

7.1.19 Faridabad

The Faridabad district is located in the southern part of Haryana state. The district lies between 28°23'1.141" and 28°22'39.975" north latitudes and 77°20'44.617" and 77°32'36.575" east longitudes. The total geographical area of this district as per Census is 764 sq.kms. The district is named after the town Faridabad, which is said to have been founded in 1607 by Shaikh Farud, treasurer of Jahangir, with the object of protecting the highway, which passed through the town in those days.

The climate condition of the district slightly differs from other southern districts of Haryana state. The climate characteristics of the district are dry air, except during monsoon, hot summer and cold winters. The normal annual rainfall is 521.1 mm. It increases towards east. About 77 percent of annual rainfall in the district is received during the monsoon months i.e. July to September. On an average there are 28 rainy days in a year in the district. Temperature begins to rise from March to June. June is the hottest month. Maximum temperature may go up to 48°C. With the onset of monsoon, temperature starts falling and during monsoon period weather remains uncomfortable due to increased humidity and warm night. January is the coldest month. Occasionally during winter season, cold in association with western disturbances brings temperature down to freezing point.

The district has monotonous physiography and has alluvium deposits. The district is enjoying with very good network of canals, wells and tube- wells alongwith the river Yamuna as its natural water source. The district is also having a good potential for ground water in most of the places.

The western part the district is the extension of Rajasthan desert. The natural vegetation of the district is dominated by Kikar (Acacia).

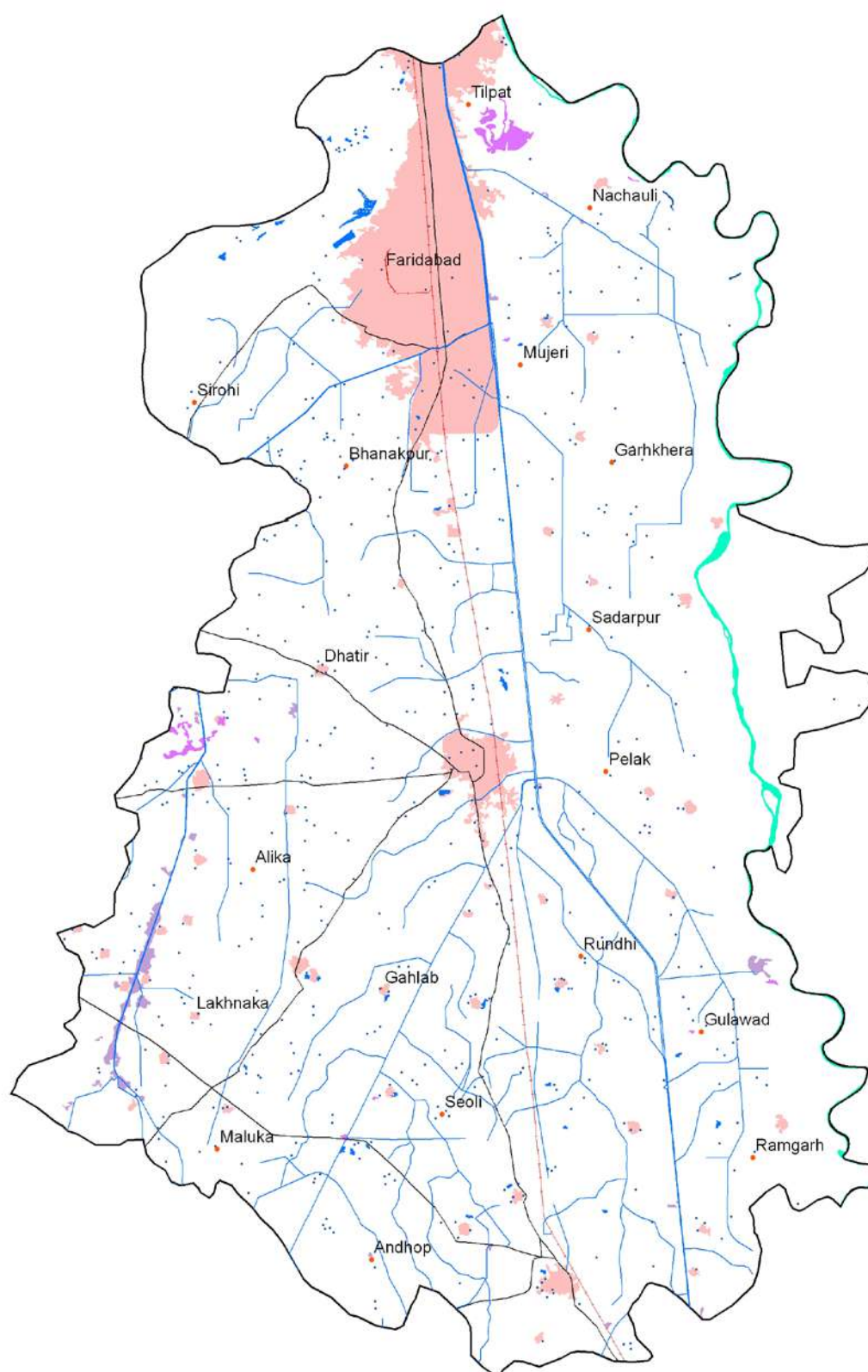
Table 24: Area estimates of wetlands in Faridabad

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	1100	Inland Wetlands - Natural					
1	1101	Lakes/Ponds	1	80	2.25	11	0
2	1102	Ox-bow lakes/ Cut-off meanders	2	17	0.51	11	11
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	12	511	14.36	287	164
6	1106	River/Stream	1	1409	39.59	830	1116
	1200	Inland Wetlands -Man-made					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	37	254	7.14	236	216
9	1203	Waterlogged	29	761	21.38	628	612
10	1204	Salt pans	-	-	-	-	-
		Sub-Total	82	3033	85.22	2003	2119
		Wetlands (<2.25 ha), mainly Tanks	526	526	14.78	-	-
		Total	608	3559	100.00	2003	2119

Area under Aquatic Vegetation	424	389
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Area under turbidity levels		
Low	200	173
Moderate	887	1170
High	916	776

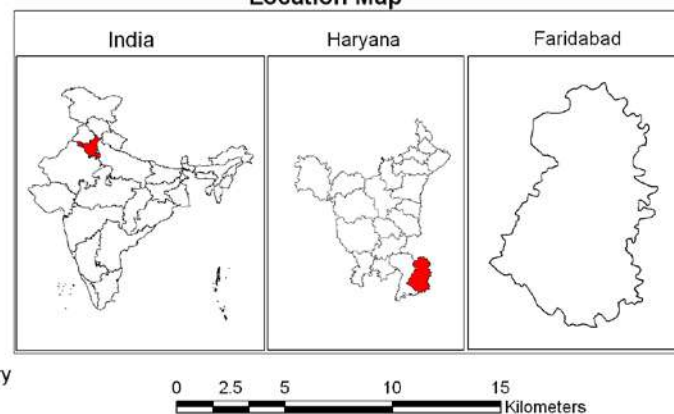
The total wetland area in the district is 3559 ha and rivers/streams contribute around 40 per cent wetland area and natural and manmade waterlogged area contributes almost equally to the total wetland area of the district. There are 82 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 526. Three classes of turbidity were observed in both the season. Area of high turbidity is 916 ha and 776 ha in post and pre-monsoon season respectively. Out of 3559 wetland area 424 ha area was covered by aquatic vegetation while pre-monsoon season it was 389 ha.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Settlements
- Drainage (line)
- Major Roads
- Railway
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map**Data Source :**

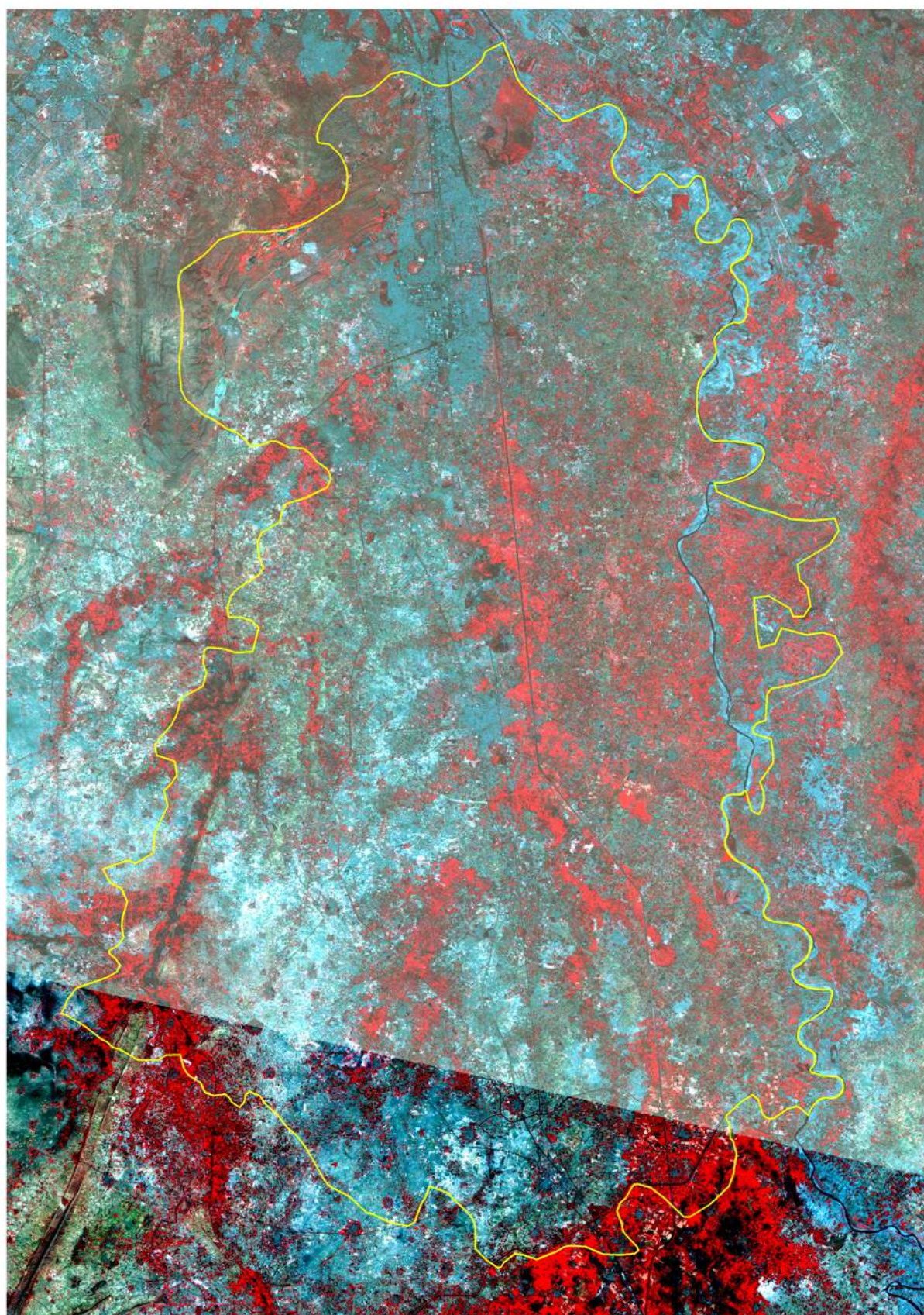
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :

Space Applications Centre (ISRO), Ahmedabad
and
Haryana Space Applications Centre, Hisar
and
M. G. Science Institute, Ahmedabad

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MAJOR WETLAND TYPES

8.0 MAJOR WETLAND TYPES OF HARYANA

Major wetland types observed in the state are Rivers, Waterlogged areas and Tanks/Ponds. Details are given in Plate-1. Ground truth data was collected for selected wetland sites. The standard proforma was used to record the field data. Field photographs are also taken to record the water quality (subjective), status of aquatic vegetation and water spread. The location of the features was recorded using GPS. Field photographs of different wetland types are shown in Plates 2a, and 2b.

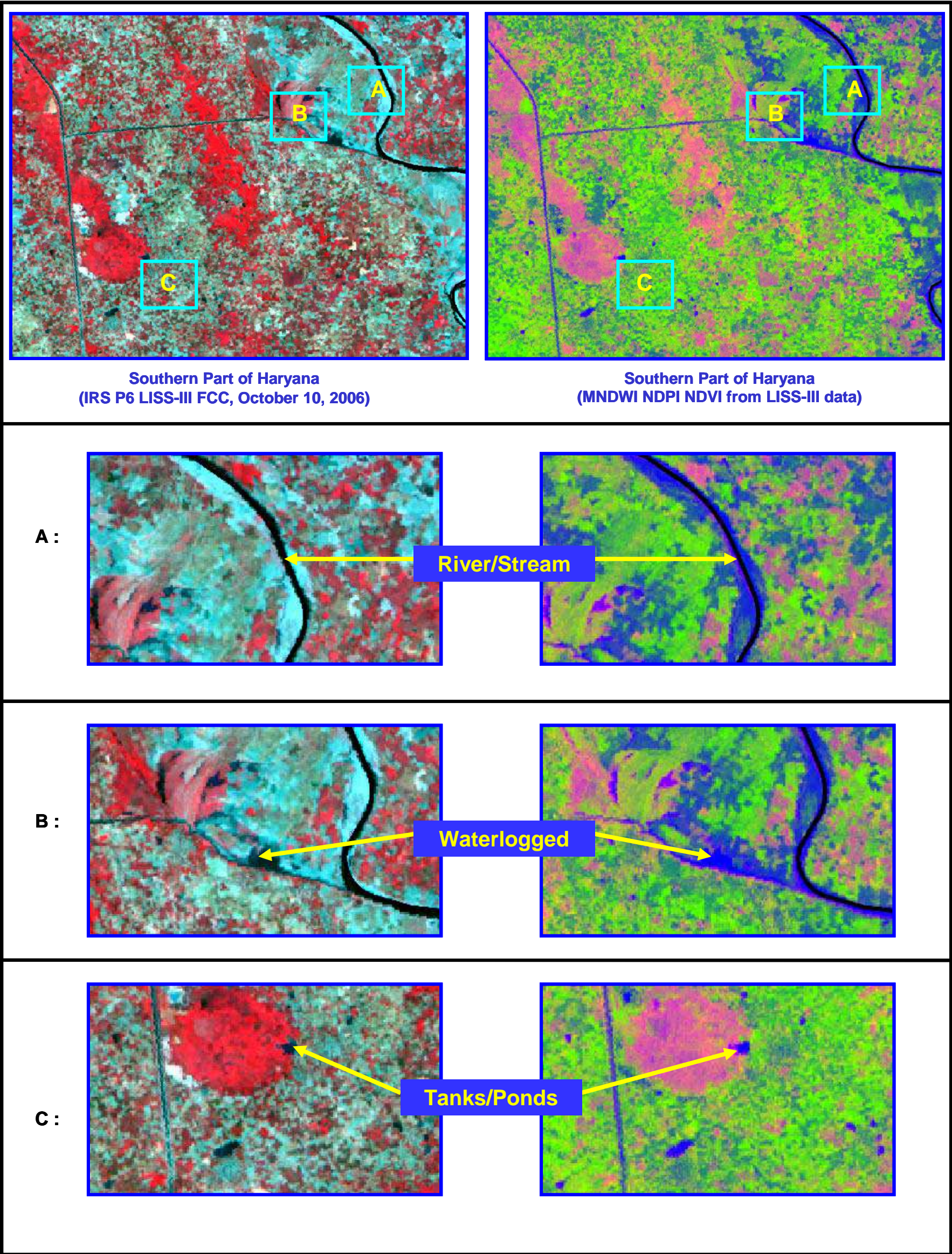


Plate - 1: Major wetland types of Haryana





Sr. No.	Description	Field photograph
1	<p>Wetland Type: Waterlogged Area (Natural)</p> <p>Location: Longitude: 76° 37' 33" E Latitude : 28° 45' 55" N</p> <p>Turbidity: High</p> <p>Aquatic vegetation: Present</p>	
2	<p>Wetland Type: Tanks/Ponds</p> <p>Location: Longitude: 76° 18' 05" E Latitude : 28° 57' 18" N</p> <p>Turbidity: Low</p> <p>Aquatic vegetation: Present</p>	
3	<p>Wetland Type: River/Stream</p> <p>Location: Longitude : 77° 15' 55" E Latitude : 28° 24' 14" N</p> <p>Turbidity: Moderate</p> <p>Aquatic vegetation: Present</p>	
4	<p>Wetland Type: Waterlogged Area (Natural)</p> <p>Location: Longitude: 77° 21' 12" E Latitude : 28° 26' 30" N</p> <p>Turbidity: High</p> <p>Aquatic vegetation: Present</p>	

Plate 2a: Field photographs and ground truth data of different wetland types in Haryana





Sr. No	Description	Field Photograph
5	<p>Wetland Type: Tanks/Ponds</p> <p>Location: Longitude: 76⁰ 49' 38" E Latitude : 29⁰ 57' 40" N</p> <p>Turbidity: Low</p> <p>Aquatic vegetation: Nil</p>	
6	<p>Wetland Type: Tanks/Ponds</p> <p>Location: Longitude: 77⁰ 15' 54" E Latitude : 28⁰ 24' 13" N</p> <p>Turbidity: High</p> <p>Aquatic vegetation: Present (Algal-bloom)</p>	
7	<p>Wetland Type: Lake (Sultanpur Bird Sanctuary)</p> <p>Location: Latitude : 28° 27' 49" N Longitude : 76° 53' 30" E</p> <p>Aquatic vegetation: Present (Floating / Submerged / Emergent)</p> <p>Turbidity: Low</p>	
8	<p>Wetland Type: Waterlogged Area (Man-made: Bhindawas Bird Sanctuary)</p> <p>Location: Latitude : 28° 32' 2" N Longitude : 76° 33' 3" E</p> <p>Aquatic vegetation: Present (Floating / Submerged)</p> <p>Turbidity: Moderate</p>	

Plate 2b: Field photographs and ground truth data of different wetland types in Haryana

IMPORTANT WETLANDS OF HARYANA

9.0 IMPORTANT WETLANDS OF HARYANA

The wetlands of the state mainly comprise of small lakes/ tanks and waterlogged areas mainly associated with canals. Most of the waterlogged areas are infested by phragmatis grass. Some of the village tanks have been restored and well managed to meet the local needs. There are three wetlands which attract migratory birds and two are named as bird sanctuaries - sultanpur Bird sanctuary and Bhindawas Bird Sanctuary located in Gurgaon district and Jhajjar district respectively. These wetlands are located near to national capital and attract large number of tourists during winter season. Shallow wetlands are being used for agriculture and fodder production and it is a regular practice observed in and around Mewat district. Other than two bird sanctuaries, Damdama lake and Brahm Sarovar are important wetland sites of Haryana.

Extensive field work was carried out for important wetland sites. Wetland maps have been prepared for 5 km buffer area of each wetland sites. Details of each wetland and wetland map of 5 km buffer area are shown in plates 3 to 17.

9.1 Sultanpur Bird Sanctuary

Name: Sultanpur Bird Sanctuary

Location:

Latitude : 28° 28 ' 15" N and 28° 27' 14" N
Longitudes: 76° 52' 50" E and 76° 54' 2" E

Area: 145 ha

Altitude: 220 – 230 m

Average Annual Rainfall:

Average annual rainfall: 300 mm

Mean Temperature: 24 to 28° C.

Morphometric features :

Maximum depth 1- 2m

Average depth 30 cm

Sultanpur bird sanctuary is one of the early notified bird sanctuaries by the state of Haryana. It is situated on National High way no. 8 in Gurgaon district. It is a heaven for bird lovers in the state. This is one of the famous lakes in the country, so far as the variety of the migrant birds from Europe and Siberia. These birds come here with the onset of winter and returns back at the onset of summer. One can see the abundance of birds, more than a 100 species in a day, in a most natural surrounding at really close quarters.

Vegetation:

There are some areas dominated by Typha sps. and phragmites (Grasses). Shoreline is dominated by emergent vegetation and floating vegetation mainly limna and water hyacinth. Most of the area around the core area is under cultivation.

Fauna:

The wildlife in the park includes ungulates, a verity of waterfowl, notably pelicans, ducks, geese, and cranes. Many species of raptors occur in the area, including the Imperial eagle, greater spotted eagle, and tawny eagle and marsh harrier.

Overall turbidity of lake water is moderate.

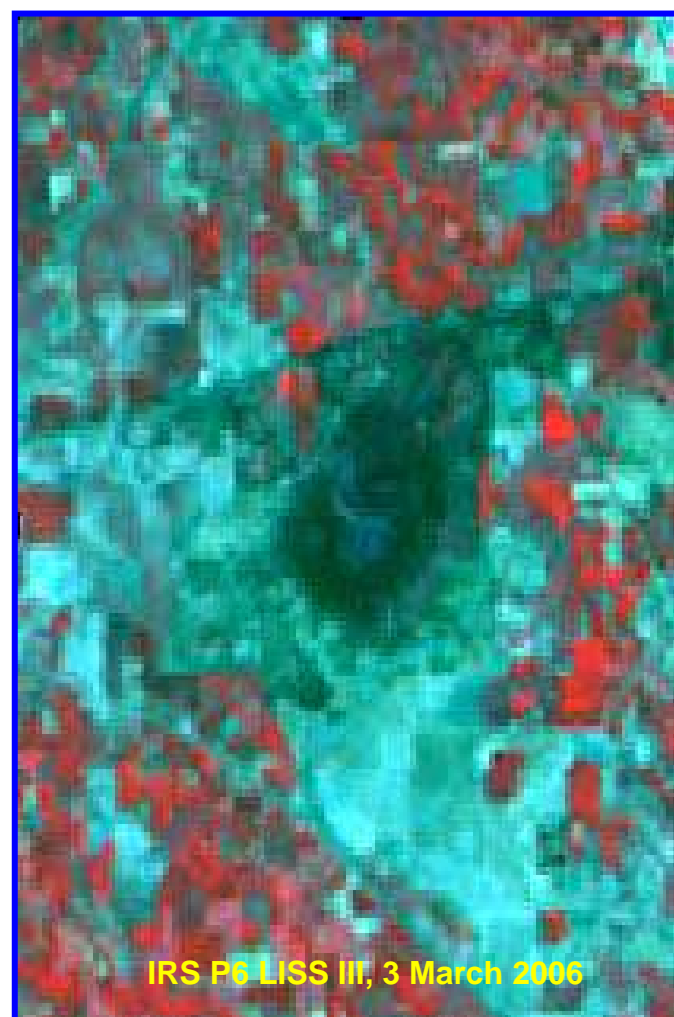
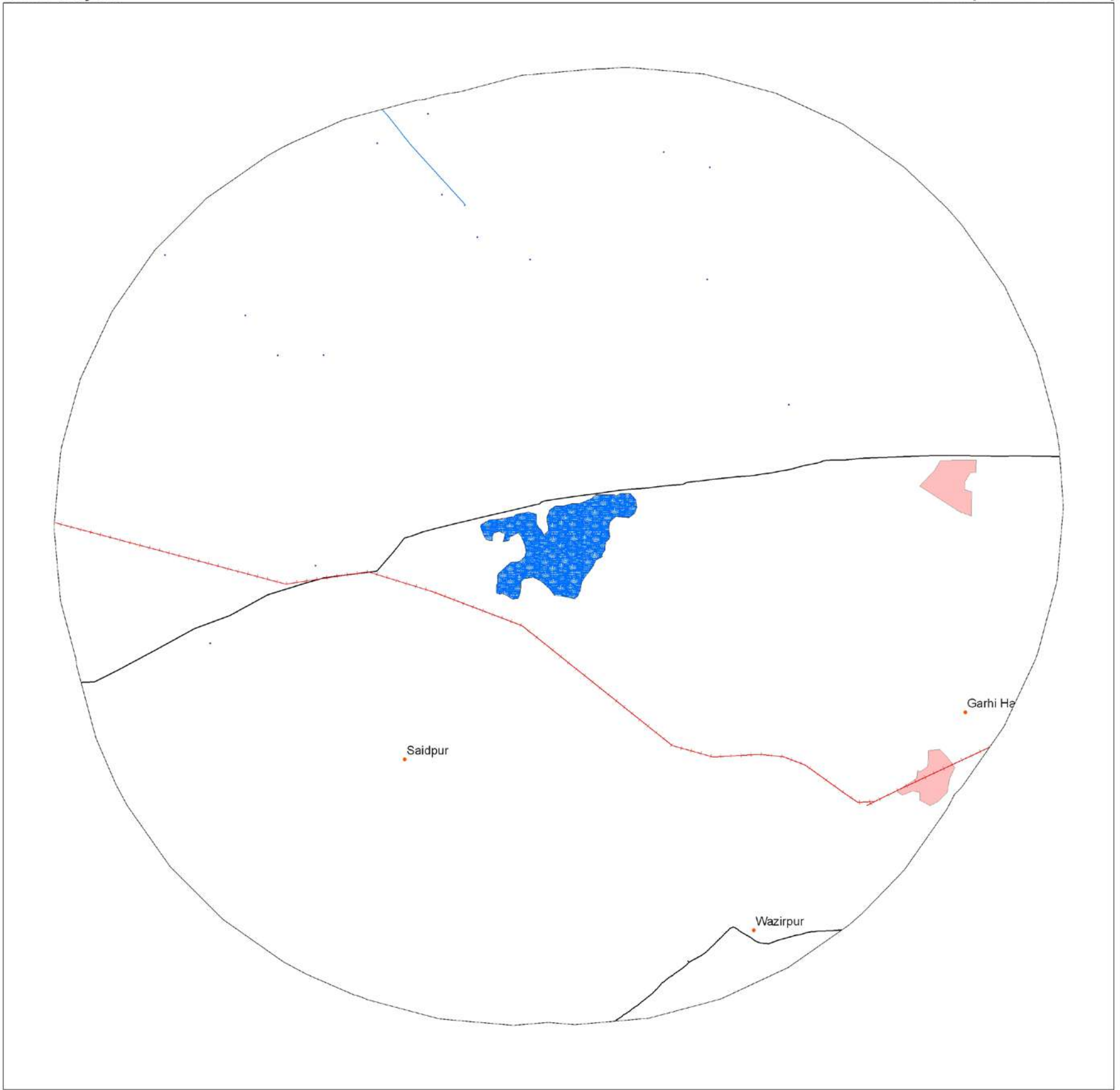
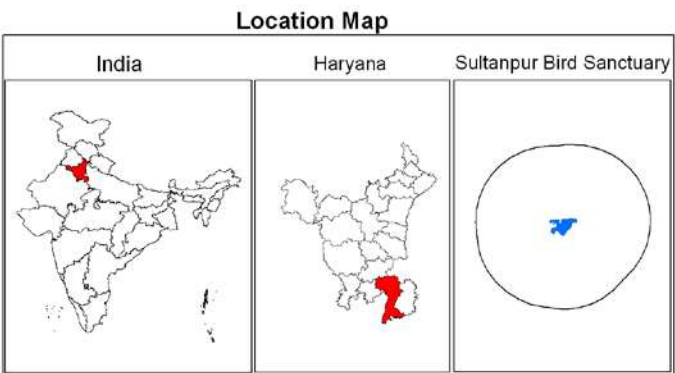


Plate 3: Sultanpur Bird Sanctuary



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
 - Settlements
 - Canal
 - Drainage(line)
 - Railway
 - Roads
 - District Boundary
 - Towns/Settlements



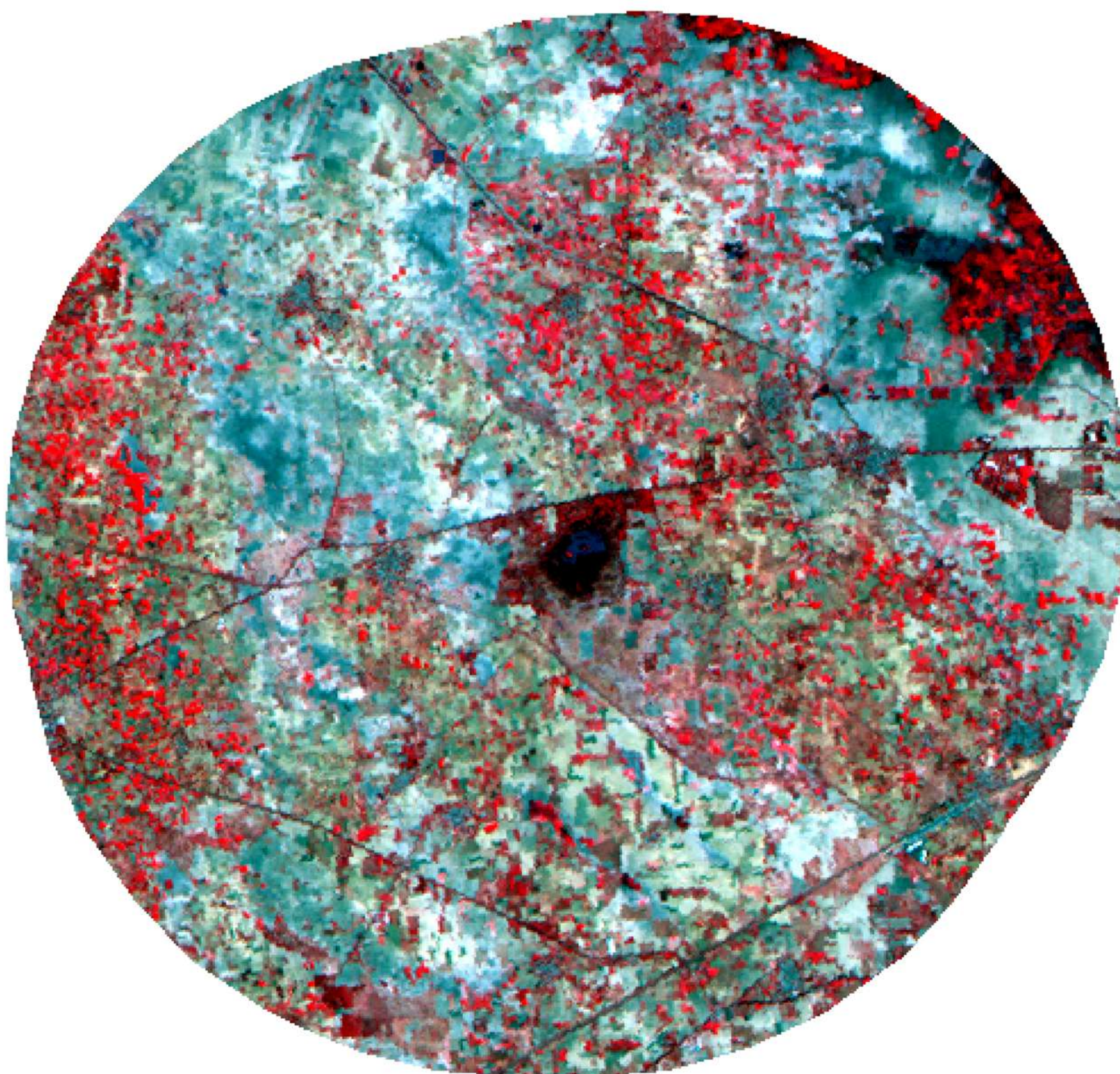
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Data Source :
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

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Plate 4: Wetland map - 5 km buffer area of Sultanpur Bird Sanctuary



IRS P6 LISS-III post monsoon data (2006)

Plate 5: IRS LISS-III FCC - 5 km buffer area of Sultanpur Bird Sanctuary

9.2 Bhindawas Bird Sanctuary

Name: Bhindawas Bird Sanctuary

The peripheral embankment is man made and basically constructed to store the escaped water of Jawaharlal Nehru canal through an escape channel

Location:

Latitude : 28° 32 ' 47" N and 28° 31' 57" N
Longitude : 76° 31' 54" E and 76° 34' 10" E

Area: 435 ha

Altitude: 200 – 230 m

Average Annual Rainfall:

Average annual rainfall: 300 mm

Mean Temperature: 24 to 28° C.

Morphometric features :

Maximum depth 1- 2m

Average depth 30 cm

Vegetation:

Mainly acacias and eucalyptus species plantations are found. The 412 ha low lying storage area has twelve kilometers of motorable embankments running round the perimeter which is planted with acacias and eucalyptus species.

Fauna:

Blue Peafowl, White-throated Kingfisher, Rose-ringed, Great Egret, Eurasian Collared Dove, Mallard, Crested Lark, Jungle Babbler, Ashy Prinia etc are some of the more common birds found in the sanctuary. In addition to the above birds, the antelope Neelgai (Blue Bull) and Jungle Cat can also be seen in the sanctuary.

Overall turbidity of lake water is low.

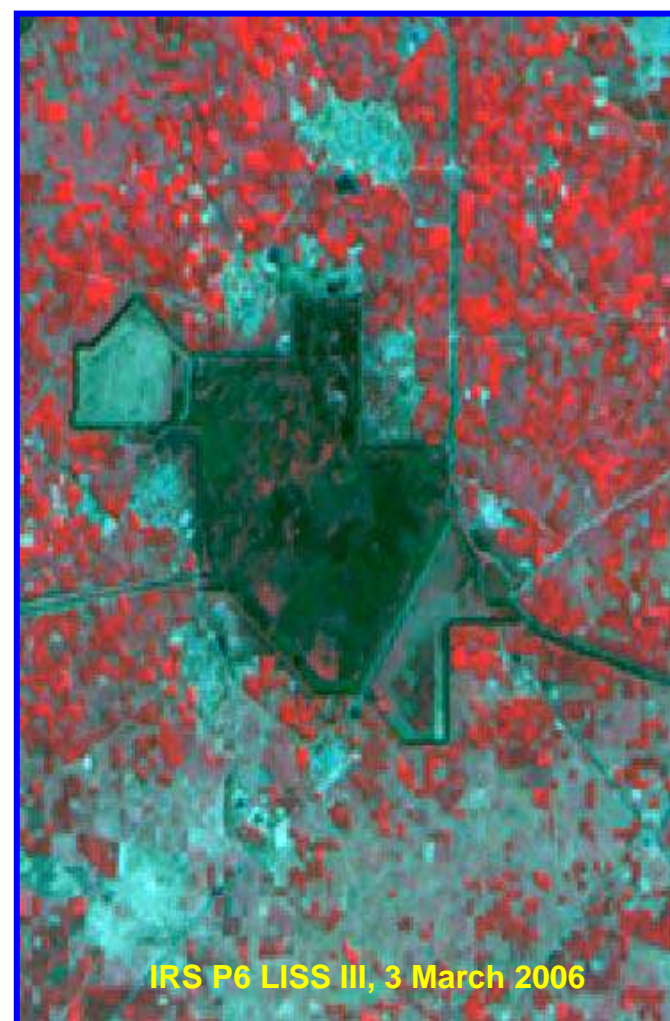
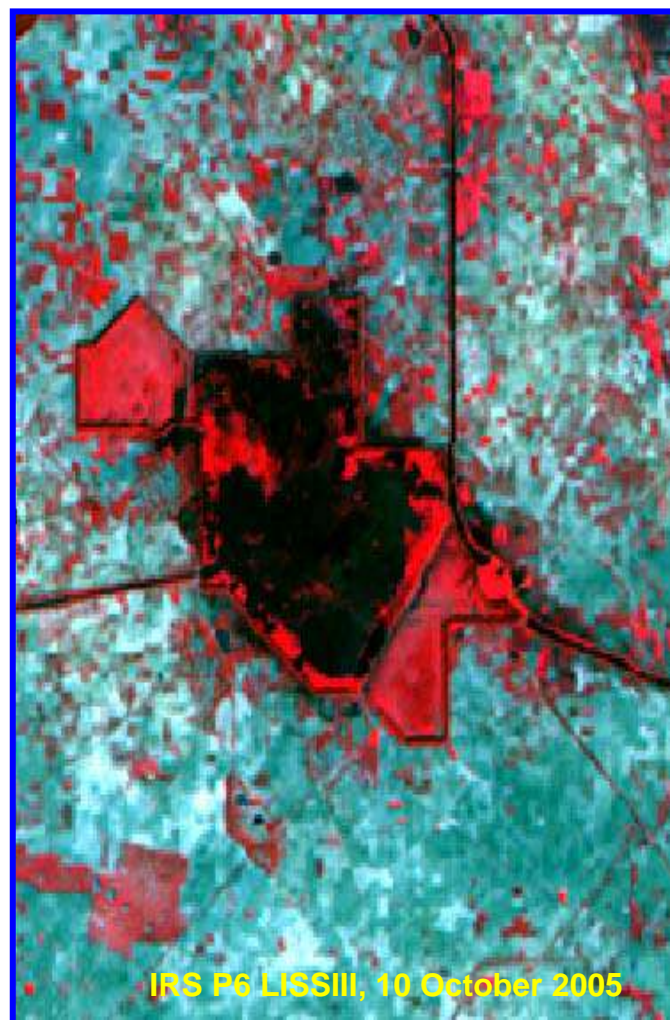
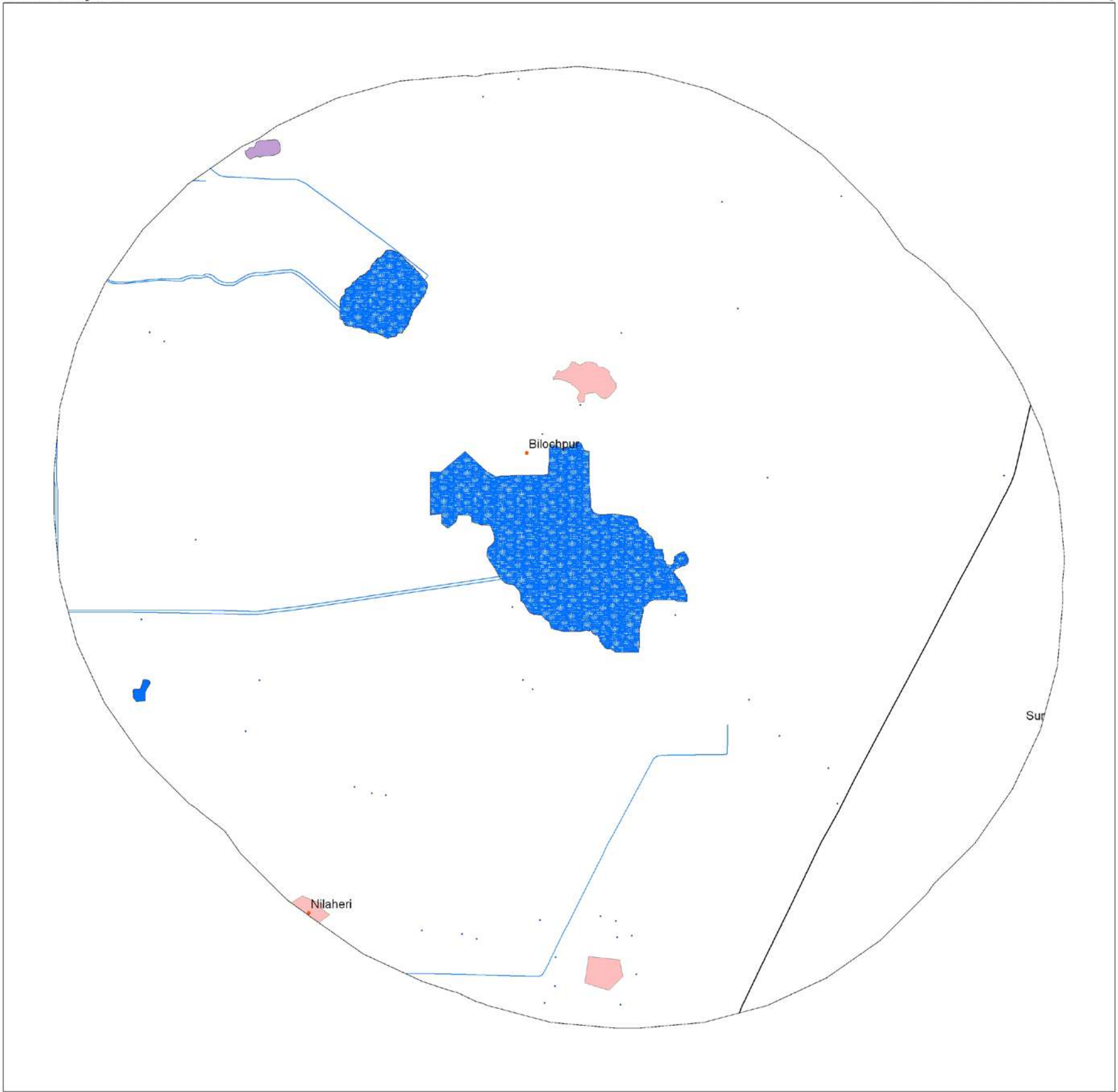
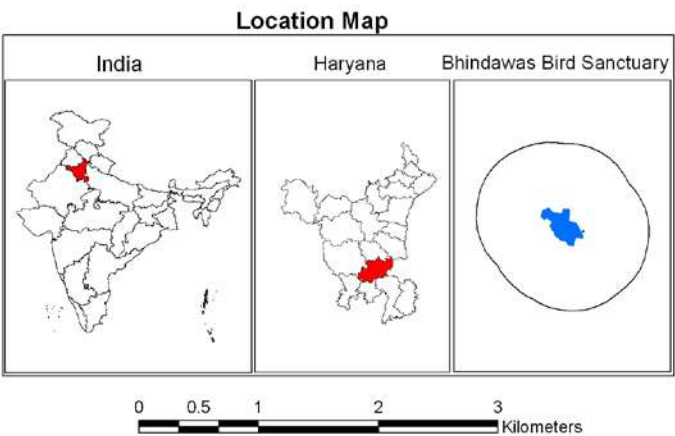


Plate 6: Bhindawas Bird Sanctuary



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
 - Settlements
 - Canal
 - Drainage(line)
 - Railway
 - Roads
 - District Boundary
 - Towns/Settlements

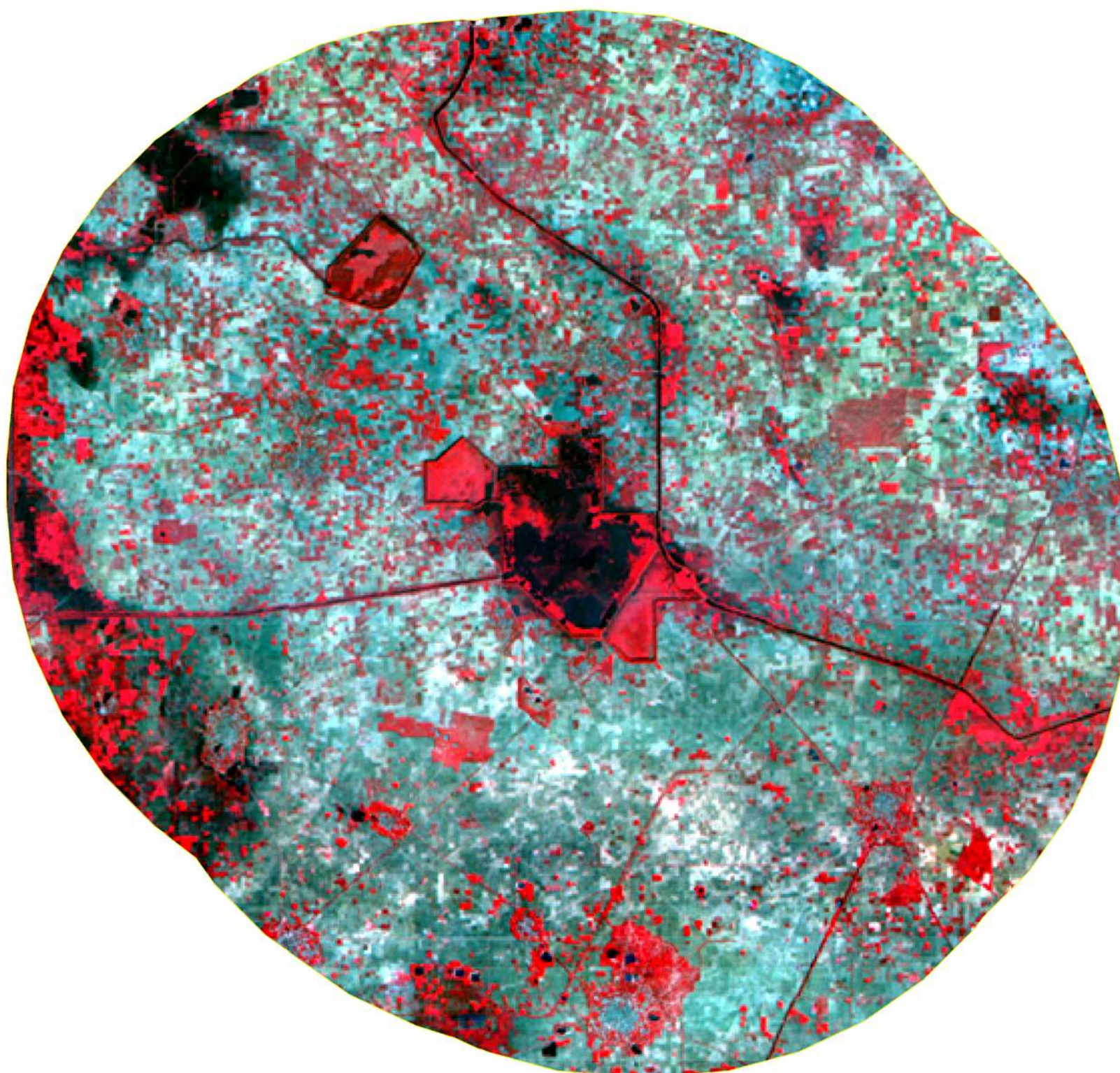


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Plate 7: Wetland map - 5 km buffer area of Bhindawas Bird Sanctuary



IRS P6 LISS-III post monsoon data (2006)

Plate 8: IRS LISS-III FCC - 5 km buffer area of Bhindawas Bird Sanctuary

9.3 Damdama Lake

Name: Damdama Lake

Location:

Latitude : 28° 18 ' 50" N and 28° 17' 54"
Longitudes: 77° 07' 37" E and 77° 08' 09" E

Area: 43 ha

Average Annual Rainfall:

Average annual rainfall: 300 mm
Mean Temperature: 24 to 28° C.

Morphometric features :

Maximum length: 1.5 km
Maximum breadth: 0.5 km
Average depth: 38 cm

Vegetation:

Aquatic vegetation of this lake includes grasses, reeds, water hyacinth, Ipomea aquatica and acacia sps. .

Fauna:

White-throated Kingfisher, Great Egret, Eurasian Collared Dove, spoon bill, Crested Lark, Jungle Babbler, cormorant, Green bee eater etc are some of the more common birds found in and around the lake. Overall turbidity is moderate.

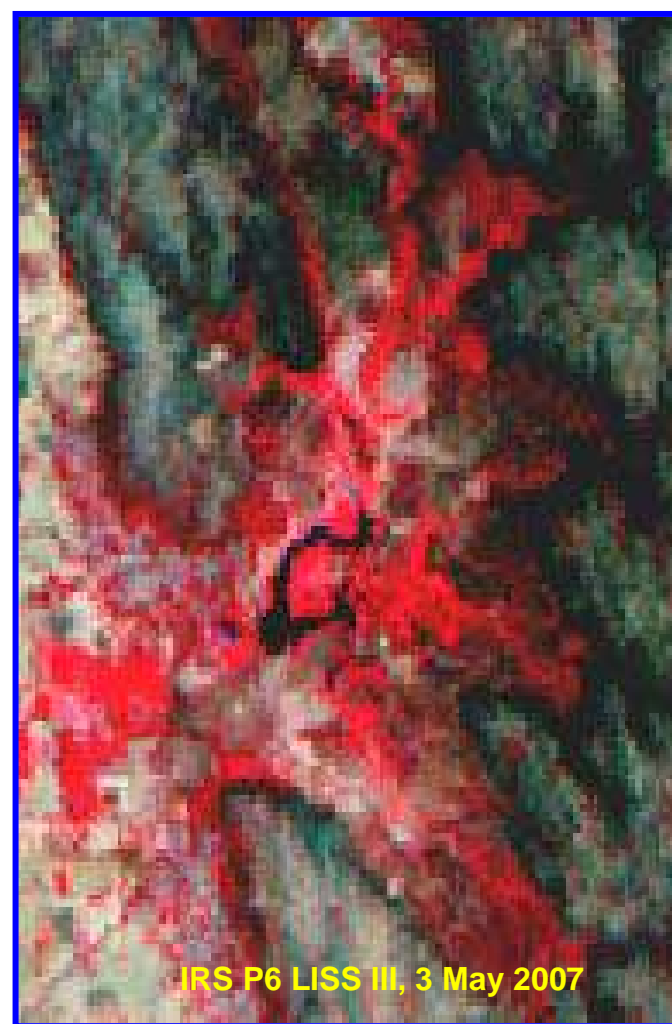
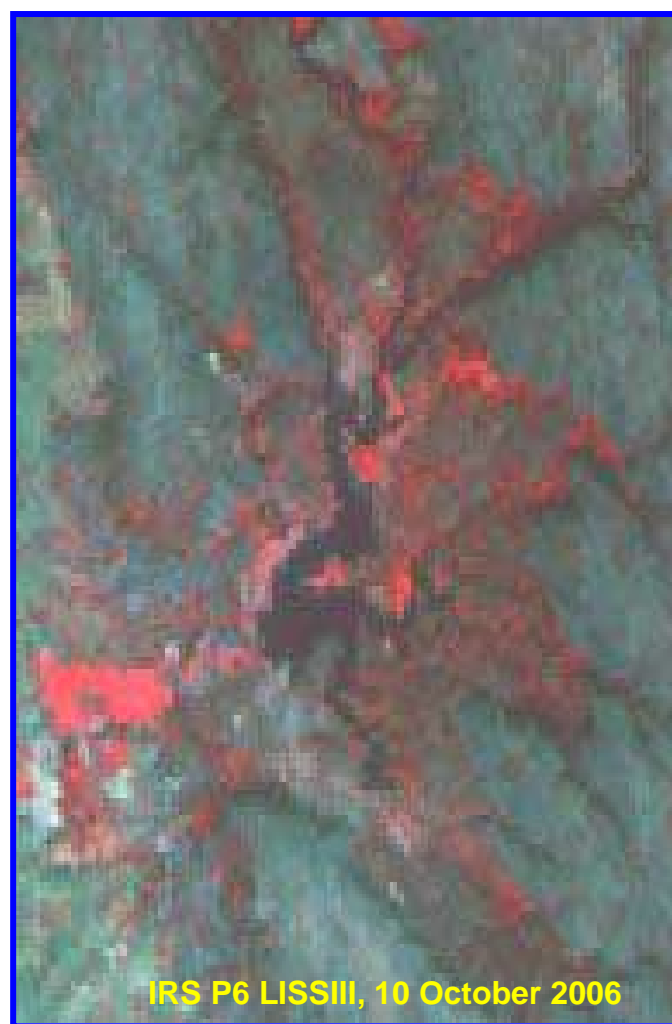


Plate 9: Damdama Lake

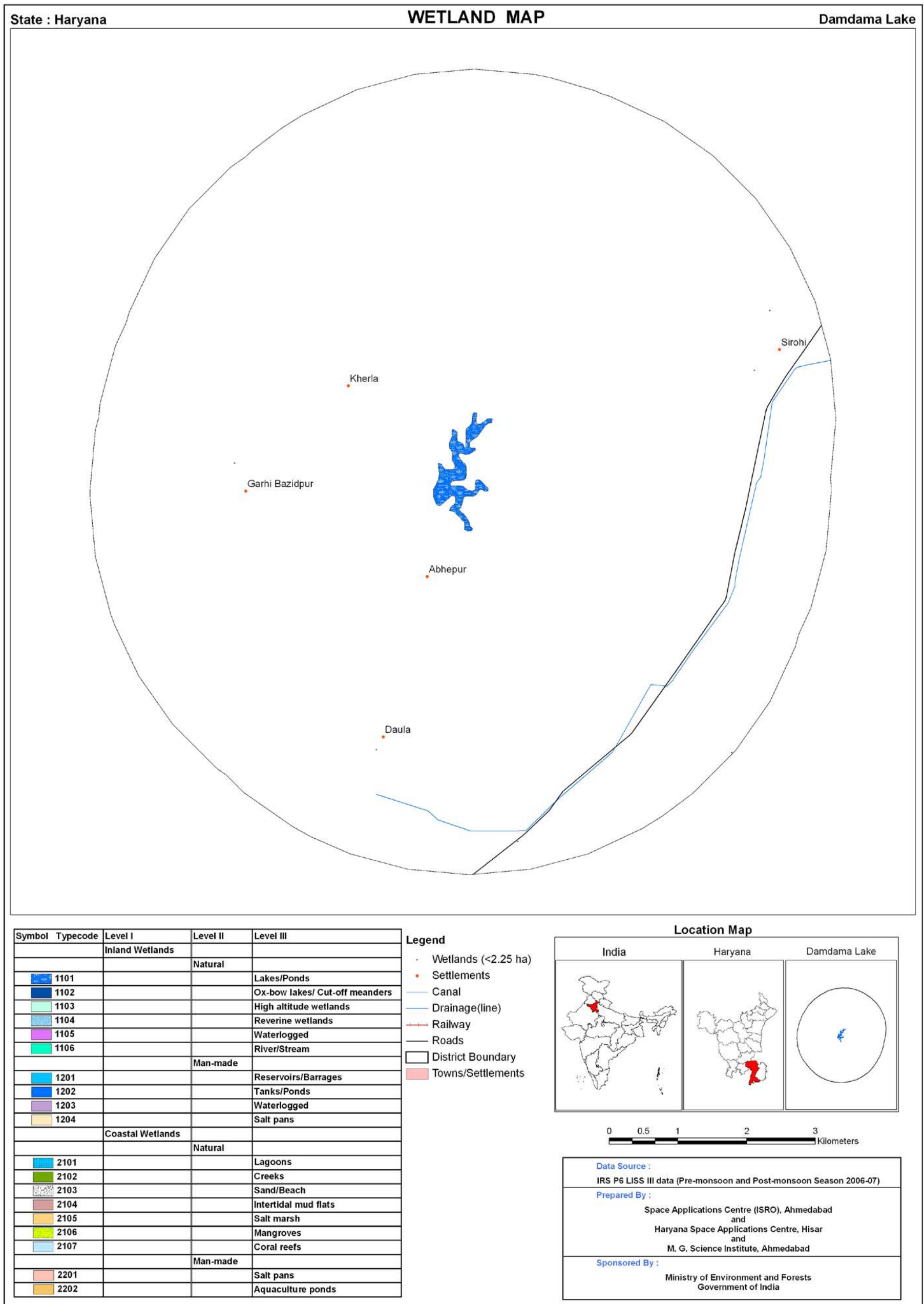
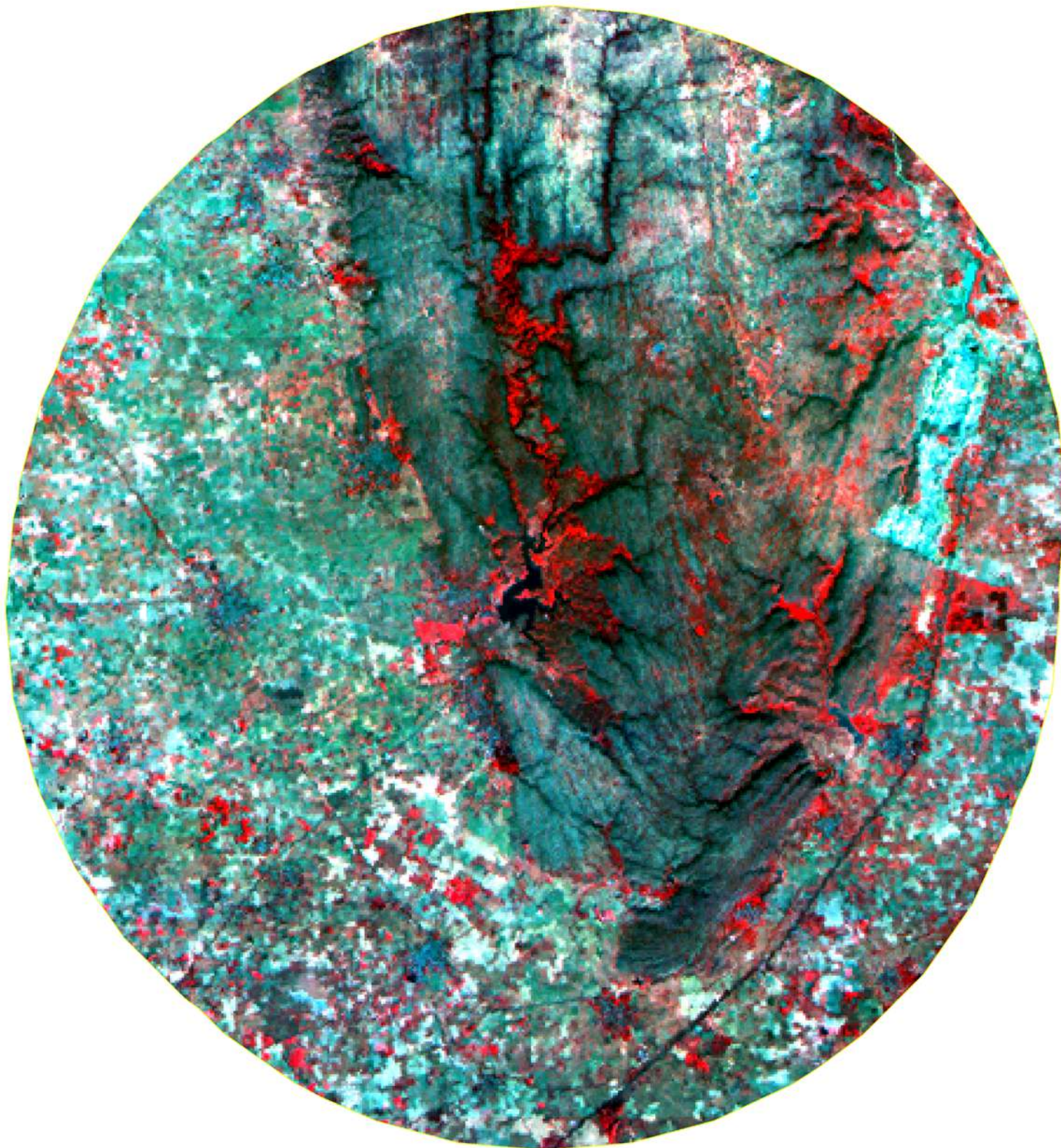


Plate 10: Wetland map - 5 km buffer area of Damdama Lake



IRS P6 LISS-III post monsoon data (2006)

Plate 11: IRS LISS-III FCC - 5 km buffer area of Damdama Lake

9.4 Brahm Sarovar

Name: Brahm Sarovar

Location:

Latitude : 29° 57' 51" N and 29° 57' 32" N
Longitudes: 76° 49' 20" E and 76° 49' 59" E

Area: 44 ha

Average Annual Rainfall:

Average annual rainfall: 300 mm
Mean Temperature: 24 to 28° C.

Morphometric features :

Maximum depth 1 km
Average depth 475 cm

Vegetation:

There is no aquatic vegetation except phytoplankton.

Fauna:

It is a man made lake and managed by the authorities to encourage recreational and religious rites. Fauna mainly includes zooplankton and fishes. Overall turbidity is moderate.

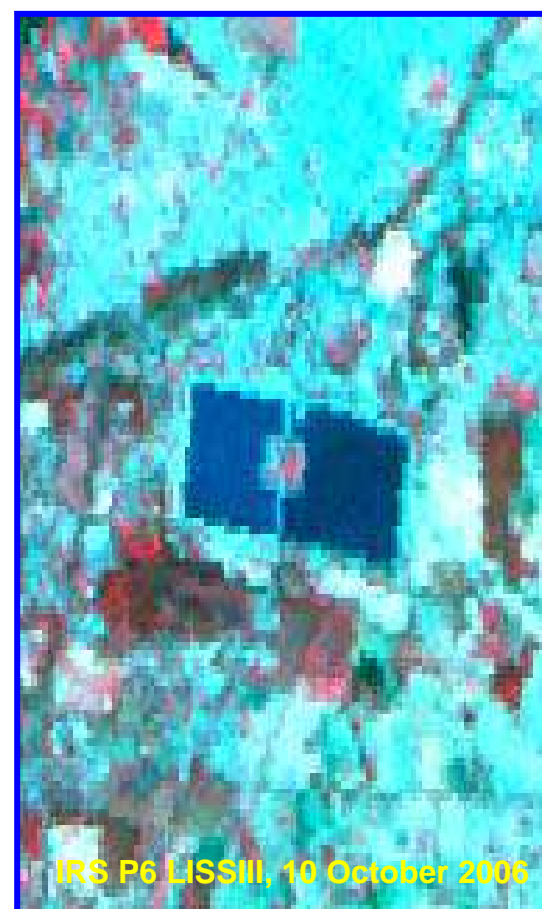
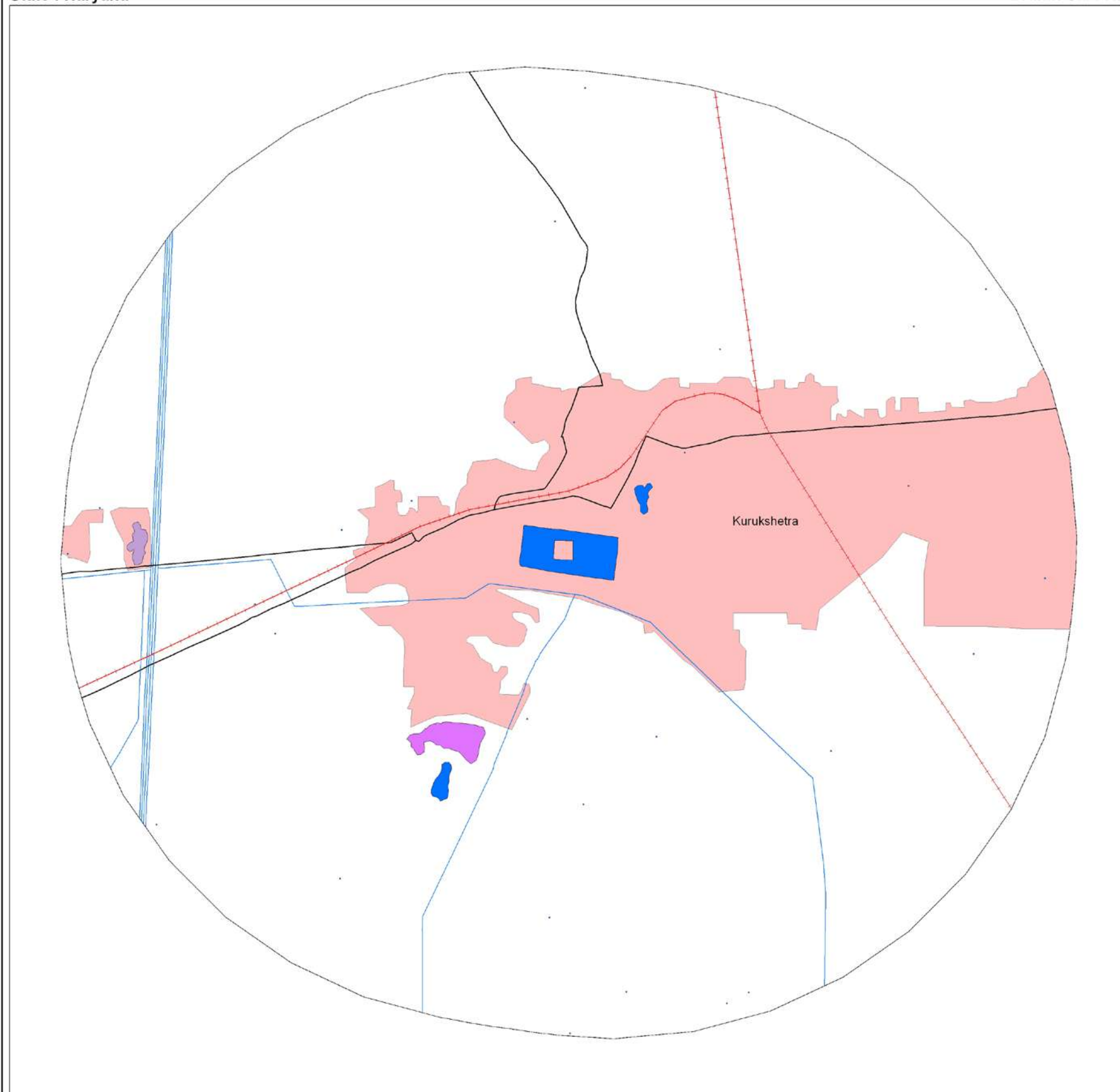


Plate 12: Brahm Sarovar

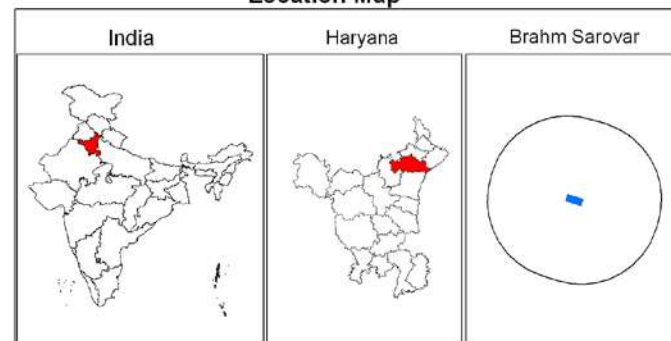


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Canal
- Drainage(line)
- Railway
- Roads
- District Boundary
- Towns/Settlements

Location Map



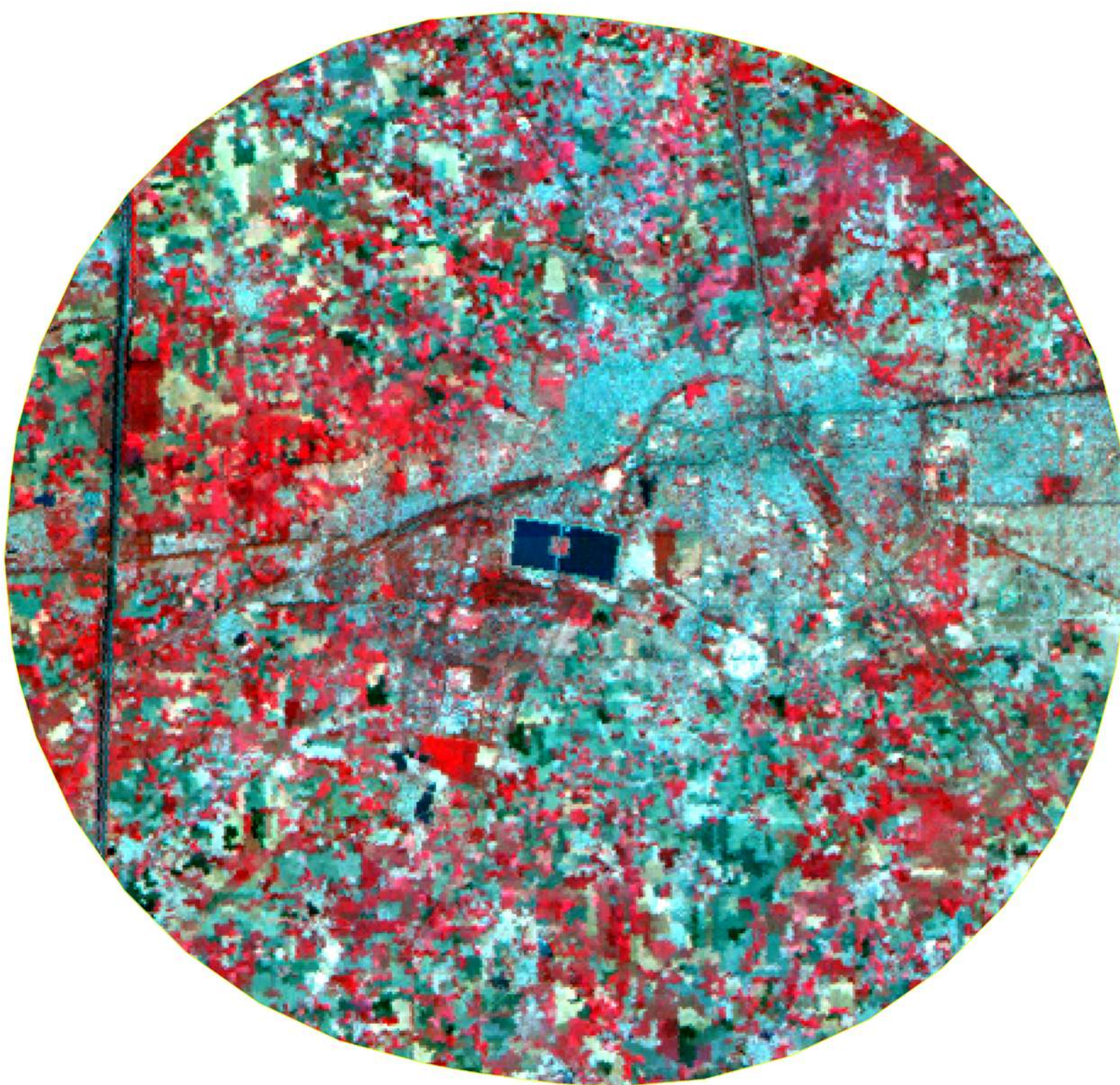
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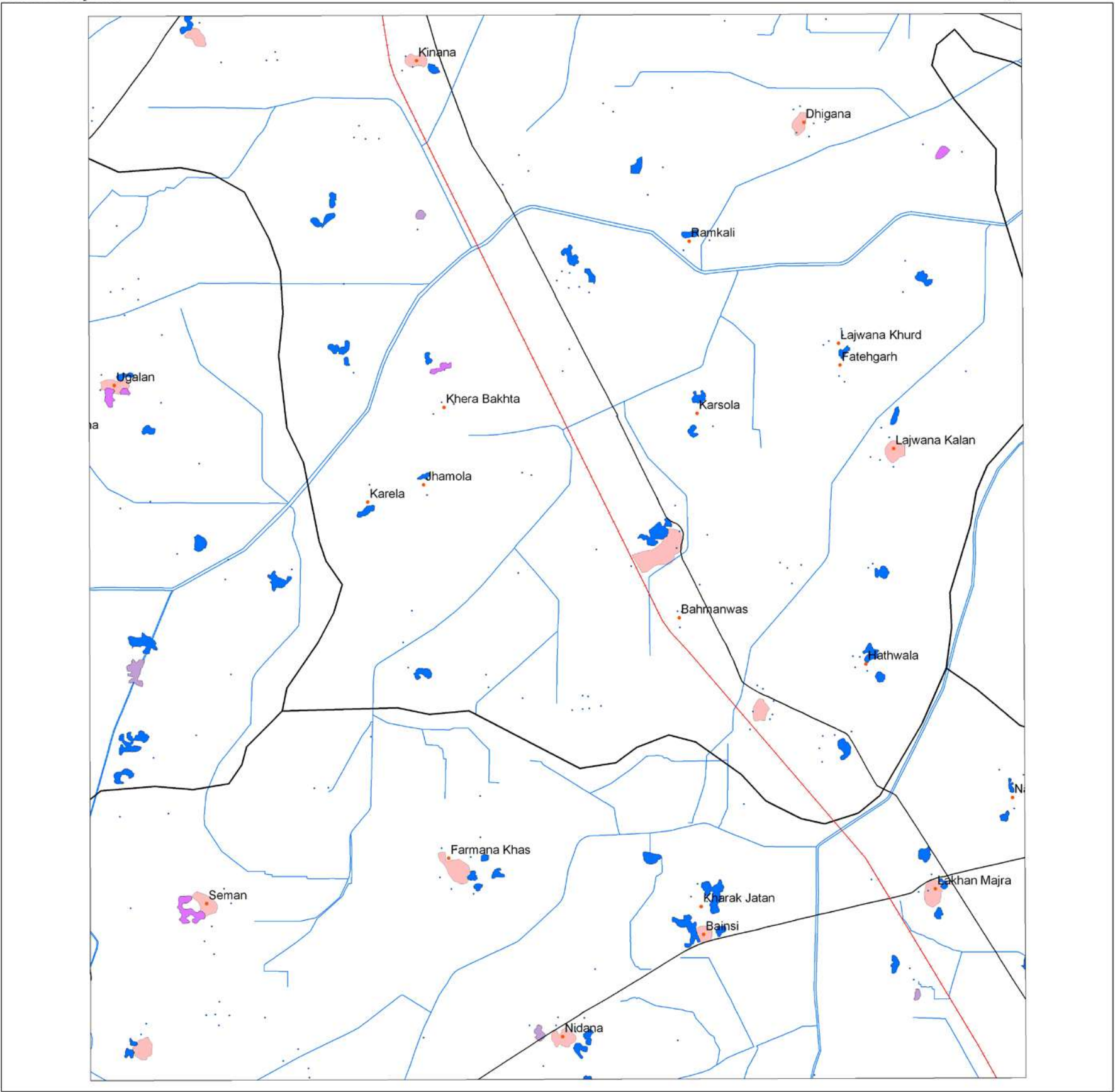
Plate 13: Wetland map - 5 km buffer area of Brahm Sarovar



IRS P6 LISS-III post monsoon data (2006)

Plate 14: IRS LISS-III FCC - 5 km buffer area of Brahm Sarovar

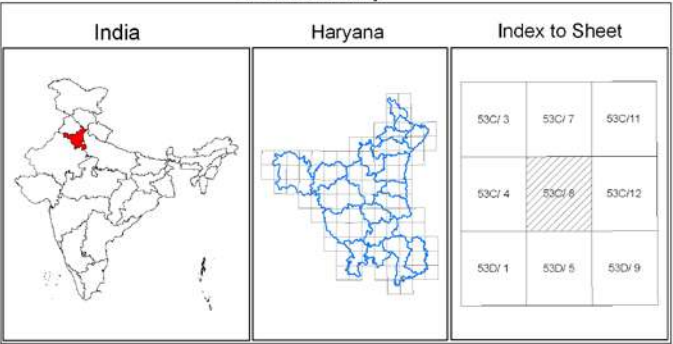
SOI MAP SHEET-WISE WETLAND MAPS (Selected)



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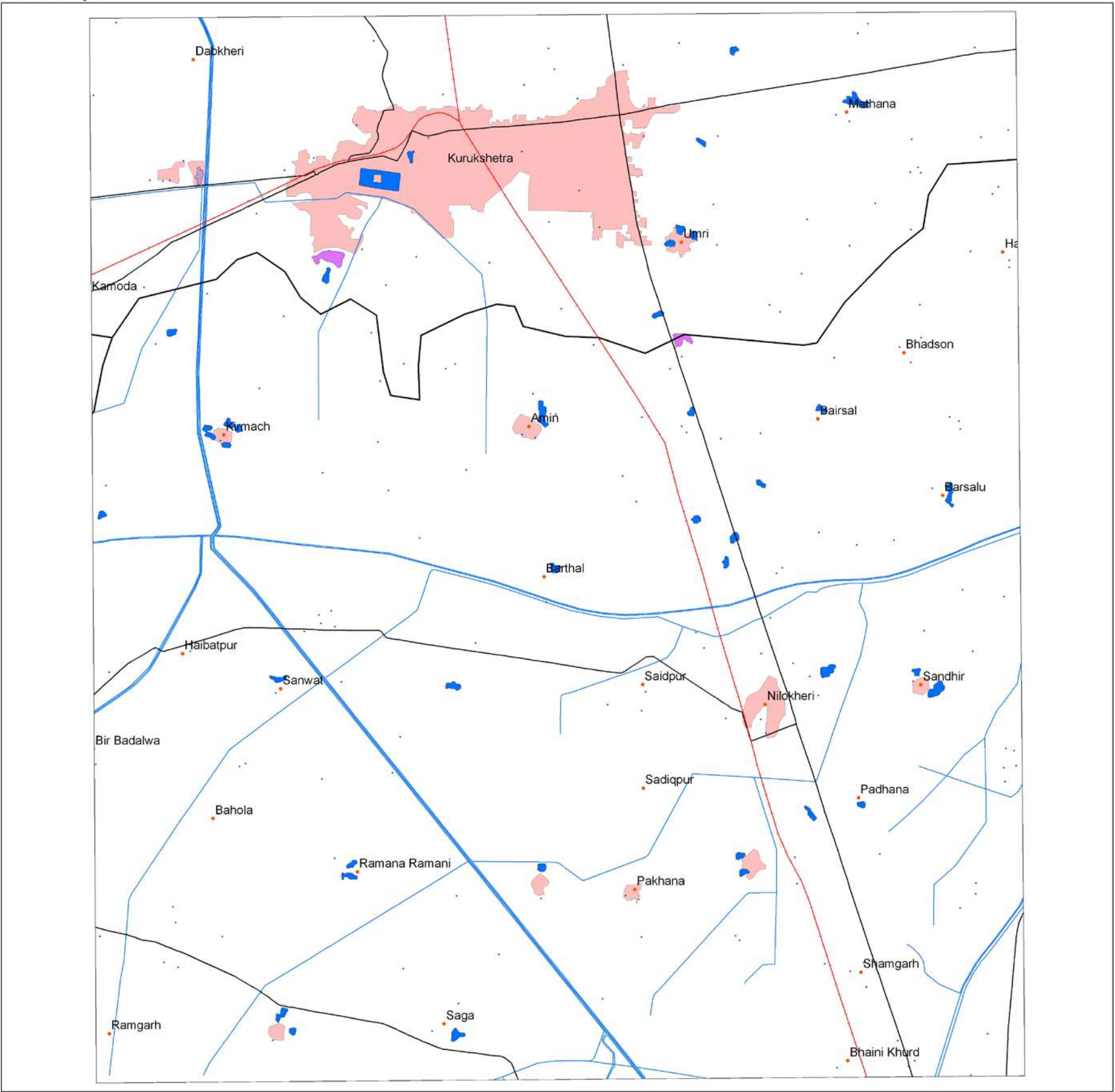
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Location Map



0 1 2 4 6 Kilometers

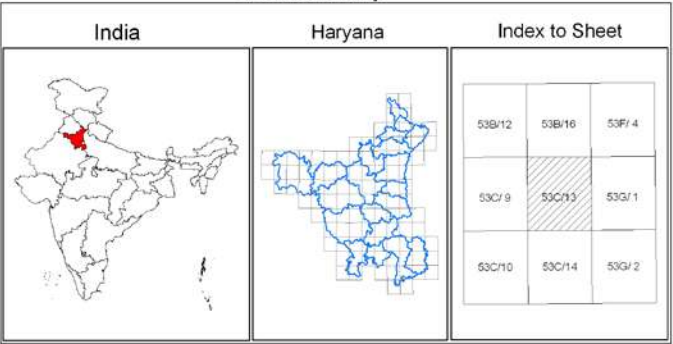
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Location Map

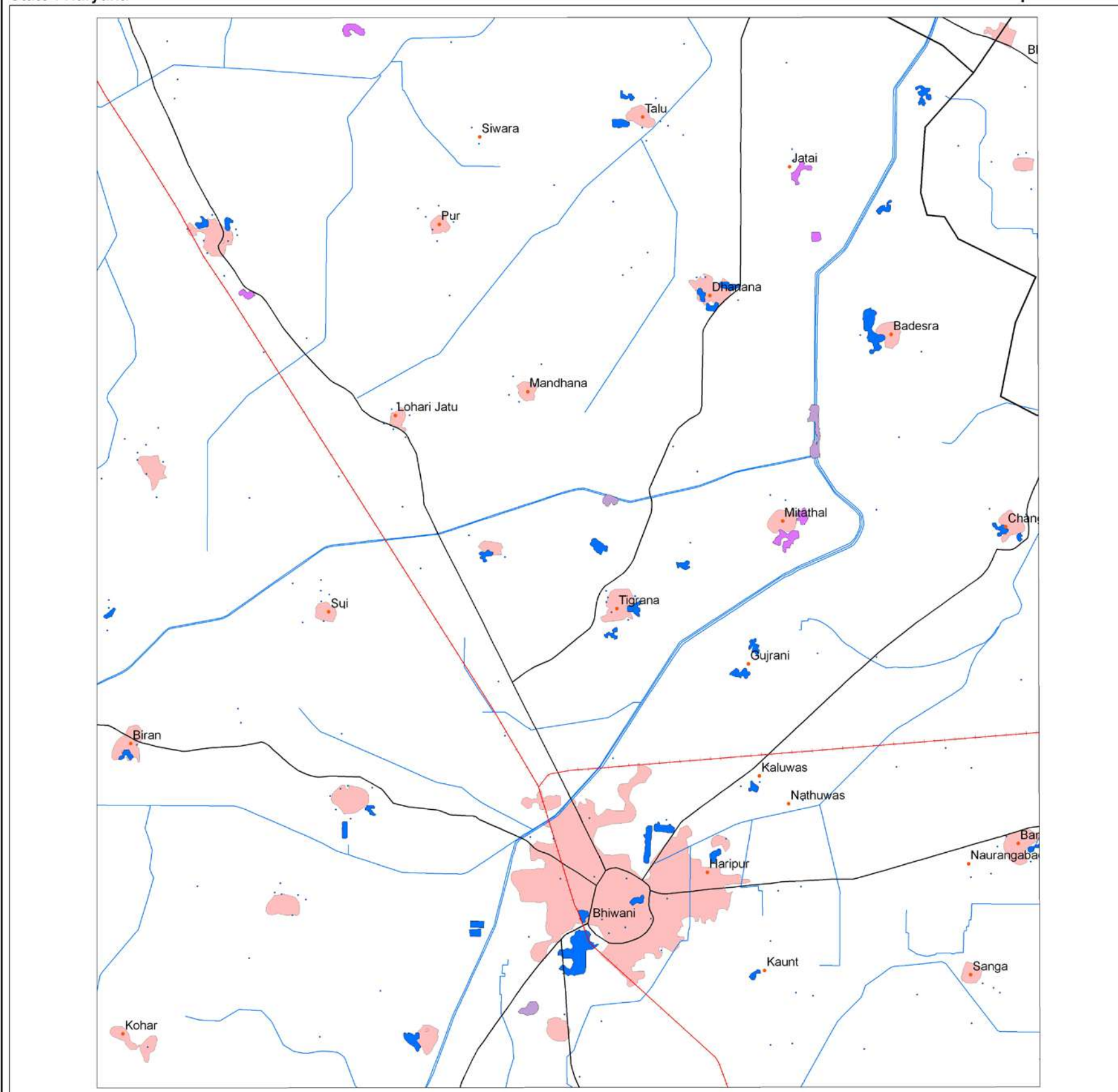


0 1 2 4 6 Kilometers

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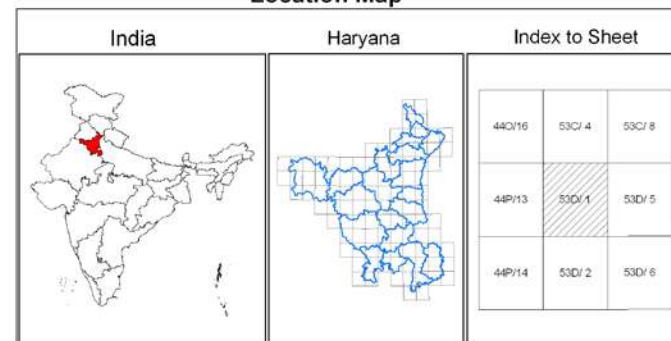


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25 ha)
- Settlements
- Canal
- Drainage(line)
- Railway
- Roads
- District Boundary
- Towns/Settlements

Location Map



0 1 2 4 6 Kilometers

Data Source :

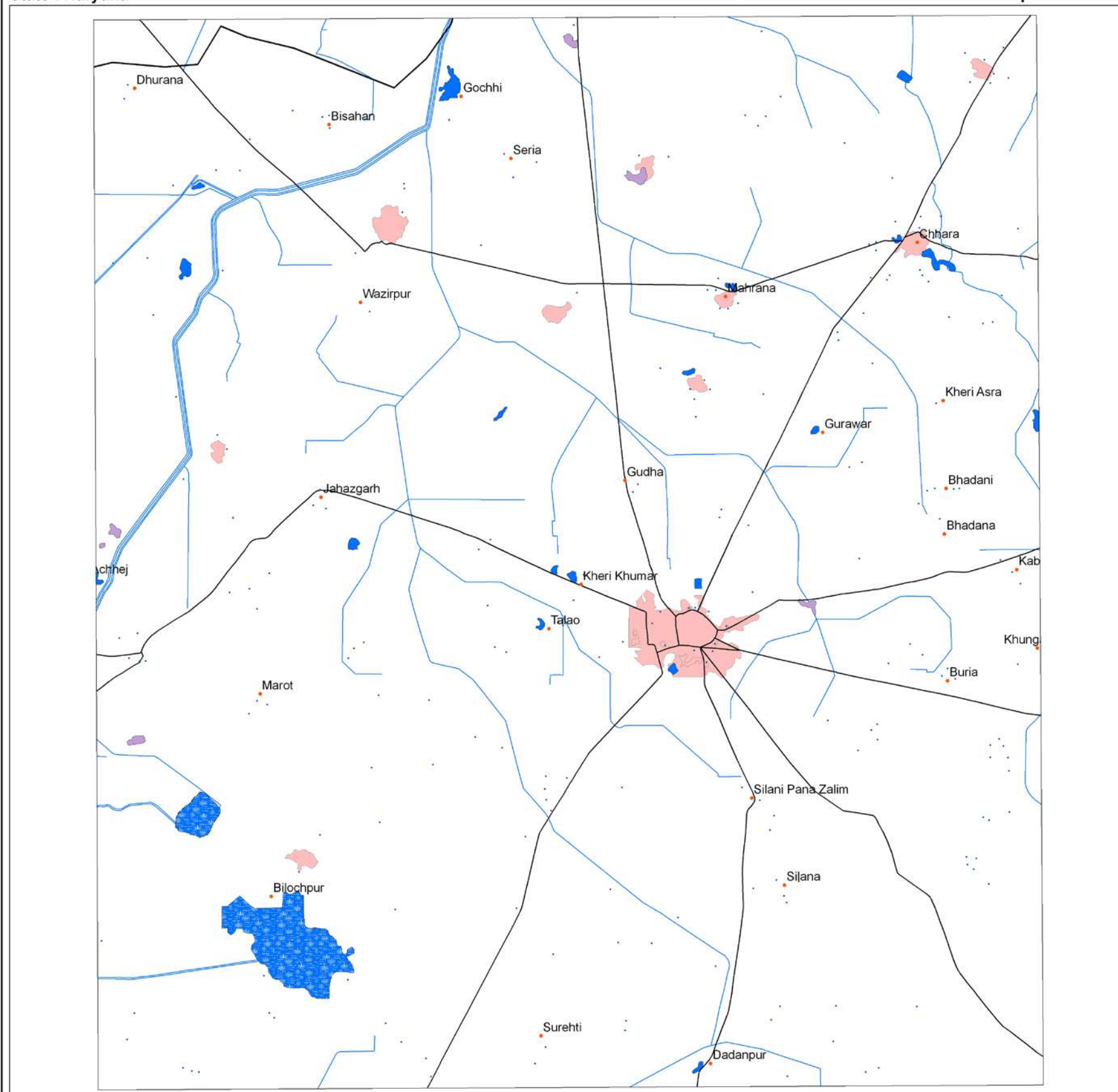
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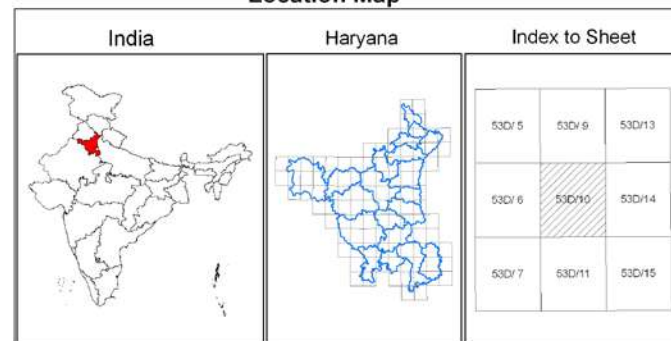


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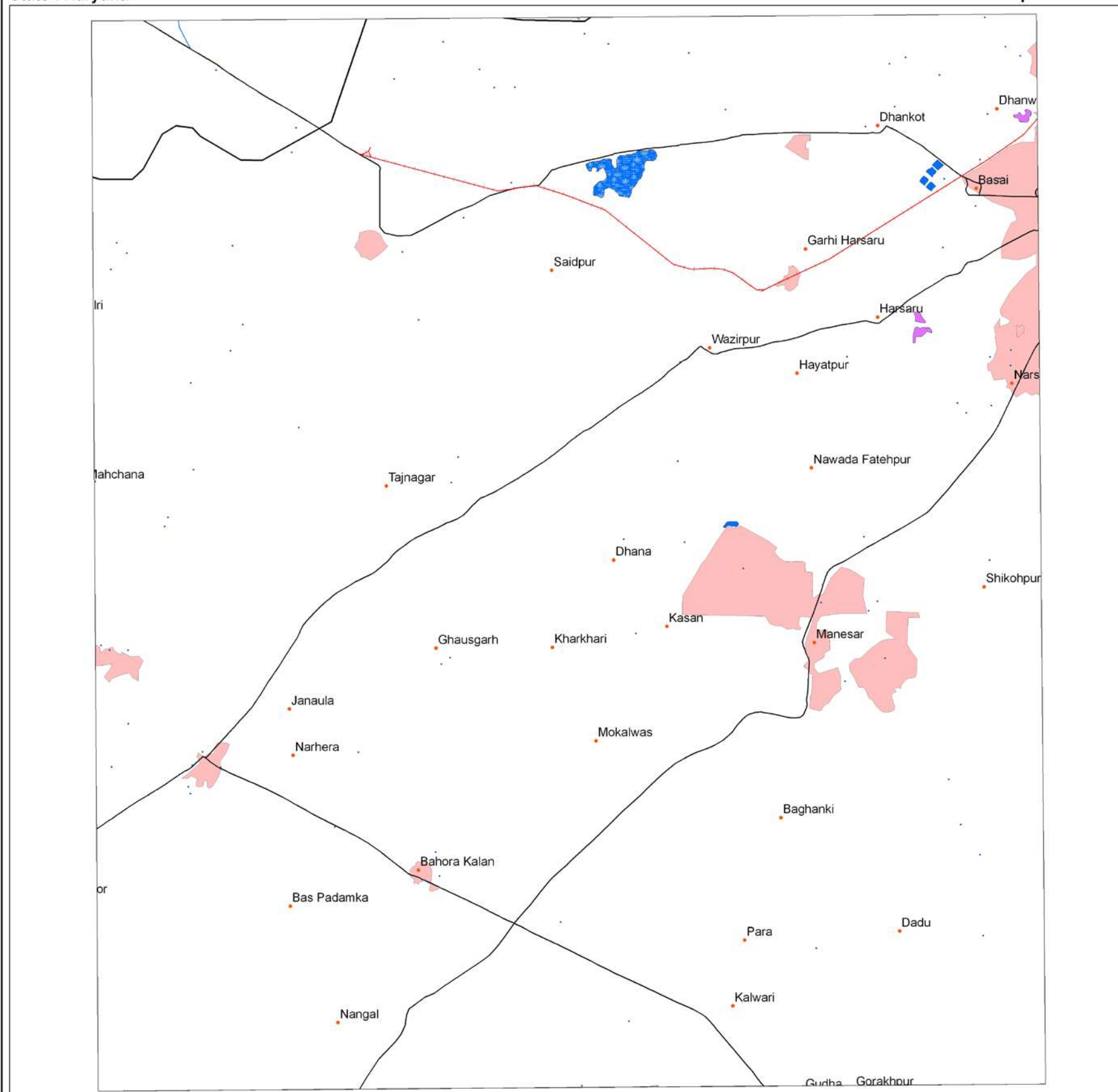
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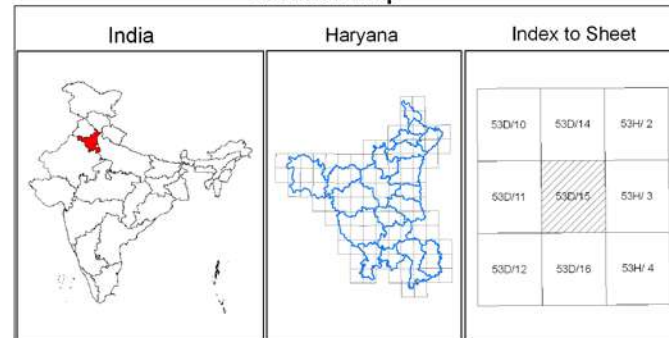


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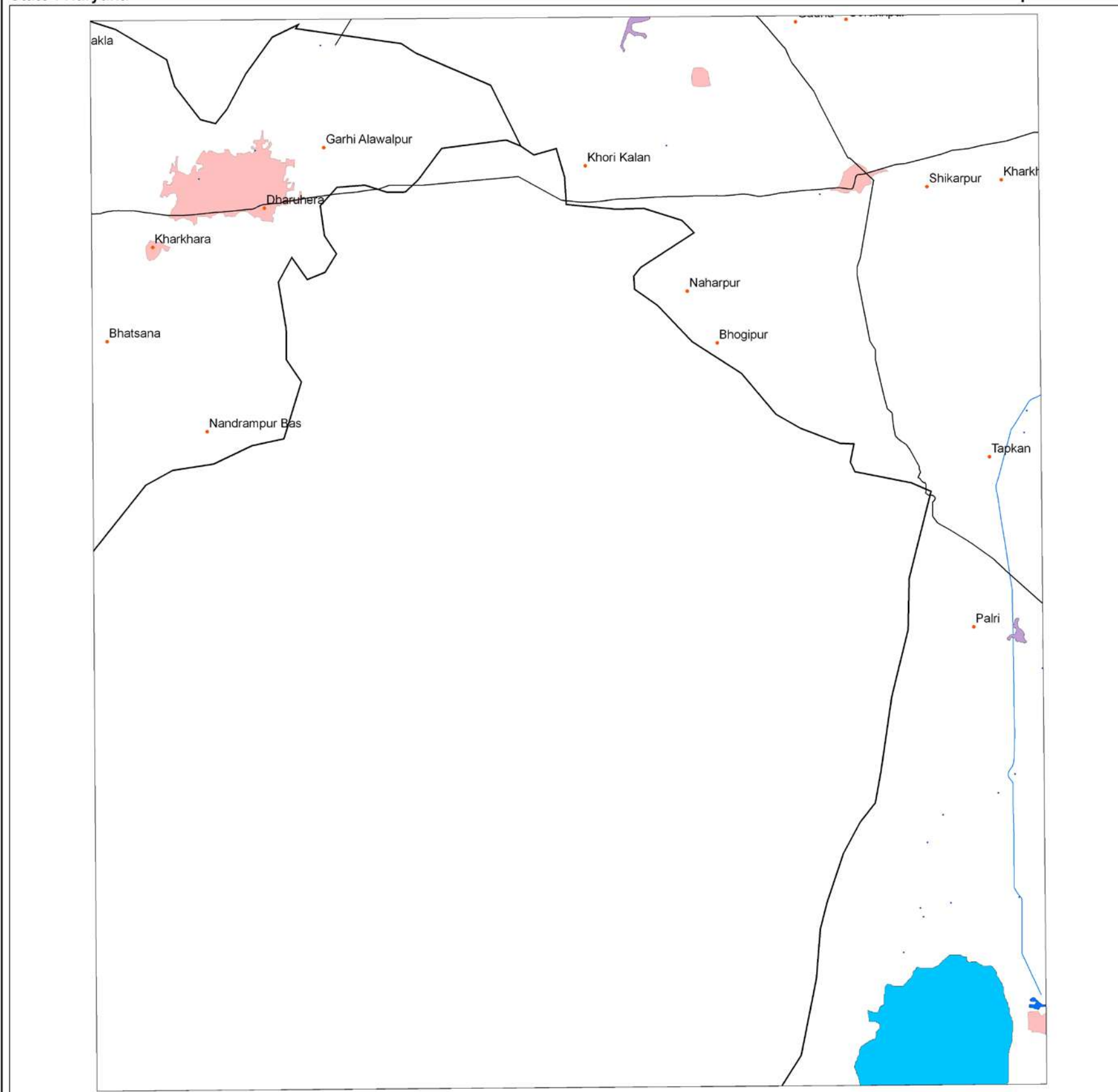
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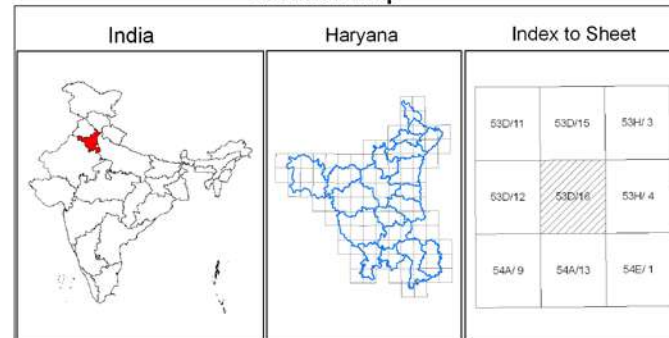


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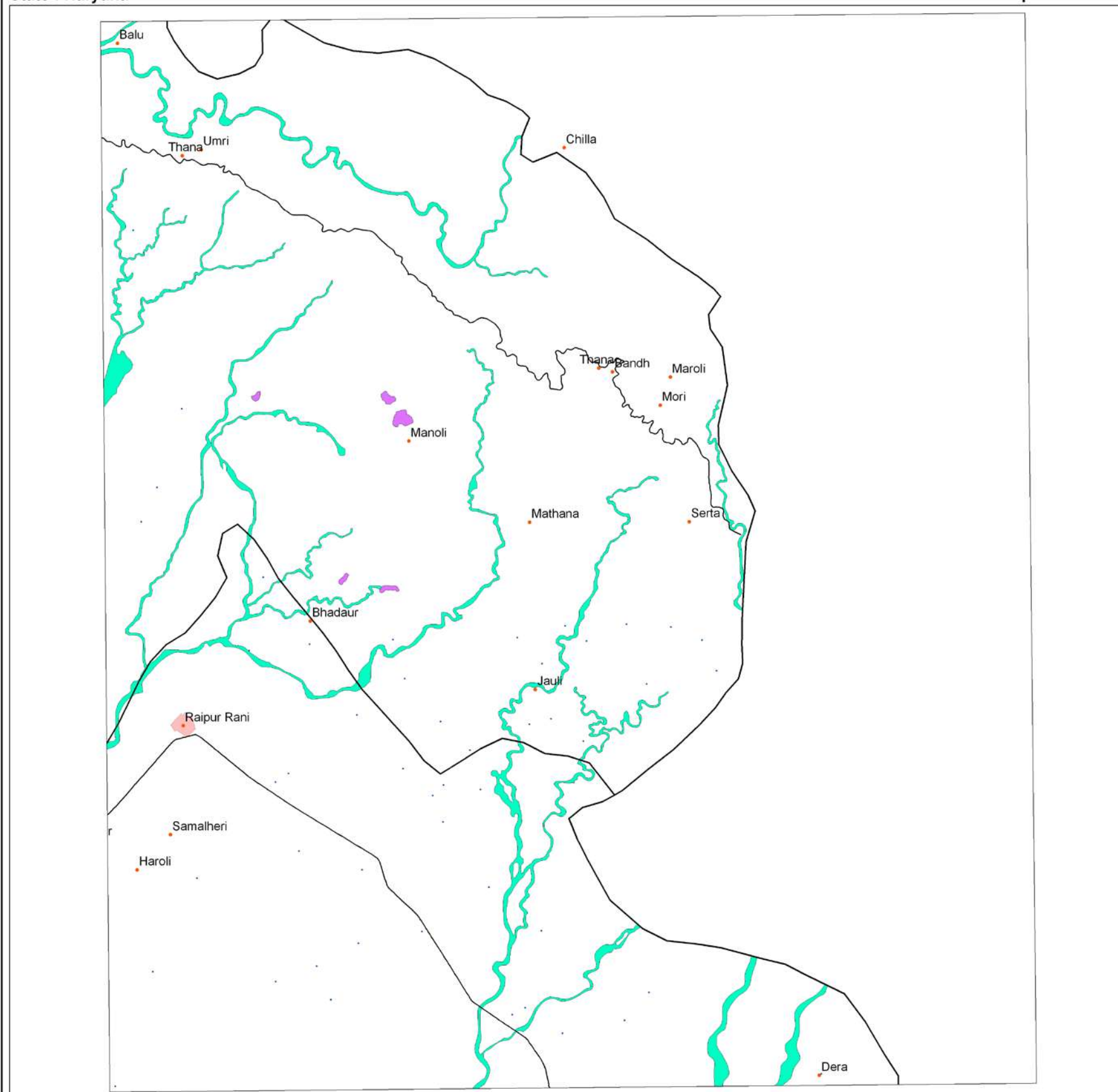
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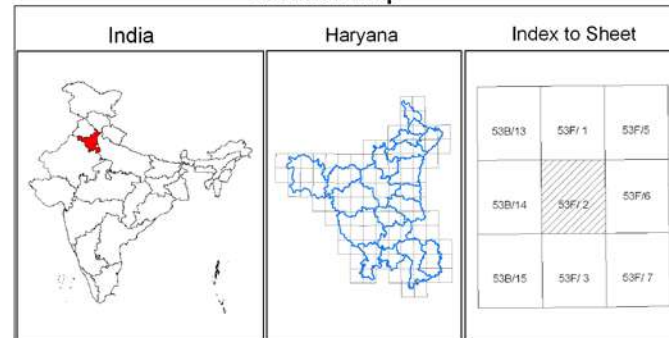


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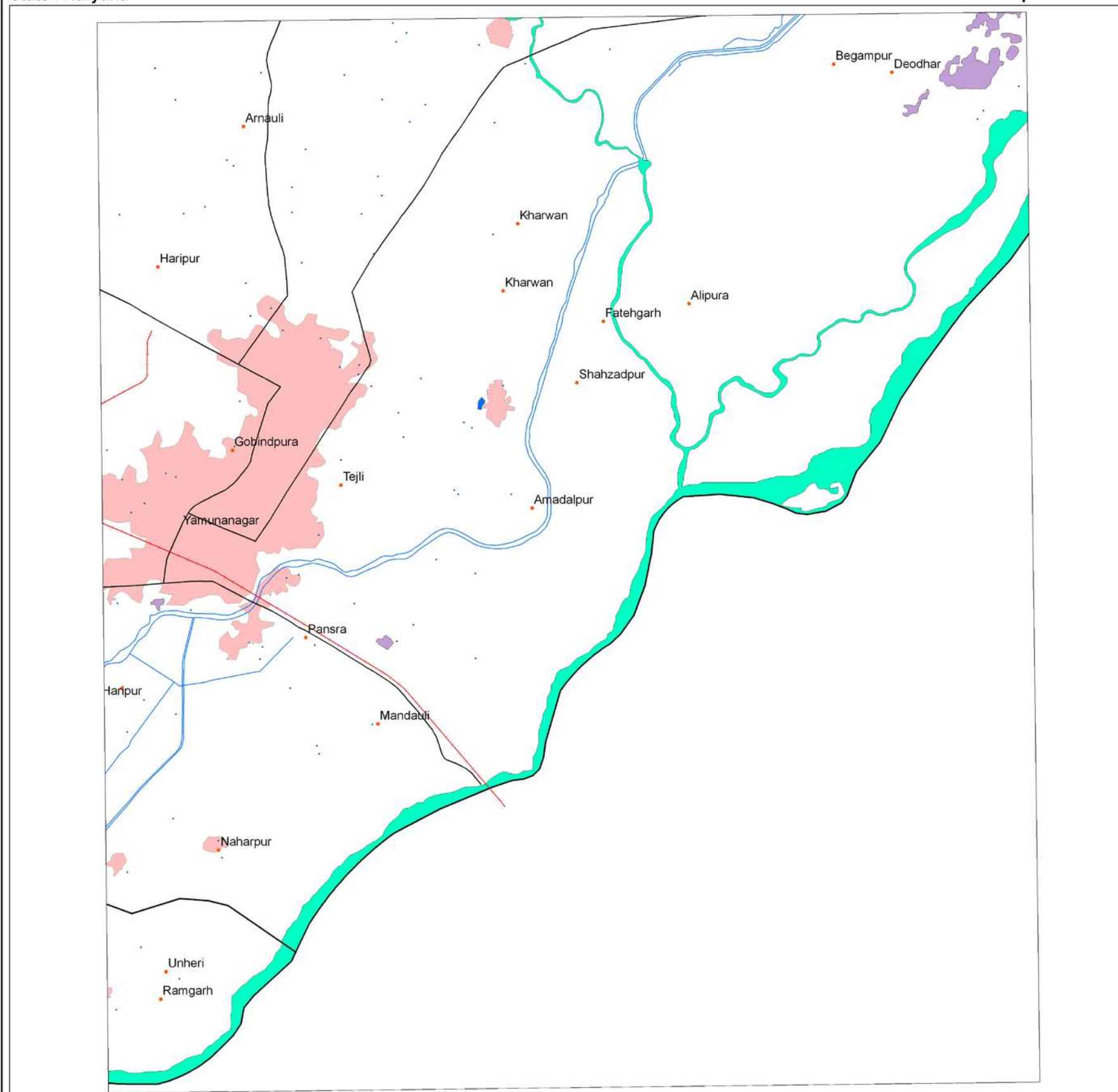
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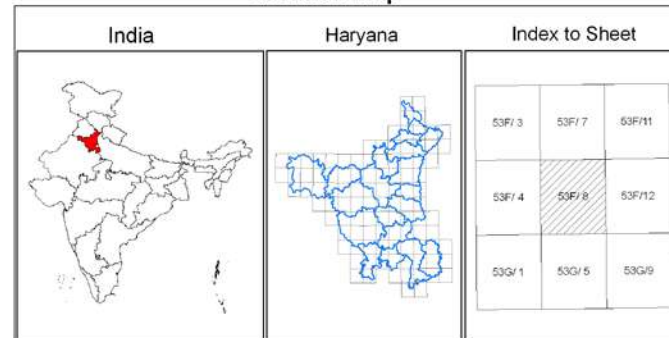


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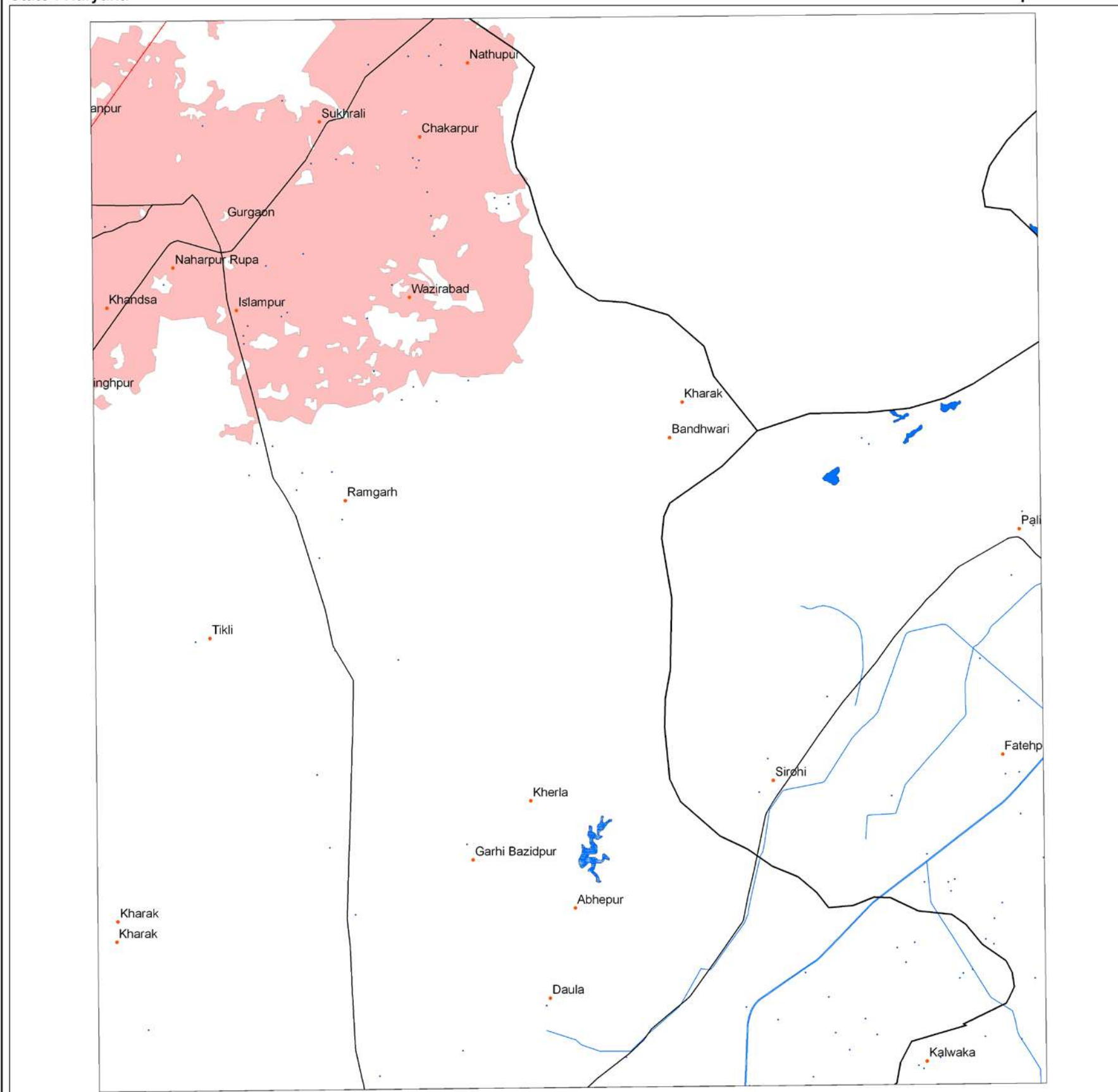
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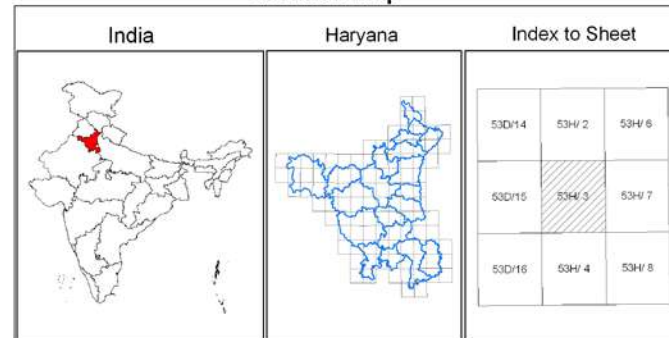


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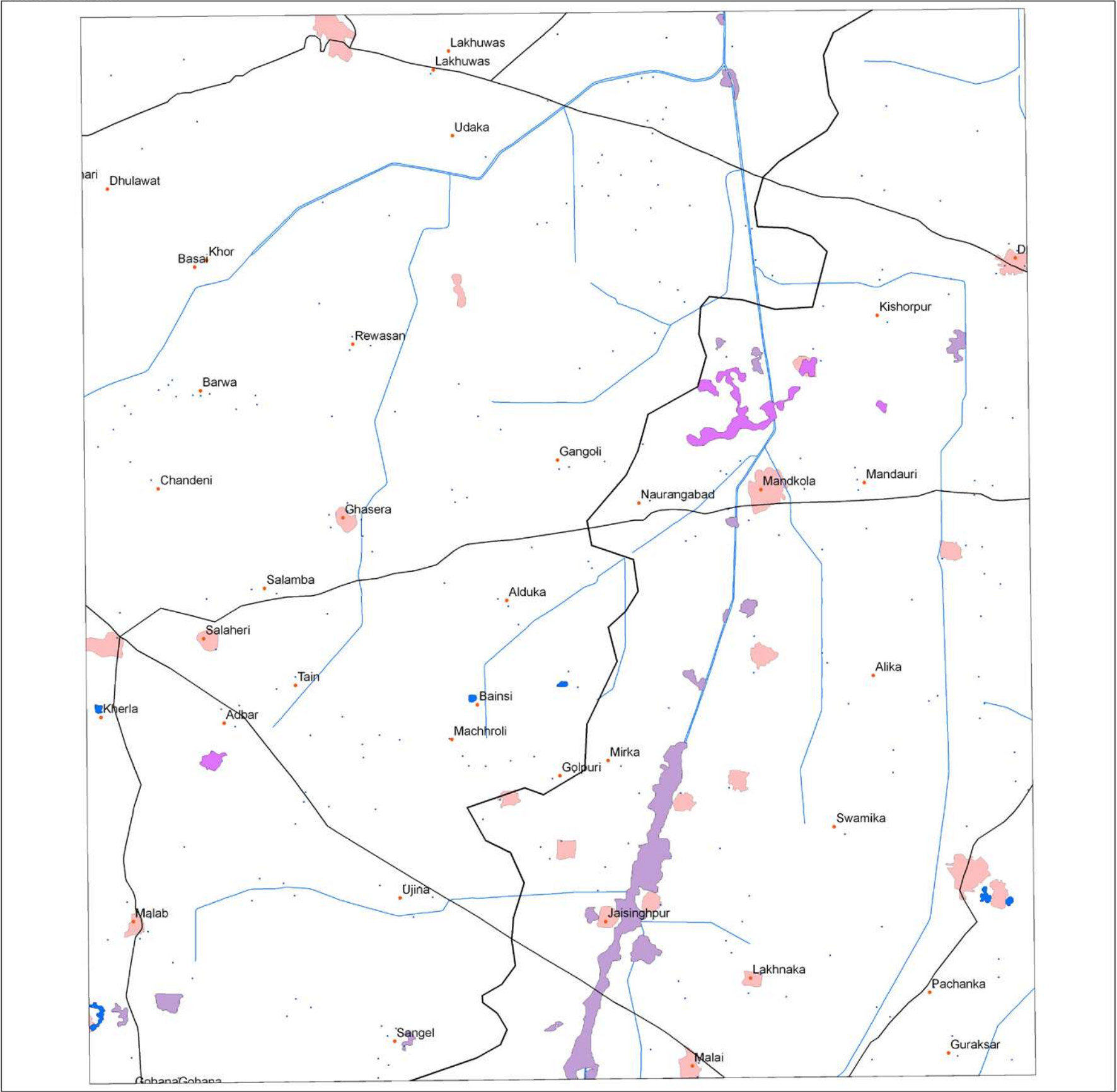
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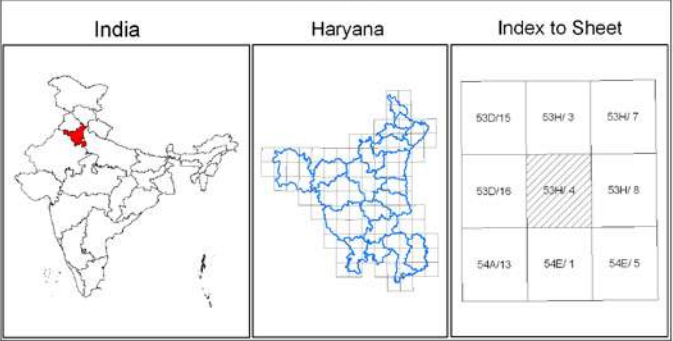
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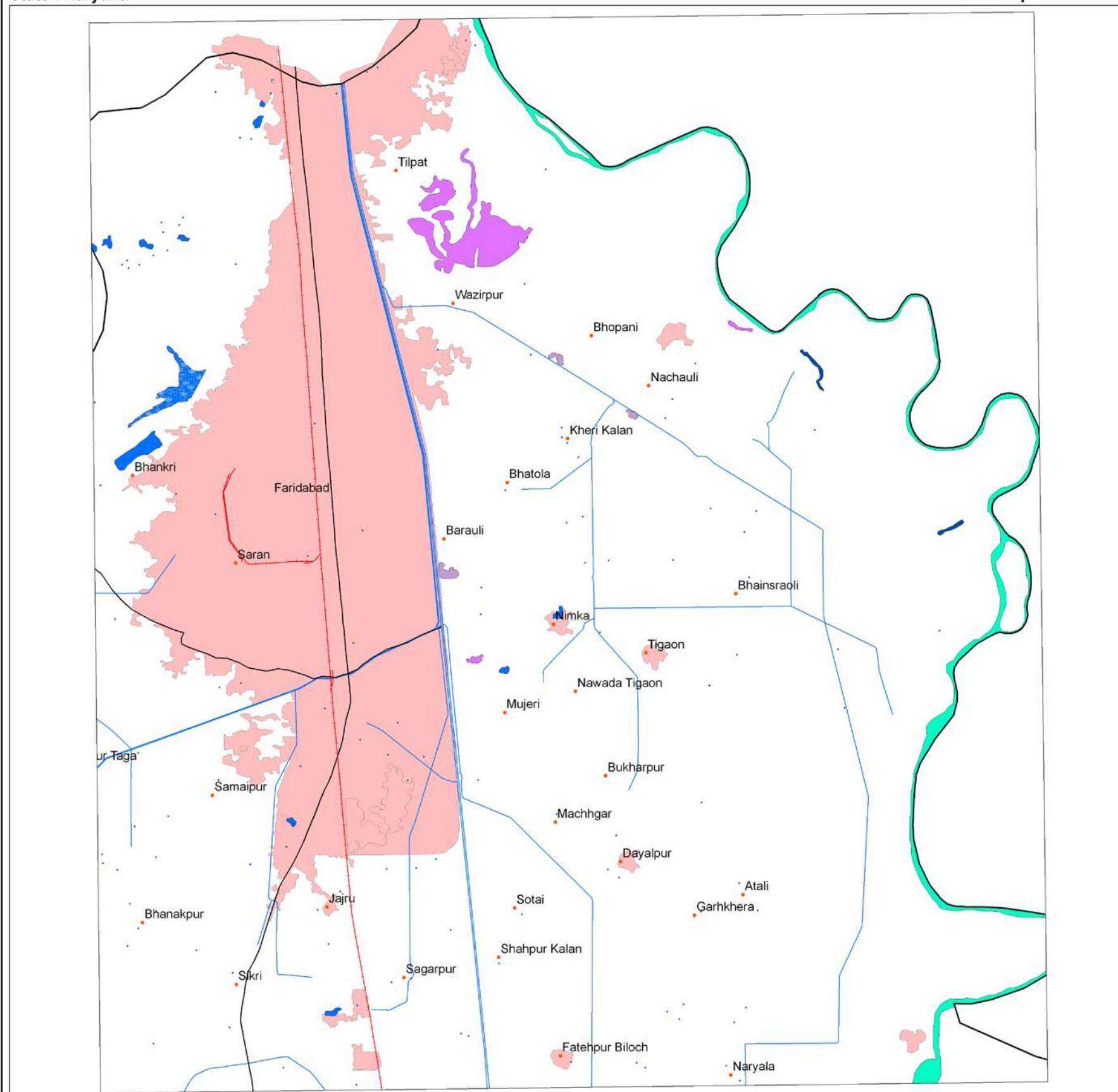
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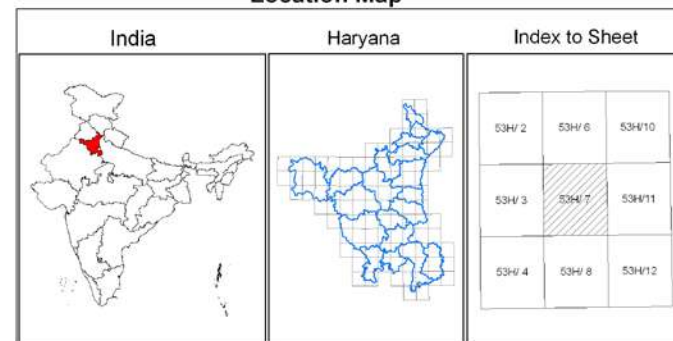


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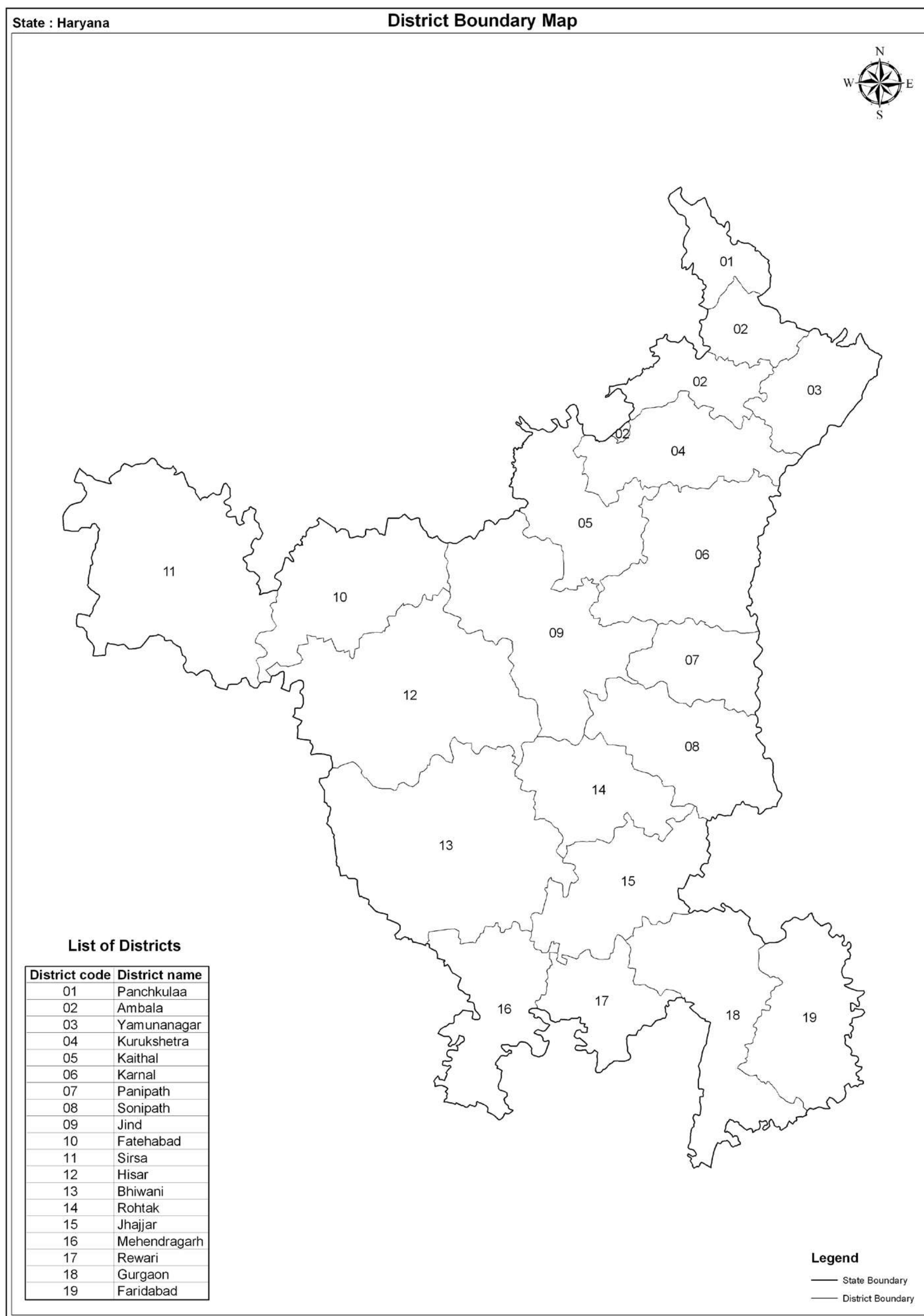
Annexure I
Definitions of wetland categories used in the project

For ease of understanding, definitions of wetland categories and their typical appearance on satellite imagery is given below:

Wetland type code	Definition and description
1000	Inland Wetlands
1100	Natural
1101	Lakes: Larger bodies of standing water occupying distinct basins (Reid <i>et al</i> , 1976). These wetlands occur in natural depressions and normally fed by streams/rivers. On satellite images lakes appear in different hues of blue interspersed with pink (aquatic vegetation), islands (white if unvegetated, red in case of terrestrial vegetation). Vegetation if scattered make texture rough.
1102	Ox-bow lakes/ Cut off meanders: A meandering stream may erode the outside shores of its broad bends, and in time the loops may become cut-off, leaving basins. The resulting shallow crescent-shaped lakes are called oxbow lakes (Reid <i>et al</i> , 1976). On the satellite image Ox-bow lakes occur near the rivers in plain areas. Some part of the lake normally has aquatic vegetation (red/pink in colour) during pre-monsoon season.
1103	High Altitude lakes: These lakes occur in the Himalayan region. Landscapes around high lakes are characterized by hilly topography. Otherwise they resemble lakes in the plain areas. For keeping uniformity in the delineation of these lakes contour line of 3000 m above msl will be taken as reference and all lakes above this contour line will be classified as high altitude lakes.
1104	<p>Riverine Wetlands: Along the major rivers, especially in plains water accumulates leading to formation of marshes and swamp. Swamps are 'Wetland dominated by trees or shrubs' (U.S. Definition). In Europe, a forested fen (a peat accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly <i>Sphagnum</i>) could be called a swamp. In some areas reed grass - dominated wetlands are also called swamps). (Mitsch and Gosselink, 1986).</p> <p>Marsh: A frequently or continually inundated wetland characterised by emergent herbaceous vegetation adapted to saturated soil conditions. In European terminology a marsh has a mineral soil substrate and does not accumulate peat (Mitsch and Gosselink, 1986). Tone is grey blue and texture is smooth.</p> <p>Comment: Using satellite data it is difficult to differentiate between swamp and marsh. Hence, both have been clubbed together.</p>
1105	Waterlogged: Said of an area in which water stands near, at, or above the land surface, so that the roots of all plants except hydrophytes are drowned and the plants die (Margarate <i>et al</i> , 1974). Floods or unlined canal seepage and other irrigation network may cause waterlogging. Spectrally, during the period when surface water exists, waterlogged areas appear more or less similar to lakes/ponds. However, during dry season large or all parts of such areas dry up and give the appearance of mud/salt flats (grey bluish).
1106	River/stream: Rivers are linear water features of the landscape. Rivers that are wider than the mapping unit will be mapped as polygons. Its importance arises from the fact that many stretches of the rivers in Indo-Gangetic Plains and peninsular India are declared important national and international wetlands (Ex. The river Ganga between Brajghat and Garh Mukteshwar, is a Ramsar site, Ranganthattu on the Caverry river is a bird sanctuary etc.). Wherever, rivers are wide and features like sand bars etc. are visible, they will be mapped.
1200	Man-made
1201	<p>Reservoir: A pond or lake built for the storage of water, usually by the construction of a dam across a river (Margarate <i>et al</i>, 1974). On RS images, reservoirs have irregular boundary behind a prominent dyke. Wetland boundary in case of reservoir incorporates water, aquatic vegetation and footprint of water as well. In the accompanying images aquatic vegetation in the reservoir is seen in bright pink tone. Tone is dark blue in deep reservoirs while it is ink blue in case of shallow reservoirs or reservoirs with high silt load. These will be annotated as Reservoirs/Dam.</p> <p>Barrage: Dykes are constructed in the plain areas over rivers for creating Irrigation/water facilities. Such water storage areas develop into wetlands (Harike Barrage on Satluj – a Ramsar site, Okhla barrage on the Yamuna etc. – a bird sanctuary). Water appears in dark blue tone with a smooth texture. Aquatic vegetation appears in pink colour, which is scattered, or contiguous depending on the density. Reservoirs formed by barrages will be annotated as reservoir/barrage.</p>

1202	<p>Tanks/Ponds: A term used in Ceylon and the drier parts of Peninsular India for an artificial pond, pool or lake formed by building a mud wall across the valley of a small stream to retain the monsoon (Margarate <i>et al</i>, 1974). Ponds Generally, suggest a small, quiet body of standing water, usually shallow enough to permit the growth of rooted plants from one shore to another (Reid <i>et al</i>, 1976). Tanks appear in light blue colour showing bottom reflectance.</p> <p>In this category Industrial ponds/mining pools mainly comprising Abandoned Quarries are also included (Quarry is defined as "An open or surface working or excavation for the extraction of stone, ore, coal, gravel or minerals." In such pits water accumulate (McGraw Hill Encyclopaedia of Environmental Sciences, 1974), Ash pond/Cooling pond (The water body created for discharging effluents in industry, especially in thermal power plants (Encyclopaedic Directory of Environment, 1988) and Cooling pond: An artificial lake used for the natural cooling of condenser-cooling water serving a conventional power station (Encyclopaedic Directory of Environment, 1988). These ponds can be of any shape and size. Texture is rough and tonal appearance light (quarry) to blue shade (cooling pond).</p>
1203	<p>Waterlogged : Man-made activities like canals cause waterlogging in adjacent areas due to seepage especially when canals are unlined. Such areas can be identified on the images along canal network. Tonal appearance is in various hues of blue. Sometimes, such waterlogged areas dry up and leave white scars on the land. Texture is smooth.</p>
1204	<p>Salt pans: Inland salt pans in India occur in Rajasthan (Sambhar lake). These are shallow rectangular man-made depressions in which saline water is accumulated for drying in the sun for making salt.</p>
2000	Coastal Wetlands
2100	Natural
2101	<p>Lagoons/Backwaters: Such coastal bodies of water, partly separated from the sea by barrier beaches or bass of marine origin, are more properly termed lagoons. As a rule, lagoons are elongate and lie parallel to the shoreline. They are usually characteristic of, but not restricted to, shores of emergence. Lagoons are generally shallower and more saline than typical estuaries (Reid <i>et al</i>, 1976). Backwater: A creek, arm of the sea or series of connected lagoons, usually parallel to the coast, separated from the sea by a narrow strip of land but communicating with it through barred outlets (Margarate <i>et al</i>, 1974).</p>
2102	<p>Creek: A notable physiographic feature of salt marshes, especially low marshes. These creeks develop as do rivers "with minor irregularities sooner or later causing the water to be deflected into definite channels" (Mitsch and Gosselink, 1986). Creeks will be delineated, however, their area will not be estimated.</p>
2103	<p>Sand/Beach: Beach is an unvegetated part of the shoreline formed of loose material, usually sand that extends from the upper berm (a ridge or ridges on the backshore of the beach, formed by the deposit of material by wave action, that marks the upper limit of ordinary high tides and wave wash to low water mark(Clark,1977).Beach comprising rocky material is called rocky beach.</p>
2104	<p>Intertidal mudflats: Most unvegetated areas that are alternately exposed and inundated by the falling and rising of the tide. They may be mudflats or sand flats depending on the coarseness of the material of which they are made (Clark, 1977).</p>
2105	<p>Salt Marsh: Natural or semi-natural halophytic grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidally or non- tidally (Mitsch and Gosselink, 1986). Salt marshes look in grey blue shade when wet.</p>
2106	<p>Mangroves: The mangrove swamp is an association of halophytic trees, shrubs, and other plants growing in brackish to saline tidal waters of tropical and sub-tropical coastlines (Mitsch and Gosselink, 1986). On the satellite images mangroves occur in red colour if in contiguous patch. When mangrove associations are scattered or are degraded then instead of red colour, brick red colour may be seen.</p>
2107	<p>Coral reefs: Consolidated living colonies of microscopic organisms found in warm tropical waters. The term coral reef, or organic reef is applied to the rock- like reefs built-up of living things, principally corals. They consist of accumulations of calcareous deposits of corals and corraline algae with the intervening space connected with sand, which consists largely of shells of foraminefera. Present reefs are living associations growing on this accumulation of past (Clark, 1977). Reefs appear in light blue shade.</p>
2200	Man-made
2201	<p>Salt pans: An undrained usually small and shallow rectangular, man-made depression or hollow in which saline water accumulates and evaporates leaving a salt deposit (Margarate <i>et al</i>, 1974). Salt pans are square or rectangular in shape. When water is there appearance is blue while salt is formed tone is white.</p>
2202	<p>Aquaculture ponds: Aquaculture is defined as "The breeding and rearing of fresh-water or marine fish in captivity. Fish farming or ranching". The water bodies used for the above are called aquaculture ponds (Encyclopaedic Directory of Environment, 1988). Aquaculture ponds are geometrical in shape usually square or rectangular. Tone is blue.</p>

Annexure – II
Details of District information followed in the atlas



Source : Survey of India (Surveyed in 2004 and published in 2005)

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