

CHAPTER 3

STUDY AREA

3.1 General Aspects

Thol Bird Sanctuary (TBS) is located in Kadi taluka of Mehsana district, Gujarat between 23° 15' to 23° 30' N Latitudes and 72° 30' to 72° 45' E Longitudes (**Fig 3.1 and 3.2**). Originally constructed for irrigation purpose by the Gayekwadi State Rulers in the year 1912; however, owing to its high conservation value it was declared as a sanctuary in November 1988. It has a total area of 6.99 sq. km and 5.62 km periphery (PCCF & HoFF GoG, 2018 and Kamboj and Tatu, 2017). There are five villages in the periphery of the sanctuary, viz. Bhimasan, Hajipur, Karoli, Jethlaj and Thol. The nearest city is Ahmedabad about 25 kms and the nearest taluka is Kadi which is 22 kms away from the Sanctuary. Thol area experiences three distinct seasons namely winter, summer and monsoon. The wetland receives rainfall from July to September during monsoon season; however the rainfall data of Thol during the last two decades show rainfall to be highly erratic and ranges from 203 mm to 917 mm (Sasikumar K., 2014, **Table 3.1**).

The wetland was first evaluated by desktop assessment of Hydrological / drainage pattern reflected in Google time line images. The desktop evaluation, (USEPA; National wetland Condition Assessment: Site Evaluation guidelines, 2011) was followed by a field visit of TBS Wetland for preliminary survey and to see the actual field drainage pattern in the wetland. For this, a walk was done on the inner periphery parallel to the East, South and West sides of the '*bundh*' of the wetland

Table 3.1: Year Wise Annual Rainfall Data of Thol.

Sr. No.	Year	Rainfall (mm)	Sr. No.	Year	Rainfall (mm)
1	1999 - 2000	232	11	2009 - 2010	409
2	2000 - 2001	189	12	2010 - 2011	917
3	2001 - 2002	500	13	2011 – 2012	695
4	2002 - 2003	203	14	2012 – 2013	367
5	2003 - 2004	662	15	2013 - 2014	806
6	2004 - 2005	582	16	2014 – 2015	594
7	2005 - 2006	855	17	2015 – 2016	505
8	2006 - 2007	659	18	2016 – 2017	266
9	2007 - 2008	786	19	2017 – 2018	860
10	2008 - 2009	473	20	2018 – 2019	158

(Source: Irrigation Division, Taluka Panchayat, Kadi)

3.2 General Hydrology of Thol

Common field observations and interaction with Forester/locals revealed that there are two main sources of water for the Thol wetland viz. water from the catchment area and water through the Narmada canal. The practice of releasing Narmada river water into the Thol wetland through the canal started from the year 2002-2003. However, the volume of water released into the wetland depends upon the volume demanded (and not on a regular basis) by the irrigation division of Kadi Taluka and the volume sanctioned by the higher authorities of irrigation department. The water finds its way into the TBS from the catchment area i.e. from the Bhimasan and Karoli village sides while river Narmada water enters the wetland through canal which crosses the Khatraj Bhimasan road before pouring

into the wetland. The total catchment area of the water body covers 320 sq. km. spreading up to Kadi taluka of Mehsana district and Kalol taluka of Gandhinagar district. Water finds its way through number of canals draining into the feeder canal located on the north to north-eastern side of the Thol wetland. Water is received through Eastern canal, Saij-Hajipur canal, Irana-Indrad-Wamaj canal, Hajipur-Piyaj canal, Eastern feeder at Saghan drain and Jaspur Canal. There is a water diversion known as waste weir 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 which drains into the canal that runs along the eastern boundary of the Thol wetland to reach Nalsarovar Wildlife Sanctuary located southwest of Thol Wildlife Sanctuary. However, it has been decided by the Government to maintain the water level between 3 feet to 6 feet in the interest of Birds. Some of the salient Hydrological features of Thol wetland are as follows (**Table 3.2**). Thol wetland occupies 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, Chandanpur, Jhaloda which spread to 55.95 sq. km. It has well developed canal based irrigation system having total length of about 19.97 km and four head regulators at the water body to control the flow of water from TBS wetland (Sasikumar K., 2014).

- Irrigation culvert no 1 is towards the East - South corner of the Thol wetland.
- Irrigation culvert no 2 is adjacent to the parking area of the forest camp site.

- Irrigation culvert no 3 is towards the West - South corner of the Thol wetland.
- Irrigation culvert no 4 is near the visitors parking area / check post.

Table 3.2: Some Salient Hydrological Features of Thol Wetland

Sr. No.	Particulars	Measures
1	Full Supply Level (FSL)	163 ft
2	High Flood Level (HFL)	167 ft
3	By-pass level	165 ft
4	Storage Capacity	312 MCF
5	Total Command Area	3,670 acres
6	Irrigation Command Area	1,835 acres
7	Area of the Tank	1728.31 acres
8	Area under the Submergence of FSL	1780 acres

(Source: Sasikumar K., 2014)

Generally water is discharged through canals for irrigation purpose during the monsoon period. It is also to be noted that water is not allowed to be discharged if the water level in the wetland is 3 feet or below. The volume of water released for irrigation from Thol wetland is as per **Table 3.3**.

Table 3.3: Water Release by Irrigation Department from Thol Wetland

Sr. No.	Years	Release in MCF				
		2014 – 2015	2015 – 2016	2016 – 2017	2017 – 2018	Average
	Total	25.000	39.522	25.569	22.025	28.029

(Source: Irrigation Division, Taluka Panchayat, Kadi)

The main crops cultivated in downstream regions are paddy during the monsoon season and wheat during the winter season. The surrounding land use mainly falls into arable; grazing and forest type. There was a profolous growth of water lilies

towards the East-South region of TBS. This is the area from where the water finds its way towards the deeper i.e. West-South and towards the Western Parts of the wetland. Thus, the continuous earthen bund on its western, southern and eastern periphery helps in collection of water that flows into it during the monsoon from the catchment area which is located to its north and north – east of the wetland. As mentioned earlier Thol water body also supports a canal based irrigation system and therefore it is always important to carry out studies related to environmental aspects on regular basis so as to monitor the changes in a dynamic ecosystem, as here in this case, the changing water regime of the Thol Wetland. It remains covered with water in the rainy season. During winter it begins to dry and by summer the wetland is separated into water bodies of varying size, the biggest being towards the western side. Cattle wading, water pumping for irrigation was found in some spots of the Wetland.

3.3 Biological Significance of Thol

Thol wetland being fresh water ecosystem is dominated by birds. Almost 92 different species of waterfowl falling across 14 different families have been recorded. It is also 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. The flagship species of Thol are Sarus Crane (*Grus antigone*) and Osprey (*Pandion haliaetus*). It is an important place for pre-breeding congregation and for nesting of the Sarus Crane. The foraging habits, roosting habits along with the richness and abundance of water

fowls in a wetland is influenced by the availability of water (GEER Foundation, 2002, Sasikumar K., 2014).

Table 3.4: Estimated Population Census of Waterfowl at Thol Bird Sanctuary

Sr. No.	Name of Group / Year	2004	2006	2008	2010	2012	2014	2016
1	Grebes	2	40	3	16	164	21	29
2	Pelicans	4	321	750	1292	2	429	47
3	Ducks & Geese	1753	5599	7671	8679	16872	9648	16397
4	Rails, Coots, Crakes	21	943	552	122	5027	3057	2413
5	Jacanas	0	0	0	0	39	28	10
6	Cormorants	830	942	482	167	375	277	367
7	Hérons, Egrets, Bittern	479	485	210	529	436	1633	615
8	Storks	83	236	95	306	67	19	75
9	Ibises & Spoonbills	768	183	5099	8761	18263	5553	20895
10	Flamingos	0	273	205	706	0	140	1
11	Cranes	380	664	1651	2613	2013	440	5922
12	Wader-Shorebirds	13839	8140	8120	7652	7832	2638	14293
13	Gulls -Terns	199	143	234	166	53	17	152
14	Kingfishers	10	15	25	20	47	53	69
15	Wagtails & Pipit	0	0	53	317	33	3173	106
16	Eagles & Harriers	4	7	15	34	32	54	47
	Grand Total	18372	17991	25165	31380	51255	27180	61438

(Source: Office of the DCF, Wildlife Division, Sanand)

During present study period, I had an opportunity to participate in the Appreciation Training Programme on Birds, Ecology and Conservation (ATPBEC) with 4 days Bird Watching Training on weekends of February 2015-2016 organized by GEER Foundation, Gandhinagar. As a part of this Training Programme the participants were taken to Thol Wetland and some of the Birds observed during the field visit are listed as **Table 3.5**.

Table 3.5: List of Birds Observed at Thol Wetland during Bird Watching Training

Sr. No.	Common Name	Scientific Name
1	Little Grebe	<i>Podiceps ruficollis</i>
2	White / Rosy Pelican	<i>Pelicanus onocrotolus</i>
3	Dalmatian Pelican	<i>Pelicanus p. crispus</i>
4	Great Cormorant	<i>Phalacrocorax carbo</i>
5	Little Cormorant	<i>Phalacrocorax niger</i>
6	Darter	<i>Anhinga rufa</i>
7	Grey Heron	<i>Ardea cinerea</i>
8	Little Heron/ (Little Green Heron)	<i>Butorides striatus</i>
9	Great Egret / (Large Egret)	<i>Ardea alba</i>
10	Painted Stork	<i>Mycteria leucocephala</i>
11	White Stork	<i>Ciconia ciconia ciconia</i>
12	Black Ibis	<i>Pseudibis papillosa</i>
13	Glossy Ibis	<i>Plegadis falcinellus</i>
14	Eurasian Spoonbill / (White Spoonbill)	<i>Platalea leucorodia</i>
15	Lesser Falmingo	<i>Phoenicopterus minor</i>
16	Grey Lag Goose	<i>Anser anser</i>
17	Northern Pin Tail / (Pin Tail)	<i>Anus acuta</i>
18	Mallard	<i>Anas platyshynchos</i>
19	Eurasian Wigeon	<i>Anas Penelope</i>
20	Common Pochard	<i>Aythya ferna</i>
21	Red Crested Pochard	<i>Netta rufina</i>
22	Comb Duck	<i>Sarkidiornis melanotus</i>
23	Common Crane	<i>Grus grus</i>
24	Red Wattled Lapwing	<i>Vanellus indicus</i>
25	Black Winged Stilt	<i>Himantopus himantopus</i>
26	Common Kingfisher (Small Blue Kingfisher)	<i>Alcedo atthis pallasii</i>
27	Osprey	<i>Pandion haliaetus</i>
28	Northern Shoveller (Shoveller)	<i>Anas clypeata</i>
29	Garganey Teal	<i>Anas querquedula</i>
30	Indian Pond Herone	<i>Ardeola grayii</i>
31	Coot (common coot)	<i>Fulica artra</i>
32	Spot Billed Duck	<i>Anas poecilorhyncha</i>
33	Little Egret	<i>Egretta grazetta</i>

Thol wetland also supports several species of mammals, reptiles, amphibians and fishes too (GEER Foundation, 2002, Sasikumar K., 2014). Apart from above birds, other common animals like Turtle (*Lissemys punctata*), Monitor Lizard (*Varanus bengalensis*), Garden Lizard (*Calotes versicolor*), Langur (*Presbytis entellus*), Mongoose (*Herpestes edwardsi*), Hedgehog (*Paraechinus micropus*) and Nilgai (*Boselaphus tragocamelus*) were also seen during the study period (**Plate 3.1 and 3.2**).









Plate 3.1: Some of the Birds Observed at Thol Wetland During the Study Period



Nilgai and Common Langur



Turtle - Feeding and Basking



Shedded Scales (Ecdysis) of Snakes

Plate 3.2: Some of the Other Animals Observed at Thol Wetland During Study Period

3.4 Sampling Locations and its Features

Based on site observations and the interactions with the Forester, the preliminary survey was carried out to choose sampling sites. The sampling locations were so decided that they are accessible, feasible for sampling throughout the year and considering the logistical and safety constraints (**Fig. 3.3**).

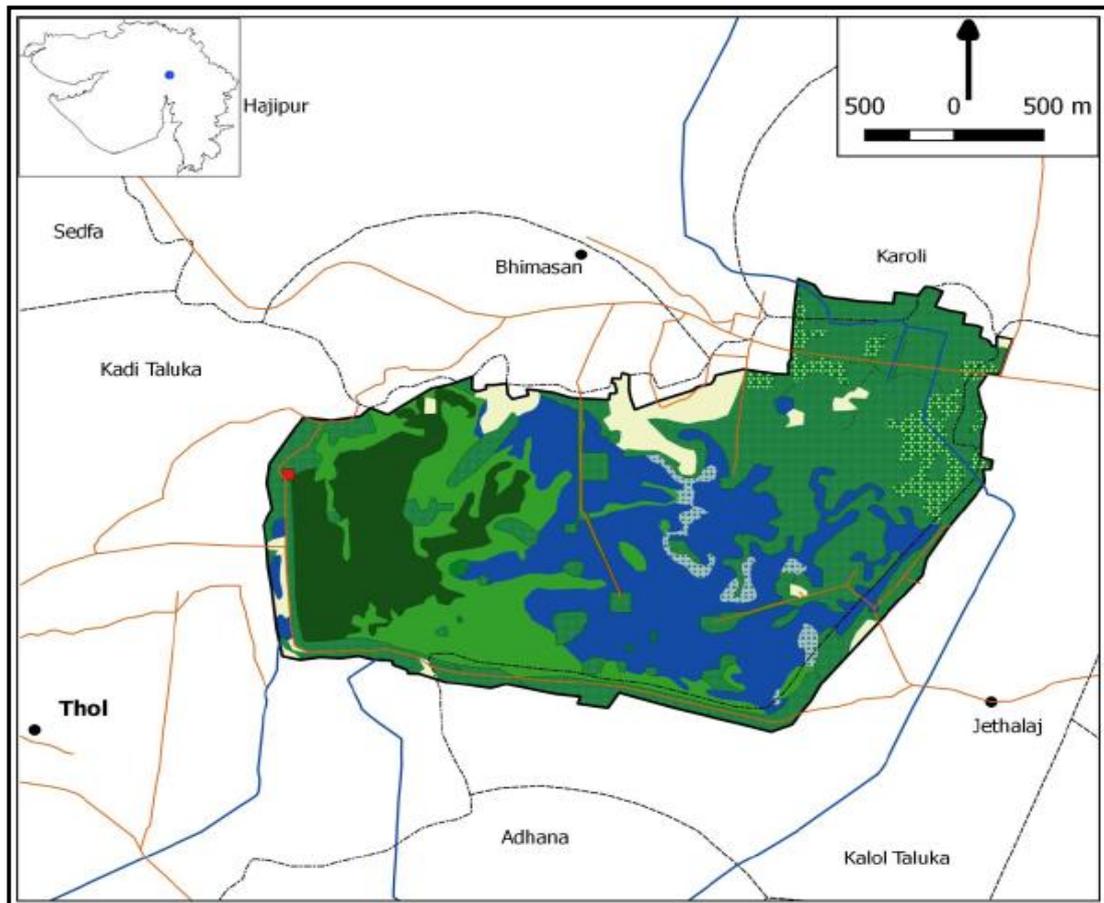


Fig 3.1: Location of Thol Wetland (Source: GEER Foundation)

Later on, considering the approachability, anthropogenic pressures and annual water regime in the wetland as mentioned earlier, following three sampling locations were covered during the study. The general information and typical features of the sampling locations are as per **Table no 3.6**.

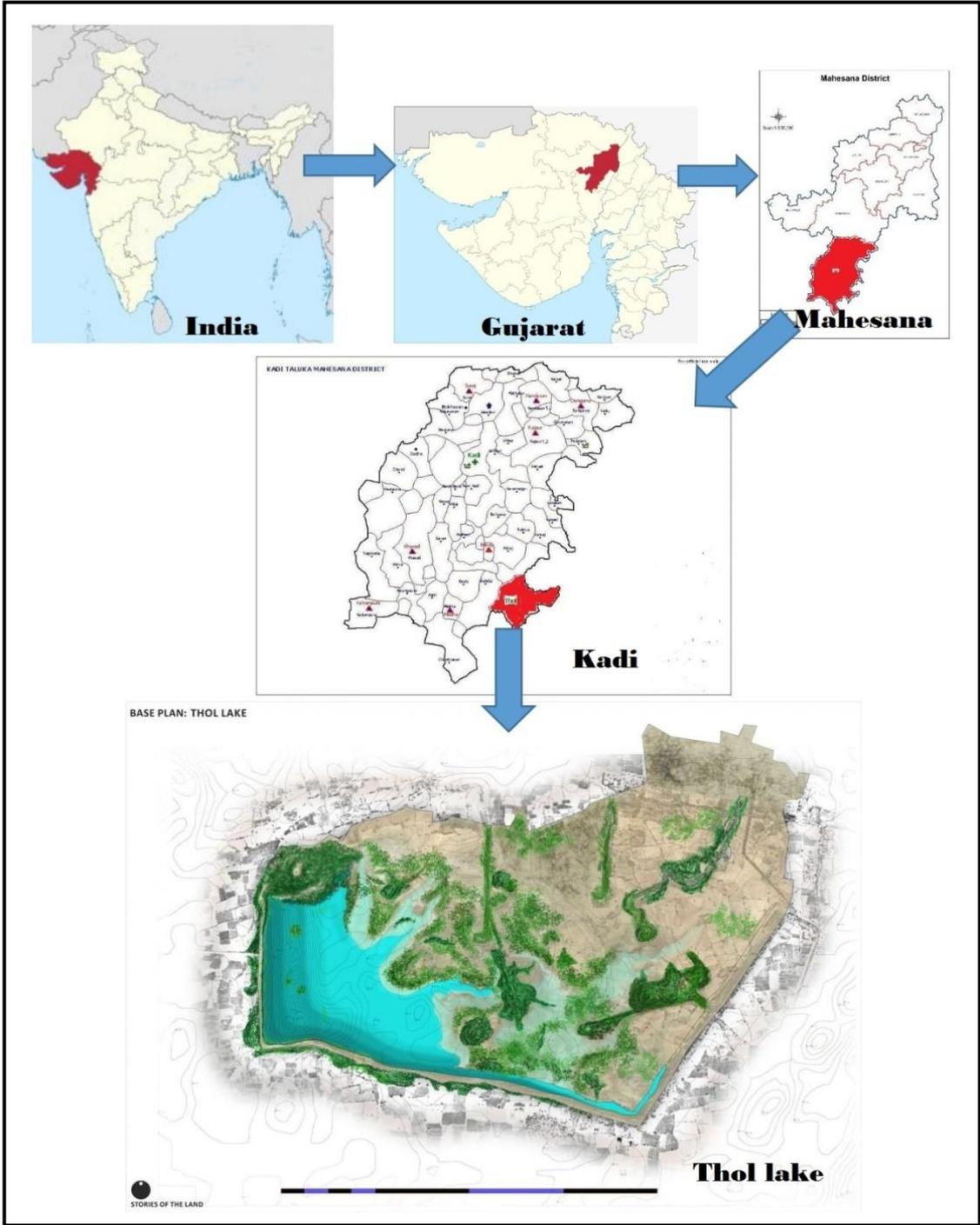
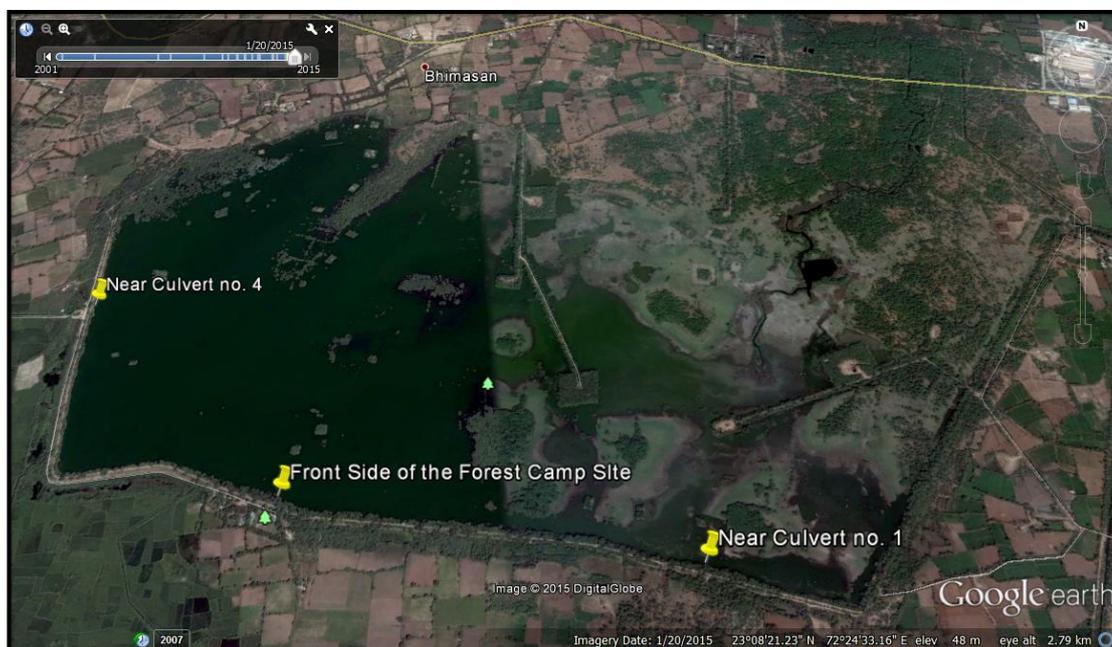


Fig. 3.2: Geographical Location of Thol Bird Sanctuary Wetland
 (Source: Google Earth)

Table 3.6: Sampling Locations

Sr. No.	Details	Location 1 (L1)	Location 2 (L2)	Location 3 (L3)
1	Name	Near Culvert no. 1	Front of Forest Camp Site	Near Culvert no. 4
2	Latitude	N 23° 07' 53.9''	N 23° 08' 01.8''	N 23° 08' 26.0''
3	Longitude	E 72° 24' 46.7''	E 72° 24' 01.3''	E 72° 23' 35.0''
4	Main Features	Comparatively minimal human intervention, proximity to catchment water influx and Narmada river water influx through canal, pristine wetland area. Mainly Falls under the Core Zone of Wetland.	Comparatively maximum human intervention, Transit between the other two locations. Mainly Falls under Recreational/ Tourism zone.	Comparatively deeper region, water remains almost throughout the year. Falls under Core Zone as well as Recreational/ Tourism zone.



**Fig. 3.3: Sampling Locations at Thol Bird Sanctuary Wetland
(Source: Google Earth)**

These locations clearly exhibit visual variation in seasonal features which are captured and placed at **Plate no 3.3, 3.4 and 3.5** respectively. The permission to access the TBS Wetland for sampling and study purpose was obtained from the competent Authority of the Forest department, Gujarat State vide letter no. WLP/28/C/233-34/2015-16 dated 20.06.2015.



Summer

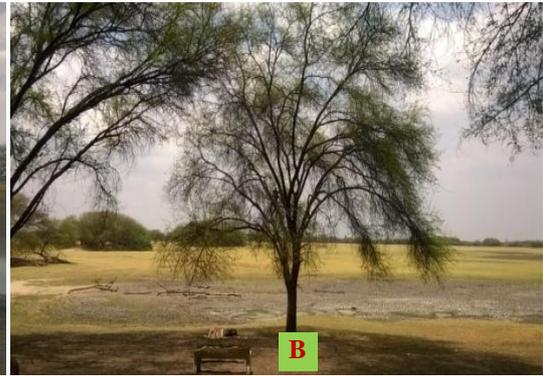


Monsoon



Winter

Plate 3.3 (A to F): Visual Appearance of Location 1 in Different Seasons



Summer



Monsoon



Winter

Plate 3.4 (A to F): Visual Appearance of Location 2 in Different Seasons



Summer



Monsoon



Winter

Plate 3.5 (A to F): Visual Appearance of Location 3 in Different Seasons