tragocamelus)*.

2.4. Ground water recharge

Thol Wetlands play a critical role in regulating the movement of water. Thol Wetlands store precipitation and surface water and then slowly release the water into associated surface water resources, ground water, and the atmosphere. It helps to maintain the level of the water table and exert control on the hydraulic head. It provides a force for ground water recharge and discharge to other waters as well. The soil, vegetation of the site, perimeter to volume ratio, and water table gradient of Thol acts to support the nearby aquifers. Researchers have discovered ground water recharge of up to 20% of wetland volume per season (Weller 1981). Ground water is vital resources for a region like Mehsana where agriculture, domestic water supply and industry are highly dependent on it. It is also single largest and most productive source of irrigation water and plays a critical role in maintaining agricultural production during droughts. Due to fast urbanization and reduction of agricultural zone, which could have acted as the percolation zone, the replenishing of this ground water is getting difficult and the consequence of which is evident as the scarcity of water. Floodplains in the Sanctuary recharge the ground water.

2.4.1. Geology and Water Quality.

Geologically it is a part of the alluvial plain of recent age. The soil is clayey to sandy clay. There are no hard rock outcrops in and around the sanctuary. The highest average depth of water is 3.04 meter and lowest water depth is 0.60 metre.

2.4.2. Analyses of the Water Quality

Wetland ecosystem is a very queer and delicate balanced system. During the last three or four decades, wetlands throughout the world, in the developed countries, have exhibited an increasing enrichment or eutrophication brought about by man's direct or indirect

influence. They are mainly in the form of excessive dumping of nutrients from varying sources in the form of domestic or industrial effluents, agricultural runoff etc. Which in turn definitely affect the biotic and abiotic facts of the aquatic bodies (Jindal, 2008). It is imperative to maintain the productive and protective role of wetlands in perpetuity. Not much information is available regarding the water quality of this wetland. There is a possibility that over the year's water is supplied with more of Nitrogen and Phosphate nutrients and one species covers the wetland leading to the problem of eutrophication, this disturbs the ecosystem balance which could influence the depending biodiversity of the area. The attempt made in these regards in this study had assessed different water quality parameters like pH, Electrical Conductivity, Alkalinity, Acidity, Total Solids, Total Dissolved Solids, Total Suspended solids, Organic Matter, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Nitrogen, Phosphates, Phenols & Heavy Metals in various locations within the sanctuary boundary.

2.5. Economical value

Thol Wetlands contribute to the local economy by producing resources, enabling recreational activities and providing other benefits, such as pollution control and flood protection. While it can be difficult to calculate the economic value provided by this wetland. These amounts can be impressive.

2.6. Irrigation

Ironically although Thol is a wetland with a great water spread, it is located in an arid region. The area receives very less mudflat- the average being only 24 inches or 600 mm. The water spread decreases considerably during the summer season. It is the time, when the villagers around Thol also have to face acute scarcity of water, both for drinking and agriculture. The villagers, therefore, resort to lifting of water from Thol during the summers and in the scarcity years throughout the years. This activity may render the wild creatures inhabiting Thol virtually, devoid of their valuable lifeline- water. There are total 15,499.48 ha. of agriculture land in 10 surrounding villages which depend upon Thol for irrigation.

2.7. Grazing

The villagers from the nearby areas of the Sanctuary are dependent on it for livestock grazing, wood and grass extraction. A large number of livestock especially goats, buffaloes and cows exclusively depend and get their fodder from the floodplain areas in and around the sanctuary for seven months in the year when the flooding water recedes. Different plant species, which grow in the Sanctuary like, Saccharum sp., Typha species, are used by the local peoples for various purposes.

2.8. Climate

Thol area experiences three distinct seasons namely winter (November to February), summer (April to May) and monsoon (June to September). Months of October and March mark the transition period from monsoon to winter and winter to summer respectively. The pond receives rainfall from July to September through the southwest monsoon. Old records for Mehsana district in general (Anno., 1975), as well as rainfall data of previous years at TS indicate that the rainfall is highly erratic and ranges from 203 to 786 mm.

2.9. Hydrological Features

Thol water body occupy total area of 699 ha (6.99 sq.km.) and its periphery is 5.62 km long. Thol wetland provides water for agriculture to the six villages i.e. Thol, Jethlaj, Adhana, Vayana, Chandanpura, Jhaloda which spreads 55.95 sq.km. It had well-developed canal based irrigation system, there are four head regulators at the water body to control the flow of water.

Table 5: - Details of the irrigation canals of Thol water body

Sr No.	Canal No./ Distributory	Length (km)	Command Area (Acres)	Discharge (CUSECS)
1	Canal 2	2.56	360	9.00
2	Canal 3	4.10	435	11.00
3	Canal 4	6.70	300	26.00
4	Distributary (Distri.) 1 of Canal 4	0.80	100	2.80
5	Sub-Distri. Of Distri.1	0.65	200	2.80
6	Distri. 2 of Canal 4	2.52	200	10.00
7	Distri. 3 of Canal 4	2.64	285	12.00
	Total	**19.97**	**1780**	**-**

The canals and their distributaries / sub-distributaries are about 19.97 km long The catchment area of the water body which covers 320 sq. km is located to its north and north-east so the spread is from Kadi taluka of Mehsana district and Kalol taluka of Gandhinagar district. Water finds its way through a number of canals draining into the feeder canal located on the north to northeastern sides of the water body. Water is received through following canals at Thol water body

1. Eastern canal
2. Saij-Hajipur canal
3. Irana-Indrad- Wamaj canal
4. Hajipur-Piyaj canal
5. Eastern feeder at Saghan drain
6. Jaspur canal

In addition to the feeder canal, the water body receives run-off water directly from the catchment area. Before the feeder canal reaches the manmade wetland, there is a diversion, which is known as waste weir and is employed to control the volume of water in the water body. If the level of water reaches beyond 9 ft., the water is diverted to waste weir. Waste weir drains into a canal, which runs along the eastern boundary of the Thol pond/tank to reach Thol Wildlife Sanctuary located southwest of Thol Wildlife Sanctuary. Thol and Thol Wildlife Sanctuary are thus connected with each other. Some salient features of the water body have been highlighted in table below

Table Salient Features of Thol

Sr. No.	Particulars	Measure
1	Full Supply Level (FSL)	163 ft.
2	High Flood Level (HFL)	167 ft.
3	Top of the bank	172 ft.
4	By-pass level	165 ft.
5	Sill level	153 ft.
6	Catchment area	320 sq. km
7	Storage capacity	312 Million Cubic ft.
8	Total command Area	3,670 acres
9	Irrigation Command Area	1,835 acres
10	Area of the tank	1728.31 acres
11	Area under submergence at FSL	1780 acres

3

History of Management

3.1. Background

Originally Thol tank was constructed for irrigation purpose in the year 1912 by the Gayekwadi State Rulers during the reign of the then Baroda State. It was built to prevent erosion and flooding and to store rainwater for irrigation purpose (Vaghela, 1993). Initially the area was declared as "Game Reserve" vide Government notification dated 29th May 1986 by Forest and Environment Department. Later on due to its popularity amongst the bird fraternity the area was notified as Sanctuary through the notification GVN-53-88-WLP-1386-162-V.2 dated 18th November, 1988 under Section 18 of Wildlife (Protection) Act, 1972 (Anno. 2001).

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3.2 Review of the Past Management Plan

The last management plan for the period from 2002 to 2011 was prepared by Shri S. J. Pandit for the period of ten years but physical and financial target for different activities had been projected for the first five years only. It was clearly suggested in the last management plan that a supplementary plan would be designed in the fifth year of the plan period for next five years and designing of the supplementary plan would be based on monitoring and evaluation of implementations of plan during first phase. Also suggested that supplementary plan for phase II would not be in detail like the plan prepared but it would contain supplementary information critical analysis of performance of phase I proposed programmers and their physical and financial targets. As per the suggestion made in last management plan on the basis of monitoring and evaluation of implementations of the last plan during first phase the physical and financial target for different activities for the plan period from 2002 to 2007 was proposed on the issues related to Habitat improvement (Creating artificial mounds

or island in the water body, Introducing suitable fish varieties for food supply to birds & hygiene of water and Planting trees on the periphery of the sanctuary), Protection (Preparing circular road on the inside of the fence and Gate and a hut), Education and training (Staff training camps) and Research & Monitoring. Detailed aspects were taken in this management plan to manage and conserve the flora, fauna and all biodiversity components of Thol Wildlife Sanctuary. The Sanctuary is a home of some local migratory and local resident birds as well as migratory birds coming from far away. In the background of the past management and future needs of the sanctuary the objectives of this supplementary plan was narrated as under

i) Conservation and Development of Thol Pond Ecosystem, with special emphasis on Sarus Crane.

ii) To create awareness about importance of Wetlands and its preservation.

iii) Development of Eco tourism.

3.3. Activities

In the year 1999 – 2000, a Team of W.W.F., Ahmedabad carried study on abundance and diversity of waterfowl and published the report. It was sponsored by the GEER Foundation. Wildlife conservation work at present is confined to seasonal vigilance only. Due to scarcity since last two years there was lot of pressure on the water reserve. TWS faces resource constraints which is sought to be addressed during this management plan.

3.4. Status of Protection

Presently some daily wager watchmen and one Forester look after all the works at TWS including protection. This is not enough and needs strengthening.

3.5. Staffing

The sanctuary is under the administrative control of Deputy Conservator of Forests, Nal, and Sanand. It is managed by R.F.O., Nal (West). There is only one post of Forester at Thol.

3.6. Infrastructure

Though there is a tower of Wireless Station, it is yet too made operational. Messages for staff are communicated to some locals of Thol village on telephone. There are no vehicles and boats for the sanctuary.

3.7. Tourism

At present number of tourists visiting Thol sanctuary is marginal. There is hardly any tourist facility available. Presently tourists form Ahmedabad visit the area during the

winter on holidays. No tourist facilities are available except few benches and a rest hut. Entry fees are charged at present. It is suggested to take special measures to popularize the place among tourists Information brochures both in Gujarati and English will to be published. Proper publicity about the place will be done through media.

Tourist facilities like Parking place, Rest huts, Benches, Toilets, Drinking water will be provided. It is proposed to train unemployed youth of the surrounding villages for bird watching. They would be provided with binoculars and reference books. They can serve as guides for tourists and earn their livelihood. Due to limited area tourists will not be allowed to enter the water. Lodging and Boarding facilities are also not required. It is suggested to start entry fee for tourist after development of basic facilities.

3.8. Interpretation Centre

The interpretation centre or **nature centre** of the Sanctuary has to be redesigned to educate people about Lake its values and the environment. Nature centre will display the live model exhibits, displays and nature dioramas. Nature centres will also have an orientation show theatre which will screen a thirty minutes movie about Thol. The interpretive centre has a Food stall managed by the Eco Development committee. The interpretative centre offer educational programs to the general public, as well as school group programs.

3.9 SWOT Analysis

The people living around TWS have got two distinct characteristics, first they are very religious minded and second, except a few communities majority of people are purely vegetarian. Due to these qualities of the people, poaching is almost absent in TWS except only few sporadic cases. Unlike in the other forests all over India, there are no organized gangs operating in and around TWS largely because the people believe in nonviolence, and consider wild animals as sacred. Also, since most of them are vegetarian, the hunting of the birds for meat is relatively very less. People of the region realize the benefits they derive as part of eco-services, sustainable economic services, cultural services, inspirational and recreational facilities etc. which result into public support for conservation of TWS. People living in the region understand that they have advantage over other parts of Saurashtra because they hardly face scarcity due to ecological protection and various goods and services provided by TWS. Legal issues related to demarcation of boundaries, settlement of rights and concessions have already been settled TWS. Except a few rights granted, the PA is free from other liabilities which provide strong legal base for protection and management of the area. Indigenous knowledge of staff, specially trained manpower in the Department is major managerial

strengths in the system. Job opportunities in other sectors like diamond industries and increase in productivity of land due to intensive agriculture are better alternatives available to local people which reduce direct dependence on natural resources derived from forests. This situation may be used as strength in designing management strategy.

Large scale industrial development has taken place during recent past along the coastal belt near the TWS and many industrialists have plans to set up industries. The cement manufacturing plant mainly sustains upon limestone which is quite abundant in the surrounding areas. With Forest (Conservation) Act, 1980 coming into force, all activities including mining in these areas were prohibited and hence, presently the extraction of limestone is confined to the areas outside the sanctuary only.

The development of tourism has both Vpositive as well as negative impact on forest. Whereas the tourism development brings about the awareness of forest conservation among people, it also leads to disturbance to the wildlife. Construction of roads on the periphery may further deteriorate the habitat. Therefore, the magnitude of tourism should not be allowed to go out of proportion. The salinity from sea is invading the deep water reservoirs at an alarming rate towards the inland areas. The only possible solution at this juncture is to bring up the water table. This is a difficult task since the present water abundance lures the farmers to grow cash crops like sugarcane which consume water intensively.

Lack of attitudinal changes in the field staff from traditional forestry practices to conservation of biodiversity is main weakness of the administration which needs to be improved through continuous trainings. Inter departmental coordination needs to be improved to strengthened managerial approach and implementation of eco-development project. Mining in ecological zone, development of communication system, industrial growth in coastal zone, expansion of religious complexes are main threats which may result into increase in anthropogenic pressure and fragmentation of TWS landscape ecosystem.

3.9.1 Strengths

- A designated wetland site - a particularly important area for migratory birds.
- Birdlife and birding world wide identify it as an important birding area with over recorded species including many Red Data species and some very unusual sightings.
- Good research and monitoring potential.
- Modified to be permanently inundated.
- Important area for environmental education.
- Has good infrastructure.

- The city has great historical interest.
- Important for local culture

3.9.2 Weaknesses

- Lack of interdepartmental coordination.
- No planning of management at landscape approach.
- The cement manufacturing plant mainly sustains upon limestone which is quite abundant in the surrounding areas
- No state of the art Rescue centre in the region.

3.9.3 Opportunities

- Could possibly be extended to other wetlands in the network of protected areas.
- Some areas could allow for habitat alteration or modification to improve birding.
- Possible opportunities for private sector development.
- Need to form joint advisory/assistance committee with bird groups.
- Closer links could be formed with NGOs.
- Potential to develop more visitor facilities.
- Requires more focused awareness regarding TWS and local birds
- Environment needs to be monitored.

3.9.4 Threats

It is a small and dynamic wetland system which makes it vulnerable to environmental factors. These threats are:

a. ***Recurring drought, lessening catchment area inflows and erratic release of water***: As the prime management objective is to maintain ecological seral stage of the ecosystem, maintenance of water levels in the wetlands is most important. With erratic rainfall and decreasing inflows from the catchment this becomes difficult to ensure this. As the water levels remain low over a period of time, the woodland start to ingress in the wetland areas resulting in shrinking of the wetland area thereby threatening the ecological characteristics of the area.

b. ***Invasive species*****:** There are three main invasive species in the sanctuary. Water hyacinth (*Eichorrnia crassipes)* invades the wetland areas. Due to management intervention the spread of this species is presently in check. *Papalum disticum* is present a few of the satellite wetlands. Its thick mat prevents regeneration and utilization of other aquatic plant species by avi-fauna. During periods of drought *Prosopis juliflora*

vigorously spreads and reduces the wetland area. These invasive species are a threat to the natural species composition of both the wetland and the woodland/ grassland areas of the sanctuary.

c. *Contamination of water with pesticides, fertilizers etc.*: The inflow of high levels of pesticides and fertilizers from the adjoining agricultural fields in the sanctuary area influences the plant productivity which affects the ecological succession processes. Higher levels of pesticides in the water get bio-magnified through the food chain and adversely effect the birds and other faunal species.

d. *Fire*: Occurrences of man induced fire affect the breeding of terrestrial birds. Recurring fire in the grassland changes the species composition and leads to habitat loss.

e. *Sedimentation*: Increasing sedimentation directly affects the water holding capacity of the wetland. The land-use practices in the catchment area are enhancing the sedimentation load in this wetland. It is causing further ingression of woodland into wetland and resulting loss of wetland habitat.

f. *Competition for resources*: The competition for biomass between wild herbivores and domestic as well as feral livestock within the sanctuary wetland is increasing.

g. *Tourism*: Thol Wildlife Sanctuary being easily approachable is well-visited. The huge number of tourists causes a lot of disturbance to the wild animals and birds during certain times of the year.

h. *Catchment area degradation*: Inappropriate and incompatible land use practices particularly mining and excessive groundwater withdrawal in catchment area is leading to its degradation. This affects the overall availability of water inside the sanctuary.

i. *High hunting pressure on birds leaving the Sanctuary.* Poaching, encroachment of sanctuary land, forest fire, mining in ecological zone, development of communication system, industrial growth in coastal zone, expansion of religious complexes are main threats which may result into increase in anthropogenic pressure and fragmentation of TWS landscape ecosystem.

4

The Protected Area and The Interface Landuse Situation

4.1 Introduction

Each of India's Protected Areas (PAs) today is a tiny island among the vast sea of human inhabitation. Hence, every PA is facing one or more threats from the human population residing inside or in its surrounding areas. TS is no exception to this and major human activities in and around TS have already been identified and described in brief in the section 2.2.7. In this chapter, threats arising due to these activities to waterfowl conservation have been discussed. Data on all human activities were collected throughout the study period. Specific visits were made for collecting additional data i.e. on industries in the catchment area, ONGC wells, status of canals etc.

4.2 Agriculture

As discussed in section 2.2.7, this activity has the highest bearing on bird conservation at TS. The general practice among concerned conservationists and nature lovers has been to blame this activity and even recommend stopping the release of water for irrigation. Unfortunately, this viewpoint has only intensified the conflict. Conservation is a process in which support of local people is a must and at TS their support is already existing as people have been guarding the pond (though for a different purpose) the habitat of waterfowl for decades. History has played an important role in shaping the present scenario and the following discussion focuses on the situation as we have analysed it.

First of all, TS was created as an irrigation tank and it has traditionally been the tight of people to draw water from it. The State Irrigation Department administered and controlled the distribution of water for irrigation. The farmers of the region have for long been growing paddy and therefore, water must be present in the region throughout, especially if it does not rain at regular intervals. Since the Irrigation Department does not permit digging bore wells in the command area of Thol waterbody, the villagers are left with no option, but to depend on TS for supply of water. This also limits them in a way and most farmers take one or at the most two crops as compared to three or four crops taken in some intensively cultivated areas of the State. This is the historical background of the need for irrigation at TS. In fact, this practice is far better when compared with the recent invasion of industries around TS because of three reasons. First, paddy and other crops ensure the availability of excellent feeding grounds for birds. Second, cultivation helps in recharging ground water; and third it has few negative impacts when compared with the impacts of industries. Nonetheless, as irrigation depletes water very rapidly and that too at a very crucial time when most migrant waterfowl have arrived and the resident species are still around; it should be viewed as a threat. Apart from withdrawal of water for irrigation, use of fertilisers and pesticides in the catchment area of the pond

was also a concern. Major threats arising due to these practices have been summarised below.

1. Because of irrigation, water level and spread depleted so fast that by January there was little water left at TS. By November, the depth was reduced to mere one ft in most areas, making the pond unsuitable for many species. Reduction in water spread also reduced bird species richness and abundance as discussed earlier.

2. The use of pesticides and fertiisers is a far greater danger for birds and also for people living around as well as those consuming the food grains grown in areas irrigated by Thol waterbody. Fertilisers and pesticides reach aquatic ecosystems either through leaching or by the way of run-off from crop fields. Leaching of fertilisers containing nitrogen and phosphorous, which turn into nitrates and phosphates could cause eutrophication of TS. Mason (1981) has quoted the example of the effect of eutrophication on Lough Neagh in Northern Ireland. This lake among other nutrients received high amounts of nitrates from fertilisers used in farms along the catchment. He summarised the effects of eutrophication as reduced species diversity change in dominant biota, increased biomass, increased turbidity high sedimentation and anoxic conditions. All these may ultimately lead to shortening the life span of the water body or mass mortality of one or more groups of fauna.

Pesticides on the other hand are toxic pollutants. Many are persistent organic pollutants (POPs), especially the organochiorine pesticides like DDT, BHC, Aidrin. These pesticides not only affect the target organisms, they also have impacts on other non-target species (Timbrell 1989). Moreover, these get concentrated in the food chains (bio-accumulation and magnification), in which organisms accumulate very high levels of pesticides from low levels in water in such a way that top carnivores have the highest concentrations of these substances. Pesticides like DDT and BHC are known for their bio-accumulation effects (Mason 1981). An additional effect is the thinning of eggs hells of birds leading to low reproductive success (Timbrell 1989). Studies by Vijayan (1991) on waterfowl of Keoladeo National Park and Singh and Tatu (2000) on Sarus Crane in Gujarat, reported high concentrations of organochiorine pesticides (Aidrin and others) in various tissues and excreta. Both studies also indicated mortality due to pesticide poisoning in Sarus Crane arid many other species of waterfowl as well as terrestrial birds. Vijayan (1991) also documented contamination of eggs of piscivorous bird species by organochlorine compounds such as DDT, BHC, Endosulfan, Dieldrin, Heptachior and Heptachior epoxide. We found that pesticides such as Endosulfan, Forotex and Pholadon powder were used by farmers around TS.

3. Another danger particularly for birds such as the Sarus Crane and many others, which mainly depend on agriculture is the change in agricultural practices around TS. One such change is the transition from food to non- food (cash) crops and intensification of farming. The same could be seen taking place around TS. The Gazetteer of Mehsana District (Rajyagor 1975) noted that in the Gaekwad regime (1883), the proportion of food to non- food crops grown in Mehsana District was 95:5 per cent. This changed to 69:3 1 per by 1975. In year 2000, this ratio also have undergone change presumably in favour of cash crops. This transition would reduce food availability for many species. Intensive farming on the other hand would require the use of more pesticides and fertilisers leading to over all degradation in soil quality and ultimately damage the habitat. Gole (1989) identified intensification of farming as a threat for Sarus Crane more than a decade ago.

4.3 Industries

Water is a fluid medium, which receives pollutants through the processes of advection (mass-movement) and diffusion. Further, the pollutants tend to accumulate in the bottom sediments (Alloway & Ayres 1993). Water can be polluted directly by the discharge of effluents from factories and industrial processes or through leakage of toxic wastes stored or dumped underground (Timbrell 1989). Many industries are considered to be producing substances that can be hazardous for all life in general and also for the entire ecosystems. To assess the potential hazard of industries, particularly those located in the catchment of Thol waterbody, we carried out a survey of the industrial units in the proximate catchment area of Thol water body i.e. the Khatraj Industrial estate. The results showed that out of the 32 units surveyed, majority were small and medium size units. It can be seen from Table-8.1 that Chemicals, Plastic, Ceramics and Paper & Packaging were the major industries in the area.

Table - 4.1 Industries located in the catchment of TS (a sample from Khatraj)

Sr. No.	Name of the Industry	Number	Percent
1.	Chemicals (including dyes, paints & pharmaceuticals)	08	25
2.	Plastic & Allied	05	16
3.	Ceramic & Tiles	06	19
4.	Paper & Packaging	03	09
5.	Others (steel, foam, rubber, oil, printers etc.)	10	31
	Total	32	100

The possible impacts of these have been outlined below.

- According to Dr. R.C. Trivedi, ex-chairperson of the Gujarat Pollution Control Board (GPCB); North Gujarat is a land-locked area with no perennial river system. Hence, the pollutants! effluents are generally disposed off on land, which inevitably reach ground water.
- Chemicals, paper & packaging and metallurgical units can be categorised as hazardous (Dr. R.C. Trivedi, pers. comm.). Metallurgical units can be sources of heavy metals such as zinc, copper, nickel and cadmium; which are considered to be the most dangerous of all pollutants (Mason 1981). Vijayan (1991) reported high levels of heavy metals such as lead, zinc and copper in bodies of seven species of piscivorous birds found dead inside Keoladeo National Park. Chemical industries (including pharmaceuticals) also have hazardous effluents.
- Small units of paper and pulp (which are present around TS) have to rely on recycling of paper, which involves bleaching- a process that releases harmful effluents. In the past we have seen effluents having pink-red colour outside the paper unit at Khatraj, close to the feeder canal.
- These units are located in the catchment area of Thol waterbody and some are precariously placed i.e. close to the feeder canal to the north of TS. This means that danger of contamination and subsequent damage cannot be ruled out. The system of canals and village ponds that connects Thol waterbody to its catchment area makes it even more vulnerable to harmful effects of pollution. This is how effluents from as far as Indian Farmers Fertilisers Co-operative (IFFCO-Kalol) had reached TS (Dr. R.C. Trivedi, pers. comm.) in past.
- None of these units possess any facilities for treating the effluents as they are small and medium sized units who find it difficult to spend money on pollution control. And even if they treat the effluents, there is no safe way of dumping them as discussed earlier.
- Industries are expanding further and good agricultural land is being diverted to industrial use as the latter is willing to pay a heavy price for land. This process without assessing its consequences could lead to a perilous situation.

4.4 Fishing

Fishing as discussed earlier (see section 2.2.7) though not a major activity appeared to pose the following threats.

- Intensive fishing activity during September and October seemed to be instrumental in reducing the quantity of fish. This had its effect on the piscivorous birds such as the

Great White Pelican, storks, egrets, herons and cormorants. The pelicans in particular seemed to be the most affected group and were not seen foraging at TS owing to this reason.

- In addition to direct reduction in fish numbers, fishermen also caused disturbance to birds as they entered the pond to fish.

Table - 4.2. Tourist profile of TS

No. of days on which tourists were seen	No. of groups	No. of tourists	Destination (groups)	
			Ahmedabad	Others
17	51	446	46	5

4.5 Oil Drilling by ONGC

The gazetteer of Mehsana District (Rajyagor 1975) states that following the indications that Mehsana was an oil-rich area exploratory drilling was started in 1961. First oil production started in Kalol fields. Kadi Taluka was also found to be containing rich oil deposits and in south Kadi structure, exploratory drilling had started as far back as 1968 (Rajyagor 1975). As referred to earlier, there are, seven crude oil wells in the Sanctuary area, which pump oil (Singh 1998). It is then transported through pipelines. Singh (1998) also states that Oil and Natural Gas Commission (ONGC) is keen to set up more wells in the area. This is evident considering the spurt observed in its activities in the southeast and northern areas of TS during the present study.

The imminent danger posed by the oil wells in and around TS is of an oil spill. Although, an oil spill in freshwater has no parallel to the grotesque marine oil spills, these could nonetheless occur due to run-off, leaks and discharges from oil wells. Although no major oil spill or its consequent effects have been reported at TS, exposed ditches filled with oil and soil stained with oil were observed by us at more than one site. During the rains, the oil in surrounding ditches could easily reach the Thol waterbody. It is important to consider that the wells are not just located within the Sanctuary They are also scattered throughout the catchment area. We believe that an oil spill from any well located within or in the catchment of Thol waterbody could have the following impacts on its physicochemical as well as biological environment.

Damage to birds and mammals would result from smothering which would lead to fatal cooling and drowning as well as suffocation of insects that need to come on the surface to breathe, the oil film obstructing this process (Jeffries & Mills 1990). This would also affect fish and the food chain of TS.

- In case of an oil spill, the oil film would also reach the crop-fields along with irrigated water, affecting the agricultural ecosystems.
- Breakdown of oil molecules would result in additional organic input, which can be utilised by aquatic organisms (Jeffries & Mills 1990).

4.6 Tourism

We recorded the number of tourists, their purpose of visit, time of arrival and stay as well as impacts caused by their presence at TS to produce its tourist profile. The results are summarised in Table-4.2.

446 tourists in 51 groups visited TS from September to March. Highest number of tourists visited TS during January (63%), followed by December (22%), February and November (Fig. 6.14). Majority of tourists came from Ahmedabad. The number of tourists at TS was very low compared to that of prominent and well-known PAs such as Nalsarovar Bird Sanctuary (pers. observation of the first author). This was despite the fact that Ahmedabad (from where most tourists came) is only 25 km from TS.

To find out the time preference of tourists to visit TS, the day was divided into four periods viz. morning (till 12 hrs.), afternoon (12-16 hrs.), evening (16-19 hrs.) and night/ overnight (beyond 19 hrs.). It was found that majority of tourists came during evening and morning hours (see Figure-6.15). Only one group spent the night at TS. We asked the tourists the purpose of their visit or observed their behavior to decipher the same. We found that most tourists (84%) came for picnic/recreation purposes, while only 14 per cent came for bird watching and a meagre 2 percent came for photography/filming

(Figure16). This pattern was indeed surprising as most of them knew that TS is well-known for birds. In contrast, Vijayan (1991) showed at Keoladeo National Park that nearly 75 % tourists came for bird-watching and related purposes, where as only 17% tourists came for recreation/picnic.

The impacts of tourism at TS are summarised below.

- As a number of tourists walked across from the southern bund towards the pond on the other side, they caused direct disturbance to birds. The birds that were present flew off as a result. On two occasions, such behaviour prevented the roosting birds from landing.
- Most tourists made noise, played games and walked along the bunds; all these causing disturbance to birds.
- A negative impact was found in the form of littering of garbage. Many tourists left their rubbish (which ranged from plastic bags; paper plates, tissue papers, food remains and even beer cans), which caused degradation of the aesthetic and organic environment of the site.

4.7 Livestock Presence

The livestock that grazed around TS included cattle, buffalo, sheep and goats. Their presence at TS was mainly for drinking water. However, buffaloes were seen wading and even wallowing inside the pond. Herds of sheep and goats as large as 400 plus were seen.

Livestock presence was noticed throughout the study, though their intensity increased as smaller, temporary water sources in the vicinity of TS dried up. Livestock presence led to following impacts.

- Disturbance to birds as animals sometimes waded through the water.
- In 1998, buffaloes and even cattle were observed walking right towards a nest of Sarus Crane (*Grus antigone*) number of times and disturbed the incubating bird.

4.8 Poaching

No incidence of poaching was noticed during the entire study period including night stays at TS. Dead birds (pelican and flamingo) were found on two occasions, however the cause of death could not be ascertained. Local people's presence and sentiments certainly helped to reduce the chances of poaching. Reports of poaching taking place on Jethlaj side of TS are still heard though we could not confirm the same.

4.9 Other Activities

Another activity, which could influence TS and its waterfowl was the removal of Gando Bawal (*Prosopis chilensis*) from the peripheral areas of TS. There were many *P. chilensis* trees on the banks of peripheral ditch and some along the bund of the main pond. These trees were removed (cut from the base) during fourth week of February, 2000. This step exposed the entire area and only a few Deshi Bawal (*Acacia nilotica*) trees were spared. The implications of this move can be as follows.

- Soil erosion due to lack of vegetal cover can result as all the trees were removed simultaneously.
- Evaporation rate of water stored in the peripheral ditch could increase thereby speeding up the process of its drying.
- Since the trees were cut from the base, and not uprooted, coppice growth has already started (July 2000). This would need more pruning and cutting in future.
- The waterfowl that foraged there would be affected due to lack of cover and perch sites, which the trees offered earlier.

Part-II

The Proposed Management Plan

5

Vision and Objectives

5.1 Vision

Develop a comprehensive and reliable wetland information base to support effective planning, law-making, and policy development. Comprehensive, reliable, and up-to-date information is a prerequisite for effective decisions about wetland protection and restoration. To determine priorities for wetland protection and restoration, it is important to know how much of various types of wetland we have and need, their condition, the nature and causes of ongoing risks, and what type of action is most likely to be effective in the long-term.

Developing an adequate information base requires sufficient and effectively directed research funding, refined tools for monitoring and managing wetlands, a uniform wetland classification scheme, and effective means of sharing information with all who may need it.

- Increase public, industry, and government awareness of the importance of Thol Wetlands and commitment to wetland protection and restoration.
- Enhance legal protection of Thol Wetlands through effective and effectively enforced laws and policies.
- Ensure the effective integration of wetland protection in strategic land use processes.
- Secure the protection of priority Thol Wetlands and the conservation and restoration of natural Thol Wetlands throughout the province.
- Improve coordination and strengthen partnerships to maximize effectiveness in Thol Wetlands protection and restoration.

5.2 Objectives of management

Thol Wildlife Sanctuary is a very dynamic and fragile ecosystem. It requires regular intervention in the form of a well thought out management programme. The overall mission of this plan will be to protect and conserve the sanctuary ecosystem and its rich biological diversity in accordance with sound principles of sustainable biodiversity conservation in consonance with the goals set forth in the National Forest Policy and Wildlife Protection Act. The objectives of the sanctuary management are as follows:

1. Conservation and Development of Thol Lake Ecosystem, with special emphasis on endangered birds.
2. Undertake education and awareness programmes to create an eco-conscious society.
3. To promote eco-tourism, maximise wilderness experience of the tourists by enabling them to watch the natural display of behaviour of the birds and animals.

4. To provide site specific, eco-friendly package of measures to reduce dependency of local communities on protected area resources and provide alternate livelihood options.

5.3 Problems in Achieving Objectives

The following are the most serious problems in achieving the above objectives of the management in Thol Wildlife Sanctuary.

Problems related to protection

- Encroachment in catchment area.
- Lack of proper demarcation of satellite wetlands.
- Lack of adequate staff.

Problems related to habitat management.

- Invasion of weeds.
- Soil erosion, degradation and siltation.
- Successional patterns and changes in water quality.
- Seasonal changes in water availability.
- Narmada water intrusion.

Problems related to conservation of wildlife

- Movement of birds outside the protected areas.
- Increase in human-wildlife conflict.

Anthropogenic issues and problems related to biotic pressure

- Destruction of habitat due to factories and residential plots.
- Traffic movement on roads passing along PA.
- Changing land use pattern outside the protected area, especially in agriculture sector.
- Withdrawal of water below critical limit from the reservoirs in satellite wetlands.
- Increase in tourism related problem, development of infrastructure nearby the PA.
- Setting up of new industries around sanctuary.
- Rapid industrialisation around sanctuary.

Other problems

- Inadequate infrastructure.
- Lack of inter-departmental coordination.
- Inadequate knowledge and skills among staff about wildlife management.

- Lack of scientific information.
- Lack of basic amenities for the ground staff.
- Lack of land for creating basic infrastructure facilities in the sanctuary i.e. fencing around periphery, circular road, buildings, tourist facilities, tree belt around sanctuary for protecting birds from the outside disturbance of the city & providing batter ground to the birds for nesting & breeding & resting.
- Lack of co-operation from the ONGC Authority
- In flux of the sewage gutter water in the sanctuary.
- Flooding of the sanctuary area in the monsoon

6

ZONATION

6.1. Zones

It is planned to have two zones in the Sanctuary which are tourism zone and core zone. The overall goal of the zoning is to: "contribute to ecosystem contiguity, ecological connectivity and ensure species persistence within the Thol Biological Conservation Complex, while fulfilling the needs of the resident communities and deriving national benefits from conservation, as well as through the creation of well-defined zones and associated legislation that are ecologically sound, socially acceptable and economically viable."

This goal will be realized through short-term and medium-term objectives. Various principles, including several non-negotiable principles, and criteria for delineating zones were developed to help guide zone development.

As per this management plan zones are divided into **:**

1. **Core Zones:** Total protection
2. **Recreational/ Tourism Zone:** tourist potential areas in multiple-use zones and low impact trails and sites in core zones
3. Ecosystem Zone
4. Landscape approach

With the aim to manage protected areas on a people-cantered basis and address current as well as emerging issues, the zoning of protected areas into management units has become a vital and absolutely necessary tool for protected area management. Zoning will not only ensure proper planning and implementation of activities within respective management units, but also improve effective use of human resources in protected areas.

6.2. Criteria for delineation of zones

6.2.1. Core Zones :

1. Breeding and roosting area for birds.
2. Area with diverse species of birds
3. Area with endemic and globally significant species
4. Pristine wetland areas.
5. Area with high numbers of birds evidence
6. Habitat of keystone species
7. Area undisturbed by humans
8. Seasonal residency for animals/birds
9. Micro ecosystem (patch ecosystem)

The core zone as prescribed and duly demarcated in the previous plan is continued in this plan also. It is, however, prescribed that, this zone should be kept as free from any disturbance from the tourists as well as the local fishermen etc. as possible. A watchtower has been constructed on The locals should not be allowed to do any illegal activities. Neither the tourists be allowed to venture in this maximum conservation zone.

The plan prescribes plantations of *Acacia nilotica,* which comes up well in this area. This activity is required to be continued in this plan period also. The wetland birds like to perch on high trees and other objects. It is, therefore, required to plant such trees on bets which can grow tall and provide suitable places for perching to the birds. Also, crosses can be fixed at certain distances in the water on which the birds would perch and can be visible from long distances. Furthermore watchtowers are proposed to be constructed to control illegal activities like poaching, fishing and grazing near core zone.

6.2.2. Recreational / Tourism zone

1. Resource-use area
2. Pastoral areas(Head-load)
3. Ecotourism and other use area
4. Existing camp site
5. Area having traditional rights
6. Areas close to or adjoining village border
7. Important habitat outside Sanctuary boundary
8. Area that is likely to pose a threat to the sanctuary
9. Pristine ecosystem
10. Special landmark

The tourists are not to be allowed in Thol water body for watching birds. The movement in the waterbody should be restricted and they would in no circumstances be allowed to enter the core zone. The tourism zone may receive number of tourists especially in winter season. However, facilities should be created so that the tourists can take maximum benefit of their visit for watching birds. It is, therefore, recommended that on certain bets the watch towers cum observation points would be constructed. These watch towers cum observation centres would facilitate the tourists to see birds from some height. They can cover longer distances from these observation points, and it would not be necessary for them to go nearer to the birds, which in turn would reduce the disturbance to the birds and their habitat. Telescopes are planned to be kept on Earthen

Bunds so that tourist can watch birds and also this will help in preventing poaching of the birds.

6.3 Plan for Eco-sensitive Zone

The main objective of having eco-sensitive zone is to regulate the industrial effluents in Thol Wildlife Sanctuary as well as in satellite wetlands. Thol Wildlife Sanctuary enjoys important place for its biodiversity, the bird like, Spotted duck, flamingoes, cormorants, painted storks, adjutant storks, showeller, spoonbills, etc resides in it. The revenue area in which substantial population of all birds found in sanctuary has also been established in a course of time and requires due protection and minimization of threats to prevent destruction of habitats in the area. Many cement and chemical factories established near by the proposed eco-sensitive zone, calcium stone is being used as raw material. To meet requirement of raw material, many business agencies asked for land on lease from Revenue department. Most of the proposals of lease have been sanctioned. As a result of this, most of the land converted into mining areas and habitat area for birds decreased to a great extent. It may lead to man-bird conflict. By declaring this area as an eco-sensitive zone, we can restore the eco-system of birds and its habitat in coordination with protection and development of agriculture land and city residential area. Thus the aim of area required to be declared Ecosensitive Zone with major objectives as to develop and protect habitat for birds as well as to regulate industrial effluents in the area.

Table 6.3: The Radius, Mean Radii and Range of Radii

Radial Direction	Approx. Distance (in km.)
The Radius_ Centre to East	**2.400**
The Radius_ Centre to West	**3.400**
The Radius_ Centre to North	**2.500**
The Radius_ Centre to South	**2.200**
The mean Radius_	**2.640**

The broad thematic activities to be included in the master plan for the region should be :

- Protection of birds, Natural Habitat and Corridor.
- Nos. of Water points will raised in the zones even more water bodies will be raised and old water bodies will be maintained.
- With coordination of Agriculture Department, Veterinary Department, Health Department and District rural Development Agency activities like immunization of Cattles, Health Camp of people, Wages oriented scheme will be implemented.
- Wildlife protection and anti-poaching measures in the entire Eco sensitive zone.

Recommendations

It is proposed to notify the peripheral sanctuary area of radius of radii of 1.16 km from center of TWS. As part of zonal sub plan, a conservation plan for eco sensitive zone would be prepared with following recommendations:

1) Only Non-polluting industries shall be allowed to be established within eco sensitive zone.
2) Quarrying and mining activities would be banned in the area mentioned in Table No. 6.3.
3) Any kind of sand mining shall not be carried out during the period from sunset to sunrise.
4) No fresh mining lease shall be granted in the eco sensitive zone.
5) The existing mining leases, if any, shall be faced out by not renewing the leases on expiries of current terms.
6) There shall be no felling of trees, whether on forest, revenue, private lands, unless such felling is required to improve the habitat value. In such cases, permission shall be granted by the competent authority only under the prevailing rules and statutes.
7) In no any circumstances, the effluents from the industries should be allowed to discharge in any of the open area or in any of the wet land or any part connecting the Sanctuary. This should be regulated with highest priority seeing the importance of satellite wetlands, all the industries in eco-sensitive zone should have plan for effluent discharge.

6.4 Plan for Buffer Zone: Landscape approach

The significant number of population of birds living outside the sanctuary in satellite wetlands in Thol city. Birds are distributed in peripheral areas, coastal side and other wetlands. The exchange of gene among these populations and with the source population is essential for long term conservation of these birds' species. Thol Wildlife Sanctuary is an ecological island as there is no terrestrial connectivity with any other forest area but there is continuous movement of avian species from and to this sanctuary .The wetland birds move between Thol Wildlife Sanctuary and the satellite wetlands and for this reason a landscape level approach to conservation needs to be adopted. Measures have been initiated to gradually develop these wetlands, promote tourism and to bring them ultimately to the status of a protected area. More than 22 satellite wetlands found in the radius of 50 km are proposed for peripheral zone viz. lakes, dams, irrigation channels, village ponds. Thus, it is suggested that other than the core areas where birds

visitation are reported will be managed by respective authority in coordination with Thol Forest Division through developing a separate plan of respective satellite population for better management and long term conservation. The habitat of these satellite wetlands may differ from the core in terms of availability of resources as well as environmental factors. Keeping the status of habitat, prey based availability, socio-economic status of local community and human dimension towards birds conservation, the respective authorities will set a management and conservation strategy for each satellite wetlands. It is recommended that plan of these satellite area should deal with following aspects of management viz overall habitat improvement, Prey base development, Availability of water throughout the year, Protection from poaching, Human-Wildlife Conflict management, Rescue and treatment, Education and awareness programme and Eco development and upliftment of socio-economic status of local community. It is proposed that conservation programmes should be initiated in these satellite wetlands for which the following measures are to be taken up.

1. Management planning including inventory of resources, status survey of critically endangered species, preparation of regional and landscape plans, stakeholder consultations, seminars etc. are to be taken up a an initial step.
2. Strengthening nature awareness through research, education and awareness activities, including conducting nature education/public awareness programmes for children, other stake holders and public.
3. Staff development and capacity building including specialized trainings in the use of GIS, GPS, eco-development initiatives, legal issues and wildlife forensics, study tours, specialized trainings in sanctuary interpretation etc.
4. Anti-poaching activities including establishment of patrolling camps, organizing vehicular patrolling, raids, supply of field ration to various protection units, provision of secret funds to informers , legal support for defending court cases, constitution of awards/rewards for exemplary work by the villagers / subordinate staff etc.
5. Habitat improvement including habitat improvement practices like various soil and moisture conservation activities, creation and maintenance of water harvesting/retention structures, removal of invasive alien species as per the specific requirements of the area.
6. Constituting village eco-development committees and Joint Forest Management Committees.
7. Fostering ecotourism by advertising, providing facilities like watch towers and camping sites for tourists, training village youth as tourist guides providing sale outlets, organizing ethnic dances and the like.

7

Habitat Management

The preference for a particular habitat by different species and utilization of each habitat by them were studied. Habitats were classified into the following 6 types according to the dominant plant community and water regime.

7.1. Open Water

This site is fully open and has deep water. Birds can be observed from the bank as entry in the lake is not allowed. The observation was done early in the morning, at the afternoon and in the evening through binocular and telescope from the watchtower.

This covers comparatively deeper area of the lake spread over on either side of the dykes and towards the middle of the aquatic blocks with submerged vegetation. This area is the front-side of the lake in the open water area beyond 2 meters from the edge of the pond. Dominant submerged vegetations are *Ceratophyllum demersum* and *Hydrilla veorticillata,* free floating vegetation *Eichhornia crassipes* and rooted floating vegetations are *Ipomoea aquatica, Neptunia oleracea.* This serves as the chief attraction for all swimming birds. This habitat was used highly by all ducks storks, herons, egrets, spoonbills, ibises and many waders probably due to the presence of a roosting tree in the water area.

7.2. Shallow Water with Sparse Vegetation

This site is located on both the sides of the pathway while entering the sanctuary. While walking along the path wader birds could be observed here. Apart from this such site is also located near Jethlaj village. At the edge, the water level is much less and irregularly distributed amongst the patches of grass and open water is areas with sparse vegetation which usually are covered by a film of water. In this habitat, the vegetation is neither very low, nor is the water volume very open. *Ipomoea aquatica* forms the major vegetation in these areas. Shallow water with sparse vegetation attracts Ciconidae family sp.and several wading birds could be seen.

7.3. Grass Patch

This site is located on north central side where cultivation of Acacia is there below which grass patches can be seen. Here wading birds could be observed mostly while walking along the path. In this type of habitat, the grass grows very thick and forms a kind of mat. This comes up during the monsoon and spring when the grasses are at their peak of vegetative growth. In winter, however, decomposition of grass makes these areas less prominent and attracts several waterfowl species.

7.4. *Ipomoea* + Grass

This site is also seen both the sides of the sanctuary, mostly camp side. The observation was done mostly in the morning and in the evening while walking and here Ardeidae

family sp. could be seen. It is a mixture of *Ipomoea* sp. and grass. At certain places *Eleocharis* sp. patches are also included. Mostly to be seen in the area of transition between grass and *Ipomoea* patches.

7.5. Trees and Branches Hanging Over Water

This site is situated near Jethlaj village. Where entire area is covered with *Acacia nilotica* trees which could be observed while walking and used binocular. Tress mainly on the edge of the dyke forms the resting habitat for many birds. The entire aquatic area of the sanctuary is intersected with a number of *Acacia nilotica* plantedon dykes. On either side of these dykes, apart from the clumps of *Acacia* sp., *Salvadora* sp., *Butea* sp., *Cassia* sp., *Prosopis* sp., *Madhuca* sp. and *Manilkara* sp., other bushes are also noticed. This serves as the chief attraction for many diving birds and these trees serve as nesting sites for various aquatic birds.

7.6. Puddles

This site is located on the front side of the watchtower and the other site is scattered from North side of the sanctuary which could be observed while walking and used binocular. The water level drops during the dry season (May - June), leaving only a few pools in the deeper areas. Aquatic organisms are concentrated in these increasingly smaller areas and become readily utilizable food for highly mobile predators, particularly wading birds.

7.7. Issues

The major portion of the sanctuary area is covered by agricultural region which is given to local people for cultivation at a meagre rate. This activity causes disturbance to the birds. Also the withdrawal of water for irrigation which is through supply canals in command area and lift irrigation causes pressure to the wetland ecosystem. According to the norms water supply should be regulated and the water level has to be maintained till 3 fts. But it was seen to be pumped out even after it had gone down (GEER, 2002). Another threat to the wetland is the use of fertilizers and pesticides within the catchment area, which will have effect on the Thol wetlands. As Mehsana district has the distinction of being one of the top food grain producing districts in Gujarat (Annon. 1975), the gross cropped area is 536025 ha. In the year 2007-08 (Agriculture department, Gandhinagar). The estimated consumption of fertilizer in the district will be 98.79 tons per hectare. While catchment area have 71% of the total area under agricultural land (GEER, 2002) so the use of fertilizers and pesticides will be of concern pertaining to the wetland biodiversity.

Catchment areas have 8 identified industrial regions and main among them are Chattral and Kalol GIDC. During rainy season these waste water get mixed up and reaches water body getting it contaminated. There are 13 functional ONGC oil wells within the sanctuary area. The occurrence of oil spills is not uncommon (Singh, 1998). Again during monsoon the oil gets mixed up with water which endangers the aquatic biodiversity.

Another major pressure on the Thol Wildlife Sanctuary is due to livestock population. Livestock of five peripheral villages as well as of the pastoral people from Kutch and Saurashtra comes to the place for grazing in scrub lands and for drinking water. The grazing pressure is there. Another major threat to the Sanctuary area is the developmental activities going on surrounding the area. These activities might reduce the surrounding agricultural land which is the feeding ground for Cranes. In future there will be reduction in population due to habitat destruction and it may cause disturbance to the birds. This issue needs to be emphasized since one of the vulnerable species, Sarus crane is found in this region.

7.8. Management of Habitats

Habitat is the natural home of any living form, may be an animal or a plant. It is the external environment to which the species has become adapted in the course of evolution. An assessment of specific habitat requirement of individual species is vital for management of the species. Smith (1980) suggested that habitat preference may be one form of imprinting in birds. However, Mc Farland (1980) suggested that birds respond to a summation of many factors and habitat selection thus, has some variability within a species. According to him (i) the characteristics of the terrain, (ii) nesting, feeding and drinking sites, (iii) food availability, and (iv) other animals, are important factors influencing habitat selection.

The sanctuary offers several macro and micro habitats suitable for the vast number of species. It has been observed that some species show particular preference to certain habitats while some can be seen in wide range of habitat. Therefore, identification of various habitat types was the prerequisite for determining preference by various species.

Tatu (1995) has attempted to identify certain habitat types and their distribution as well as monitoring changes therein with the help of satellite imageries. However habitat assessment models and habitat availability model developed by him were for only two species viz. the Rosy or White Pelican *(Pelecanus onocrotalus)* and the Chestnut Bittern *(Ixobrychus cinnamomeus)*. The former one being the most abundant species and the later one being the rarest species in Thol as per the 1992 mid winter waterfowl census carried out in the area by the Forest Department. He had also identified various

structural components of the wetland and changes therein. However, it did not include in detail different requirement of different waterfowl species.

7.8.1. Habitat Management for Invertebrates

Invertebrates can be encouraged by maintaining oxygen levels in the water and by having a good amount of organic debris in the substrate. The best management, therefore, might consist of keeping excess nutrients from entering the wetland, thus leading to lower oxygen levels. Maintaining a buffer zone around the wetland is an effective method for preserving the quality of the water. Actively drawing down (lowering) water levels will increase the availability of invertebrates for shorebirds, an important habitat management activity during migration periods.

7.8.2. Habitat Management for Amphibians and Reptiles

The single most important management activity for amphibians and reptiles occurs during the design phase. The slopes of the wetland must be about 1:10 or they will be too steep for easy access by the animals. Shallower slopes are preferred. Salamanders make good use of logs and brush left around the perimeter of the wetland, so you should not be too hasty in cleaning up debris. A leaf-litter mat also encourages amphibian use. Frogs make good use of shallows for feeding provided there is available cover nearby. Thus, a dense stand of emergent or submergents should prove helpful. Having fish in the wetland creates some problems because the fish will feed upon amphibians and their eggs. There must be shallow areas where fish cannot reach if the two groups are to co-exist. Reptiles like to bask in the sun to raise their body temperature. Leaving some trees and logs in the water with parts sticking out will provide excellent basking areas. Nearby deep water will serve as an escape route. Keeping good water quality is also important. Bog turtles, spotted turtles, and pickerel frogs all require emergent plants with clear, unpolluted water. You can encourage reproduction by several species of reptiles and amphibians if you have an area of sandy soil with a warm, southern exposure. Turtles and snakes will lay their eggs in these areas and burrowing toads will also be attracted.

7.8.3. Habitat Management for Fish

Fish will have to be stocked into the wetland, and providing for a self-perpetuating fish community can be tricky. You will need forage fish and predators. It can be discussed with a fisheries biologist. As with all wildlife, fish need food, cover, and breeding areas. If you have a good invertebrate community, you have a food source on hand. Cover can be provided by planting shrubs along the edge, creating shady spots. You can also place structures underwater. Several tires strung together or sunken brushpiles are good cover for fish. Breeding areas are found within the plant types that you have. Remember,

different species of fish require different habitats. Again, good water quality is essential. Clear water allows submerged aquatics to survive and these plants then provide good cover and breeding areas for fish.

8

Wetlands and Water Birds Conservation

8.1 Wetland Protection

As the protection aspect tops all other priorities, and forms a very important managerial strategy, the Thol Wildlife Sanctuary is known to have adopted a protectionist attitude for a long time, with its reliable communication system, strategically located forest camps and intensive patrolling by the ever-vigilant staff, resulting in an appreciable increase in wildlife populations, and intrusion and encroachment well under control. Protection plays a very important role in wildlife conservation. Occasional poaching takes place in the region. Field staffs, mobile squad unit would continue to patrol area to control offences. Local staff is to be trained to deal with poaching cases and they would develop skills to keep track records of poachers. Cases of poaching would be dealt strictly under Wildlife (Protection) Act, 1972. The following protection measures will form an effective overall protection strategy in Thol Wildlife Sanctuary.

a. Wildlife Crime Cell

A Wildlife Crime Cell is already organized in TWS under the guidance of the CF, North Gujarat Wildlife Circle, Gandhinagar, with coordination of CCF Crime Cell, Gandhinagar. Following team is expected to prevent wildlife crime in Thol Wildlife Sanctuary

b. Regional Level Committee

This Committee will supervise the District Level Committees. In this Committee, the IGP is the Chairman while the CF (NGWL) is the Member Secretary.

c. District Level Crime Cell

District SP will be the Chairman, while concerned DCF will be Member Secretary, ONGC, Irrigation Department, concerned PSI and RFO will be members of the District Level Committee. Under the chairmanship of the District Superintendent, every month Committee will meet and discuss the law and order situation regarding wildlife crime.

Following are the responsibilities of Wildlife Crime Cell.

- Identify hyper sensitive and sensitive areas.
- Preparing database on wildlife crime
- Change in law and order
- Collection of secrete information
- Interstate coordination
- Workshops and seminars on wildlife crime
- Awards

d. Law enforcement

Considering the ever-increasing biotic pressure on wildlife protected areas, it is very important that the law enforcing officers/ staff of wildlife protected area are well-acquainted with and updated on the various forest and wildlife laws, such as the Indian Forest Act, 1923; the Indian Wildlife (Protection) Act, 1972 and the Forest Conservation Act, 1980, and maintain a very close working relationship with the police and judiciary to put across the government's point of view more effectively. The Government has empowered the various ranks of field staff of Forest Department to take cognizance of offences relating to forest and wildlife. The frontline staffs of Thol Wildlife Sanctuary is always required to be kept well - prepared with necessary documents using, proforma prescribed under the above Acts for taking appropriate action and registering a forest and wildlife offence. The management should also ensure that the staff remains trained and updated on the latest amendments to the concerning laws, and for this purpose easy translation in Gujarati of the relevant laws may be circulated down to the lowest level for a better understanding of the subject. Besides, periodic Legal Workshops and discussion forums are proposed to be organized, involving resource persons from the Judiciary and the Police Department to guide the staff in the proper investigation of forest offences, procedural norms, and to simplify the intricacies of the laws. The staff would be benefited by such arrangements, as these close interactions point out the various shortcomings or mistakes in the entire procedure which render the cases weak, increasing the possibility of criminals going scot-free. The management of Thol Wildlife Sanctuary has learnt lessons that procedural flaws would help the offenders in escaping prosecution, and even the staff may find themselves facing legal proceedings for improper arrest or seizure. Taking cue from the above, the PA management is now convinced that the staffs of the PA require periodic internal refresher courses and discussions, and high level of discipline and motivation. Such discussions and workshops would build the confidence of the staff in the following.

- Arrest or apprehension of persons/ offenders engaged in illegal acts inside the PA
- Proper documentation of illegal activities for court proceedings, including evidence in the form of confiscated wildlife articles, relevant photographs, signed statements, and reports.
- Proper seizure of items prohibited under the Laws, or required as evidence to testify to an illegal act.
- Simple legal procedures in delivering the arrested offenders to the police/ court, and filing charges.

e. Strengthening of striking force

Strike forces will be strengthened with vehicular mobility. These well-staffed and well-equipped strike forces will look after all the zones including satellite wetlands. A Range Officer, who has been provided with the necessary route-chart and the other logistics, heads each force. The strike forces have to be entrusted with the following responsibilities.

- Building up an effective intelligence network to monitor, prevent and pre-empt illegal activities in the PAs.
- Intensive night patrolling throughout the landscape and the villages surrounding it.
- Raid and seizure of illegal wildlife products.
- Weekly market checking and general surveillance.
- Periodic checking of village level crime registers and updating crime maps.

f. Awards to informer

Gujarat Forest Department launched one scheme for awarding the informants for timely and useful information. Cash awards have been proposed in the satellite landscape for the informants. Following are the strategies for this scheme.

- A corpus fund has to be created and the Management of this fund will be supervised by PCCF Wildlife. A committee will be created by him for cash award amount to the informer.
- The personal detail of informer and the award amount will be kept secret. Utilization of funds will be made as per police department rules and regulations.
- If any informer injured or died during clash with the poachers then an amount of three lakh will be given to the family of the person
- If person injured during the clash with the poachers than free medical facilities will be provided and a care take will be paid Rs. 200/- per day, during the treatment. And compensation will be given to the said person according to the certificate given by the District Health Officer.

g. Pakshi Mitra (Friends of Birds)

People participation in conservation efforts has been raged through various measures such as establishment of eco-clubs, Vanya Pakshi Mitra, eco-development. A scheme for engaging local youth as Pakshi Mitra has to be initiated in nearby villages which come under eco-development zone; individual village information on presence of birds may be gathered by Pakshi Mitra on daily basis on prescribed format. These formats can then be forwarded to the RFO and DCF. The volunteers will also work as direct link with

Range office to give latest information on birds' presence and also to carry out rescue operation by directly informing the individual Range office and to the Rescue Centre to be established at Thol. The Pakshi Mitra are proposed to be given proper training so that they can act as trainers to train local people in the assigned villages. Pakshi Mitra are proposed to be selected from every village falling under the landscape.

h. Patrolling strategies

The overall patrolling strategy of the Thol Wildlife Sanctuary includes the following features.

- Staff/ camps listed with duty allocation and route chart.
- The teams are equipped with mobile wireless sets and firearms.
- The patrolling teams systematically cover the area allotted to them.
- Special instructions or provisions for squads.
- Surveillance: hotels, tourist points, vehicles, bus stands.
- Coordination with local police.
- Sanctioning labourers for patrolling (2 team).
- Networking.
- Preparation of daily schedule.
- Market checking (5 places/ week).
- Surprise checking of barriers.
- Preparation of "crime maps" with periodic updating.
- Preparation of crime gang dossiers.
- Preparation of individual crime dossiers.
- Using tape recorder/ camera etc. to record evidences.

i. Red alerts and combing

Besides above exigencies arising due to natural calamities, the PA management is required to be in the state of readiness for other emergencies and to avoid any wildlife crime. A team will be ready to warn or alarm to a situation of the highest priority or greatest urgency, especially an imminent situation to deal with such conditions. On a red alert situation prepared for any trouble or danger that may occur in the landscape, the respective forest officials with the help of police department will reach to the area immediately so as to deal with the situation. The DFO with the help of field staff and police support will comb an area regularly and also randomly to avoid any untoward incident.

8.2 Network, modern communication system and crime risk management

Communication through wireless network is essential for the effective protection of the area. In the sanctuary, the wireless communication network was established in early nineties by systematic radio survey. The wireless communication network was intermittently upgraded by addition and replacement of old sets by new efficient sets. The wireless communication system is being extensively used for the protection of forests and wildlife and has proved to be very useful. Wildlife protection and crime risk management in the present scenario requires a widely distributed information network using the state-of-the art technology. GIS is a user-friendly tool for data integration to facilitate prompt action. With Internet and Intranet technologies, complemented by VSAT, GPS, wireless and fibre optic communication in networking, the PA HQ can be connected to the State HQ and Police HQ to disseminate information for field action in apprehending the offenders. The following imperatives would ensure the success of wildlife protection and crime risk management.

- Efficient surveillance
- Timely reporting and networking
- Prompt situation analysis
- Immediate action

Geographical Information System has the ability to manage both spatial and non-spatial data and therefore provides an ideal framework for wildlife protection and risk management. Thus, an integrated approach based on space remote sensing in the GIS domain with relevant technological, ecological and socio-economics inputs can play a vital role in wildlife crime risk management. A Wildlife Crime Prevention Strategy using the 'state of the art' technology is urgently required for this sanctuary. The following strategies are proposed to be applied for the protection and crime risk management.

- Creation and maintenance of a crime database in the GIS domain of the PAs included in the zone, using forest cover, terrain images from NRSA, overlaid with GPS point data from the field and the Management Information System (MIS).
- Regular round the clock updating of the crime database from the Range HQ of PA by establishing communication links with the Control Room.
- Updating the database with surveillance information like: crime-history, criminal dossiers from local police, district and inter-district criminals, criminals operating on railways, wandering gangs, and resident gangs.
- Updating the database with risk factors leading to proximity, analysis for 'sensitivity charting' viz. closeness to habitations, roads, railway, bus routes, accessibility during monsoon, types of traffic, cattle kill, human kill and injury by carnivores.

8.3 Anthropogenic pressure

The cattle depend upon Thol for 6 to 8 months for grazing. Gondro - a palatable - aquatic grass species is growing profusely in Thol which is favoured by the cattle for grazing. This illegal activity is also a very high threat for the aquatic flora and fauna directly. Whereas enhancing human activity causing disturbance to the avifauna and other wild creatures of Thol, is an indirect threat.

The grazing of bovines in Thol has resulted in depletion of palatable grasses, which otherwise would form an important habitat for numerous creatures apart from the birds. These grasslands in the vicinity of Thol Wetlands acts as a major habitat for breeding and roosting of birds. The grazing of the cattle acts as a disturbance of the birds. There should be restriction of these activities in Thol. Development of grazing land should be one of the major intervention which has to be undertaken. Various government schemes like MGNREGA should be potential used to develop the grazing land. Plantation of tree fodder species like Acacia has to be promoted in fringe of sanctuary and also in the wasteland of all the villages. Perennial fodder plots and fodder grasses has to be promoted in the villages through animal husbandry department. Further some initiatives have promoted for providing better breeds of cattle with stall feeding. Animals Hostels (*Goushal)* has to developed in the village. Cattle feed units are planned with the help of Uttam Diary in the area.

8.4. Equipment and Infrastructure

Major problems faced in Thol is uncontrolled Tourism. This has become one of the major menace of Thol. Proper check post and watch towers in the area are to be constructed. These watch towers should be manned with one room accommodation, RO drinking water facility and solar lights.

8.5. SMART patrolling

Excessive poaching activities have arisen to the need to strengthen patrolling activities in Thol area. Even though routine patrolling has proven to be effective in deterring poachers and detecting wildlife crimes, in the current scenario however, patrolling is not uniform in how they are conducted. While such patrolling activities also provide the opportunity to use important information gathered during patrolling, as a basis to affect decision makings, the non-uniform and unsystematic procedure of data collection, compilation and an analysis in most of the field offices has been identified as a constraint. This has given a need to address the problem on immediate basis.

SMART is a site-based approach used to monitor and improve the effectiveness of conservation management. SMART means Spatial Monitoring and Reporting Tools. This is practiced in most of the South East Asian countries, will look into rectifying these issues by putting in place a standard and systematic system of data collection during patrolling, compilation and analysis. SMART Patrolling will require patrol teams to use the GPS as a mandatory tool, fill in standard data recording sheets and follow a patrolling protocol.

It is needed to have a handheld GPS devices for the patrolling team to record geospatial and metadata information about encounters with poachers, snares, and other types of disturbance and encroachment in the protected area. Further High Zoom geo tagged camera has to be also given to the patrolling team so that they can immediately track the crime scene. The field data is subsequently downloaded from the GPS device to a central computer where it is aggregated as a local and/or national level dataset. This compiled data will give picture of the activity of Poaching to the officer in charge. This can help to vigil the area. Since Thol in completely being in range of cell phone connection. Each anti- poaching squad can be give a closed user group SIM card. This will facilitate in easy communication between various anti- poaching squad. The use of these technology will help in an unparalleled 'big picture' view of where resources are most needed and where they can most effectively be deployed.

Details of Equipment for SMART Patrolling

Sr. No.	Name of the Equipment	Details	
		No.	Cost
1	GPS equipment		
2	Camera		
3.	Hands free Wireless		
5	Binoculars		
6.	Telescope on Watchtower		
7.	Infra Red Camera		
6.	Ammunition		
	Revolver		

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the major intervention which has to be undertaken. Various government schemes like MGNREGA should be potential used to develop the grazing land. Plantation of tree fodder species like Acacia has to be promoted in fringe of sanctuary and also in the wasteland of all the villages. Perennial fodder plots and fodder grasses has to be promoted in the villages through animal husbandry department. Further some initiatives have promoted for providing better breeds of cattle with stall feeding. Animals Hostels (*Goushal)* has to developed in the village. Cattle feed units are planned with the help of Uttam Diary in the area.

8.6 Protection from Pollution

a. Water pollution

Thol Wildlife Sanctuary is a dynamic which receives water from many cultivated fields and sewage of industries. In this process the excessive chemicals from fields get dissolved in this water which in turn affects the aquatic vegetation and associated flora and fauna. The water inside the sanctuary should be analysed for pesticide residues and other chemicals. It is proposed to conduct an Integrated Pest Management programme in the catchment area and in villages adjoining Thol Wildlife Sanctuary in collaboration with the Agriculture Department.

b. Air pollution

An air monitoring station has to be set up in the sanctuary to study the variations in SO2 concentration in the air to see the level that the SO2 concentration in the air which is under permissible limits or not.

c. Noise pollution

No vehicles of tourists should be allowed in the core / bird watching zone. Sanctuary authorities

The following measures are prescribed to protect the sanctuary from various kinds of pollution.

1) The chemistry of water should be monitored regularly. To reduce the chemical load Integrated Pest Management programme as well as use of Bio pesticides should be taken up in the villages around the sanctuary.
2) The vehicular traffic around the sanctuary should be minimised. No vehicles of tourists should be allowed in the core / bird watching zone.
3) Carrying of food stuff in polythene bags should be totally banned because the visitors throw the polythene material in the marshes thereby polluting it or on roads spoiling the natural habitat.

4) Visitors should be made to observe silence during their visit. No transistors are to be allowed in the sanctuary.

5) It has been observed that school children especially in large groups behave very unruly and cause lot of disturbance to other visitors as well as the Wild Life. Therefore, it should be made compulsory for them to engage Naturalist guides of the sanctuary for every group of 10 or more students / people.

d. Siltation

It is yet another biggest problem of Thol Water body. Excessive runoff during monsoon and soil erosion in the nearby catchment area is resulting in siltation of the lake thus decreasing the capacity of lake. Proper plans are to be made during this management cycle to tackle siltation especially to desilt the pond and deepen it at some areas.

Soil and moisture conservation measures are to be taken up in the catchment areas of the lake to control siltation.

8.7. Maintenance of Water Level

Proper coordination mechanisms are to be worked out with villagers and other department to maintain the water at minimum 3ft in Thol lake.

8.8. Oil Spillage

Spill Prevention, Control and Countermeasure Plans are to be formulated with ONGC. The park authorities should be also trained in Countermeasure plan. The oil spill will general happen during monsoon with runoff of water toward the lake.

8.9 Rescue and treatment

The Wild Animal Rescue Operations are warranted in wake of incidences such as requirement for treatment, injuries during kite festival and in several reasons like wild animal in distressed condition. To address these problems, Rescue and Treatment Centres (RTC) has to be established under supervision by veterinary doctors under the guidance of respective DCF. The Rescue Centre will be responsible for different rescue operations, treatment, release operations, health monitoring of wildlife, wildlife health research, laboratory, investigations and vaccination of domestic cattle etc. They will also conduct the post-mortem of dead wild animals. The rescue team members need to have quick decision making capacity, patience in planning, execution and release operations, and ability to control/pacify aggrieved local people and manage any untoward situation. Good coordination and communication skills are pivotal for communication with senior officers and other team members besides necessary care of team members.

Wildlife rescue and treatment is a complex issue influenced by the biology of the species, local situations, geographical distribution, climatic conditions and management actions. Effective management of rescue and treatment will have to strike a balance between minimizing serious long-term conservation of the wildlife species. Therefore, before attempting any rescue and rehabilitation work, one should be equipped with technical expertise and the minimum infrastructure to handle the whole process. It is useful to check whether the area has a history of continued wild animal rescue cases. All the available information on rescue records of the area, such as, the species of wild animal rescued, time of the year of rescue, survival rate of previous rescues if any etc. should be collected. Further, the proximity of the rescue site to a Protected Area, the conservation status of the species that are likely to be rescued, whether they are migratory or resident etc. are also important information to be collected.

Figure 8.1: Four key factors of a successful rescue centre

There are benefits of rescue confiscated animals by providing the veterinary, genetic and other rehabilitating treatment will undertake and provide monitoring programmes for overall biodiversity conservation:

1. In situations where the existing population is severely threatened, rescue might improve the long-term conservation potential of the species as a whole or of a local population of the species.
2. Rescue makes a strong political/educational statement concerning the fate of animals and may serve to promote local conservation values. However, as part of any education or public awareness programmes, the costs and difficulties associated with this must be emphasized.

3. Species returned to the wild have the possibility of continuing to fulfill their biological and ecological roles.
4. Genetic and behavioural considerations, as well as the possibility of disease introduction, also play a fundamental role in determining the long-term survival of a population. The potential conservation benefit of the rescue should clearly outweigh the risks.

Designing and Planning of a Rescue Centre

Based on the location and terrain of the proposed facility, a proper design should be prepared considering all standards to be met. The most important section is the enclosures to house different animals. Enclosures should be natural or "natural looking" with plenty of greenery around. Only in unavoidable situations like treatment, cleaning or food supply, should humans enter this area. Enclosure design is a matter that requires inputs from professional experts. But such experts should be supplied with all basic information like weather, soil conditions, temperature ranges in different seasons and availability of specialized materials required for construction of such enclosures etc. The next important need is a room for examination (clinic) of injured animals. The veterinary hospital should be equipped with all the necessary equipment. Keeping a closed-circuit camera in the all enclosures to monitor the animals from the office premises would be a very useful tool. A weighing balance to weigh the animals is a necessity in any scientific rehabilitation facility. Adjacent to the veterinary hospital there should be a small facility for minor surgical procedures. A space for keeping injured animals for daily handling and for cleaning and treatment of their wound should be made near the clinic. Infrastructure should be made available in the facility to infants/orphans. Communication facilities should be planned in the office including telephone, fax and internet to receive rescue calls and to get all the information about such events happening in protected areas.

There should be a suitable vehicle to transport the rescued animals to and from the facility. Veterinary hospital should be attached with the rescue centre for the veterinary care of rescued animal. It should be headed by full-time veterinary officer and sufficient number of supporting staffs should be available. Food supply and distribution room should be separate and within nearby area of veterinary hospital. Food must be prepared and inspected according to guidelines. Proper waste disposal and drainage should be available. The principles below should be considered when feeding:

- ensure you provide a balanced diet
- fresh clean water should be available at all times

- in case of infants, do not organize exercise sessions for the animals immediately after eating
- avoid sudden changes in diet
- do not overfeed

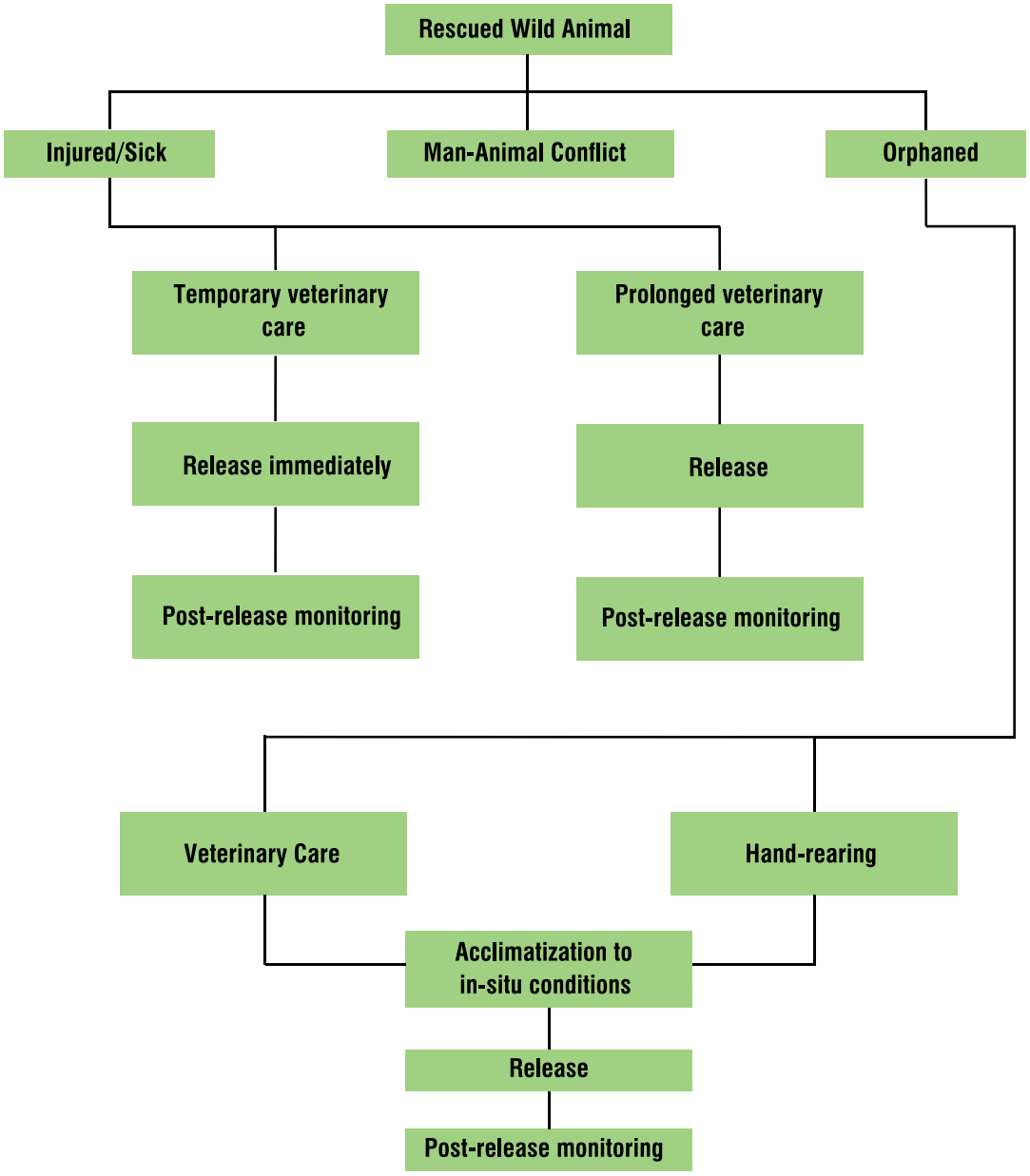


Figure 8.2 A Flow Chart of Rescue, Treatment and Rehabilitation of Wild Animals

Enclosures must be having species specific space available and proper ventilation facilities should be provided. Flooring, roofing, side wall, feeding and watering cubical according to species specific should be included in designing any enclosure. As the problem is on rise in India, most of the PA has not enough man power and are not well equipped with the expert

rescue team and modern equipments. There is a need to create mobile rescue team. Post-mortem examination is a highly specialized surgical procedure that consists of a thorough examination of a corpse to determine the cause and manner of death and to evaluate any disease or injury that may be present. Modern practices in wildlife conservation call for involvement of all stakeholders in the planning and implementation of conflict mitigation measures to muster greater support and cooperation from people. The overall aim should focus on a participatory approach, ensuring support of local communities and other stakeholders for conservation and management of wildlife.

Recommendations

- All the basic equipment and advance treatment facilities should be made available at this Rescue and Treatment Centre.
- There is an urgent need to appoint permanent experienced veterinary doctors to tackle various problems related to wildlife rescue and treatment.
- Hospitals at RTC should be with facilities of X-ray, blood analyser, operation theatre etc. as well as CCTV camera to monitor treated animals intensively.
- All the rescue teams must have adequate infrastructure and mobility to reach the problem site in shortest period of time.
- There is an urgent need for a mobile medical van to provide first-aid and shift the injured birds to the nearby rescue center. Currently only few persons from sent to carry out these operations. Therefore, there is an urgent need to train additional field personnel so that they can augment as a stand by party in a situation of multiple exigencies or complex circumstances.

8.10 Human Wildlife Conflict

Habitat loss and fragmentation is one of the greatest challenges to the conservation. Habitat restoration aim in transforming degraded habitat into natural condition, increasing the natural food plants, and restoration of prey base of the birds will help and reduce the migration and dispersal of wildlife, and reducing the conflict level. The preventive measures to control human-wildlife conflict are always related to the ecology, biology, behaviour and habitat of the species. An extensive research programme will help in investigating the lack of information and reasons for the conflict.

9

Sarus Conservation

The crane family, Gruidae, comprises 15 extant species of large, graceful birds distributed across five continents. Unfortunately, cranes worldwide are threatened by habitat loss, excessive harvest, and disturbance (Meine &Archibald, 1996), making Gruidae one of the most threatened groups of birds in the world. Within the crane family, 10 species are considered to be globally threatened (Hilton-Taylor & Mittermeier, 2000). The sarus crane (*Grus antigone*), the world's tallest flying bird, has a broad distribution that spans two continents and is the only species of crane that breeds both in India and in Southeast Asia (Fig. 1; Meine & Archibald, 1996). Although this species is considered non-migratory, some populations of sarus cranes will shift their range in response to environmental changes due to fluctuations between wet season and dry seasons (Meine & Archibald, 1996). There are four recognised subspecies of sarus cranes, Indian (*G. a. antigone*), eastern (*G. a. sharpie*), Australian (*G. a. gillae*) and the extinct Philippine sarus (*G. a. luzonica*; Blanford,The Indian sarus crane Grus antigone antigone (Linn.) is the only resident breeding crane in western India (Ali and Ripley, 1983). It is chiefly distributed in few northern states of India. the Indian sarus is differentiated by a distinct white feathering on its throat and tertials (Meine& Archibald, 1996).

The current range of the Indian Sarus Crane *G. a. antigone* includes the plains of northern, north-western, and western India and the western half of Nepal's Terai Lowlands. Small numbers are also observed in Pakistan. The sarus crane, a bird species characteristic of wetlands, is categorized as vulnerable on the IUCN Red List. In India, sarus cranes occur mostly outside protected areas and use these unprotected areas for feeding and breeding. They are consequently threatened by poaching and the destruction of their eggs and juveniles. It has been extirpated from larger portions of its historic range and continues to decline in areas where it still exists. Due to rapidly declining population and several other threats, the species is considered as globally threatened. In the paddy crop agro-ecosystem, it preferred the non-cultivable agricultural marshland as a nest site (Borad et al., 2001c). A hidden conflict with the farmers was considered as a major factor behind its population decline.

9.1 Habitat & Ecology

Sarus cranes are mostly non-migratory in India, but often make short seasonal movements between dry and wet season habitats in Southeast Asia and Australia. The Indian Sarus Cranes G. a. antigone have adapted to the dense human population in India, and interact closely with people in areas where traditions of tolerance prevail. Similar adaptations occur with the Eastern Sarus G. a. sharpii in some regions of Myanmar. Human-modified habitats such as croplands are detrimental to many species of breeding birds because of ploughing, trampling, machinery-related mortality, decline in density

of prey, and increased predation due to reduced vegetation cover after the harvest (brickle and Peach 2004, grüebler et al. 2008, The Sarus Crane (*Grus antigone*) is a globally threatened, declining species breeding largely in privately owned agricultural fields or in Thol Wetlands managed for common use (Archibald et al. 2003, Sun-dar and Choudhury 2003). Agricultural intensification at the cost of Thol Wetlands is suspected to be imperilling this slow-breeding species by forcing it to shift to suboptimal flooded rice paddies for nesting and reducing its breeding success (Meine and Archibald 1996). Cranes live here amid a very dense human population in a predominantly agricultural landscape and benefit from social norms and religious attitudes that dis-allow persecution of adult birds despite considerable crop damage (Sundar and Choudhury 2003; pers. obs.). In these districts the cranes nest in both rice paddies and natural wet-lands, a situation ideal for studying whether breeding success in the two habitats differs. Here, I describe the Sarus Crane's nest-site selection and use the nest-survival and known-fates models, respectively, in the program MARK (1) to explore factors that are related to daily survival rates of nests and brood survival (S; from hatching until dispersal of chicks from natal territories) and (2) to estimate the effects of these factors on survival, especially whether the effects in rice fields differed from those in wetlands.

Throughout their range Sarus Cranes utilize a wide variety of landscapes, depending on food availability, cropping patterns, and other seasonal factors. Their optimal habitat includes a combination of small seasonal marshes, floodplains, high altitude wetlands, human-altered ponds, fallow and cultivated lands, and rice paddies. Often they focus their foraging on underground tubers of native wetland vegetation such as Eleocharis spp. Breeding pairs place their nests in a wide variety of natural wetlands, along canals and irrigation ditches, beside village ponds, and in rice paddies. Compared to other crane species, Sarus Cranes will utilize open forests where Thol Wetlands occur as well as in open grasslands more so than other crane species. Where possible, the nests are located in shallow water where short emergent vegetation is dominant. For nesting, use of human-dominated Thol Wetlands is most common.

Mated pairs of cranes, including Sarus Cranes, engage in unison calling, which is a complex and extended series of calls where male and female vocalizations differ but are coordinated. The birds stand in a specific posture, usually with their heads thrown back and beaks skyward during the display. In Sarus Cranes the female initiates the display and utters two calls for each male call. The male always lifts up his wings over his back during the unison call while the female keeps her wings folded at her sides. All cranes engage in dancing, which includes various behaviours such as bowing, jumping, running, stick or grass tossing, and wing flapping. Dancing can occur at any age and is commonly associated with courtship, however, it is generally believed to be a normal part

of motor development for cranes and can serve to thwart aggression, relieve tension, and strengthen the pair bond.

Nests of all Sarus Cranes consist of wetland vegetation. In India, nests located in flooded rice paddies are constructed entirely of rice stalks. Indian Sarus Cranes breed primarily during the rains, with few pairs breeding outside this season in response to chick loss and creation of nesting habitat due to flooding caused by irrigation at Thol. Females usually lay two eggs and incubation (by both sexes) lasts 31-34 days. The male takes the primary role in defending the nest against possible danger. Chicks fledge (first flight) at 50-65 days.

9.2. Threats

Wetland loss and degradation are critical problems throughout the range of Sarus Cranes. Heavy chick loss because of the wildlife trade is currently limiting population numbers of the Eastern Sarus Crane. Human interference in the bird habitat is becoming a biggest obstacle in the conservation of these birds. people were the most important cause of egg mortality. Destruction of Thol Wetlands due to agricultural expansion, however, is increasing dramatically and poses a significant threat as well. These threats reflect increasing human population pressures.

The future of the Indian Sarus Crane is closely tied to the quality of small Thol Wetlands in India that experience heavy human use, such as: high rates of sewage inflow, extensive agricultural runoff, high levels of pesticide residues, intensification of agricultural systems and increasing number of cattle population. In India, mortality due to collision with electrical wires is a significant threat and cranes have died due to pesticide poisoning.

Egg destruction was mainly due to flooding (12.20%), predation (21.95%)and conflicts with farmers (14.64%). Predation accounted for 31.58% of chick mortality. The egg and chick mortality factors identified were unique to the agricultural ecosystem. The number of chicks that hatched and of chicks fledged per nest did not differ significantly in different microhabitats. Hatching success was higher in non-cultivable agricultural marshland (68.18%) compared to paddy cultivated marshland (38.48%), mainly due to human disturbance and higher predation risk.

9.3. Conservation Measures

Habitat

Since the Sarus Cranes utilize a wide variety of landscapes, depending on food availability, cropping patterns, and other seasonal factors. And also their optimal habitat

includes a combination of small seasonal marshes, floodplains, high altitude wetlands, human-altered ponds, fallow and cultivated lands, and rice paddies. Hence we have to make a conservation plan that addresses all verities' of these habitats.

People should be made aware of how these birds help maintain a balance in our ecology. Increase in the use of pesticides for agriculture activities has been affecting the breeding and the growth of the bird species.

Education and Training

Public education programs involving the Sarus Crane have special opportunities to emphasize the uniqueness of the Sarus Crane as the world's tallest flying bird; the importance of wetland conservation and sustainable use of wetland resources (especially in areas where reintroduction is under discussion); and watershed-level approaches to river systems and the costs and benefits of development plans. Similarly, professional training programs are able to stress techniques in wetland management (especially the need to coordinate surveys, research, wetland restoration, water management, and watershed-level planning) and the relationship between sustainable land use practices and the quality of Thol Wetlands and crane habitat.

To protect the crane's habitat and nests a community education and awareness campaign was carried out, using audiovisual shows and presentations, in villages and schools in the vicinity of sarus crane nesting sites. With this process it is possible to re-establish a bond between farmers and nature, and work on community involvement for the sarus crane is a continuous process. Meine & Archibald (1996) suggested that wetland conservation should be integrated into village-based education and development programmes for preserving the habitat of the sarus crane in India.

Field visits to important sarus crane breeding sites can be made every week during the breeding season. Colour pamphlets and postcards in local languages have to print for distribution in schools and villages. The pamphlets and postcards helped us obtain information from people about sarus crane nesting sites and juveniles, and it can be reached people via their children in school or via friends and neighbours. The information can be provided by letter, phone, and in personal visits. The use of such printed postcards and pamphlets can be effective in gathering information from a wide area and from people who cannot be reached directly by any other means.

Audiovisual shows and lectures on the sarus crane, including a short documentary film explaining the breeding period, habitat, and development of the chicks. It will help to dispel misconceptions regarding the crane's supposed destruction of crops, showed that its eggshells are ineffective for various health problems, increase people's knowledge of

the species' breeding biology, and demonstrated the importance of the surrounding Thol Wetlands for the species.

It is necessary to erect sign boards in important crane breeding sites to appeal to people whom we could not contact directly. It will attribute more value to the conservation efforts by painting on walls and sign boards. Interpretation board has to be installed at key breeding site for the sarus crane.

10

Socio-Economic Aspects and Eco-Development

10.1. Committee Development

The Eco-tourism concept in this region has a great potential not only as an awareness activity but also as a major economically viable activity for the people of peripheral villages of the sanctuary. Eco tourism activity will help to increase the livelihood opportunities of the villagers and supplement income generating option. It is observed that the Extended of tourism has increased many folds in past few years. Scarcity of staff has resulted into ill management of the park, especially during the peak seasons, when the visitors throng Thol in huge number. This situation is creating a need at the same time work as an opportunity to have a participatory management of park with villagers, Forest officials and tourist. Eco-development Committees (EDC) in and around Protected Areas with a view to ensure biodiversity conservation of the Sanctuary is the need of the hour. Various functional Committees have to be constituted within the fourteen villages in the periphery of the sanctuary. For formation of EDC group a detailed Micro-plans has to be prepared with the views and aspirations of the villagers. Detailed Group discussions have to be organised with sarpanchs and gram sabha for formation of these EDC. The local villagers have to be encouraged for sharing of the benefits and usufructs. Forest Department in association with Gram Sabha has to approve a common modus operandi of works, that each EDC will take-up, additionally it should include detailed instructions on constitution of committees, activities undertaken, account keeping and usufruct sharing. All EDC has to be registered under Society Registration Act 1860.

Various capacity building trainings has to be conducted to empower these EDCs. The brief modules should be Orientation module, Micro-planning module and Accounts module. The works of these EDC has to be regularly monitored and evaluated by forest officials on pre set criteria. Monitoring reports should reflect meetings of the committees, agendas discussed, money spent, loan amount advanced/ recovered. To ensure transparency in the working of the committees, bimonthly accounts of the committees has to shared in a meeting chaired by DCF and committees.

It is planned to organize the current people employed in various activities into different categories of EDCs according to their present dependence on the sanctuary. It is planned to develop some professional group like young guide, Guided boat ride, SHG that will manage Food Courts and Traditional Eateries, SHG managed Night Stay in tented accommodation, Star Gazing, Nature Club, SHG for entertainment of the tourist Further in the neighbourhood assisted body will be formed that will the stress on socio-economic upliftment, various neighbourhood assisted bodies will be formed for vigilant watching of the illegal activities in the sanctuary.

The Committee shall protect sanctuary from fire, illegal grazing, encroachments and poaching and render all such co-operation to the Forest Department. The Committee will work as a vigilance network that informs the Forest Department about persons indulging in illegal activities in the sanctuary area. The Committee, in consultation with the Forest Department, detailed work plan as per the task allocated to them. The Committee will execute the approved work plan. The Chairperson of the Committee will sign a Memorandum of Understanding with the DCF of the Sanctuary, The Committee would maintain account of funds received from various sources and the expenditure would be audited by an agency appointed by the Forest Officer.

The new participatory management strategy of sanctuary will help in conserving the bio-diversity resulting in a changing paradigm of partnership. The increased boosting and collaboration of local people in conservation efforts will create belongingness and result into effective and extensive management of the Sanctuary.

10.2 Progress in Eco-development Activities

Based on their proximity to the sanctuary and also on their apparent dependence on the sanctuary villages have been selected for the eco-development activities.

Only residents of the respective villages were registered as members of the EDCs

This committee can receive funds from other agencies/donors also. Integrated Development Programmes are carefully drawn for overall development of the neighbouring villages without disturbing the ecology of the sanctuary.

A book shop is run by this committee inside the sanctuary and apart from books on wildlife, tourists can avail wildlife paintings, T-shirts, Caps, Key chains etc from here.

10.3 Proposed eco-development activities

i. The local population is to be motivated to undertake and expand eco-development activities. It is proposed to undertake activities like popularization of non – conventional energy, varietal improvement of cattle, employment generation by involving the villagers in tourism related activities, community development programmes etc. in a phased manner, for a period of five years.

ii. Promote use of non conventional energy (biogas plants, smoke free chullas, solar lights, and solar cookers, LPG etc.) in order to reduce fuel wood dependency on forests. The State government would be approached to open permanent supply depot in each taluka headquarters and elsewhere depending on the population. People may be encouraged to grow fuel wood trees around the boundary walls of individual farmlands. Trend of bio-gas for domestic use need to be encouraged. To

prevent from noise and air pollution from diesel generators, and also to avoid lying down of transmission lines in the sanctuary area, eco-friendly solar devices need to be advocated, encouraged and supported. Distribution of gas stove at subsidized rate in the ecodevelopment scheme is proposed

iii. Introduce phased reduction of scrub livestock and improvement of livestock breeds through controlled fertilization of female stock in proper health and age with males of better local breeds, aided by sterilization of scrub bulls by way of organising cattle improvement camps.

iv. Children from the adjoining villages are to be developed as guardians of the nature. Programmes to educate and encourage them are to be undertaken by involving institutions like WII and WWF.

v. A new Eco Development Committee should be constituted for the nature guides who are registered with the sanctuary.

vi. Prepare micro plans for all the village EDCs and the two tourism related EDCs in the format attached as Appendix – 12.

vii. Promote local handicrafts as tourist souvenir which can be sold through appropriate sale outlets with in the sanctuary.

viii. Organise periodic training programmes for various stakeholders in hospitality and natural history. This programme aims at bringing all the Thol city people with whom the tourists interact, speak the same facts about the sanctuary.

ix. Some of the naturalists with in the sanctuary are not well versed with the English language. Apart from English speaking tourists, German and French people also visit the sanctuary in good numbers. It is proposed to conduct regular courses in different foreign languages for the benefit of village youths working in tourism related jobs in and around the sanctuary.

x. The villagers may be prompted to constitute self-help groups and can be provided assistance depending on their contribution in the activity. Income generation activities may be taken up by the groups with coordination from other agencies.

xi. The implementation of programmes will be undertaken by involving the local people for basic data collection. The evaluation, monitoring and research will be undertaken by the officials of state forest department.

xii. The registration of Eco Development committees that is not active and not responding to the repeated efforts to cooperate with the sanctuary administration should be cancelled after following the prescribed procedure.

xiii. It is proposed to organize various conservation activities viz., awareness programmes, wildlife camps and competitions, particularly during the Wildlife Week, and to give knowledge relevant to reduce human-wildlife conflict, and about the possibilities for co-existance of human and wildlife. Involve or invite the local educational institutions to the camps being organized by the forest department. Schools in the more degraded peripheral forests be encouraged and involved in plantation activities and provided with saplings of local tree varieties. Together with the schools in the area, a "Newsletter" is proposed so as to cover the various facets of wildlife conservation.

10.4 Participatory Process

Necessary provisions will be made in the village micro-plan for implementation and monitoring. The inhabitants of the target villages were the guiding spirit, who gave necessary motivation for the creation of the respective Village Level Committees. The target villages are in close proximity to the PA, and the inhabitants are familiar with the ongoing conservation efforts. Though many of the villagers earn their livelihood from the labour oriented works, there are quite a few interface problems warranting timely redressed. Adoption of a participatory approach through the Village Level Committee for providing reasonable alternatives would ensure the much-needed public support for the protected area. The Village Level Committees of target villages would have the joint responsibility to ensure that the provisions of the micro-plan are successfully implemented. The cooperation for implementation has to be sought, as and when required, from various State Government Agencies, Government of India, and Public Representatives.

10.4.1 Institutional Framework

Village Level Committees will be formed in all the target villages of PA, in accordance with the Government resolution. These would be autonomous under the respective Gram Panchayat with independent financial and management functions. The composition of the individual Village Level Committees is furnished in the site-specific micro-plan.

10.4.2 Awareness, Education and Interpretation

The implementing agency would be responsible for imparting the necessary skills to frontline staff of the PA for site-specific micro-planning. Further, the agency would frequently convene village level meetings for promoting awareness amongst the local inhabitants, apart from carrying out meaningful interpretation of PA values. The interventions in micro-plans should be need-based and site-specific, which can be grouped as below:

10.4.3 Agricultural Development Works

- Land levelling and bunding
- Providing bullocks for ploughing
- Lift irrigation
- Stop/check dam
- Overhead tank
- Pipeline
- Water pump
- Providing thrashers to the committee
- Providing improved seeds/ fertilizer
- Horticulture (supply of fruit bearing species)
- Sericulture

10.4.4 Off-farm Income Generation Activities

- Apiculture
- Poultry development
- Hand craft
- Motor vehicle repair shop (soft loan: ED fund)
- General store/shop
- Supply of sewing machines
- Eco-tourism

10.4.5 Skill Development/ Training

- Guide training for unemployed youth
- Training for skill development

10.4.6 Plan for Resource Substitution

- Bio-gas plants
- Fuel efficient chullahs
- Production of fuel wood from field bunds
- Improvement of cattle breed
- Artificial insemination
- Providing improved strain breeding bull
- Providing improved strain of livestock
- Veterinary care to cattle

10.4.7 Development of Fodder

- Rain-fed silvi-pasture on community lands
- Irrigated pasture on community lands

10.4.8 Plan for Community Cooperation

- Crop protection
- Solar fencing
- Stone rubble wall
- Infrastructure Development
- Day-shelter
- Community hall and EDC office
- Health unit building
- Repair of school building
- Residence for school teacher
- Approach road for hamlets
- Single point electricity connection
- Drinking water
- Hand pumps
- Repair of existing wells and pumps

10.5 NTBS Conservation Society

Conservation of the birds is one of the priorities of the State Government of Gujarat as well as that of the Government of India. The efforts of the State/ Central Governments have borne fruits as can be seen from the gradual increase in population and geographical spread of the birds population in Saurashtra. It is desired that the resources for the birds' Conservation Programme be augmented with participation of various sections of the society. It is understood that the entrepreneur especially those from Gujarat are keen to participate in this important endeavour of the State. It is desired that an opportunity be created for such participation. This shall help augment funds to pace up the lion conservation programme and also help instill in society sense of ownership of the effort. Keeping these aspects in view a proposal for constitution of the 'Nalsarovar/ Thol Wildlife Sanctuary Conservation Society' (NTBSCS) to be submitted by the Principal Chief Conservator of Forests (WL) and ex- officio CWLW, Gujarat State with the following conditions.

The Society has to be registered under the Indian Societies Registration Act (XXI) of 1860.

The registered office of the society shall be at Gandhinagar.

The society shall be governed as per the Memorandum and articles of Association.

The Society shall be autonomous and may enter into MOU/contract in pursuance of its objectives.

The society shall follow prudent financial management in its working.

The State Government will continue to give funds in the form of Grant-in-aid to this Society for capital works approved by the State Government. For maintenance of the Thol Wildlife Sanctuary other recurring expenditure shall be borne by the Government as at present. The Budgetary allocation Year to Year would reflect the effect of inflation in maintaining of assets. In view of the nature of the activities present Staffing of the Government will continue for whom salary and other allowances will be borne by the Government. Whenever the society considers it necessary to get support from other qualified individuals the Society shall make Contractual arrangements to obtain the services from those individuals in a manner such that it does not create any permanent financial burden on the State Government.

Table 10.1 Executive Committee of the 'Nalsarovar/Thol Wildlife Sanctuary Conservation Society'

Status	Post
Conservator of Forests, North Gujarat Wildlife Circle, Gandhinagar	Chairman
Deputy Conservator of Forests, Nalsarovar Division, Sanand	Secretary
Honorary Wildlife Warden, Ahmedabad	Member
The Financial Advisor, Forest & Environment Department	Member
The Deputy Secretary, Forest & Environment Department looking after the wildlife matters	Member
Deputy Conservator of Forests, Social Forestry Division, Ahmedabad and Mehsana	Member
Dy. Director, Animal Husbandry, Ahmedabad and Mehsana	Member
Two NGOs to be nominated by the Government of Gujarat	Member
Two representatives of donors to be nominated by Government in consultation with the Chief Wildlife Warden	Member

The society would be free to receive Government grants for projects, to raise donations, to invoke new ideas for raising resources and subject to the constitutional arrangement of the Society be able to utilize those funds for the objectives mentioned in the Memorandum and Articles of Association.

The Society shall resort to outsourcing by contractual arrangements as much as possible for activities that are generally carried out by Class III & IV employees in the Government.

A separate bank account in a nationalized bank shall be opened in the name of Member Secretary of the Society and the accounts of Govt. funds and society own funds shall be maintained separately by the society.

The Society shall function like a corporate entity with a Social purpose and optimize public benefit for the expenditure incurred by it.

10.5.1 Goal

i. Conserve birds and its habitat for its long term survival
ii. Facilitate reclamation of lost territories and thereby promote stable meta populations of birds in satellite wetlands.
iii. Provide wildlife health care and veterinary services to support the cause of conservation of birds and its associate fauna in the region.
iv. Promote healthy eco-tourism in the region that shall contribute to increased awareness for need and issues of conservation locally as also globally.
v. Extend and make it aware for benefits of conservation; and
vi. Facilitate ecologically suited sustainable development of local population.

10.5.2 Objectives

i. Identify and delineate habitats of satellite wetlands to ensure that present population grows to viable numbers in wild in the medium term.
ii. Identify satellite wetlands used by birds and its associates for movement in the region, secure them and identify gaps and bottlenecks.
iii. Support the case of having multiple gene pools representing widest possible genetic diversity in different geographic locations in Saurashtra.
iv. Facilitate village micro-planning for effective and efficient ecodevelopment, augment and provide resources for implementation of micro-plans.
v. Elicit active participation of local communities in promotion of tourism through ecodevelopment or eco-tourism committees for their benefit.

10.5.3 Functions of the NTBSCS

The Society shall prepare a detailed Annual Plan of Operations (APO) based on various requirements of *in-situ* conservation of Birds in Sanctuary and Satellite wetlands and its habitat in and around sanctuary and to meet other objectives of the Society. This APO shall be prepared in accordance with the long term management strategy for

conservation. The APO shall be presented to the Committee of the Society in its annual meeting for approval and shall be reviewed from time to time. Prior to submission to the Committee it shall be submitted to CF (North Gujarat Wildlife Circle, Gandhinagar) for endorsement.

i. The Society shall provide technical assistance and guidance to the State Government and management of TWS and such other bodies responsible for conservation of birds and its habitats.

ii. The Society may commission studies and sponsor research to address its objectives.

iii. The Society may provide inputs of human resources and finances for addressing issues like, habitat management, man-animal conflict, ecodevelopment, ecotourism and human resource development.

iv. In discharge of its functions, the Society shall engage personnel and/or consultants on contract basis for fixed periods.

v. The Society may organize a campaign to raise awareness on conservation issues through various means of communication. It may document, develop, publish and disseminate relevant material, data and scientific details for the purpose.

vi. The Society shall strive to raise funds through various means to address its objectives.

vii. The Society may enter into MOU/contract in pursuance of its objectives.

viii. The Society may perform such other functions as requested by the State Government and/or the Chief Wildlife Warden.

10.6. Convergence with other department

The heart of any successful initiative is Participatory planning from the grassroots level upwards led by local governments. This leads to a strong sense of ownership and achieve much of better results in local development. There are many specialized initiatives and sector-wise thrusts of development, run under the aegis of many respective line department. Many sectorial development plans such as District Health Plan, District Education Plan, District Water and Sanitation Plan, District Agriculture Development Plan, District Rural Road Development Plan, etc have been prepared horizontally to each other. It is being steadily observed that the output of all these are effectively the same denizen of the villages. In order to use resources efficiently and involve the local governments actively, vertical planning process needs to be transformed into a horizontal planning process, so that the planning of each entities work together and resulting into a sustainable development.

It is being interestingly observed that all these guidelines stipulate inter programme coordination and convergence. Broad procedures and processes are similar in many ways in these programmes. The following are major flagship programmes for local area development have to identified and the managers of Thol Protected Area should adopt an integrated approach towards socio-economic upliftment of the local people, by coordinating with various departments, which can implement some of the schemes in this area. Also this would call for interventions at the highest level for coordinating and convincing various department heads to give benefit of such schemes in this area.

11

Eco-Tourism, Interpretation and Conservation Education

11.1. Background

Thol, owing to its proximity to highly populated city like Ahmedabad, has become an important tourist destination. It receives lot of tourists every year especially during winters . The tourist flow is likely to increase in coming years. With the increase of tourists the disturbance to the birds is also likely to increase manifolds. The tourism also has the dark side. Not all the tourists are conservationists, neither all of them are disciplined enough to maintain the sanctity of the sanctum sanctorum.

Presently, the tourists are allowed to begin their bird watching expedition inside the water bodies. In the peak season, great numbers of tourists gather at this site. This has resulted into many problems like, the areas of Thol water body at this location is under maximum adverse impact. Over a time in the peak season, the birds tend to keep away from this point. It is proposed in this management plan to open a camp site near the current interpretation centre. Further, A tourism zone has been prescribed in this plans of Thol, which has been demarcated. The tourist traffic should be restricted in this tourism zone only.

The following measures are suggested.

1. Tourists should be allowed in the tourism zone only.
2. The locals are required to be trained in interpretational skills. They would also act as good guides with better equipment like bird watching books, Binoculars etc

All guides would be registered with the local management of the Sanctuary. Ticketing mechanism has to be introduced. This will act as pre-paid guide system which will fix the tourist routes in terms hours. The tourists would be required to choose a particular route, from amongst these routes, whose distance as also the rate and total amount to be paid would be fixed. The tourists would pay in advance, which would prevent disputes.

11.2 Problems

i. There is a high degree of disturbance in the sanctuary from overcrowding during holidays.

ii. There is no proper parking space available for the vehicle, rickshaws and waiting space for the nature guides at the entrance.

iii. There is no proper receptionist available in the sanctuary to provide assistance to the tourists in the Interpretation Centre and the library.

iv. The sanctuary is still in a developing stage and there are not much tourist facilities available.

11.3 The strategies for management of Eco-tourism

The following practices are prescribed for the management of tourism in Thol Wildlife Sanctuary:

i. Motor vehicles other than that of the forest department should not be allowed to enter beyond the tourist zone.

ii. Tourists should not be allowed to move in the grassland areas during summer.

iii. Along these nature trails, signage, benches and dust bins that blend with the surroundings should be established to provide the visitors with resting places to enjoy the beauty and relax.

iv. Some viewing platforms, watch towers and tree top huts should be constructed at suitable points to provide a birds' eye view of the various blocks. These viewpoints should not be located at very conspicuous places and should be well camouflaged.

v. Windows should be created in the vegetation along the roads/trails to facilitate watching of the birds without disturbance.

vi. Closed circuit televisions should be established in the Interpretation Centre and live telecast of nesting activities in the heronry can be shown to the tourists using hidden cameras

vii. All the films available on Wildlife should be converted to VCD/DVD and daily shows are to be arranged in the Interpretation Centre

viii. All the trails/roads have to be repaired and beautified every year as per requirement.

ix. Tourist traffic should be managed according to carrying capacity calculated for the space available.

x. Environment friendly brick paving of the trail from should be done in order to enable tourist satisfaction as well as reduce overcrowding in the main road.

xi. The main gate and associated facilities like ticketing counter and orientation centre should be redesigned to avoid crowding and enable easy and quick passage of tourists.

xii. The services of M/S Sulabh International may be requested for maintenance of the toilets near the sanctuary.

xiii. The booking window and associated structures / buildings at the barrier should be renovated. Basic visitor facilities like toilet, coffee shop, memento shop, drinking water outlet etc. should be provided here.

xiv. Strict vigil is to be maintained by the staff against vandalism by tourists. Dos & Don'ts and provision of punitive action should be displayed at appropriate places like main gate, barrier, Shanti Kutir, the Interpretation centre and all the hotels.

xv. Visitors should not be allowed to enter the waters or get down from the road to get closer to the animals and birds.

xvi. All the visitor groups especially students beyond ten in number should essentially be accompanied by nature guides/sanctuary staff so that they do not violate the sanctuary rules and observe silence during their sanctuary visits.

xvii. Negative impact of tourism is broadly due to high number of tourists and inappropriate and unregulated activities. All these should be examined properly and make modifications in regulations of tourism and its activities in the interest of the wildlife conservation.

11.3.1 The Main Gate and Interpretation Zone

It comprises of the ticket counter, the Orientation centre, Office of the Forester and Office of Naka guard. This is a very important and strategic zone because the visitor first comes to this place. This is the place where he should be properly guided and educated before he goes inside. Therefore, management may be adopted as under:

i. All persons entering the sanctuary should obtain a valid ticket at this point itself before entering the sanctuary.

ii. The visitor should be encouraged to visit the Orientation Centre so that they can get an overview of the sanctuary and can plan their visit accordingly.

iii. Tourists should not be allowed to carry food items packed in polythene inside the sanctuary. Paper covers at reasonable prices should be made available by the staff welfare society.

iv. Plastic water bottles should be allowed inside after deposition of a security amount which should be reimbursed upon production of the empty water bottle.

v. The Orientation Centre should display the trails and their distances and also posters on themes like wetland values, wetlands of international importance, and world conventions on wetlands, sanctuary ethics and information on the interpretation centre.

vi. Simple literature about the sanctuary in Hindi, English and Gujarati about the Dos & Don'ts and a map of the sanctuary should be made available for the use of a common visitor along with the ticket.

vii. The services of the guides should be made available at main gate and near the barrier for the convenience of the visitor.

viii. Separate parking arrangements should be made for cycle, rickshaws, cars and coaches.

ix. The new parking space to be constructed at the main gate should be immediately pursued and the space for parking of rickshaws and cycles should be shifted to the new area.

x. Main gate should be reconstructed for improving the appearance.

xi. The tariff for the guides should be revised periodically and displayed for the benefit of visitors through sign boards and also on the ticket.

11.3.2 Prescriptions for the Nature Guides operating in the sanctuary

i. Only those Nature Guides having a valid licence and wearing proper uniform should be allowed to enter the sanctuary.

ii. Only the licensed Nature Guides should be allowed to operate inside the sanctuary at a tariff fixed by the administration.

iii. Refresher courses should be held periodically to improve the interpretive performance of the naturalists. Renewal of licence should be done only after successful completion of the refresher course.

iv. The services of the guides or the Nature and Wildlife Interpreter's should be made available at the barrier on request.

v. The system of hiring out guides should be chalked out and they should be made to observe the code of conduct. Licences of defaulting naturalists should be cancelled either temporarily or permanently.

vi. Participation of nature guides in the programmes organized by the sanctuary (Plastic removal, various training programmes in which they are asked to attend, emergency situations like fire fighting etc.) should be made compulsory and the licenses of the defaulters should be cancelled temporarily or permanently.

11.3.3 Education and Awareness

i. The tourists are to be given an initial orientation about the sanctuary by means of a comprehensive brochure provided at the time of the purchase of entry ticket.

ii. In order to reduce vandalism, volunteers have to be trained, who can educate the tourists. The guides can prove to be the best in educating tourists apart from sign boards being erected at vantage points.

iii. A large number of tourists hire guides who in turn make them better aware of how to do their bit for the conservation. These volunteers have to be trained at regular intervals.

iv. Nature awareness camps have to be conducted for young people, school and college students, contribute at various levels for the cause of conservation of our natural heritage.

v. All the information about the sanctuary including published research works and facilities available to the tourists should be displayed in the website of the sanctuary.

vi. A sanctuary interpretation expert should be employed who will look after the interpretation centre and the library.

vii. Nature camps for students, teachers, lawyers and media people should be regularly organized by utilizing services from NGOs.

viii. Informative as well as pictorial brochures and other material should be regularly published for distribution to the participants of nature camps.

11.3.4 Regulations, monitoring and evaluation

11.3.4.1 Operational guidelines

a. For tour operators/developers

- To abide by the planning restrictions, codes and standards prescribed by the authorities.
- Implementation of desired environmental principles through regulation.
- Being sensitive to the conservation of endangered species and corridor value of the area.
- To ensure construction of structures blending with the environment as per the prescribed building code.
- To take into consideration the carrying capacity and sociological use-limits of the site while creating tourist facilities, and ensuring safety and convenience of tourists.
- To use local material and design as far as possible, while avoiding over construction. The planning, architectural design and construction of tourist facilities should use eco-friendly techniques viz., solar energy, recycling of garbage and waste, harvesting of rain water, natural cross-ventilation instead of AC.
- Energy and water saving devices should be used apart from controlled sewage disposal.
- Control of noise pollution, chemical pollution and air emissions.
- Use of signages/ boards as per the standard prescriptions in the code.

- Reduced use of environmentally unfriendly items like asbestos, CIS, pesticides and inflammable material.
- Respect the historical and religious sites in the area.
- Provide appropriate interpretative service to visitors for communication with nature and local culture.
- Ensure proper marketing of eco-tourism products.
- Ensure training of staff on environmental issues.
- Ensure safety and security of visitors.
- Respect local inhabitants, culture and involving them in various activities and vocations as far as possible.

b. For the visitors

- Abiding by the code of conduct, "Do's" & "Don'ts".
- Helping conservation, apart from protecting any site natural or cultural, which may be adversely affected by tourism.
- Avoiding wastage of resources.
- Avoiding littering and carrying back all non - degradable litter.
- Leaving the camp sites clean before departing.
- Avoiding removal of plants, seeds, drift - wood from the site.
- Respect local culture/ customs.
- Respect holy places.
- Strictly adhering to the safety precautions.
- Do not visit the sanctuary without authorized guide.

c. For the host community

- Respect the value of environment and cultural heritage.
- Avoid overusing the area.
- Co-operate with the authorities and ensure healthy eco-tourism.
- Realize and react to the threat of investors who see opportunities and exploit the locals.
- Be friendly with the visitors as effective "nature guides" and "conservationists".

11.3.5 Sanctuary Ethics

To Be Displayed at the Hotels, Main Gate, & Thol Wildlife Sanctuary

✓ Animals have a right of way - If you come across an animal crossing the road, resting or feeding by the road side, slow down and be silent.

- ✓ Watch the wild life at leisure and respect the right of others to watch.
- ✓ Most animals have a keen sense of hearing and alien sounds startle them. Do not scream or talk loudly.
- ✓ Small groups are ideal for sanctuary visit.
- ✓ Enjoy the song of the birds. Do not use your music players inside the sanctuary.
- ✓ Animals gather their own food. Do not feed them with your food.
- ✓ DO NOT smoke inside the sanctuary. You might kindle a wildfire in the sanctuary.
- ✓ While in a sanctuary it is better to blend with the surroundings by wearing khaki or green coloured dress.
- ✓ During summers, carry drinking water with you.
- ✓ Dust bins are provided all along the roads. Do not throw litter around the sanctuary.
- ✓ DO NOT get into the water and disturb the birds.
- ✓ Carry a note book and sanctuary map. Travel light and do not carry any valuables except cameras and binoculars.
- ✓ Keep a safe distance from the animals and birds. Respect their privacy and you will be rewarded with hours of undisturbed viewing.
- ✓ Early mornings and late afternoons are best suited to visit the sanctuary.
- ✓ Nature Guides are available to the tourists at the main gate. It is compulsory to engage a guide if your group size is 10 or above. Guides know the sanctuary well and can answer your countless queries.

11.4. Awareness Campaign

It is observed that majority of tourist who come to Thol sanctuary are well educated. It is also proposed to arrange film shows, talk shows for creating large-scale awareness among tourist towards conservation. The media relays symbols to the general public. For example, the polar bear is not the most threatened animal in the world, nor is it the only animal impacted by climate change, but it is frequently used in visual mediums to appeal to people. Disseminating information about threatened species and salient issues pertaining to wildlife conservation is much easier when done through an effective media outlet. In modern times, the ascent of social media has made it easier for wildlife organizations to promote their cause and articulate their mission. In any case, the media shapes how individuals feel and what they are exposed to - increasing exposure to an issue usually yields positive results in terms of interest, and hopefully, action.

It often takes public outrage to put change into effect. The media can alert the public to poaching, habitat destruction, illegal trapping, etc., and the public can then exert pressure on governments to enact laws or regulations to attempt to solve the problem. A concerned public will also increase its donations to organizations that can be act as a partner of Forest department in their conservational efforts.

The Forest department and Sanctuary management authorities can adopt the easy and cost effective methods by adopting Web 2.0 and social media technologies and Web sites to providing detailed information. Through this department can brand themselves and also create interest groups that can be reached out to the public more effectively and efficiently. These groups can act as an external mechanism that provides support for the system.

The social media technologies have to be managed by keeping the priorities like conservation and protection aspects in agenda. There has to be a target audience and at the same time the expectation level of them has to be managed.

The information conveyed through these media can focus on Wildlife action, Campus Ecology, Climate change, wildlife watch etc. Through these people can share their insights or observations and also participate the events. The entire activities can be more entertainment oriented by putting some fun elements to keep their interest going. For that there can be small events like wildlife photograph and videos related to Thol and other water bodies can be promoted through this. There can be a small budget allocation for managing these all events as these all comes as a part of Information, Education and Communication (IEC) activity.

In Thol Protected Area, every year around 35-40 Nature Education Camps are to be organised, involving students of schools and colleges. During such camps, the participants are to be made aware about Nature and its diversity. Their exposure to Nature and its various facets, at such an early age, when they are found to be most inquisitive and eager to learn, leaves a long lasting effect in their memories. The nature education, therefore, sometimes entirely changes their lifestyle and sensitizes them towards nature. It is proposed to organize 50 camps for the school and college students each year. It is proposed to organize a tour of important Wildlife Sanctuaries and National Parks for the local leaders in a year. This tour would bring about necessary awareness regarding the conservation.

Every year, one training would be arranged for the tourist guides. This is very important as the guides, who accompany the visitors in the boats, should have proper knowledge about the PA and wildlife and at any cost no wrong information should go to the tourists, who are the ambassadors to the outside world for the PA.

Due to the proximity of Thol to the Industrial and highly populated city like Ahmedabad. Eco-tourism in this region has a great potential as not only the awareness activity but also as a major economic activity for the people of peripheral villages. They also derive benefit from this activity by earning livelihood from providing traditional food items and running eateries. Because of tourism other forms of business may also flourish, in the region. In absence of enough number of staff the villagers involved in this tourism related activities remain the only means of communication for the tourists, especially in the peak seasons, when the visitors throng Thol in huge number. The development of tourism is a way to make wetlands economically viable, and can provide employment and income for local people. The wetland site has been able to raise considerable funds directly from tourism. Some of the mechanisms used to raise such funds are discussed. The wetlands provide society with a range of essential services, and these services should be recognized by some form of public financing. However, as this is not always possible, managers need to be inventive in raising funds, and tourism is a promising source of such revenue.

The main methods to be employed to raise funds for nature conservation:

Entrance fees: Fees will be charged per person/ vehicle, for entrance and access to wetland areas

User fees: Fees charged to visitors for undertaking specific recreational activities or for the use of specialised facilities like for parking and photography within wetland areas, subject to compliance with the area's regulations

Concessions and leases: contracts between managers of wetland areas and business or individuals under which the businesses or individuals are permitted to operate within the wetland area;

Direct operation of commercial activities: provision of commercial goods and services (such as accommodation, guiding, specialised rental equipment, food sales or merchandising of clothing, crafts and souvenirs, for example);

Volunteers and donations: volunteers are persons who offer their services to a wetland area of their own free will and without payment (except, in some cases, to cover their basic living expenses); donations are gifts or money, or in some cases goods and services, that are donated to support the conservation of wetland areas.

Clearly, as wetland areas rely increasingly on income from tourism to pay for conservation initiatives, local communities often have to compete with conservation projects for revenues.

The challenge is to direct a substantial proportion of the income earned through these means to community/local poverty reduction projects.

Conservation could do more to address poverty reduction, as poverty alleviation also can lead to improved conservation outcomes. When commercial operations are being developed, local people living within or around the areas should be involved, in order to bring jobs and income to the community.

Some of the suggestion to construct the tourism facilities are

1. In wooded areas, well-maintained hides or observation towers with carefully hidden access paths can be constructed to enable visitors to obtain close views of concentrations of water birds, *e.g.* breeding colonies of water birds.
2. In sites that are used as wintering and staging areas, special attention could be given to constructing facilities (*e.g.* an open observation tower with a bench) for people to watch the daily movements of certain species between feeding areas and roosts, both inside and outside the protected area. Such flights can be very spectacular, and many visitors enjoy standing or sitting at a strategic spot to see these at sunrise and/or sunset. It is often possible to find a good location for viewing these flights that does not cause any disturbance to the birds.
3. Facilities such as benches and picnic tables encourage visitors to remain in one area for a considerable period of time, and should only be provided in areas where there is a low risk of disturbing birds. It may be advisable to plan clusters of such facilities at well-hidden sites, and provide only single benches or tables in more open areas, if at all.
4. The planning of other facilities will depend on the numbers of visitors that are acceptable in the area. Large and attractive facilities will encourage large numbers of visitors; a lack of facilities will tend to keep numbers down.

12

Research, Monitoring and Training

Monitoring is an important component of any sort of management plan. Through monitoring we can quantify the changes or responses to the management interventions on the conservation and protection of the Sanctuary. Through continuous and systematic monitoring we can develop and adopt the strategies for further improvement. The information collected using monitoring programs is a way of summarising patterns occurring more widely within a wetland. When implementing a monitoring program, we need to be mindful of introducing errors that may lead to the wrong interpretation of what is actually going on. While these inaccuracies might appear insignificant when presented alone, combined, they can lead to significant errors in the data collected. To reduce the chances of collecting inaccurate data, some simple precautions can be taken. There are various methods and tools can be adopted for effective monitoring.

At every two year period, the bird population estimation is carried out. The methods of this estimation exercise, has been discussed in detail elsewhere in this document. This exercise plays an important role in monitoring of the bird population and different species- both migratory and resident. Their interrelations, their relation with different water depths and the emergent vegetations creating different habitats etc. can be determined on the basis of this exercise.

12.1. Monitoring data log

A data log has to be established for your wetland and used to keep track of past and present monitoring. This information will help to keep track of what has been done and why. It is easy to lose track of what has been done when different people have been responsible for monitoring through time.

Sr. No.	Date	Parameter monitored	Technique used	Number of sites Person / people undertaking monitoring
1				

The techniques and methods that can be used in the monitoring of Thol Sarovar are given below.

12.2. Ongoing monitoring

12.2.1. Photo points (Habitat)

The Photographs has to taken from selected points at regular dates, embed posts to rest the camera to help take the same view each time. Panoramic photographs from a high vantage point, combined with permanently established photo points provide good coverage of the wetland. The locations have to be selected on the basis of habitat

variance, hence try to cover all the type of habitats. In a particular type of habitat the area can be divided and photo points are selected randomly in a manner to cover the variations.

These photographs help to address the questions like, How does the vegetation in the wetland look after management is changed? And whether there any change in distribution of large emergent species change after management? In areas where these species have expanded, the growths of other emergent and submerged species are likely to be restricted.

The photographs can be later used for the comparison and analysis the habitat region.

12.2.2. Vegetation

Monitoring long-term aspects of vegetation health is a valuable aid in assessing if there are any long-term stresses impacting on the vegetation surrounding your wetland. The monitoring will have to focus on the composition, cover and life stage of different vegetative habitats within the wetland? Select sites before leaving for the field. To do this, attach an overhead transparency to the aerial photograph of your wetland and using semi permanent overhead pens, identify and then trace around the different vegetation associations in the wetland based on texture (height), tone, colour, canopy spacing. Texture (height) can be interpreted if you have a stereo pair of photographs and a stereo scope. If there is a decline in vegetation health then it is important to find out the cause of the impact.

Various methods can be used to measure the vegetative health. Some of them are mentioned below.

12.2.3. Line intercept method

The line intercept method is designed to help assess changes in the distribution of vegetation in the wetland. Start by marking a permanent starting point, fill out a site location data sheet and use a tape measure to mark out a transect on a set bearing. Start the transect in the area influenced by management and extend the tape measure to the middle of the wetland.

Monitoring long-lived deep-rooted vegetation should occur at each of the baseline vegetation inventory sites. Additional tree health assessments may also be undertaken elsewhere within the wetland to cover a greater geographical area. This is required at Thol Wetlands where the number of baseline vegetation inventory sites is low.

12.2.4. Grid based survey method

Establish a series of quadrates within these zones to assess the composition, abundance and reproductive stage of the species. Using the species area curve method (Appendix 2), decide on the size of the quadrate required and how many locations that are required to adequately sample the population in each zone. After that it is important to replicate these quadrate surveys in zones found at the same elevations around the wetland. Fill in a site location sheet at each site and record the GPS position, or physically mark the beginning of your transect. Record the bearing of your transect survey to ensure your subsequent surveys are done in the same direction.

12.2.5. Plant survival

The new plantations its periodic monitoring has to done to measure the health and survival rate of the plants. The number of plants per species that died, this will help to decide which species are more suitable for your site with less amount of maintenance. Because it is difficult to identify water stress in this species it is extremely important to consider its water stress tolerances.

12.3. Research

Thol is a very interesting ecosystem. There are very complex processes always going on in this ecosystem. The wetland is primarily important for birds, but the population of birds is dependent on many factors some of which still unknown requiring in-depth research. The depth of the waters in Thol, its spread, presence of phytoplankton and zooplanktons which are at the lowest tropic level, etc. are the factors which play a significant role on the bird's diversity as well as their population. Therefore, Thol can be very interesting for any researcher. However, ironically not many research works have been undertaken so far. Following research are recommended:

- The water quality.
- The meteorological data.
- The aquatic and terrestrial vegetation.
- The composition of fish fauna.
- Nesting of birds and breeding success of various species.
- Population trends and activities of birds in the sanctuary.
- Annual census of animals and birds in the sanctuary.
- Vegetation mapping of the sanctuary and satellite wetlands.
- The Research Officer shall also be responsible for the job of up-dating the check list of the birds and animals from time to time.

- Problems and strategies to manage satellitic population of satellite wetlands.
- Study and monitoring of endangered species of Birds in this landscape.
- Monitoring the population of ecological indicator species of flora and fauna.
- Study on wildlife diseases.
- Study on impact of tourism and its carrying capacity in the sanctuary.

12.4. Documentation Centre

One of the weaknesses of Thol Wildlife Sanctuary is augmentation of knowledge management about ecosystem through various research projects. Planning for the development of a herbarium, faunal museum has not yet completed and work is in progress to establish it. Such centre will help future research works. However, maintain it, specialized staffs is required. Dissemination of different research findings for the use by field staff, local people, nature educators, researchers etc. is also very important. For this a media-matrix would be developed after considering different groups and information to be disseminated. This documentation centre would also have the collection of various audio-visual productions, produced by different filming parties, professionals etc.

12.5. Training

The importance of training need not be over emphasized in a world where the new scientific findings and amendments to the legislations are frequent. Training keeps the staff tuned in to the latest developments and also imparts more and more skills which are a must for Human Resource Development of the department. It leads to interaction between the management and the executives and many a times untapped staff skill comes to the fore and management also learns a lot from training. Training is an integral part of any management activity. Protected area planning and management is a highly technical aspect, bringing together the theory of quite diverse disciplines, ecology, forestry, agro-forestry, geography, wildlife management, education, public relation, landscape architecture, land-use planning, hydrology, estate management, ecotourism, social science, economics, personal management, and general business management. It has become increasingly apparent that development of these abilities requires specialized training programmes. The training can be formal course or study tour as well as on the job training. Regular training for the PA staff on the subjects like, rescue and release operation, ecology, technical matters like habitat manipulation activities, maintenance of communication systems, law enforcement, legal procedure, collection and corroboration of evidences, use of weapons and their maintenance, wildlife health monitoring, monitoring of radio-collard animals, computer use, etc. would be organized twice a year.

12.5.1 Themes identified for training

- Wildlife Techniques
- Wildlife Health Indicators for monitoring in the field
- How to handle dead animals and how to collect evidences from the spot
- Taxidermy
- How to prepare herbarium
- Weapon training
- Handling of tranquilizing gun
- Wireless equipment handling and care.
- Legal aspects
- Detection and framing of offences.
- Fire Drills - especially before the fire season for better fire fighting.
- Identification of birds.
- Training in Interpretation (communication) skills
- Training in First Aid to man as well as animals.
- Training in use of audiovisual equipment.
- Computer Applications
- Vehicle repair in case of emergency
- Training needs will cater to the achievements of the park objectives.

12.5.2 On the job training

On the job training would include informal discussions as a routine field activity and organisation of short term courses in which experts from universities and parks will be invited to give guest lectures. One day workshops will be conducted for field staff, Naturalists, Villagers, NGO's and Teachers. Regular budget provisions will be made. Guards, Foresters and Range Forest Officers are the foundation of any protected area. They are the backbone and play significant role on the ground. In-service training on the following subjects would be organized regularly for these personnel for better conservation and management of the protected area.

- Application of laws and regulation.
- Wildlife evidence, collection of biological materials and their interpretation.
- Wildlife health care matters.
- Rescue and release operations.

- Handling and maintenance of weapons.
- Wildlife census and population estimation.
- Nature education and interpretation.
- Foundation course in wildlife and habitat ecology.

It is worthwhile holding periodic refresher courses or training exercise for such staff and accordingly time should be set aside for this purpose. Such exercises can be enjoyable, good for personal relations and moral boosting, as well as valuable training

12.5.3 Formal Training courses

State should sponsor names of officers (DFO and RFO) for regular courses and modules held at the Wildlife Institute of India. State Police Schools should be contacted to conduct regular courses for foresters and guards on Weapon Training. Forest Legal Cell should conduct courses in Forest and Wildlife laws. Fire fighting drills will be conducted at a regional level. Officers should be encouraged to participate in formal wildlife training courses in India and abroad. The existing facility in the sanctuary should be developed with assistance from target project. The activities to be undertaken under this programme are:

1. Training programmes for field staff, nature guides and Naturalists.
2. Provision of books on wildlife and equipment to field staff.
3. Up-gradation of communication equipment.
4. Infrastructure and publicity material for nature education.
5. Improvement of facilities like bicycles and toilets and for tourists.
6. Eco-development activities.
7. Research and monitoring activities.
8. Annual research seminar.

12.6 Nature conservation and environment education

12.6.1 Environment education programmes

i. In order to reach the local communities, students, tourists and other target groups, different theme based packages of environmental education programmes are designed for implementation under this plan.

ii. Celebration of designated environmental days would be carried out in villages, schools, for PA staffs and tourists to create awareness about significance of these days through different activities like poster campaign, village meeting, workshops, children's competitions etc.

iii. Publication of booklets, brochures, leaflets in vernacular language about BS, benefit of TWS, threats to TWS for local communities and students of nearby school is undertaken.

iv. Introduction of audio-visual campaign that started with release of audio cassettes on TWS would be further strengthened with a film on TWS in vernacular language, presenting the local perspective. Regular film, slide shows and interaction sessions will be organized in different villages, with help of qualified and experienced nature educators.

v. Specially designed hoarding would be placed at different temple complexes including the entry points for the pilgrims to the Thol city to educate them about the conservation values of TWS including the dos and don'ts.

vi. Theme based workshops would be organized for different stakeholders to educate them about the issues and create a support base for the TWS among them.

vii. Nature education camp activities for students are to be continued. Some changes in the activities of nature education camps is proposed to make it more interesting so that a second generation of resource persons, Birds lovers from it can be generated. These changes are may be in form of introducing more environment games and exercises.

viii. Interpretation programmes for tourists would be strengthened further in the line as proposed in the ecotourism chapter.

ix. Different education material on Ecosystem Management, biodiversity, Soil Moisture Conservation, Village eco-development, People's Participations etc., would be prepared in vernacular languages for the use of PA staff and local communities.

12.6.2 Nature and environment education camps

It is observed that involving people in wildlife conservation is possible by bringing them in close and intimate contact with nature. The strong media has been found to be the students of age 10 to 17 years and teachers. A package of education programme would be designed every year as per the feedback from campers. Students along with teachers are taken in the forests where they are educated about flora and fauna and their functional role in the ecosystem. A major component of nature and environment education for children could be covered through training cum workshop for school teachers. At least one such camp every year would be conducted for this target group. This plan makes provision to conduct a total of about 30 camps for students per year by the Forest Department in sanctuary. Nature clubs, WWF and other NGO would be permitted to conduct such camps at appropriate sites. Some Non Governmental

Organisations have shown increasing interest in nature education camps which may exert damaging and disturbing influence on the ecosystem. Therefore, only capable and genuine organisations should be allowed for conducting such camps in selected sites in tourism zone only. Care should be taken to maintain the standard of education. Skills of the RFOs and staff engaged for such job are to be improved, so that they can conduct environmental education programme properly. Two to three camps are to be organised for the people engaged in different profession i.e. teachers, officials from Govt. Departments, public sectors, advocates, judges, journalists and NGOs etc. Three qualified and experienced Environment educators may be hired to conduct the camps along with the forest staff.

12.7 Workshop and Seminar

Planning a seminar in sanctuary aims to obtain broad agreement with local people, other stakeholder groups, administrators, entrepreneurs, scientists and nature lovers on the issues related to management of TWS and implementation of the eco-development plan. Such programmes would be organized under this plan and makes provision for two such workshops every year.

13

Organisation and Administration

13.1 Organization

For the effective implementation of the management there is a need to change the present structure of the organization of staff in TWS. At the same time responsibilities like protection, patrolling, ecodevelopment, ecotourism and research need a different style of working. For better administration the sanctuary has sanctuary ranger dedicated to the works related to the sanctuary. The Sanctuary range looks after the protection of wildlife and management of the habitat, entry into the sanctuary, ticketing and the visitor facilities.

Table 13.1: staff strength for Thol Wildlife Sanctuary / Kadi Wildlife Range

Post	Member
Deputy Conservator of Forests	1
Assistant Conservator of Forests	1
Research Officer (RFO)	1
Range Officer (RFO - Thol & Kadi range)	1
Forester	4
Forest Guard	2
Accountant	1
Office Assistant	1
Upper Divisional Clerk	1
Driver	2
Class IV	1
Nature Interpretator / Communication Specialist	4

13.2 Structure and responsibilities

The administrative control of Thol Wildlife Sanctuary is with the Forest Department, Government of Gujarat under the Chief Wild Life Warden. The senior most executive Officer managing this sanctuary is the Deputy Conservator of Forest, Thol Forest Division as Deputy Chief Wildlife Warder, stationed at Thol. The job of Research officer will be to look all the researches in an around Thol Wildlife Sanctuary as well as in Thol Satellite Wetland Landscape.

13.3 Wildlife health unit

Presently, the birds suffering from diseases are treated by the wildlife health centres at Sakarbaug Zoo, Junagadh and Sasan. Capture of animals suffering from disease and injuries and bringing them to these wildlife health centres is done by rescue teams headed by a veterinary doctor, and animals normally released back after treatment. There is a need to develop A-Type Rescue Centre with various facilities at Thol under control of TWS. While designing cage/enclosures, enclosures, etc. certain points should be kept in mind:

1. Enough space for free movement of captive animals and for them to get adequate exercise.
2. A barrier that is suitable and safe for the species.
3. 'Private' areas where the animal can retreat whenever it wants to (if a shy animal needs to be displayed, adequate measures should be taken to watch it without disturbing it. The flight distance, or how close the animal would allow a stranger to come without getting alarmed, should be considered).
4. Scope for visual and vocal contact with con-specific and/or other species.
5. Ready access to fresh water and a diet to maintain good health and vigour.
6. Conditions that avoid mental suffering.
7. Cage must be light weighted
8. Minimum distance between 2 rods.
9. Proper lock facility
10. Treatment facility
11. Cage with wheels
12. Net surrounding the cage
13. Regular oiling and color

No wildlife conservation effort is complete unless the various stages have been duly recorded. Every single case has to be recorded in full detail mentioning the condition of the animal, medicines administered, food provided, etc. Efforts can be evaluated better by going through these comprehensive records kept over the years. A uniform record-keeping system should be developed for each and every case and should be analysed and published for external evaluation. Medical records should always be kept up-to-date and backup copies made and safely stored. For handling Schedule I species, permissions may be necessary from the Union Ministry of Environment and Forests as per the Wildlife (Protection) Act, 1972. After the recent amendment in 2002 of this Act, it is mandatory to

register all rescue and rehabilitation facilities, including those run by Forest Department, under the Central Zoo Authority (CZA). It is important that the data is collected consistently and can be analyzed over a period of time. The following basic facts need to be gathered about incidents of human-wildlife conflict:

- Who suffered the damage
- What was damaged
- Where the incident occurred
- When the incident occurred
- The wildlife species and, where possible, the age, sex etc.
- What was the extent of the damage

13.3.1 Checklist for Planning Rescue Centre

13.3.1.1 Site Selection

1. Proximity to accommodation: Is the site nearest to the rescue sites?
2. Can the site be easily reached by public transport?
3. Can mains water/drainage/electricity be connected?
4. Can your organization afford the cost of this?
5. Does the site allow for possible future expansion?
6. Have you checked all your local building and planning regulations?
7. Have you checked with the local population?

13.3.1.2 Building Materials

1. All internal surfaces (including floors and partitions) should be smooth, durable and impervious – are suitable building materials available?
2. Kennel and exercise area floors should not allow pooling of liquids (ideally floors should slope a minimum of 1 in 60 to a shallow drainage channel) – have provisions been made for this?
3. Will ventilation be provided in all interior areas without draughts?
4. Light must be provided (natural where possible) in exercise and sleeping areas.

13.3.1.3 Facilities

1. Have you made provisions for isolation facilities at your shelter?
2. You will need to have separate facilities for the preparation and storage of food (with refrigeration facilities if meats are to be stored).

Table 13.2 : Dimensions of different units for rescue centre

Sr. No.	Description	Design (in MM)
1.	Reception	9000 × 5000
2.	Administrative building	6000 × 6000
3.	Meeting room	5300 × 4800
4.	Doctor's office	4500 × 4500
5.	Compounder's room	3600 × 4800
6.	Food supply and distribution room	3500 × 4800
7.	Hospital	5300 × 4800
8.	X-ray & Ultra-sound room	4500 × 4800
9.	Laboratory	5300 × 4890
10.	Medicine / drug room	3500 × 4800
11.	Rescue equipments store room	3500 × 4800
12.	Record keeping room	3500 × 4800
13.	Dress room	1800 × 1800
14.	Sterilize room	1800 × 1800
15.	Treatment room	4545 × 4800
16.	Postmortem room	3600 × 3000
17.	Carcass room / cold storage	3500 × 4800
18.	Ungulates enclosure	3000 × 2356
19.	Small animals cage	3000 × 1500
20.	Bird aviary	3000 × 1500
21.	Sick animal passage	3000 wide
22.	Enclosure and cages area	7000 × 6000
23.	Parking area	3000 wide
24.	Urinal	2100 × 1500
25.	Drainage	-
26.	Boundary wall	1800 height

13.4 Control forms and records

Control forms and records will be maintained in the offices of Deputy Conservator of Forests, Thol Forest Division. The following records will be maintained at the Division level as prescribed by the Chief Conservator of Forests, Wildlife Circle, Junagadh.

- Control book
- Control journals
- Compartment history
- Deviation register
- Records of development work i.e. plantation, SMC works, road and causeway construction and habitat improvement.
- Records related to the Eco development project
- Records of observations on wildlife including reports of wildlife diseases
- Records of analysis of wildlife census
- Documentation records of wildlife monitoring and research including records of vegetation enumeration
- Records of forest and wildlife offences
- Records of wildlife tourism
- Records of forest fires
- Records of miscellaneous regulations

14

Budget

14.1 The Plan Budget

Although the plan has been prepared for 10 years, yet the physical and financial targets for different activities have been projected for first five years. The plan may be reviewed at the end of fifth year so that necessary changes, if any, may be made in a supplementary plan without altering the original plan. The preparation of supplementary plan would be based on monitoring and evaluation of implementation of the plan in first five years. Supplementary plan will contain critical analysis of performance, proposed programs and their physical and financial targets.

Budget Plan for Conservation of Thol Wildlife Sanctuary

Sr. No.	Item	Phy (Total)	Unit	Cost	Total in Lacs	2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-22		2022-23		2023-24	
						Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
1	Wetland protection																								
	Anti poaching centres	6	No	3.00	18.00	1	3.00	1	3.00	1	3.00	0	0.00	0	0.00	1	3.00	1	3.00	1	3.00	0	0.00	0	0.00
	Anti poaching team	6 (5 Poachers)	No	5.00	30.00	1	5.00	1	5.00	1	5.00	0	0.00	0	0.00	1	5.00	1	5.00	1	5.00	0	0.00	0	0.00
	Anti poaching vehicle	4	No	7.00	28.00	1	7.00	1	7.00	0	0.00	0	0.00	0	0.00	1	7.00	1	7.00	0	0.00	0	0.00	0	0.00
	Mobile checkpost	4	No	3.00	12.00	1	3.00	1	3.00	0	0.00	0	0.00	0	0.00	1	3.00	1	3.00	0	0.00	0	0.00	0	0.00
	Multi purpose tower	8	No	5.00	40.00	2	10.00	1	5.00	1	5.00	0	0.00	0	0.00	2	10.00	1	5.00	1	5.00	0	0.00	0	0.00
	Protection Staff quarters (new)	5		8.00	40.00	1	8.00	1	8.00	0	0.00	1	8.00	0	0.00	1	8.00	1	8.00	0	0.00	0	0.00	0	0.00
	Protection Staff quarters (repairing)	2		2.00	4.00	1	2.00	0	0.00	0	0.00	0	0.00	0	0.00	1	2.00	0	0.00	0	0.00	0	0.00	0	0.00
				Total	**172.00**		**38.00**		**31.00**		**13.00**		**8.00**		**0.00**		**38.00**		**31.00**		**13.00**		**0.00**		**0.00**
2	Habitat management																								
	Removal of excessive submerged growth	200	Ha	0.30	60.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00	20	6.00
	Raised platform(nesting site) (50m*50m)	20	Ha	1.80	36.00	5	9.00	2	3.60	2	3.60	1	1.80	0	0.00	5	9.00	2	3.60	2	3.60	1	1.80	0	0.00
	Thining of woodland	200	Ha	0.15	30.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00	20	3.00
	Removal of weeds(Reed)	100	Ha	0.20	20.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00
	Plantation of heronry	40	Ha	0.50	20.00	2	1.00	5	2.50	5	2.50	5	2.50	3	1.50	2	1.00	5	2.50	5	2.50	5	2.50	3	1.50
	Removal of Invasive Sps	40	Ha	0.30	12.00	8	2.40	8	2.40	4	1.20	0	0.00	0	0.00	8	2.40	8	2.40	4	1.20	0	0.00	0	0.00
	Techinal expert team on wetland monitoring	6	Person	1.80	10.80	1	1.80	1	1.80	1	1.80	0	0.00	0	0.00	1	1.80	1	1.80	1	1.80	0	0.00	0	0.00
	Removal of scub	100	Ha	0.10	10.00	20	2.00	10	1.00	10	1.00	10	1.00	0	0.00	20	2.00	10	1.00	10	1.00	10	1.00	0	0.00
	Checkdams	30		5.00	150.00	5	25.00	5	25.00	5	25.00	0	0.00	0	0.00	5	25.00	5	25.00	5	25.00	0	0.00	0	0.00
	Repairing of earthern bunds and Embackment	30	Km	1.50	45.00	5	7.50	5	7.50	5	7.50	0	0.00	0	0.00	5	7.50	5	7.50	5	7.50	0	0.00	0	0.00
				Total	**393.80**		**59.70**		**54.80**		**53.60**		**16.30**		**12.50**		**59.70**		**54.80**		**53.60**		**16.30**		**12.50**

Sr. No.	Item	Phy (Total)	Unit	Cost	Total in Lacs	2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-22		2022-23		2023-24	
						Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
3	Pheripheral catchment area management																								
	Desiliting	200	Ha	0.25	50.00	25	6.25	25	6.25	25	6.25	25	6.25	0	0.00	25	6.25	25	6.25	25	6.25	25	6.25	0	0.00
	Checking water quality and pollution centre	6	No	1.00	6.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00
	Satellite water management and to raised platforms	20	Ha	0.20	4.00	5	1.00	5	1.00	0	0.00	0	0.00	0	0.00	5	1.00	5	1.00	0	0.00	0	0.00	0	0.00
				Total	**60.00**	**31.00**	**8.25**		**8.25**		**7.25**		**6.25**		**0.00**		**8.25**		**8.25**		**7.25**		**6.25**		**0.00**
4	Wildlife health, monitoring & population management																								
	mentoring wetland birds	10	No	5.00	50.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00
	Control of stay dogs	10	yr	1.20	12.00	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20	1	1.20
	Restoration of food stock(fingerling addition)	10	yr	5.00	50.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00
				Total	**112.00**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**		**11.20**
5	Livelihood of the locals & EDC																								
	Promotion of organic paddy	1000	Ha	0.10	100.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00	100	10.00
	Boatman	600		0.10	60.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00	60	6.00
	Tourist Guide training	200		0.10	20.00	20	2.00	20	2.00	30	3.00	15	1.50	15	1.50	20	2.00	20	2.00	30	3.00	15	1.50	15	1.50
	Cooking, frontline trg	200		0.25	50.00	20	5.00	20	5.00	30	7.50	15	3.75	15	3.75	20	5.00	20	5.00	30	7.50	15	3.75	15	3.75
	Self employment	1000		1.00	1000.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00	100	100.00
	Community developemnt (SHG)	100		3.00	300.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00	10	30.00
				Total	**1530.00**		**153.00**		**153.00**		**156.50**		**151.25**		**151.25**		**153.00**		**153.00**		**156.50**		**151.25**		**151.25**
6	Ecology, monitoring publication & Research																								
	Observation centre	6	No	1.00	6.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00
	Monitoring soil,water,birds & vegetation	6	No	1.00	6.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00	1	1.00	1	1.00	1	1.00	0	0.00	0	0.00
	Migratery birds study	2	No	5.00	10.00	1	5.00	0	0.00	0	0.00	0	0.00	0	0.00	1	5.00	0	0.00	0	0.00	0	0.00	0	0.00
	Research	10	No	5.00	50.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00	1	5.00
	Impact assesment of	10		2.00	20.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00	1	2.00
	Short film	4		2.00	8.00	1	2.00	1	2.00	0	0.00	0	0.00	0	0.00	1	2.00	1	2.00	0	0.00	0	0.00	0	0.00
	Advertisement on conservation(digital Board)	40		1.00	40.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00	4	4.00

Sr. No.	Item	Phy (Total)	Unit	Cost	Total in Lacs	2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-22		2022-23		2023-24	
						Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
	Booklet on birds, veg,wetland & ecosystem	20		3.00	60.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00	2	6.00
	Signage and hordings	200		0.50	100.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00	20	10.00
	Conservation , awarness board on migratery birds	20	No	1.00	20.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00	2	2.00
				Total	**320.00**		**38.00**		**33.00**		**31.00**		**29.00**		**29.00**		**38.00**		**33.00**		**31.00**		**29.00**		**29.00**
7	Stalkholder involement, education, awarness& training																								
	NEC for school & colleges	200		0.13	26.00	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60	20	2.60
	Awarenss of leader,adminstration, teachers, private public	100		0.2	20.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00	10	2.00
	Skill up gradation & training for Staff	10		0.4	4.00	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40	1	0.40
	Wetland workshop	4		2.5	10.00	1	2.50		0.00	1	2.50		0.00		0.00	1	2.50		0.00	1	2.50		0.00		0.00
	Birds conservation seminar	2		2.5	5.00		0.00	1	2.50		0.00		0.00		0.00		0.00	1	2.50		0.00		0.00		0.00
	Good managed areas tour(exposure visit)	10		1	10.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00	1	1.00
	Birds Protection committee	40		2	80.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00	4	8.00
	Friends of NAL	2		10	20.00	1	10.00	0	0.00	0	0.00	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	0	0.00
				Total	**175.00**		**26.50**		**16.50**		**16.50**		**14.00**		**14.00**		**26.50**		**16.50**		**16.50**		**14.00**		**14.00**
8	Tourism management																								
	Online entry, website	4	1	5.00	20.00	1	5.00	1	5.00		0.00		0.00		0.00	1	5.00	1	5.00		0.00		0.00		0.00
	Boat controlling	2	1	3.00	6.00	1	3.00		0.00		0.00		0.00		0.00	1	3.00		0.00		0.00		0.00		0.00
	Drinking water	4	1	3.00	12.00	1	3.00	1	3.00		0.00		0.00		0.00	1	3.00	1	3.00		0.00		0.00		0.00
	Public toilets	4	2	3.00	12.00	1	3.00	1	3.00		0.00		0.00		0.00	1	3.00	1	3.00		0.00		0.00		0.00
	Roads repairing	10		1.50	15.00	5	7.50		0.00		0.00		0.00		0.00	5	7.50		0.00		0.00		0.00		0.00
	Alternative site Development (ranged)	4	No	15.00	60.00	1	15.00	1	15.00		0.00		0.00		0.00	1	15.00	1	15.00		0.00		0.00		0.00
	Alternative site Development (nana Kath chi)	4		15.00	60.00	1	15.00	1	15.00		0.00		0.00		0.00	1	15.00	1	15.00		0.00		0.00		0.00
	Maintained of existing assets	6		3.00	18.00	1	3.00	1	3.00	1	3.00		0.00		0.00	1	3.00	1	3.00	1	3.00		0.00		0.00
	Telescope development	2		5.00	10.00	1	5.00		0.00		0.00		0.00		0.00	1	5.00		0.00		0.00		0.00		0.00
	Activity planning	6	No	5.00	30.00	1	5.00	1	5.00	1	5.00		0.00		0.00	1	5.00	1	5.00	1	5.00		0.00		0.00

Sr. No.	Item	Phy (Total)	Unit	Cost	Total in Lacs	2014-2015		2015-2016		2016-2017		2017-2018		2018-2019		2019-2020		2020-2021		2021-22		2022-23		2023-24	
						Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin	Phy	Fin
	Battery car	10		7.00	70.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00	1	7.00
	Boating deck	2	1	25.00	50.00	1	25.00		0.00		0.00		0.00		0.00	1	25.00		0.00		0.00		0.00		0.00
	Training & orientation guide	50		1.00	50.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00	5	5.00
	Signage's, publication	100		0.25	25.00	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50	10	2.50
				Total	**438.00**		**104.00**		**63.50**		**22.50**		**14.50**		**14.50**	**31.00**	**104.00**		**63.50**		**22.50**		**14.50**		**14.50**
9	Networking of National & international treaties																								
	Expert for coordination	4		3	12.00	1	3.00	1	3.00	0	0	0	0	0	0	1	3	1	3	0	0	0	0	0	0
	Wetland inventory management	4		3	12.00	1	3.00	1	3.00	0	0	0	0	0	0	1	3	1	3	0	0	0	0	0	0
				Total	**24.00**		**6.00**		**6.00**		**0.00**		**0.00**	**0.00**	**0.00**		**6.00**		**6.00**		**0.00**		**0.00**		**0.00**
			Grand Total		**1758.40**		**474.65**		**407.25**		**341.55**		**272.5**		**262.45**		**474.65**		**407.25**		**341.55**		**272.5**		**262.45**
					3224.80	**31.00**	**444.65**	**0.00**	**377.25**	**0.00**	**311.55**	**0.00**	**250.50**	**0.00**	**232.45**	**31.00**	**444.65**	**0.00**	**377.25**	**0.00**	**311.55**	**0.00**	**242.50**	**0.00**	**232.45**

Part - III

Annexure and Maps

Annexure - I

FLORA: A Check list of the macrophytes (aquatic and terrestrial) recorded at TS

Scientific name	Local Name	Form
1	2	3
MENISPERMACEAE		
Cocculus hirsutus	Vevdi	H
CAPPARACEAE		
Capparis deciduas	Kerdo	S
Capparis sepiaria	Kanther	S
Cleome viscose	Pili Talavani	H
ELATINACEAE		
Bergia ammannioides		H
Bergia suffruticosa	Ropatri	H
MALVACEAE		
Suaeda sp.	-	H
TILIACEAE		
Corchorus aestuans	Chunch	H
Corchorus fascicularis	-	H
Corchorus olitorius	-	S
Corchorus sp.	-	H
ZYGOPHYLLACEAE		
Tribulus terrestris	Bethu Gokhru	H
BALANITACEAE		
Balanites aegyptiaca	Ingorio, Hingoriyo	T
MELIACEAE		
Azadirachta indica	Limdo	T
CELASTRACEAE		
Maytenus emarginata	Viklo	S
RHAMNACEAE		
Zizyphus nummularia	Chani Bor	S
SAPINDACEAE		
Cardiospermum halicacabum	Kagdoliyo	CI

Scientific name	Local Name	Form
1	2	3
ANACARDIACEAE		
Mangifera indica	Ambo, Keri	T
PAPILIONACEAE		
Alhagi pseudalhagi	-	S
Alysicarpus sp.	-	H
Butea monosperma	Khakharo	T
Crotalaria burhia	Kharshan	S
Derris indica	Karanj	T
Indigofera linnaei	Fatakiya	H
Indigofera oblongifolia	Zil. Ziladi	S
Melilotus alba	Jungli Methi	H
Melilotus indica	-	H
Rhynchosia minima	Nani Kamalvel	Tw
Tephrosia purpurea	Sarpankho	H
Trigonella occulta	-	H
CEASALPINIACEAE		
Bauhinia racemosa	Asotri	T
Cassia auriculata	Aval	S
Cassia fistula	Garmalo	T
Cassia italica	Mindhi Aval	H
Cassia occidentalis	Kasundri	H
Cassia roxburghii	-	T
Cassia siamea	-	T
Cassia tora	Kuvandio	H
Tamarindus indica	Amli	T
MIMOSACEAE		
Acacia nilotica	Desi Baval	T
Acacia sp.	-	T
Albizia odoratissima	Dholo Sirisi	T
Neptunia oleracea	Lajalu	H

Scientific name	Local Name	Form
1	2	3
Prosopis cineraria	Khijado	T
Prosopis chilensis	Gando Baval	S/T
CUCURBITACEAE		
Coccinia grandis	Ghiloda	CI
Mukia maderaspatana	Chanak Chibhdi	CI
Trichosanthes cucumerina	Jangli Parval	CI
MOLLUGINACEAE		
Glinus lotoides	Mitho Okharad	H
RUBIACEAE		
Oldenlandia sp.	-	H
ASTERACEAE		
Amberboa ramose	Bada Vard	H
Eclipta prostrate	Bhangro	H
Grangea maderaspatana	Zinki Mundi	H
Launaea procumbens	Moti Bhonpatri	H
Sphaeranthus indicus	Gorakh Mundi	H
Tridex procumbens	Pardesi Bhangro	H
Vernonia cineraria	Sahadevi	H
Xanthium strumarium	Gadariyu	H
SAPOTACEAE		
Madhuca indica	Mahudo	T
Manilkara hexandra	Rayan	T
SALVADORACEAE		
Salvadora oleoides	Mithi Pilu	T
Salvodora persica	Khari Pilu	T
ASCLEPIADACEAE		
Calotropis procera	Nano akado	S
Calotropis gigantean	Akdo	S
GENTIANACEAE		
Enicostema hyssopifolium	Mamejevo	H

Scientific name	Local Name	Form
1	2	3
EHRETIACEAE		
Cordia gharaf	Nani Gundi	T
BORAGINACEAE		
Coldenia procumbens	Basario Okharad	H
Heliotropium indicum	Hathisundho	H
CONVOLVULACEAE		
Convolvulus microphyllus	Shankhavali	H
Cressa cretica	Khariyu	H
Evolvulus alsinoides	Kali Shankhavali	H
Ipomoea aquatica	Nada ni Vel	H
Ipomoea fistulosa	Naffat Val	S
Rivea hypocrateriformis	Fang	CI
SOLANACEAE		
Datura metal	Dholo Dhanturo	H
Solanum indicum	Ubhi Ringani	H
Solanum surattense	Bhoy Ringani	H
MARTYNIACEAE		
Martynia annua	Vinchhudo	H
ACANTHACEAE		
Justicia simplex	-	H
Lapidogathis trisnerivis	Haran Charo	H
Peristrophe bicalyculata	Kali Anghedi	H
VERBENACEAE		
Clerodendrum multiflorum	Arani	S
LAMIACEAE		
Ocimum basilicum	Damro	H
Ocimum canum	Ran Tulsi	H
NYCTAGINACEAE		
Achyranthes aspera	Andhedo	H
Pupalia lappacea	Lampadi	H

Scientific name	Local Name	Form
1	2	3
CHENOPODIACEAE		
Chenopodium album	Chil Bhaji	H
POLYGONACEAE		
Polygonum plebeium	-	H
EUPHORBIACEAE		
Euphorbia hirta	Dudheli	H
Euphorbia nivulia	Thor	S
Euphorbia orbiculata	-	H
ULMACEAE		
Holoptelea integrifolia	Kanjo	T
MORACEAE		
Ficus religiosa	Piplo	T
Ficus virens	Pipal	T
CYPERACEAE		
Cyperus sp.	-	H
POACEAE		
Cynodon dactylon	Darba	H
Eragrostis sp.	-	H
URTICACEAE		
Ficus benghalensis	Banyan Tree	T

NOTES :

1: In addition to the plants, like *Sesbania* sp., *Echinochloa colonum, Nymphaea* sp., (Common Lilly) and *Astereacantha longifolia / Hygrophila auriculata)* are also recorded in the environs.

2: Abbreviations : H: Herb S: ShrubT: Tree Tw: Twiner CI: Climber

Annexure - II

List of Aquatic & Terrestrial Birds in Thol Wildlife Sanctuary

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
	AQUATIC BIRDS			
	Order: Anseriformes			
	Family: Anatidae			
1	*Anas acuta*	Northern Pintail	M	Aquatic plants,grains, insects, tadpoles etc.
2	*Anas clypeata*	Northern Shoveler	M	Water insects, snails, planktons, fish spawn.
3	*Anas crecca*	Common Teal	M	Chiefly vegetable matter, insects, crustaceans etc
4	*Anas penelope*	Eurasian Wigeon	M	Largerly vegetarian
5	*Anas platyrhynchos*	Mallard	RM	Largerly vegetarian
6	*Anas poecilorhyncha*	Spot billed Duck	RM	Chiefly vegetable matter
7	*Anas querquedula*	Garganey	M	Largerly vegetarian
8	*Anas strepera*	Gadwall	M	Largerly vegetarian
9	*Anser anser*	Greylag Goose	M	Vegeterian, winter crops, grass, aquatic weeds
10	*Anser indicus*	Bar-headed Goose	RM	Chiefly green shoots of winter crops - wheat/gram
11	*Aythya ferina*	Common Pochard	M	Vegetable matter, insects, molluscs, small fish etc
12	*Aythya nyroca*	White-eyed Pochard	RM	Vegetable matter, insects, molluscs, small fish etc
13	*Sarkidiornis melanotos*	Comb Duck	R	Grain, shoots vegetable matter
14	*Tadorna ferruginea*	Ruddy Shelduck	RM	Vegetable matter, insects, molluscs, small fish etc
15	*Tadorna tadorna*	Common Shelduck	M	Ominivorous, molluscs, algae, seeds etc.
	Family: Dendrocygnidae			
16	*Dendrocygna javanica*	Lesser Whistling Duck	R	Largerly vegetarian - shoots and grain.
	Family: Anhingidae			
17	*Anhinga melanogaster*	Oriental Darter	RM	Fish
	Family: Ardeidae			
18	*Ardea cinerea*	Grey Heron	RM	
19	*Ardea purpurea*	Purple Heron	RM	Fish, Frogs, snakes etc.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
20	*Ardeola grayii*	Indian Pond Heron	R	Frogs, fish, crabs and insects
21	*Bubulcus ibis*	Cattle Egret	R	Chiefly grasshoppers, blue bottle flies,lizards, fish etc
22	*Casmerodius albus*	Great Egret	RM	Fish, Frogs,etc.
23	*Egretta garzetta*	Little Egret	R	Insects, fish, frogs etc.
24	*Egretta gularis*	Western Reef Egret	RM	Mainly crustaceans, molluscs and fish
25	*Ixobrychus minutus*	Little Bittern	RM	Fish, molluscs etc.
26	*Ixobrychus sinensis*	Yellow Bittern	RM	Fish, frogs, molluscs etc.
27	*Mesophoyx intermedia*	Intermediate Egret	RM	Fish, frogs etc.
28	*Nycticorax nycticorax*	Black crowned Night Heron	R	Crabs, fish, frogs, aquatic insects, etc.
	Family: Charadriidae			
29	*Charadrius alexandrinus*	Kentish Plover	RM	Insects and crustacea
30	*Charadrius dubius*	Little Ringed Plover	RM	Insects, sand-hoppers, tiny crabs, etc.
31	*Vanellus indicus*	Red wattled Lapwing	R	Insects, grubs, molluscs, etc.
32	*Vanellus leucurus*	White tailed Lapwing	M	Aquatic insects and other vertebrates
33	*Vanellus malabaricus*	Yellow wattled Lapwing	R	Insects, grubs, molluscs, etc.
34	*Calidris minuta*	Little Stint	M	Tiny insects, crustaceans and molluscs.
	Family: Recurvirostridae			
35	*Himantopus himantopus*	Black winged Stilt	RM	Worms, molluscs, aquatic insects, etc.
36	*Recurvirostra avosetta*	Pied Avocet	RM	Worms, aquatic insects and small crustacea, etc.
	Family: Ciconiidae			
37	*Anastomus oscitans*	Asian Openbill	R	Frogs,crabs, large insects and other small living things.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
38	*Ciconia episcopus*	Woolly necked Stork	R	Fish. Frogs. Reptiles, crabs, molluscs, large insects, etc.
39	*Mycteria leucocephala*	Painted Stork	R	Fish, frogs and snakes.
	Family: Jacanidae			
40	*Metopidius indicus*	Bronze Winged Jacana	R	Seeds, roots, etc., aquatic plants, insects and molluscs
41	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	R	Seeds, roots, etc., aquatic plants, insects and molluscs
	Family: Laridae			
42	*Chlidonias hybridus*	Whiskered Tern	RM	Tiny fishes, tadpoles, crabs, grasshoppers and insects.
43	*Sterna albifrons*	Little Tern	R	Small fish, crustaceans, insects.
44	*Sterna aurantia*	River Tern	R	Fish, crustaceans, tadpoles and water insects.
	Family: Pelecanidae			
45	*Pelecanus philippensis*	Spot-billed Pelican	RM	Fish
46	*Pelecanus crispus Bruch*	Great White Pelican	M	Fish, crustaceans
	Family: Phalacrocoracidae			
47	*Phalacrocorax carbo*	Great Cormorant	RM	Almost exclusively fish
48	*Phalacrocorax fuscicollis*	Indian Cormorant	RM	Almost exclusively fish
49	*Phalacrocorax niger*	Little Cormorant	RM	Exclusively fish
	Family: Phoenicopteridae			
50	*Phoenicopterus ruber*	Greater Flamingo	RM	Crustaceans, worms, insect larvae, seeds of marsh plants.
51	*Phoenicopterus minor*	Lesser Flamingo	RM	Phytoplankton (algae, diatoms, etc.)
	Family: Podicipedidae			
52	*Tachybaptus ruficollis*	Little Grebe	RM	Aquatic insects and larvae, tadpoles, etc.
	Family: Scolopacidae			
53	*Limosa limosa*	Black tailed Godwit	M	Worms, molluscs,crabs, insects.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
54	*Limosa lapponica*	Bar-tailed Godwit	M	Marine invertebrates, insects.
55	*Tringa glareola*	Wood Sandpiper	M	Insects, larvae, worms and molluscs.
56	*Tringa hypoleucos*	Common Sandpiper	RM	Insects, worms , molluscs.
57	*Tringa nebularia*	Common Greenshank	M	Insects and other invertebratres, tadpoles, frogs.
58	*Tringa ochropus*	Green Sandpiper	M	
59	*Tringa stagnatilis*	Marsh Sandpiper	M	Insects, invertebrates and small frogs.
	Family: Threskiornithidae			
60	*Platalea leucorodia*	Eurasian Spoonbill	RM	Tadpoles, frogs, molluscs, insects and vegetable matter
61	*Plegadis falcinellus*	Glossy Ibis	RM	Molluscs, crustaceans, insects, etc.
62	*Pseudibis papillosa*	Red-naped/ Black Ibis	R	Insects, grain and small reptiles.
63	*Threskiornis melanocephalus*	Oriental White Ibis	R	Tadpoles, frogs, molluscs, insects and vegetable matter
	Order: Coraciiformes			
	Family: Alcedinidae			
64	*Alcedo atthis*	Small Blue Kingfisher	R	Small fish, tadpoles and aquatic insects.
	Family: Cerylidae			
65	*Ceryle rudis*	Pied Kingfisher	R	Fish, tadpoles, frogs and aquatic insects.
	Family: Dacelonidae			
66	*Halcyon smyrnensis*	White-breasted Kingfisher	R	Fish, tadpoles, lizard, grasshoppers and other insects
	Order: Gruiformes			
	Family: Gruidae			
67	*Grus antigone*	Sarus Crane	R	Grain, shoots and other vegetable matter, insects, reptiles.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
68	*Grus grus*	Common Crane	M	Largerly vegetarian, tubers, grain, insects and small reptiles
69	*Grus virgo*	Demoiselle Crane	M	
	Family: Rallidae			
70	*Amaurornis akool*	Brown Crake	R	
71	*Amaurornis phoenicurus*	White-breasted Waterhen	R	Insects, worms, molluscs, grain, etc.
72	*Fulica atra*	Common Coot	RM	Grass and Paddy shoots, aquatic weeds, insects, etc.
73	*Gallicrex cinerea*	Watercock	R	Largely vegetarin - seeds and green shoots of rice etc.
74	*Gallinula chloropus*	Common Moorhen	RM	Insects, worms, molluscs, grain, etc.
75	*Porphyrio porphyrio*	Purple Swamphen/ Moo rhen	R	Shoots and vegetable matter, insects and molluscs.
	Family: Accipitridae (Or. Ciconiformese)			
76	*Circus aeruginosus*	Western Marsh Harrier	M	Frogs, fish small birds, mammals and carrion.
	TERRESTRIAL BIRDS			
	Order: Apodiformes			
	Family: Apodidae			
77	*Apus nipalensis*	House Swift	RM	Chiefly dipterous insects.
78	*Cypsiurus balasiensis*	Asian Palm-Swift	R	Tiny winged insects.
	Order: Ciconiiformes			
	Family: Accipitridae			
79	*Accipiter badius*	Shikra	R	Lizards, mice, squirrels, birds etc.
80	*Accipiter virgatus*	Besra	R	Largely small birds, mice, bats, lizards and insects.
81	*Aquila heliaca*	Imperial Eagle	RM	Rodents, ground dwelling birds, reptiles, etc.
82	*Aquila clanga*	Greater Spotted Eagle	RM	Frogs, waterfowl, small birds, etc.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
83	*Elanus caeruleus*	Black-shouldered Kite	R	Locusts, crickets, mice, lizards, etc.
84	*Milvus migrans*	Black Kite	R	Offal and garbage, earthworms, mice, lizards etc.
85	*Neophron percnopterus*	Egyptian Vulture	RM	Animal carcasses and freshwater turtles.
86	*Pandion haliaetus*	Osprey	RM	Fish
87	*Pernis ptilorhyncus*	Oriental Honey Buzzard	RM	Honeybee larvae, small birds, reptiles, frogs etc.
88	*Spilornis cheela*	Crested Serpent Eagle	R	Frogs, lizards, rats, snakes,etc.
	Order: Columbiformes			
	Family: Columbidae			
89	*Columba livia*	Rock Pigeon	R	Cereals, pulses, groundnuts,etc.
90	*Streptopelia chinensis*	Spotted Dove	R	
91	*Streptopelia decaocto*	Eurasian Collared-Dove	R	
92	*Streptopelia orientalis*	Oriental Turtle-Dove	RM	Paddy, cereals, bamboo and grass seeds.
93	*Streptopelia tranquebarica*	Red Collared-Dove	R	
94	*Treron phoenicoptera*	Yellow-footed Green-Pigeon	R	Fruits and berries.
	Order: Coraciiformes			
	Family: Coraciidae			
95	*Coracias benghalensis*	Indian Roller	R	Insects,
96	Merops orientalis	Little Green Bee- eater	R	Insects, chiefly diptera and hymenoptera
97	*Centropus sinensis*	Greater Coucal	R	caterpillars, large insects, snails, lizards young mice etc.
	Family: Cuculidae			
98	*Cuculus micropterus*	Indian Cuckoo	RM	Mainly caterpillars, insects, etc.
99	*Eudynamys scolopacea*	Asian Koel	R	Largely fruits and berries, caterpillars and insects.
	Family: Phasianidae			
100	*Coturnix coturnix*	Common Quail	RM	Grain and grass seeds, termites, etc.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
101	*Francolinus pictus*	Painted Francolin	R	Grain, grass seeds, green shoots, white ants and insects.
102	*Francolinus pondicerianus*	Grey Francolin	R	Grain, seeds, termites , beetle larvae, etc.
103	*Pavo cristatus*	Indian Peafowl	R	Grain, Vegetable shoots, insects, lizards, snakes, etc.
	Order: Passeriformes			
	Family: Aegithalidae			
104	*Aegithalos leucogenys*	White-cheeked Tit	R	
	Family: Alaudidae			
105	*Eremopterix grisea*	Ashy-crowned Sparrow-Lark	R	Seeds and insects.
106	*Eremopterix nigriceps*	Black-crowned Sparrow-Lark	R	
	Family: Cisticolidae			
107	*Prinia inornata*	Plain Prinia	R	Insects, caterpillars, ants, small beetles, etc.
108	*Prinia socialis*	Ashy Prinia	R	Insects.
	Family: Corvidae			
109	*Aegithina tiphia*	Common Iora	R	Insects, their eggs and larvae.
110	*Corvus splendens*	House Crow	R	Offal, dead sewe rat, kitchen scraps and refuse, termites etc
111	*Dendrocitta vagabunda*	Rufous Treepie	R	Fruits, insects, lizards, frogs, centipedes etc.
112	*Dicrurus leucophaeus*	Ashy Drongo	RM	Mainly insects, occasionally reptiles and small birds.
113	*Dicrurus macrocercus*	Black Drongo	R	Insects, flower nectar, occasionally small birds.
114	*Garrulus glandarius*	Eurasian Jay	R	
115	*Pericrocotus cinnamomeus*	Small Minivet	R	Insects and their larvae.
116	*Rhipidura albicollis*	White-throated Fantail	R	
117	*Rhipidura aureola*	White-browed Fantail	R	Insects, chiefly diptera and hemiptera.
	Family: Hirundinidae			
118	*Delichon urbica*	Northern House- Martin	RM	Midges and other insects.

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
119	*Hirundo smithii*	Wire-tailed Swallow	R	Midges
	Family: Laniidae			
120	*Lanius vittatus*	Bay-backed Shrike	R	Locusts,lizards , large insects, etc.
	Family: Muscicapidae			
121	*Copsychus saularis*	Oriental Magpie Robin	R	Insects, flower nectar of Salmalia and Erythrina.
122	*Saxicoloides fulicata*	Indian Robin	R	Insects and their eggs, spiders
	Family: Nectariniidae			
123	*Nectarinia asiatica*	Purple Sunbird	R	Insects and spiders, very largely flower nectar
	Family: Passeridae			
124	*Anthus campestris*	Tawny Pipit	RM	
125	*Anthus rufulus*	Paddyfield Pipit	R	Weev and other small insects
126	*Lonchura striata*	White-rumped Munia	R	Grass seeds, etc.
127	*Motacilla cinerea*	Grey Wagtail	M	Tiny insects.
128	*Motacilla flava*	Yellow Wagtail	RM	Insects, spiders and invertebrates, etc.
129	*Passer domesticus*	House Sparrow	R	Grains, insects, fruit buds, flower nectar, etc.
	Family: Pycnonotidae			
130	*Pycnonotus cafer*	Red-vented	R	Insects, fruits and berries, peas
		Bulbul		and vegetables etc.
131	*Pycnonotus leucotis*	White-eared Bulbul	R	Kitchen scraps, berries of peelu and wild caper
	Family: Sturnidae			
132	*Acridotheres ginginianus*	Bank Myna	R	Grasshoppers and other insects.
133	*Acridotheres tristis*	Common Myna	R	Fruits, insects, kitchen scraps
134	*Sturnus pagodarum*	Brahminy Starling	R	Chiefly berries, wild figs and insects
135	*Sturnus roseus*	Rosy Starling	M	Locusts, berries, nectar of Salmalia, etc.
	Family: Sylviidae			
136	*Acrocephalus arundinaceus*	Great Reed Warbler		

Sr. No.	Scientific Name	Common Name	Migratory Status	Food Habits
137	*Orthotomus sutorius*	Common Tailorbird	R	Tiny insects, their eggs and grubs, flower nectar.
138	*Turdoides caudatus*	Common Babbler	R	Insects, berries, grain and flower nectar.
139	*Turdoides earlei*	Striated Babbler	R	Insects, snails and some vegetable matter.
140	*Turdoides malcolmi*	Large Grey Babbler	R	Insects, berries, grain and flower nectar.
141	*Turdoides striatus*	Jungle Babbler	R	Spiders, cockaroaches, insects and their larvae grain, etc.
	Order: Psittaciformes			
	Family: Psittacidae			
142	*Psittacula krameri*	Rose ringed parakeet	R	Ripening fruits, standing crops of maize and jowar.
	Order: Strigiformes			
	Family: Strigidae			
143	*Athene brama*	Spotted Owlet	R	Chiefly beetle and other insects, mice, lizards, etc.
	Order: Upupiformes			
	Family: Upupidae			
144	*Upupa epops*	Eurasian Hoopoe	RM	Insects, grubs and pupae.

Annexure-III

Release of Fish fingerling in Thol Sanctuary

S.r	Year/Dt	Community	Size	Nos (Lacs)	Location
1	2002-03 Dt. 11/09/2002	Megar carp Mix	Fingar ling	0.75	Thol
2	2002-03 Dt. 01/11/2002	Megar carp Mix	Fingar ling	0.40	Thol
3	2009-10 Dt. 20/09/2009	Mringal, Rohu	26 to 35 mm	2.50	Thol

Annexure-IV

Thol Wildlife Sanctuary Tourist & Revenue Information (Last Five Years)

Sr. No.	Year	Nos. of Tourist	Revenue Rs.
1	2006-07	11926	3,81,530/-
2	2007-08	10928	5,19,505/-
3	2008-09	24162	6,91,967/-
4	2009-10	30188	11,02,490/-
5	2010-11	34167	13,02,066/-
6	2011-12	81035	19,07,084/-
7	2012-13	64941	29,52,785/-

Annexure-V

Bird Count - Groupwise estimated population of Waterfowl at Thol Bird census

No.	Name of the Group	2004	2006	2008	2010	2012
1	Grebes ડૂબકીઓ	2	40	3	16	164
2	Pelicans પેણ	4	321	750	1292	2
3	Ducks & Geese બતક, હંસ	1753	5599	7671	8679	16872
4	Rails, Coots, Crakes સંતાકુકડી, આડ	21	943	552	122	5027
5	Jacanas જલમાંજર	0	0	0	0	39
6	Cormorants કાજિયા	830	942	482	167	375
7	Herons, Egrets, Bittern, બગલા, બગલી, પાનબગલી	479	485	210	529	436
8	Storks, ઢોંક	83	236	95	306	67
9	Ibises & Spoonbill, કાંકણસાર અને ચમચા	768	183	5099	8761	18263
10	Flamingos, હંજ/સુરખાબ	0	273	205	706	0
11	Cranes, કુંજ	380	664	1651	2613	2013
12	Waders-Shorebirds, કાદવકીચડ ખૂંદનારા	13839	8140	8120	7652	7832
13	Gulls, ધોમડો	199	143	234	166	53
14	Terns, વાભગલી					
15	Kingfishers, કલકલિયા	10	15	25	20	47
16	Wagtails & Pipits પીળકીયા	0	0	53	317	33
17	Eagles & Harriers બાજ	4	7	15	34	32
18	Others, અન્ય	0	0	0	0	0
	Grand Total	**18372**	**17991**	**25165**	**31380**	**51255**

Annexure-VI

Way inside to Sanctuary (approaches for nacca planning)

North	Bhimasan, Hajipur and part of Thol and Karoli villages boundary.
South	Jethalaj and part of Thol villages boundary
East	Karoli and Jethlaj villages boundary.
West	Thol village and its boundary

Annexure-VII

Year wise annual Rainfall data at Thol Sanctuary

Sr. No.	Year	Rainfall (in mm)
1	2001	598
2	2002	319
3	2003	747
4	2004	1001
5	2005	1078
6	2006	212
7	2007	1117
8	2008	712
9	2009	273
10	2010	1573
11	2011	952
12	2012	1298
13	2013	1006

Annexure-VIII

Eco Fragile Zone – Thol Wildlife Sanctuary – included villages

Sr. No.	District	Taluka	No. of Villages
1	Gandhinagar	Kalol	5
		TOTAL	**5**
2	Mehsana	Kadi	2
		TOTAL	**2**
		GRAND TOTAL	**7**

Annexure-IX

Year wise break-up of Nature Education Camps

Year	Thol Wildlife Sanctuary	
	Camps	Campers
2002-03	0	0
2003-04	0	0
2004-05	14	1020
2005-06	10	487
2006-07	7	395
2007-08	14	779
2008-09	15	845
2009-10	15	689
2010-11	15	1036
2011-12	15	1338
2012-13	15	1309
Total	**120**	**7898**

Remarks: Total 7898 nos. Students, Teachers & Others have participated in NEC Year wise.

Annexure-X

Sarus Nests (Year wise Details)

Sr. No.	Taluka	Year	No. of Nests
1	2	3	4
1	Thol	2001-02	9
2	Ta-Kadi	2002-03	0
3	Dist-Mehsana	2003-04	7
4		2004-05	14
5		2005-06	11
6		2006-07	12
7		2007-08	12
8		2008-09	11
9		2009-10	12
10		2010-11	5
11		2011-12	10
Total			**103**

Annexure-XI

Eco-sensitive zone of Thol wildlife Sanctuary

Sr. No.	Name of Village	Taluka / District	Block / Survey No. (Total)	Area (in ha.)				
				Forest (ha.r.)	Non-Forest		Total (ha.r.)	
					Private Land Area (ha.r.)	Govt. Waste Land & Gauchar (ha.r.)		
1	2	3	4	5	6	7	8	
1	Adhana	Kalol Gandhinagar	506	Nil	475.300	0.000	475.300	
			257	Nil	205.505	0.000	205.505	ESZ
2	Jethlaj	Kalol Gandhinagar	666	Nil	518.980	0.000	518.980	
			489	Nil	361.551	27.170	388.721	ESZ
3	Bhimasan	Kalol Gandhinagar	170	Nil	162.460	0.000	162.460	
			170	Nil	162.459	0.000	162.459	ESZ
4	Karoli	Kalol Gandhinagar	377	Nil	328.840	0.000	328.840	
			204	Nil	238.477	8.230	246.707	ESZ
5	Hajipur	Kalol Gandhinagar	1927	Nil	1272.840	0.000	1272.840	
			273	Nil	180.008	0.300	180.308	ESZ
6	Thol	Kadi Mehsana	3133	Nil	1789.070	0.000	1789.070	
			1272	Nil	555.430	0.000	555.430	ESZ
7	Shedfa	Kadi Mehsana	107	Nil	215.580	0.000	215.580	
			35	Nil	083.113	1.910	085.023	ESZ
			Total		**4763.070**	**0.000**	**4763.070**	
			Total ESZ		**1786.543**	**37.610**	**1824.153**	**ESZ**

Annexure-XII

Information Sheets on Ramsar Wetlands (RIS) - Proposed

2006-2008 version

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

Notes for compilers:-

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:-

FOR OFFICE USE ONLY

DD MM YY

Designation date

Site Reference Number

Shri Praveen Kumar Arajanbhai Patel,
Deputy Conservator of Forests,
Nalsarovar Bird Sanctuary, Wildlife Division,
Sanand, Ahmedabad, Gujarat State.
Phone No. (02717) 223500
Fax No. (02717) 223232
Email: - acf-sanand-ahd@gujarat.gov.in

2. Date this sheet was completed/updated:- 19/05/2011

3. Country:- INDIA

4. Name of the Ramsar site:-

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

THOL WILDLIFE SANCTUARY

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

This RIS is for (tick one box only)

a) Designation of a new Ramsar site ☑ ; or

b) Updated information on an existing Ramsar site ☐

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

a) Site boundary and area

The Ramsar site boundary and site area are unchanged : ☐

or

If the site boundary has changed

i) the boundary has been delineated more accurately ; or ☐

ii) the boundary has been extended ; or ☐

iii) the boundary has been restricted** ☐

and/or

If the site area has changed

i) the area has been measured more accurately ; or ☐

ii) the area has been extended ; or ☐

iii) the area has been reduced** ☐

** **Important note**: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX. 6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site

7. Map of site

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

- Mark the Ramsar Wetland Boundary on the map - Annexed herewith.
- Provide a location map which shows the location of the wetland within India - Annexed herewith.
- Scale - Shown on the map
- Show some general features of the site - Wetland boundary makes major portion of the boundary of the proposed site However a small narrow strip almost parallel to the reservoir which being habitat of waterfowls has also been notified has the Sanctuary. Hence boundary of the Sanctuary as shown on the map forms boundary of the proposed Ramsar site.
- Compass bearing showing north - Complied with.

a) A map of the site, with clearly delineated boundaries, is included as

i**) a hard copy** (required for inclusion of site in the Ramsar List): ;☑

ii**) an electronic format** (e.g. a JPEG or ArcView image) ☑ ;

iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** ☐ ;

b) Describe briefly the type of boundary delineation applied:-

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchments boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a water body, etc.

Please describe how the Ramsar boundary was decided - The boundary of the notified sanctuary area has been considered for delineation of the proposed site. The notified sanctuary area has been demarcated with boundary cairns on the site.

8. Geographical coordinates (latitude/longitude, in degrees and minutes)

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

Latitude 23°15' N to 23°30' N
Longitude 72°30' E to 72°45' E

9. General location

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

The area falls in administrative jurisdiction of MEHSANA districts. Nearest large city is Ahmedabad which is about 24 km from the site while nearest town is KADI. which is about 22 km from the site.

10. Elevation:- (in metres: average and/or maximum & minimum) Max: 53.75 M. Above MSL
Min: 51.35 M Above MSL

11. Area: (in hectares) : 699 ha. (699000 sq. mtrs.)

12. General overview of the site

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Thol Wetland has a unique ecosystem of its kind. It supports 150 (150-Islam and Rahmani 2008) species of birds, of which around 90 species of waterbirds including some of the species shown in Red Data List of IUCN.

It is unique ecological community of the biographical zone having different sub habitats present at one place.

13. Ramsar Criteria

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1	2	3	4	5	6	7	8	9
☐	✓	☐	✓	✓	✓	☐	☐	☐

14. Justification for the application of each Criterion listed in 13 above

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion : 2 Thol Wetland supports following species included in the IUCN-Red data list.

Scientific Name	English Name	IUCN Red List	CITES App 1	CMS	India National Status Schedule
Mammals					
Antilop cervicapra	Black Buck				Sch-I
Hyaena hyaena	Striped Hyena				Sch-III
Canis lupus	Wolf				Sch-I
Canis aureus	Golden Jackal				Sch-II
Lepus nigricollis	Hare				Sch-III
Pteropus giganteus	Indian Flying Fox				Sch-II
Reptiles					
Ptyas mucosus	Rat Snake				Sch-II
Naja naja	Cobra				Sch-II
Xenochropis piscator	Checkered Keelback				Sch-II
Calotes versicolor	Garden Lizard				Sch-II
Sitana pondiceriana	Fan-throated Lizard				Sch-II
Mabuya spp.	Skink				-
Varanus bengalensis	Bengal Monitor				Sch-II
Lissemys punctata	Indian Flapshell Turtle				Sch-I
Birds					
Grus antigone	Sarus Crane	Vulnerable			Sch-IV
Vanellus gregarius	Sociable Lapwing	Critically Endangered			Sch-IV
Pelecanus crispus	Dalmatian Pelican	Vulnerable			Sch-I
Aquila clanga	Greater Spotted Eagle	Vulnerable			Sch-IV
Gyps bengalensis	White-backed or White-rumped Vulture	Critically Endangered			Sch-I
Neophron percnopterus	Egyptian Vulture	Endangered			Sch-IV
Haliaeetus leucoryphus	Pallas's Fish Eagle	Vulnerable			Sch-I
Rynchops albicollis	Indian Skimmer	Vulnerable			Sch-IV
Anhinga melanogaster	Darter	Near Threatened			Sch-IV
Mycteria leucocephala	Painted Stork	Near Threatened			Sch-IV
Ephippiorhynchus asiaticus	Black-necked Stork	Near Threatened			Sch-IV
Threskiornis melanocephalus	Oriental White Ibis	Near Threatened			Sch-IV
Phoenicopterus minor	Lesser Flamingo	Near Threatened			Sch-IV
Aythya nyrocas	Ferruginous Pochard	Near Threatened			Sch-IV

This mammals, birds & reptiles are included in IUCN - Red data list and Various schedules of the Wildlife Protection Act, 1972.

Criterion : 4:- Thol Wetland is a winter home of large number of migratory and resident birds. The wetland is strategically located at on the migratory route of the birds. Even in case of poor monsoon the wetland gets water from the canal area and large waterbodies which provides irrigation department, hence the minimum requirement of water & food provides to waterfowl. The name of waterbirds given in Annexure. From September to March waterbirds using the wetland.

The wetland is lifeline for a satellite population of Black Buck(*Antilop cervicapra*) and other mammals of surrounding area, which shift to this place in dry season. The globally threatened Sarus Crane (*Grus antigone*) also take refuge at this wetland during summer when other water bodies are dry. Globally threatened species like Darter, Painted Stork, Black-necked Stork, Oriental White Ibis, Lesser Flamingo, Ferruginous Pochard take refuge during the migration and this is very important place to hold during return migration.

Criterion : 5:- The wetland supports on an average 23,317 waterfowl during winter and above 20 Thousands waterfowl in summer. There is no specific estimation for summer period. Population during summer depends upon water level as during summer mainly resident species are found which otherwise disperses in the surrounding wetlands and appropriate niches.

Year	1992	2004	2006	2008	2010
Total count	1,25,074 *	18,732	17,991	25,165	31,380

*IWRB-Census 1992 (International waterfowl and wetlands Research Bureau-Asian wetland Bureau

The results of detailed winter waterfowl census for the last six years are given in Annexure -A.

Criterion : 6 Thol Wetland supports 1% of the individuals in a population of following species of waterfowls.

Scientific Name	English Name	1% Threshold	Recorded Count	Year/s, periods present *
PELICANS				
Pelecanus onocrotalus	Great White Pelican	230	1289	2008, 2010
IBISES & SPOONBILLS				
Plegadis falcinellus	Glossy ibis	2250	8425	2008, 2010
FLAMINGOS				
Phoenicopterus roseus	Greater Flamingo *	2250	-	-
*** The census is carried in Feb-March at that point of time the water level is high. So Flamingo nos. reflected less where as in May-June Flamingos are noticed in nos. of thousands.**				
GEESE & DUCKS				
Anas crecca	Common Teal	2250	4769	2008
CRANES				
Grus grus	Common Crane		2592	2010
SHOREBIRDS AND WADERS				
Limosa limosa	Black-tailed Godwit	2250	6450	2010
Philomachus pugnax	Ruff	2250	13345	2004, 2008

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation)

Name the relevant bio geographic region that includes the Ramsar site, and identify the bio geographic regionalisation system that has been applied.

a) bio geographic region

Thol wetland is a non forest area located in biotic province 4-B Gujarat Rajwada in semi arid bio geographical zone of the country as per the classification of Panwar and Rodgers WII-1988, Dehradun.

b) bio geographic regionalisation scheme (include reference citation)

Rodgers W. A. and Panwar, H S. (1988) *Planning a Protected Area Network in India.* 2 volumes. Wildlife Institute of India, Dehra Dun.

Islam, M. Z. and Rahmani, A. R. (2008) *Potential and Existing Ramsar Sites in India.* Indian Bird Conservation Network: Bombay Natural History Society, BirdLife International and Royal Society for the Protection of Birds. Oxford University Press. Pp. 592

16. Physical features of the site

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Thol tank was constructed for irrigation purpose in the year 1912 by the Gayekwadi State Rulers to supply irrigation water to villagers. Thol is predominantly and open sheet of shallow water of about 1450 ha. command area surrounded by cropland. The catchment area is nearly 15500 ha.

Thol is an important inland wetland in North part of Gujarat State and provides excellent habitat to the waterfowl during the post monsoon to winter season. More then 20000 waterfowl can be seen at the site in winter. The vast open sheet of shallow water and the surrounding crop fields, where the birds are mostly left unmolested, have created a very conductive habitat for birds.

Geologically it is a part of the alluvial plain of recent age. The soil is clayey to sandy clay. There are no hard rock outcrops in and around the sanctuary. The catchment area of Thol is the area on its North and North-East. i.e. Kalol, Kadi, Visnagar and Mehsana taluka.

It has been observed that the average area under the submergence in and winter is approximately 5 km^2, during the normal rainfall years. Thus, the actual water body in normal years is less than the legal area of the sanctuary, as 6.99 km^2 area is notified as the sanctuary under the Wildlife (Protection) Act, 1972. The legal boundaries of the area are as under:

North	**:**	Bhimasan, Hajipur and part of Thol and Karoli villages boundary.
South	**:**	Jethalaj and part of Thol villages boundary
East	**:**	Karoli and Jethlaj villages boundary.
West	**:**	Thol village and its boundary

CLIMATE

Climatically average annual temperature ranges between 7°C to 45°C. Rainfall is erratic. Average annual rainfall is about 500 mm. No. of rainy days in this area are hardly around 18 to 20 day per year. The yearly rainfall data of the area is given in Annexure-….. The rain water reaches to Thol pond through surrounding canals. In addition to these canals the pond receives run off water from catchment also. When the water level touches 9 ft., water is diverted to waste weir which runs along eastern boundary to reach Nalsarovar Bird Sanctuary. It is decided by State Government with Forest and Irrigation Department that water level should be maintain 3 ft. to 6 ft. for waterfowl compulsorily.

During winter, wind direction is from North and Northeast to South and Southwest. This wind comes from western Himalayan regions. The maximum wind velocity in winter is around 15 km/ hour, which reaches to 30-40 km/hour during summer, increasing the rate of evaporation of the water of Nalsarovar. During summer wind direction is from Southwest to Northeast.

17. Physical features of the catchments area

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type).

The catchment area is over 15500 ha.

BOUNDARIES

GEOLOGY, ROCK AND SOIL

18. Hydrological values:

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

The wetland has got great hydrological value. It is the only source of sweet (potable) water to the surrounding villages. The rain water recharges the underground water. It also saves the surrounding area from heavy flood and siltation. The reservoir is a manmade one, created in the year 1912. Thus it is about hundred years old reservoir, which is amongst largest in the surrounding area.

19. Wetland Types

a) presence

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Human made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

Ramsar wetland type 6 is dominant in the area and type 9 is co-dominant.

20. General ecological features

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The main habitat types are as follows

- **(i)** Deep open water habitat
- **(ii)** Shallow open water habitat
- **(iii)** Emergent aquatic vegetation
- **(iv)** Muddy habitat
- **(v)** Shore land and island
- **(vi)** Cultivation in surrounding area
- **(vii)** Fallow land in surrounding area
- **(viii)** Wood land habitat

Vegetation types: The vegetation types are

(i) Aquatic emergent vegetation: They are *Cyperus* spp., *Phragmites* spp. and *Typha angustifolia*, *Arundo donex*

The spread of the vegetation depends upon water level and it is controlled by grazing and grass collection. It provides roosting habitat and escape cover to waterfowl.

(ii) Submerged vegetation: They are mainly the aquatic plants. They are *Najas minor, Najas major* spp. *Vallisneria* spp., and *Hydrilla* spp., *Nymphaea stellata, Nymphaea pubescens*, *Aponogaton natans*

(iii) Vegetation on islets and shore land

On the Periphery on the lake (reservoir) tree species like *Azadiracta indica, Cenchrus cilliaris, Dichanthium annulatun, Zizyphus numularia, Calotropis procera, Cynodon duelylon, Prosopis juliflora, Acacia nilotica, Capparis decidua, Salvadora oleoides, Salvadora persica, Typha augustata, Tribulus terretaistis, Buteu monosperma, Maytenus emarginata, Bauhinia racemosa, Cassia auriculata, Cassia tora, Holoptelea integrifolea, Balanites aegyptica,* are found. These species provide excellent cover and serves has roosting-nesting site for many species of waterfowls.

(iv) Cultivation area:

In agricultural area surrounding the sanctuary, paddy, wheat, gram and cotton are grown.

While the wasteland in the down stream side and other surrounding is almost totally infested by *Prosopis juliflora*.

Terrestrial flora includes *Acacia nilotica* and *Azadiracta indica* which are dominant species. Other species are *Prosopis juliflora, P. cineraria, Balanites aegyptica, Salvadora persica* and *S. oleoides,* Bushes of *zizyphus* and *Capparis* are common.

In main flora which are found in Thol Wildlife Sanctuary i.e. *Azadiracta indica, Cenchrus cilliaris, Dichanthium annulatun, Zyzyphus numularia, Calotropis procera, Cyodon duelylon, Prosopis juliflora, Acacia nilotica, Capparis deciduas, Salvadora oleoides, Salvadora persica, Typha augustata, Tribulus terrestritis, Buteu monosperma, Maytenus emarginata, Bauhinia racemosa, Cassia auriculata, Cassia tora, Holoptelea integrifolea, Balanites aegyptica, Capparis repiaria.*

Aquatic vegetation includes different verities of *Algae, Ipomoea, Neptunia* etc.

21. Noteworthy flora

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Phragmites spp. as it provides roosting cover for waterfowl. *Najas* (spp. As it provides the staple food to the herbivorous ducks and coots.

22. Noteworthy fauna

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Black Buck, Sarus Crane(*Grus antigone)*, Oriental Darter, White Spoonbill (*Platalea leucorodia)*, White headed ibis (*Threskiornis melanocephalus)*, Black bellied tern, Indian soft shelled turtle (*Lissemys punctata*). This mammals, birds & reptiles are included in IUCN -Red data list and schedule -1 of the Wildlife Protection Act, 1972 of India.

Black Buck *(Antilope cervicapra)*

Black headed ibis *(Threskiornis melanocephalus)*

Oriental Darter *(Anhinga melanogaster)*

Black bellied tern *(Sterna acuticauda)*

23. Social and cultural values:

The Thol wetland can be termed as a lifeline for the surrounding villages. It is the main source of drinking water and irrigation to fields. Cattle lightly depend on Thol Wetland for grazing.

The periphery of the site is inhabited by the Thakor, Rabari, Vaghari, Kumbhar communities which includes in Bakshi Casts, Harijans are in a primitive scheduled cast and Patels community is as an other cast. These communities are confined to this area only. The Thakor and Vaghari communities have unique cultural heritage, rituals and very strong system of customs and justice.

a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc.

Distinguish between historical/archaeological/religious significance and current socio-economic values:-

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box ☑ and describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland: ☑

The area is a inland wetland. People residing on the periphery of the wetland gets many direct and indirect benefits. Marshy vegetation growing in the area provides excellent thatching material and also used as a fodder for cattle. Local people earns their livelihood through activities related to tourism also. The lake is about a century old lake which is the only source of an irrigation in the command area.

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland: ☐

Padhar community which is the only tribe which resides in plains and is listed as primitive tribes, resides in periphery of the Nalsarovar. Their cultural values are exceptional.

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples: ☑

People from surrounding villages draw water from the area for irrigation. Excessive drawl of the water alters the characteristics of the wetland. This activity has some negative impacts upon the area. Which needs to be addressed at the earliest.

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland: ☐

24. Land tenure/ownership

a) within the Ramsar site

The entire area is notified as sanctuary. However the area is not notified as forest under Indian Forest Act. The area is owned by the State Government. The settlement proceedings are yet to be finalized and rights of the people are yet to be inquired into, though most of proceedings have taken place. The sanctuary area get submerged under rainwater in the peak of the monsoon. As it is notified area State Government has the ownership right over the land.

21 O.N.G.C. crude oil wells are situated in sanctuary area. Sometimes leakage of oils incidents are occurred. So leakage oil mixes with water and occurs water pollution. Industries are established before the declaration of notification of the sanctuary. Which includes in sanctuary and out side sanctuary adjoining area.

b) in the surrounding area

Surrounding area consists of mainly agriculture farms and fallow with some wasteland. Farms and fallow land are owned by farmers where the wasteland belongs to the State Government.

25. Current land (including water) use

a) within the Ramsar site

As it is a notified wildlife sanctuary the site is used only for the purpose of wildlife and its habitat conservation and improvement. However, being a irrigation tank water from the reservoir is used in irrigation as well as for supplying drinking water.

b) in the surroundings/catchments

The surrounding area is mainly used for the purpose of agriculture, pastureland and settlements. There are few industrial units adjacent to the towns and along the highways.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects

a) within the Ramsar site

Withdrawal of excessive water for irrigation is the main factors adversely affecting the ecological character.

b) in the surrounding area

Increase in agriculture without adopting modern irrigation practices put lot of pressure on the quantity of water of the wetland. Development of industries without proper effluent treatment plant pose risk of polluting inflow of water for the wetland. Change in the land use in surrounding areas, meanly for residential purposes or any other non agriculture purpose may affect adversely upon waterfowls.

27. Conservation measures taken

The area is declared as a Wildlife Sanctuary under the provisions of Wildlife Protection Act, 1972, since 18/11/1988. Total area is 6.99 km^2.

The provisions of conservation of wildlife and its habitat including ban on hunting is being enforced. Management Plan is prepared and approved. The prescriptions of the management plan are being implemented. Annual Action Plan for conservation of the wetland is also prepared and the work as per the annual Action Plan are already started.

Separate division headed by the Deputy Conservator of Forests has been organized for the management of the wetland. Following staff is provided for the protection and management of the wetland which is attached with Nalsarovar Bird Sanctuary also.

Deputy Conservator of Forests	01
Range Forest Officers	01
Foresters	01
Watchman	10
Accountant	01
Clerks	02

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate)

Ia ; Ib ☐ ; II ☐; III ☐; IV ☐ ; V ☐ ; VI ☑

c) Does an officially approved management plan exist; and is it being implemented ?

Yes, 1st Management Plan of Thol Wildlife Sanctuary exists and it is being implemented.

d) Describe any other current management practices No

28. Conservation measures proposed but not yet implemented

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

Monitoring of water quality of the effluents of the industries is proposed under the Management Plan. Preservation measures of satellite water bodies around the main wetland are also planned. Ban on fishing, restriction of movement of human and cattle etc. within the sanctuary area is announced and suitable follow up measures are being taken.

In recent years the reservoir is being fed through sardar sarovar canal water. Monitoring of release water appropriate season and quantum of release needs to be maintained.

29. Current scientific research and facilities

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

A team of Zoological Survey of India, Western region has completed biodiversity survey and inventory of the wetland. The data and information are being compiled. Specific research studies on the subject of migratory birds, inter and intra species behavior, invertebrate fauna, microorganism and quantitative as well as qualitative monitoring water are proposed and specific studies on zooplankton and phytoplankton has been carried out by the GEER Foundation, Gandhinagar in 2007.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

Nature education camps for students are regularly organized. Display boards, and signage giving information about the migrating birds and their routes are available. Interpretation Center and touch – screen information kiosk are developed.

31. Current recreation and tourism

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The basic facilities of eco-tourism have been developed. About 35,000 tourists visited the wetland in 2010-11 financial year.

An interpretation center and cafeteria are under construction and are about to complete.

The wetland has got tremendous potential for development of eco-tourism.

32. Jurisdiction

Include territorial, e.g. state/region, and functional/sect oral, e.g. Dept of Agriculture/Dept. of Environment, etc.

Department of Forests & Environment, Government of Gujarat State manages the wetland which the lake is under control of the irrigation Department Government of Gujarat.

33. Management authority

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Deputy Conservator of Forests,
Nalsarovar Bird Sanctuary, Wildlife Division,
Near Mamalatdar Office, Sanand – 382110.
District: Ahmedabad, Gujarat State, India.
Phone: 02717-223500

34. Bibliographical references

Scientific/technical references only. If bio geographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

(1) Islam, M. Z. and Rahmani, A. R. (2008) *Potential and Existing Ramsar Sites in India.* Indian Bird Conservation Network: Bombay Natural History Society, BirdLife International and Royal Society for the Protection of Birds. Oxford University Press. Pp. 592

(2) Management Plans of Thol 2001 to 2006 S.J.Pandit Gujarat Forest Department, Gandhinagar.

(3) Management Plans of Thol 2002 to 2011 S.J.Pandit Gujarat Forest Department, Gandhinagar.

(4) Perennou, C & Mundkhur, T. (1992) Asian waterfowl census 1992, IWRB, Slim bridge U.K.

(5) Regional Workshop on Wetland Conservation Strategy and Issues (Western Region) 9-11 February-2003

(6) Rodgers W. A. and Panwar, H S. (1988) *Planning a Protected Area Network in India.* 2 volumes, Wildlife Institute of India, Dehra Dun.

(7) Thakkar P.S. 1982 Flamingos breeding in Thol lake Sanctuary near Ahmedabad. JBNHS 79(3) : 668

મદદનીશ વન સંરક્ષકશ્રી
નળસરોવરની કચેરી
આવક નંબર : [illegible]
તારીખ : [illegible]
ફાઇલ નંબર :

થોળ ...શી અભયારણ્ય બાબતે ચર્ચા વિચારણા કરવા માટે તા.૧૫.૦૯-૨૦૦૩ના રોજ અગ્ર સચિવશ્રી (વન અને પર્યાવરણ વિભાગ) ના અધ્યક્ષપદે ગાંધીનગર ખાતે યોજાયેલ બેઠકની કાર્યવાહી નોંધઃ

આ બેઠકમાં નીચે દર્શાવેલ અધિકારીશ્રીઓ હાજર રહેલ હતા.

૧. શ્રી પ્રદીપ ખન્ના, મુખ્ય વન સંરક્ષકશ્રી(વ.જી.)

૨. શ્રી વી.એસ.બ્રહમભટ્ટ, અધિક સચિવશ્રી, નર્મદા અને જળસંપત્તિ વિભાગ.

૩. શ્રી સી.વી.નાદપરા, અધિક સચિવશ્રી(પંચાયત) અને મુખ્ય ઇજનેર. નર્મદા અને જળસંપત્તિ વિભાગ.

૪. શ્રી જે.બી.પટેલ, મુખ્ય ઇજનેરશ્રી, સરદાર સરોવર નર્મદા નિગમ લી., ગાંધીનગર.

૫. શ્રી આર.આર.વરસાણી,જિલ્લા વિકાસ અધિકારીશ્રી મહેસાણા.

૬. શ્રી અનંત પટેલ, ઉપસચિવશ્રી,(વ.જી.) વન અને પર્યાવરણ વિભાગ.

૭. શ્રી આર.એમ.વોરા, અધિક્ષક ઇજનેર, ગાંધીનગર પંચાયત સિંચાઇ વર્તુળ, ગાંધીનગર.

૮. કાર્યપાલક ઇજનેરશ્રી, (પંચાયત), સિંચાઇ વિભાગ, મહેસાણા.

૯. શ્રી એસ.જે.પંડિત, સહાયક વન સંરક્ષકશ્રી, નળસરોવર.

બેઠકની શરૂઆતમાં અગ્રસચિવશ્રીએ સૌને આવકાર્યા.

થોળ તળાવમાં પાણીનું લઘુત્તમ અને મહત્તમ સ્તર કેટલું રાખવું તે બાબતે વિસ્તૃત ચર્ચાને અંતે નીચે મુજબ નિર્ણય કરવામાં આવ્યો.

(૧) થોળ તળાવમાં ઓછામાં ઓછું પાણીનું સ્તર ત્રણ ફૂટનું જાળવવાનું રહેશે. એટલે કે, પાણીનું સ્તર ત્રણ ફૂટથી નીચે જાય તે રીતે સિંચાઇ માટે આપી શકાશે નહિ. નર્મદા કેનાલનું પાણી છોડવામાં આવે ત્યારે આ તળાવનું પાણીનું મહત્તમ સ્તર છ ફૂટ કરતાં વધે નહિ તેની તકેદારી સિંચાઇ ખાતાએ રાખવાની રહેશે. કુદરતી રીતે પાણીના મહત્તમ સ્તરમાં વધારો થાય તો તેને પણ ક્રમશઃ છ ફૂટ સુધી ઘટાડીને લાવવાનું રહેશે.

નોંધ.NOTING

(૨)થોળ ખાતે આવેલ વન ખાતા હસ્તકના ઇન્સ્પેકશન બંગલાનો સિંચાઇ ખાતાના અધિકારી કર્મચારીઓને જયારે જરૂર હોય ત્યારે ઉપયોગ કરવા દેવામાં આવશે.

અંતમાં સૌનો આભાર માની બેઠક પૂરી થયેલ જાહેર કરવામાં આવી.

ક્રમાંક ડબલ્યુએલપી-૧૧૯૭-એલઓડી-૧-ગ.૧(૭૦૭)
વન અને પર્યાવરણ વિભાગ,
સચિવાલય, ગાંધીનગર.
તા. 18 SEP 2003

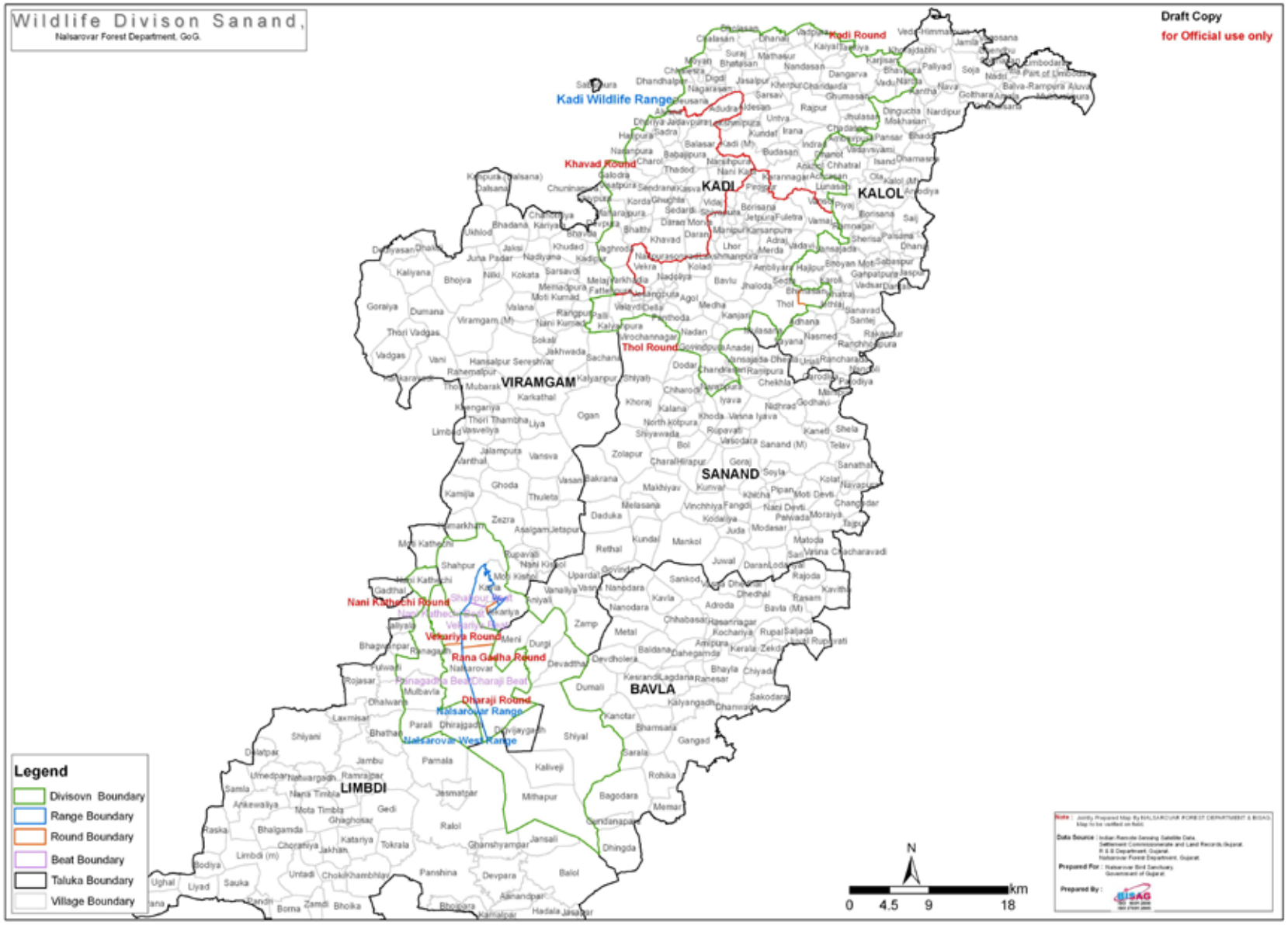
25 SEP 2003

(અનંત પટેલ)
ઉપસચિવ
વન અને પર્યાવરણ વિભાગ.

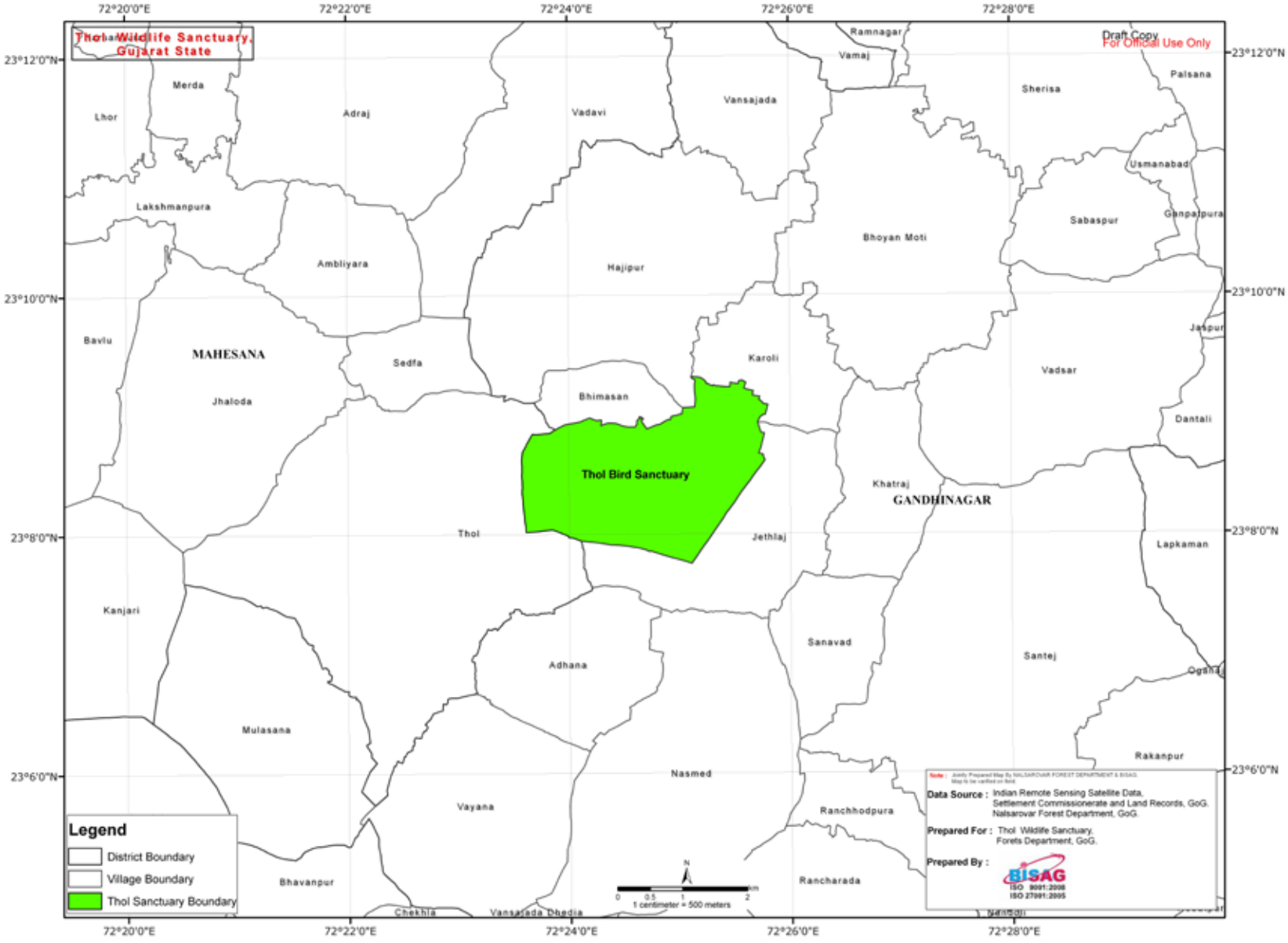
પ્રતિ,

૧. શ્રીમતિ વિલાસીની રામચંદન, અગ્ર સચિવશ્રી, મહેસુલ વિભાગ, સચિવાલય, ગાંધીનગર.
૨. શ્રી એમ.એલ.શર્મા, અગ્ર મુખ્ય વન સંરક્ષકશ્રી, ગુજરાત રાજય, ગાંધીનગર.
૩. શ્રી પ્રદીપ ખન્ના, મુખ્ય વન સંરક્ષકશ્રી (વ.જી.), ગુજરાત રાજય, ગાંધીનગર.
૪. શ્રી એમ.એસ.પટેલ સચિવશ્રી, નર્મદા અને જળસંપત્તિ વિભાગ, સચિવાલય, ગાંધીનગર.
૫. શ્રી વી.એસ.બ્રહમભટ્ટ, અધિક સચિવશ્રી, નર્મદા અને જળસંપત્તિ વિ. વિભાગ,
૬. શ્રી સી.વી.નાદપરા, અધિકસચિવશ્રી, (પંચાયત) અને મુખ્ય ઇજનેર, ન.અને જ.સં.વિ.વિભાગ.
૭. શ્રી જે.બી.પટેલ, મુખ્ય ઇજનેરશ્રી, સરદાર સરોવર અને નર્મદા નિગમ લી., ગાંધીનગર.
૮. શ્રી એ.એસ.પટેલ કલેકટરશ્રી, મહેસાણા.
૯. શ્રીઆર.આર.વસાણી, જિલ્લા વિકાસ અધિકારીશ્રી, મહેસાણા.
૧૦. શ્રી આર.એમ.વોરા, અધિક્ષક ઇજનેર, ગાંધીનગર પંચાયત-સિંચાઇ વર્તુળ, ગાંધીનગર.
૧૧. કાર્યપાલક ઇજનેરશ્રી, (પંચાયત), સિંચાઇ વિભાગ, મહેસાણા.
૧૨. શ્રી એસ.જે.પંડિત, સહાયક વન સંરક્ષકશ્રી, નળસરોવર પોલીસ્ટેશનની બાજુમાં, મુ.સાણંદ તા. સાણંદ જી.અમદાવાદ.

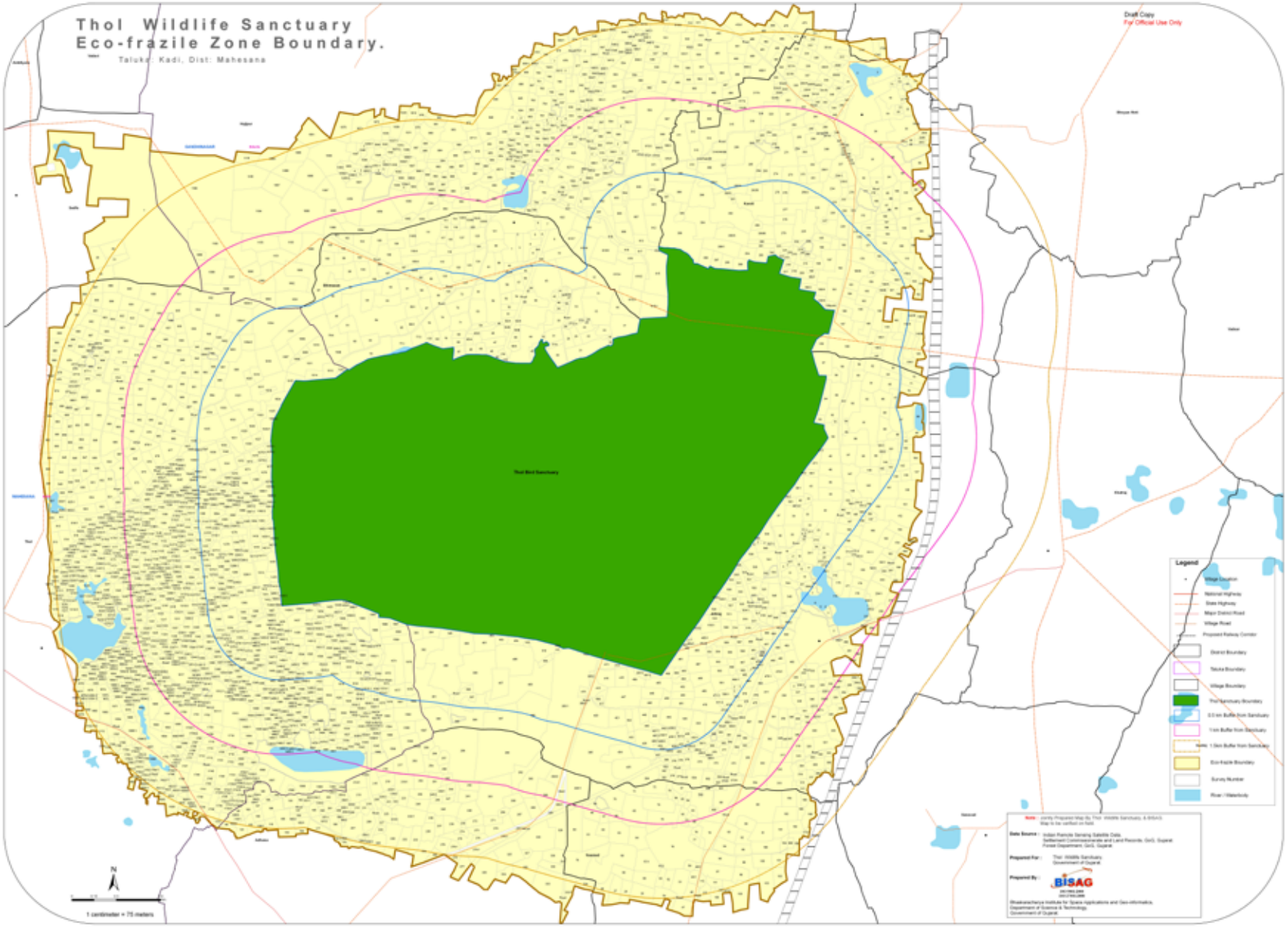
Maps



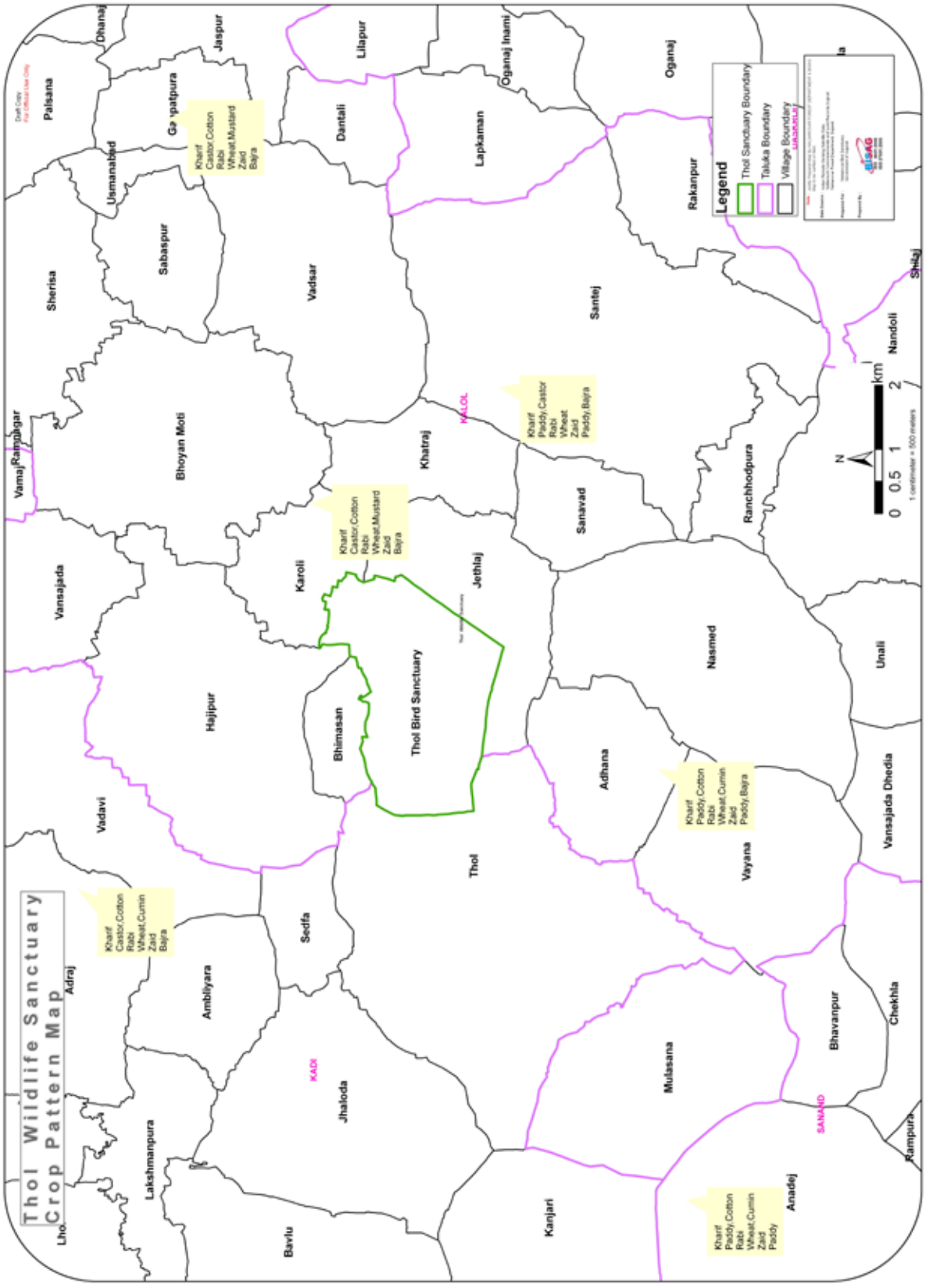
Map-1 Divisional Map of Nalsarovar Bird Sanctuary and Thol Wildlife Sanctuary



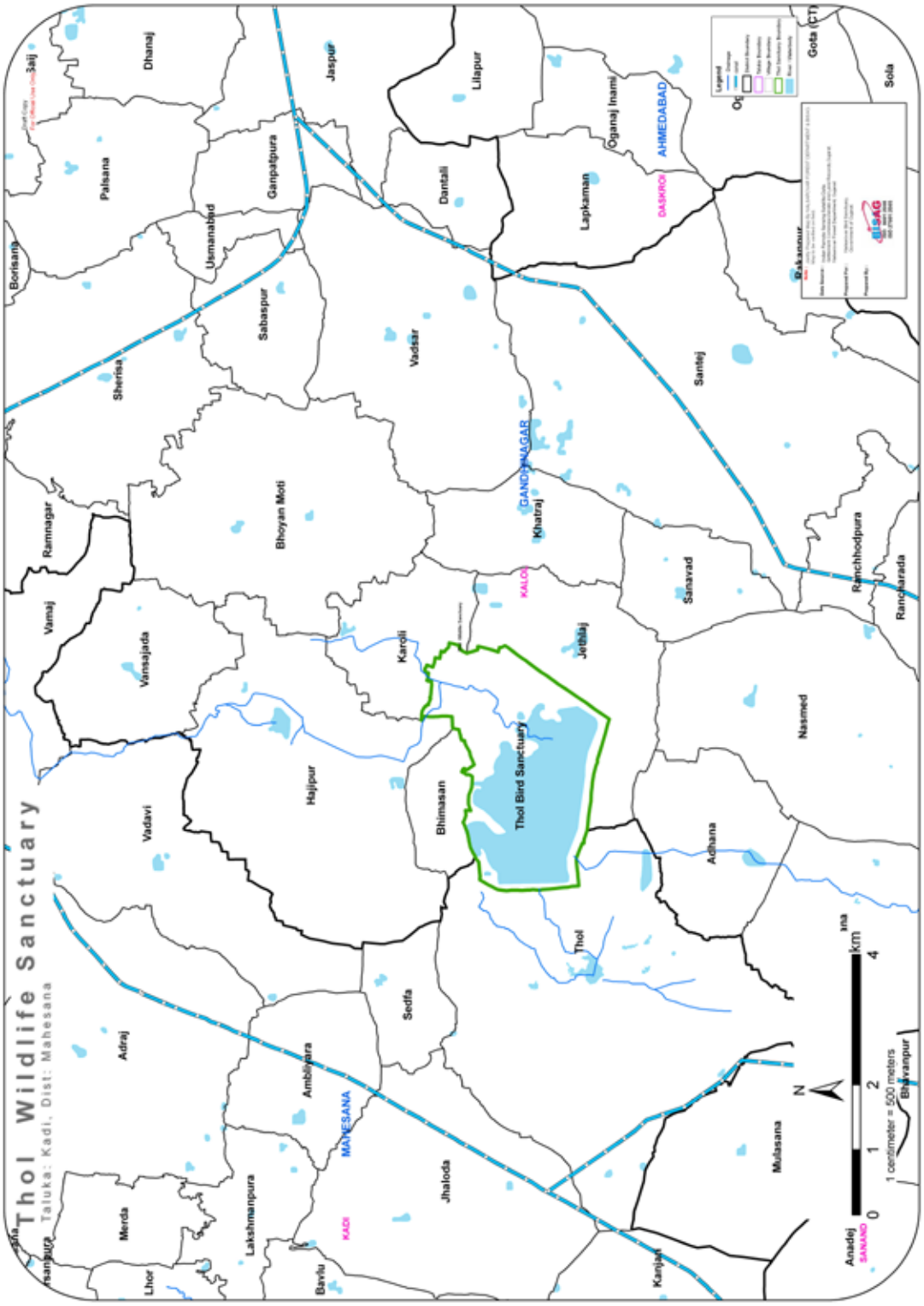
Map-2 Village Map of Thol Wildlife Sanctuary



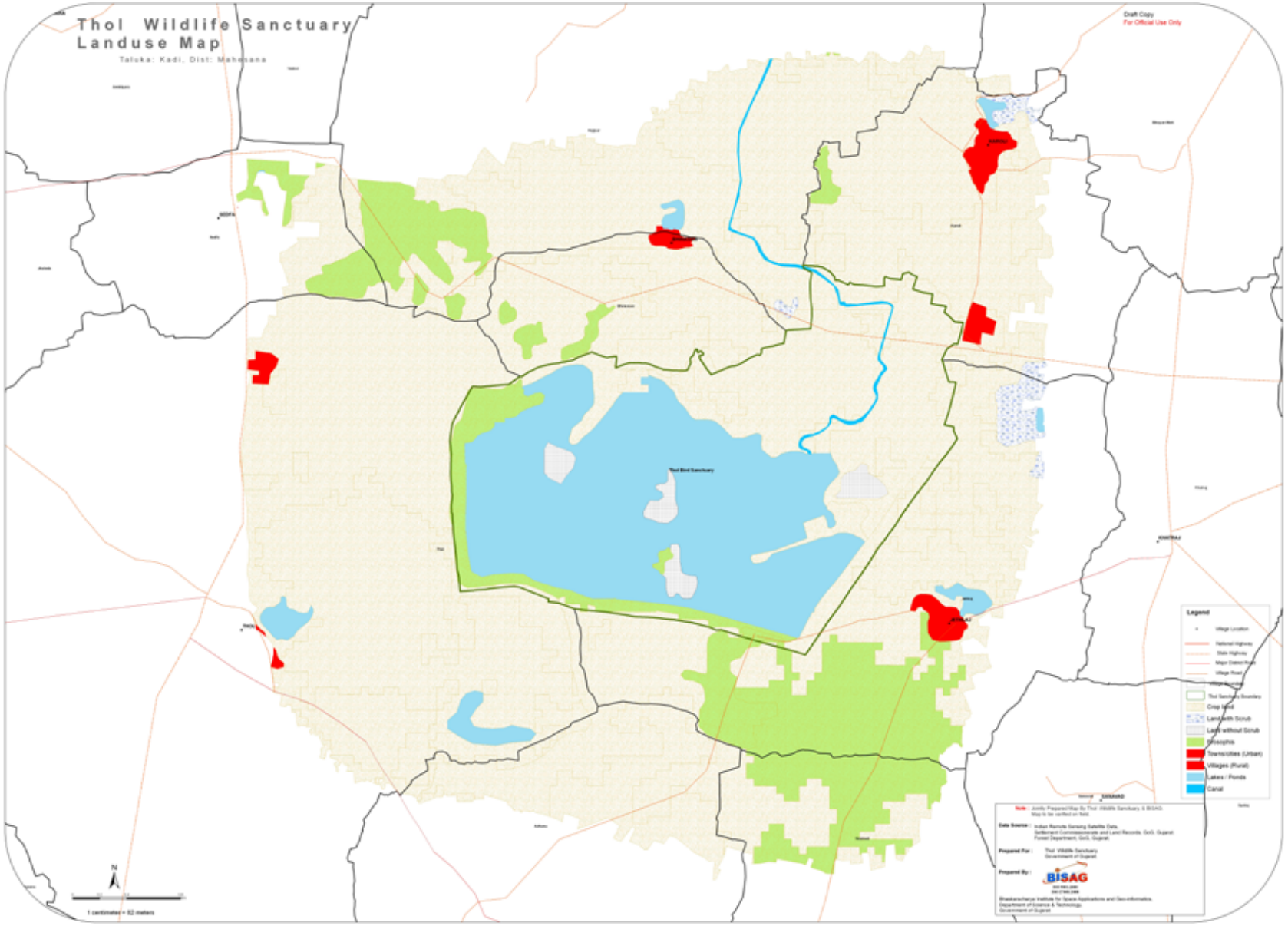
Map-3 Eco-fragile Map of Thol Wildlife Sanctuary



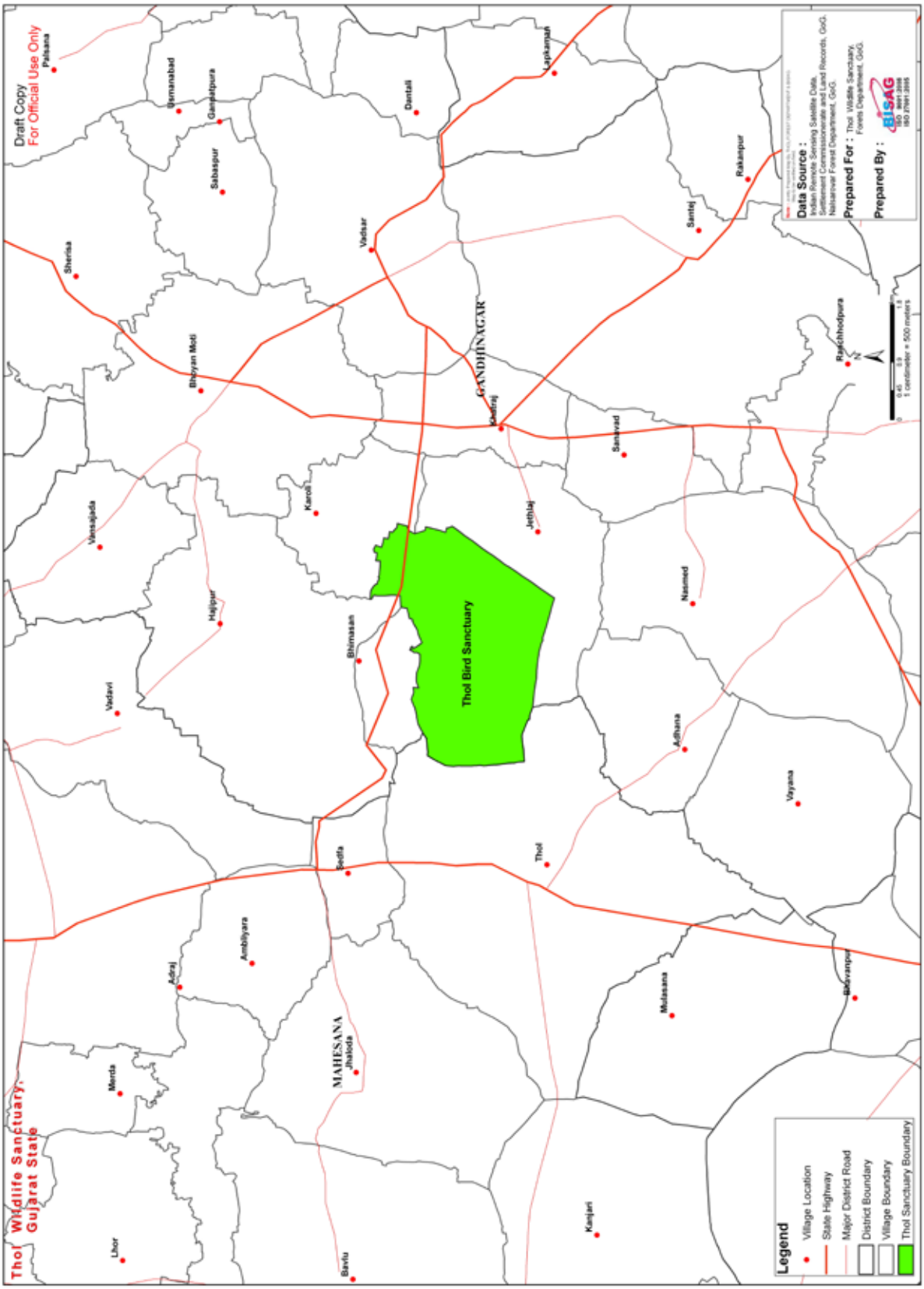
Map-4 Crop Pattern Map of Thol Wildlife Sanctuary



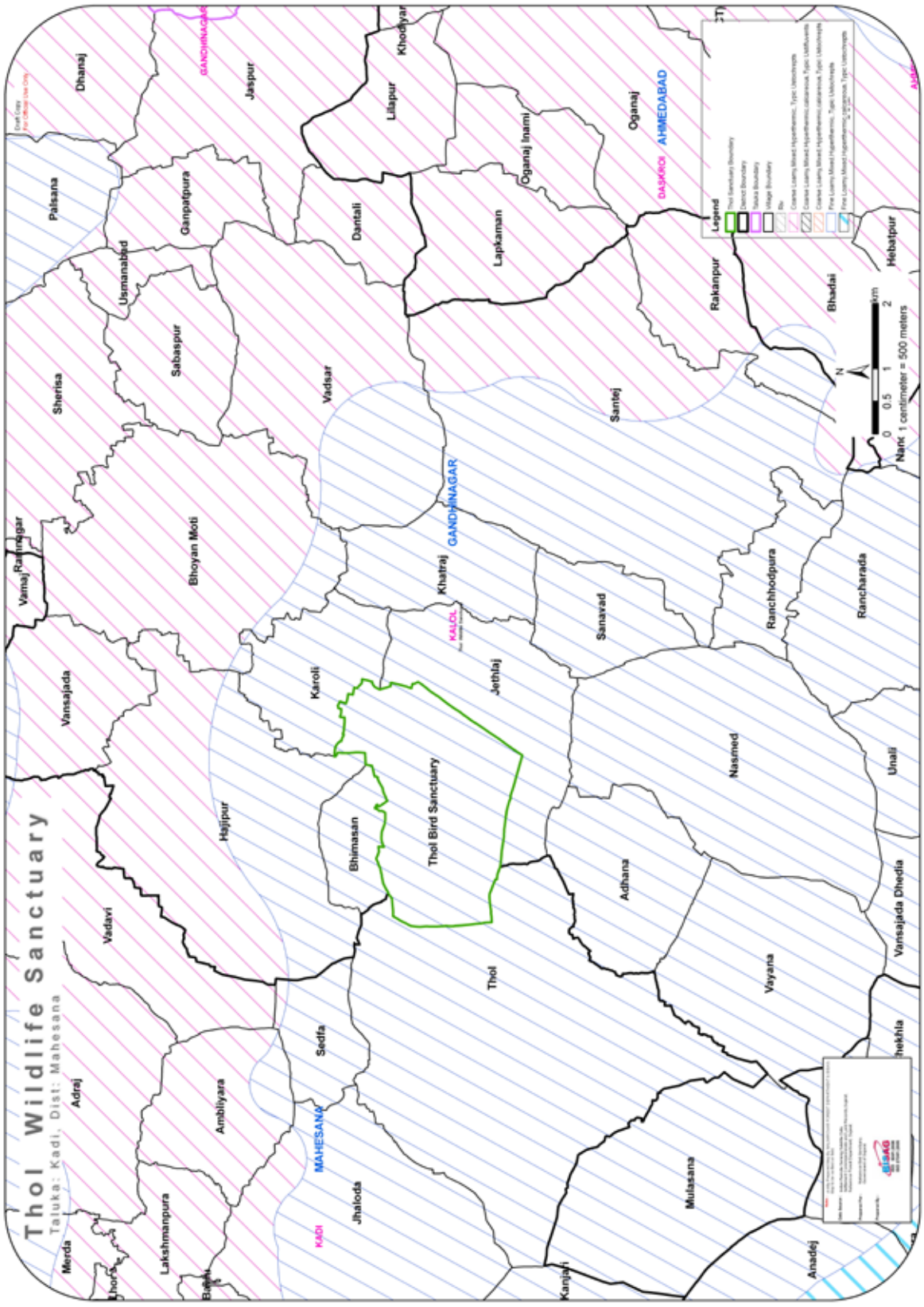
Map-5 Drainage Map of Thol Wildlife Sanctuary



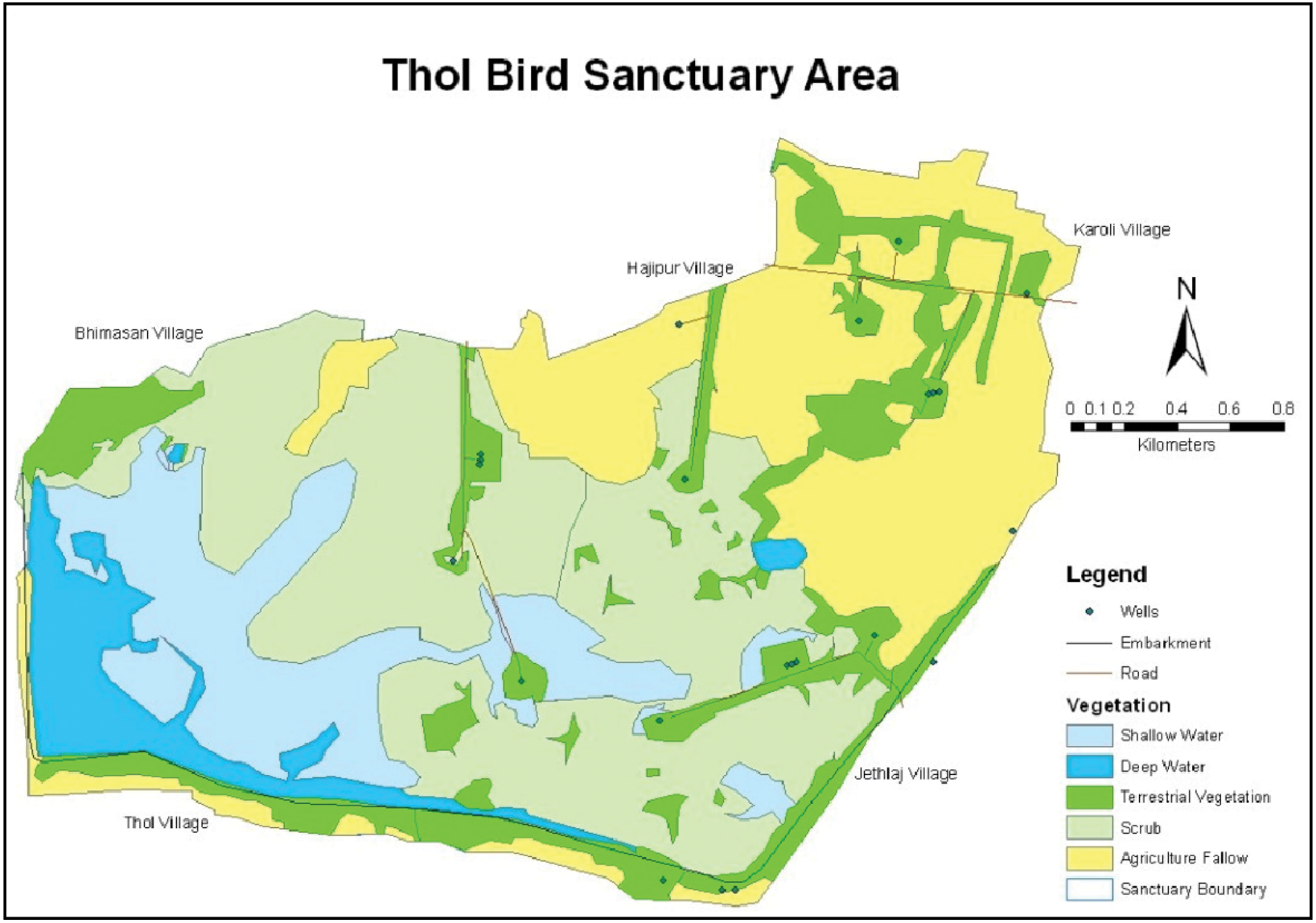
Map-6 Landuse Map of Thol Wildlife Sanctuary



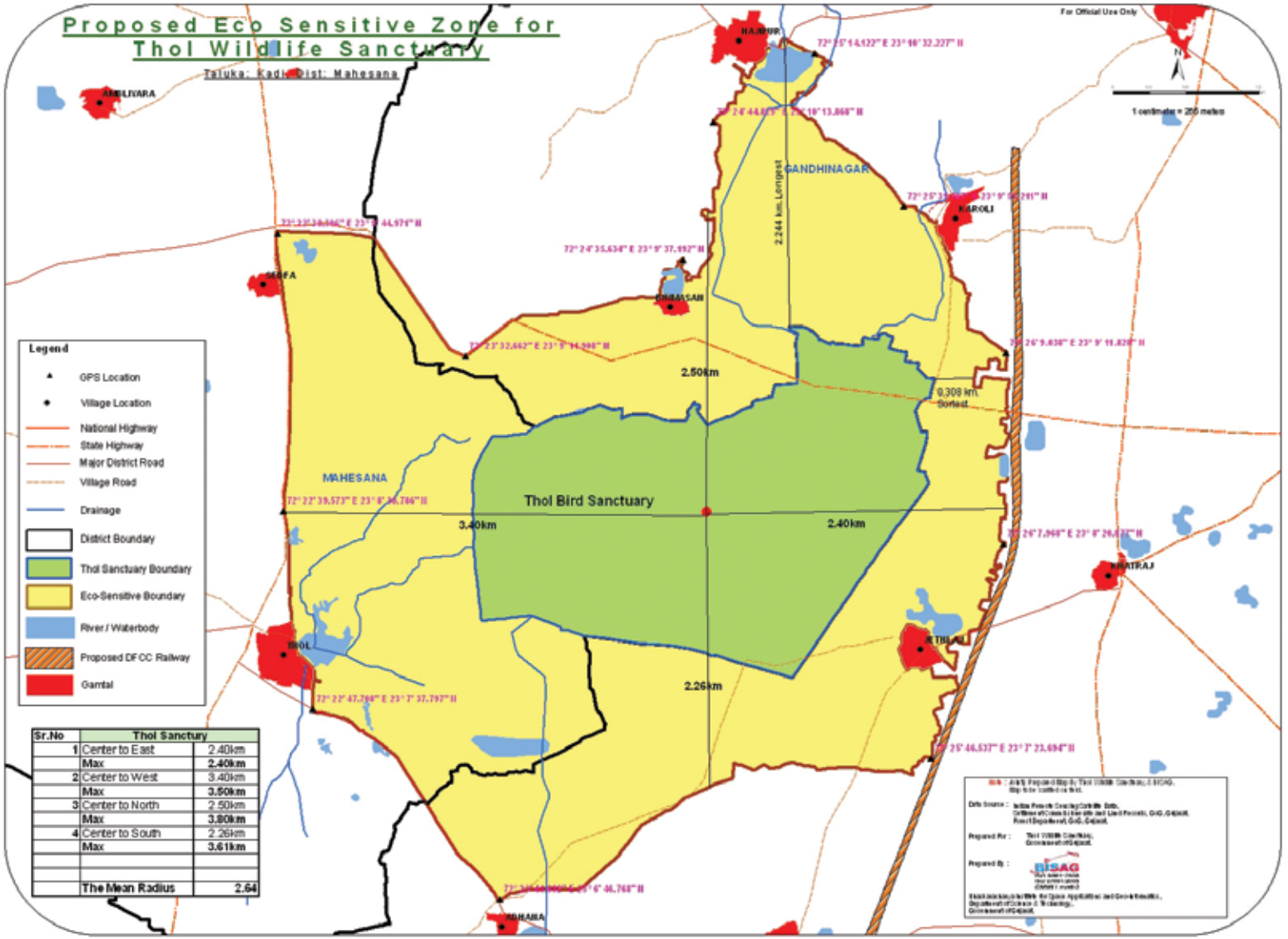
Map-7 Road Map of Thol Wildlife Sanctuary



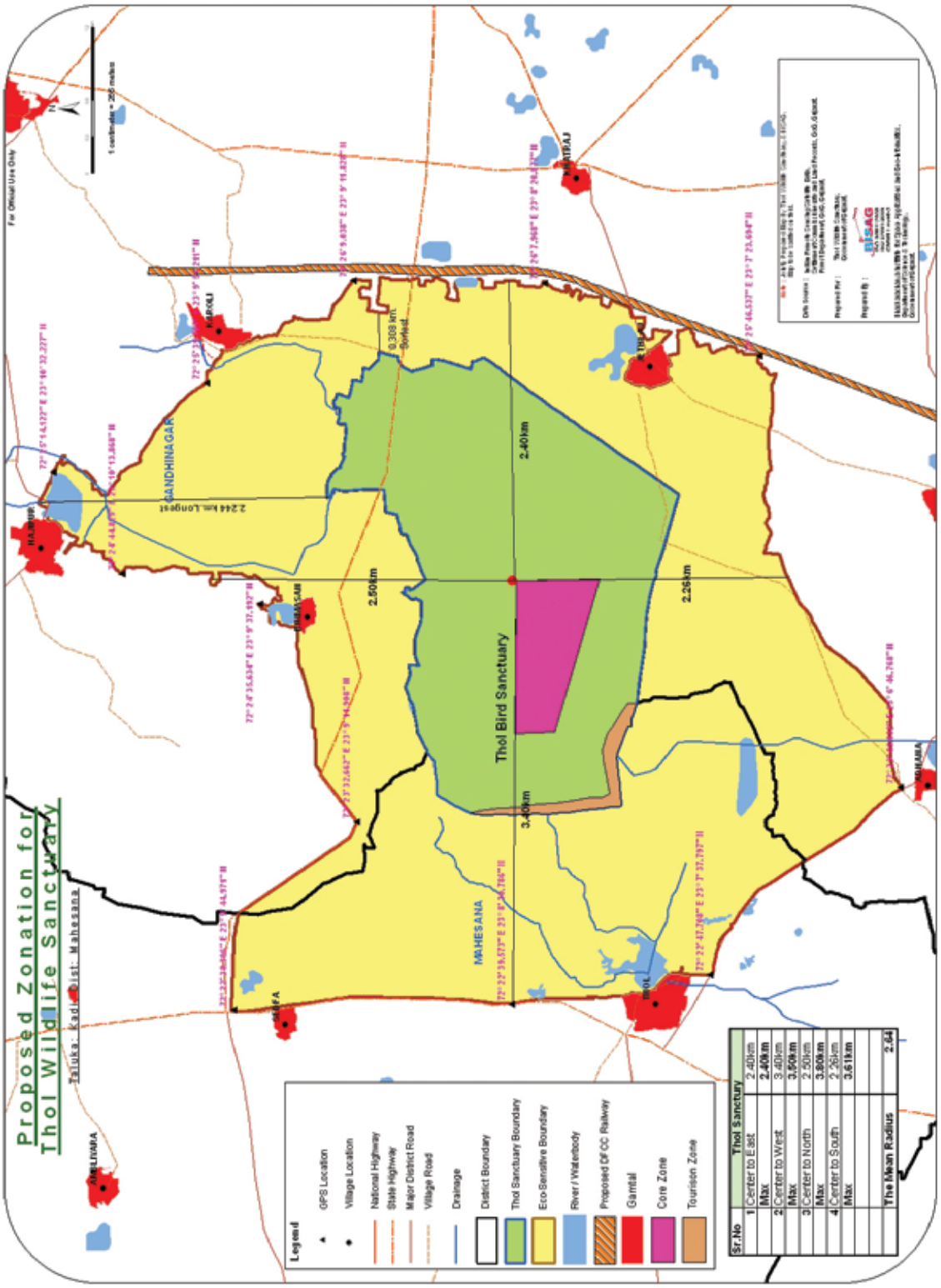
Map-8 Soil Map of Thol Wildlife Sanctuary



Map-9 Habitat Map of Thol Wildlife Sanctuary



Map-10 Proposed Eco-sensitive Zone Map of Thol Wildlife Sanctuary



Map-11 Proposed Zonation Map of Thol Wildlife Sanctuary

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