Ganga Cultural Documentation

2021

BULANDSHAHR DISTRICT
Natural Heritage

NAMAMI GANGE

National Mission for Clean Ganga

INTACH

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Front Cover:	**Boats Parked at Baba Mastram Ghat, Anupshahr**
Background:	**Local Tourists Taking Boat Ride at Baba Mastram Ghat**
Back cover:	**Hanuman Statue at Baba Mastram Ghat**
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Sponsored by :

National Mission for Clean Ganga

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1.0 Introduction

1.1 Distt. Bulandshahr, situated on the right bank of Ganga River [70 km reach in the Distt.] is close to the ancient capital of Pandavas – Indraprastha and Hastinapur. The Distt. is named after the headquarters town of Bulandshahr. As per Bulandshahr Gazetteer of 1980[1], the city was founded by Parmal, a Tomar Chief of Ahar and was originally called Banchhati (land reclaimed from forest). It later received the name of Ahirbaran, either because of being a stronghold of the Nagar tribe or from the name of Tomar king, Ahirbaran. Later the Distt. came to be known differently as Baran and Unchhainagar or Unchanagar (means high town) because of its elevation difference from the surrounding country. It was further renamed as Bulandshahr in medieval times.

1.2 The geographical area of the Distt. is 4353 Sq. km which is about 1.48 percent of the total Uttar Pradesh area. The urban area of the Distt. is 122.8 Sq. km and rural area as 4230.2[2] Sq.km The Distt. is bounded by Hapur in the North, Amroha and Badaun in the East, Gautam Buddha Nagar in the West and Aligarh in the South between latitude 28°40' N to 28° 7' N and longitude 77°40' E and 78°17' E. The Distt. is a monotonous plain with occurrence of sand dunes, sandy ridges, ravineous tracts and depressions close to River Ganga. At places, close to the River Ganga, bad land topography has developed through differentiated erosions[3]. Morphologically, the Distt. can be divided into two broad tracts/units.

I – Khadar : the sandy riverine area along River Ganga. The width of tract is variable and development of khadar is most prominent on the eastern bank of Ganga.

II – Uplands : Area towards west away from the river, broken only by various drainage and streams.

1.3 The Distt. which falls in the doab of Ganga and Yamuna river is drained by Ganga, Kali Nadi, Karwan Nadi, and Nim Nadi – all of which flow in Southeastern course. Irrigation is carried out by means of minor irrigation structures such as tube wells, cavity tube wells, canals and occasionally by dug wells. Geologically, the Distt. can be divided into two broad units – Younger Alluvium (all along the Ganga River and other streams) and Older Alluvium (occupies the entire upland or interfluve area occurring between major drainages. The soil[4] in the Distt. ranges from pure sand to stiff clays and including all

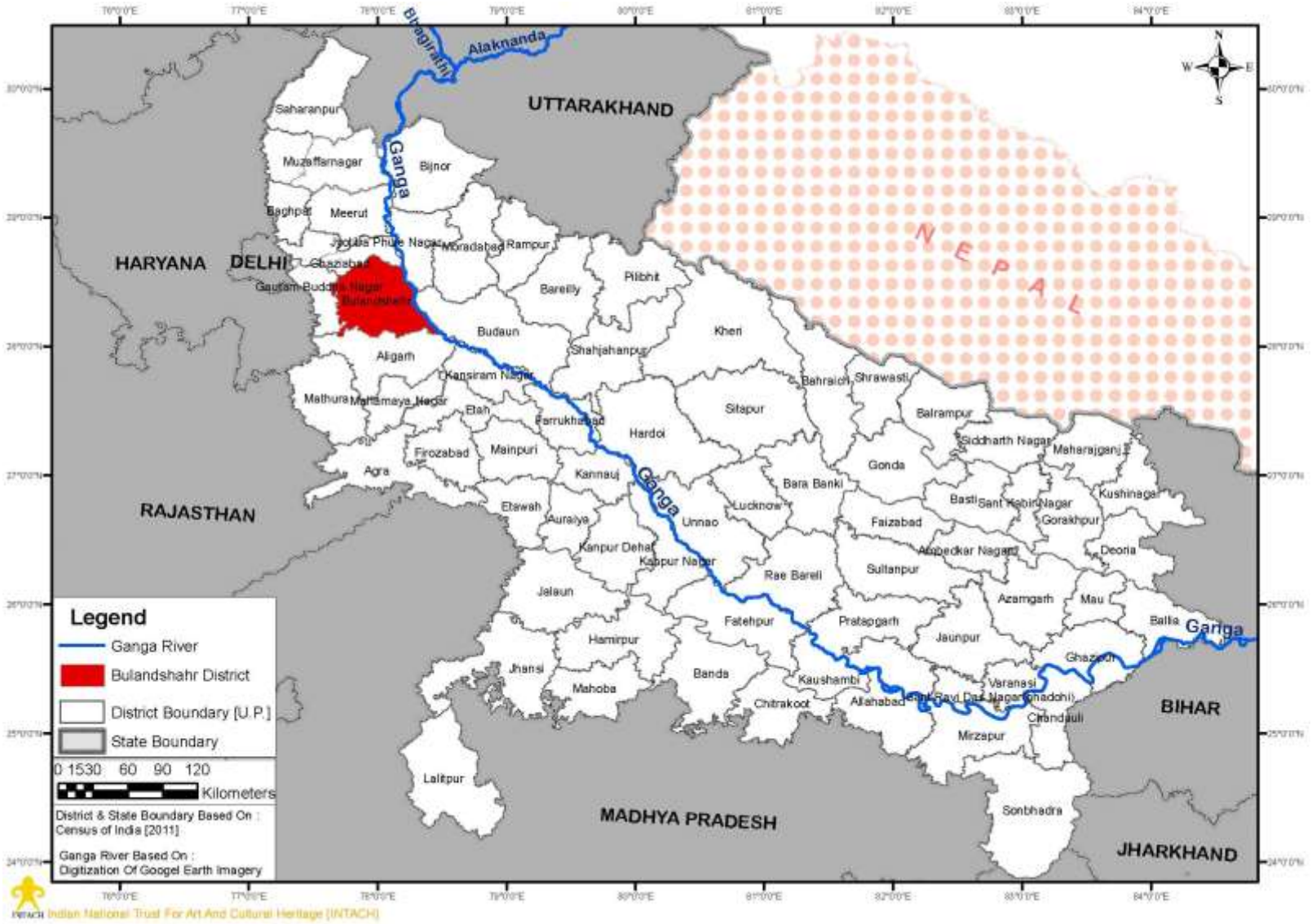
[1] Uttar Pradesh District Gazetteers: Bulandshahr, 1980 by Dept. of District Gazetteers, Lucknow
[2] bulanshahar.nic.in/district-profile/
[3] District Groundwater Brochure, Bulandshahr District, [2012-2013], CGWB, Lucknow
[4] District Groundwater Brochure, Bulandshahr District, [2012-2013], CGWB, Lucknow

combination of the two extreme lithological units. The pure sand is called *Bhur* and clay is called *Matiar.* When the sand is mixed with clay in equal proportions, the soil may be termed as Dumat or Loam – a soil suitable for agriculture. Badland patches – where nothing grows are denoted by term *Kallor*. The Distt. has 7 sub-divisions viz. Dibai, Anoopshahr, Khurja, Shikarpur, Siyana, Bulandshahr and Sikandrabad with 16 development blocks and 1246 villages with population of 34,99,171 inhabitants as per 2011 Census[5].

1.4 Bulandshahr is primarily an agrarian Distt. with agriculture being the primary occupation. Sugarcane, wheat, maize and potato are the major crops. Mango orchards are and milk production are other major sources of income in the district. Major industrial towns are Khurja, popular for potteries and Sikandrabad industrial area for tiles, ceramics, pharmaceuticals and paints production. There are sugar mills and distilleries located at several places. Village Chola located Southwest of Bulandshahr is particularly popular for Bibcol company which produces polio vaccine. There are several places of religious and cultural importance [especially ghats and temples] along the River Ganga at Karanvas, Rajghat, Ahar, Anupshahr and Narora.

Image 1 : Ganga River View In Bulandshahr Distt. [Near Farida Khadar, Jan/2021]

[5] bulanshahar.nic.in/district-profile/



Map 1 : Location Of Bulandshahr Distt. on Right Bank of Ganga

2.0 Ganga River in Bulandshahr Distt.

2.1 Ganga River enters Bulandshahr Distt. at Bhagwanpur village, Siyana tehsil after crossing Hapur Distt. [See Map No.2]. The river channel is around 1 km in width here. The length of Ganga River in Bulandshahr is around 70 km adjoining district boundary on its right bank. There is a road bridge which connects the right bank to the left bank of River Ganga, constructed in 2011. Most of the river bed is exposed here and used for cultivation of cucurbits by local farmers. Active channel with water remains narrow throughout the year except during monsoon season. The river flows almost straight till Mandu with intermittent shallow zones with sand deposits and smaller islands, which get exposed as water recedes. From Mandu, the river takes easterly route and flows southeast till Mubarikpur. From this point, Ganga moves a slightly westwards and reaches Anupshahr – an old town situated on its right bank. There is a road bridge here which connects Aligarh [southwest] to Sambhal [northeast]. At Anupshahr, there are huge patches of exposed sand beds used for cucurbits cultivation. Sand mining is also carried out on smaller scale via bullock carts seasonally as soon as the sand beds are exposed – in the entire Distt.. The Ganga again takes a left turn and flows further southeast crossing Narora Barrage. Here, the Lower Ganga Canal (on right bank) diverts water from Ganga River for irrigation towards southern Distt.s of Uttar Pradesh. Around 3 km downstream of barrage is located Narora Atomic Power Station. Around 10 km downstream, the Ganga exits Bulandshahr Distt. at village Gokulpur Khader.

2.2 Ganga River stretch in Bulandshahr falls under Upper Ganga Ramsar Site – a Ramsar wetland declared on 8th November, 2005 due to rich biodiversity and habitats under Ramsar criteria 2,3,4,5 and 7. The designated area starts from Brijghat [located in Hapur Distt.] to Narora located in Bulandshahar Distt.

3.0 Methodology

3.1 For carrying out surveys, a 7 km buffer zone with total area of around 470 km was considered. Before carrying out surveys, various access points and routes to the river were located with the help of Google Earth. Special emphasis was given to the sites and features of interest such as river channel, river bed, floodplain conditions, farming and fishing activities, sites of religious interest. Some local resource persons from village Bugrasi – around 5 km east from Ganga river, were contacted for field assistance.

3.2 The survey was undertaken from 13-16th January, 2021. At first, a motorboat was hired and a journey from Basi to Mandu village [downstream] in Ganga River was carried out to see the river and its surrounding floodplain areas. Rest of the survey was carried out by

taxi, bike and on foot. Sony Digital Camera Cyber-shot DSC-HX300 with 50X optical zoom and OnePlus 5 mobile phone was used for photography. Garmin handheld GPS eTrex30 was used for marking locations and understanding elevation difference. Pre-marked Google Earth's Kml files and Google Maps were used for navigation. Field guides were used for flora and fauna identification. Information was obtained through informal interviews and discussion with farmers, fishermen, boatmen, and local people.

4.0 Tributaries of Ganga River

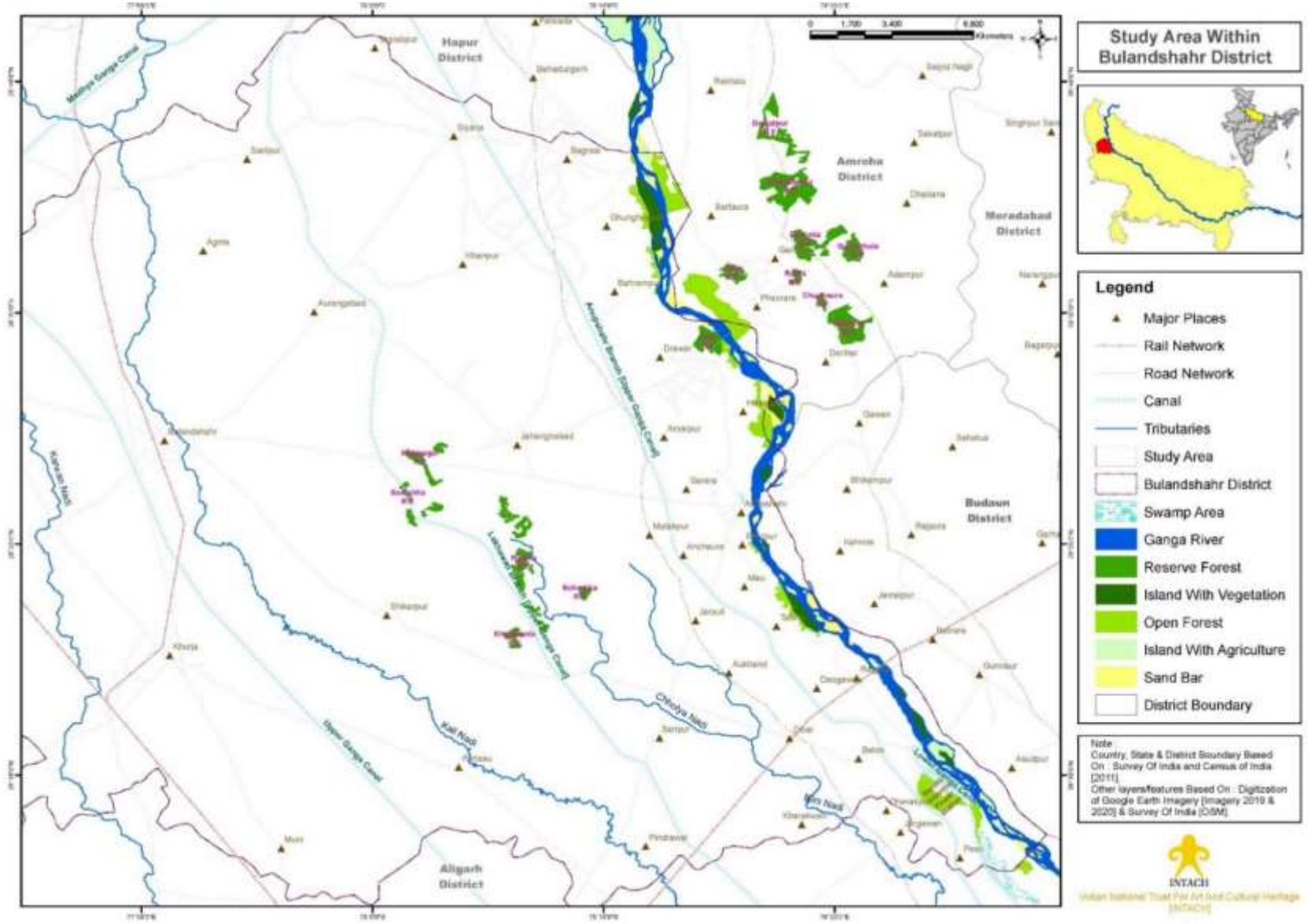
4.1 No tributaries of Ganga fall in the study area, however there are three smaller rivers which flow Southeast in the Distt. – Kali Nadi, Karwan Nadi and Nim Nadi, which are described[6] briefly below [See Map No.2]:

i) **Kali Nadi** – enters the Distt. near Gulaothi and flows in a southerly direction near Khurja. It becomes south-easterly stream in Pahasu block. The river has a tortuous course and bends are numerous being at places succession of loops. Its banks are well defined and forms a narrow flood plain. It is an ephemeral river, which is fed by effluents of industrial units especially sugar mills.

ii) **Karwan Nadi** – Between Kali nadi on the east and Mat Canal on the west, flows Karwan Nadi which originates in the NE of Dadri. Originally it was not well defined but was a chain of swamps and jheels till the Irrigation Department widened and deepened its channel and created a drainage for the area between Ganga Canal and Mat Branch. Its banks are not well defined but channel is level and firm.

iii) **Nim Nadi** – This river flows between Kali and Ganga in a southerly course. It originates in Syana block in a series of jheels. It runs in an irregular curving course. Its banks are well defined and river bed is well entrenched.

[6] District Groundwater Brochure, Bulandshahr District, [2012-2013], CGWB, Lucknow



Map 2 : Study Area In Bulandshahr Distt.

5.0 Land Use Land Cover [LULC]

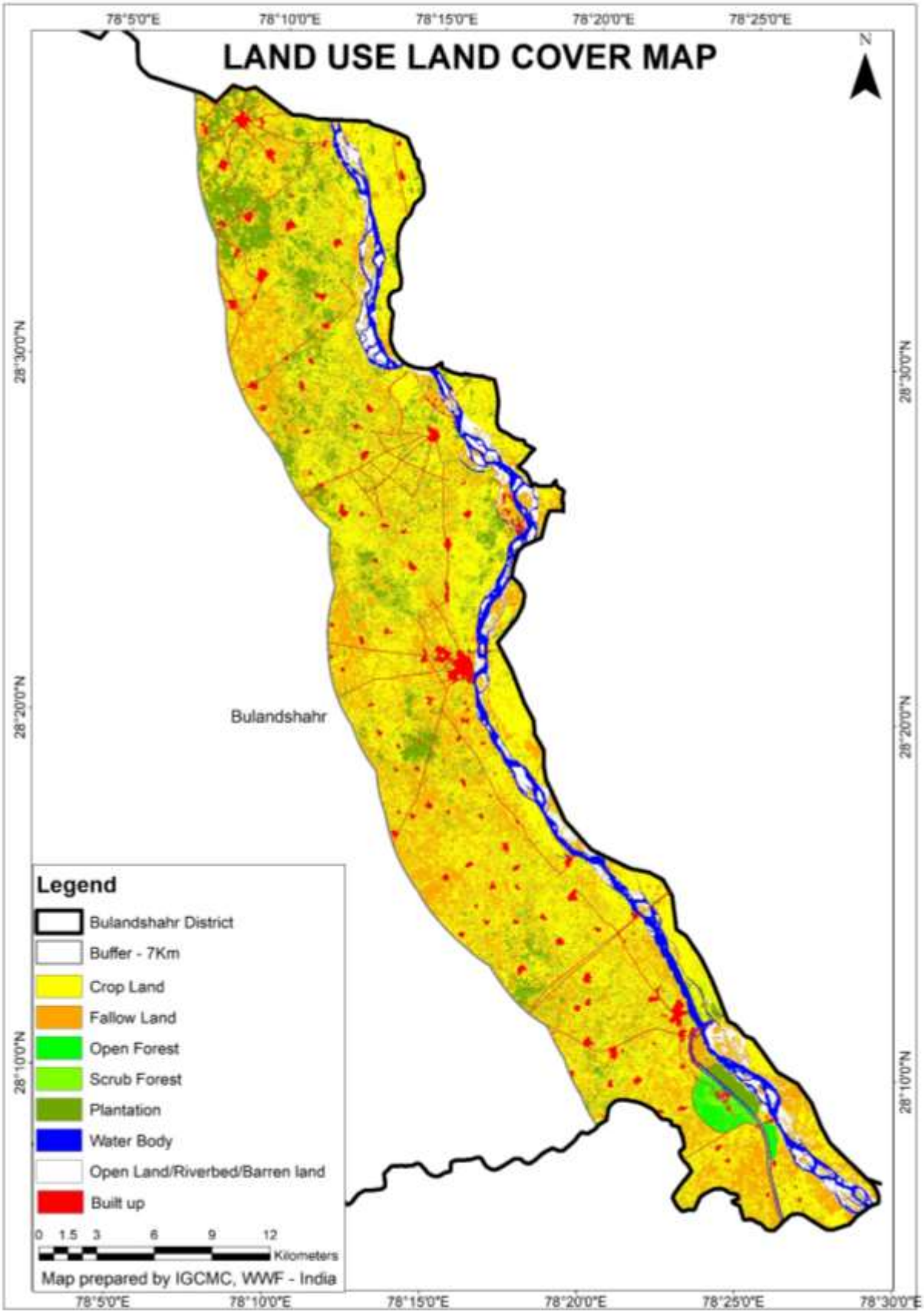
5.1 Land Use Land Cover [LULC] map of the study area has been prepared from Landsat imagery for the year 2020. [Table No.1] Using supervised classification system, 8 different classes were generated – crop land, fallow land, open forest, scrub forest, plantation, waterbody, open land/riverbed/barren land, built-up area [Map 3]. Since agriculture is the primary occupation in the Distt., cropland area dominates other classes.

Major insights are the following :

i. Cropland is the dominant land use with around 50 % of the total area [290 Sq.Km]
ii. Together with fallow land, total area under agriculture is around 75 % [448.39 Sq. km]
iii. Dense forest is nil while open forest is less than 1% [i.e. 3.88 Sq.km]
iv. Plantation- which are specially mango orchards covers around 13% [i.e. 79 Sq.km]
v. Waterbody which also includes river area is around 4.5% [i.e. 27.42%]
vi. Open/Barren/Riverbed occupies 4% while built up includes around 2.5 %

Table 1 : Land Use Land Cover of Study Area in Bulandshahr Distt. [2020]

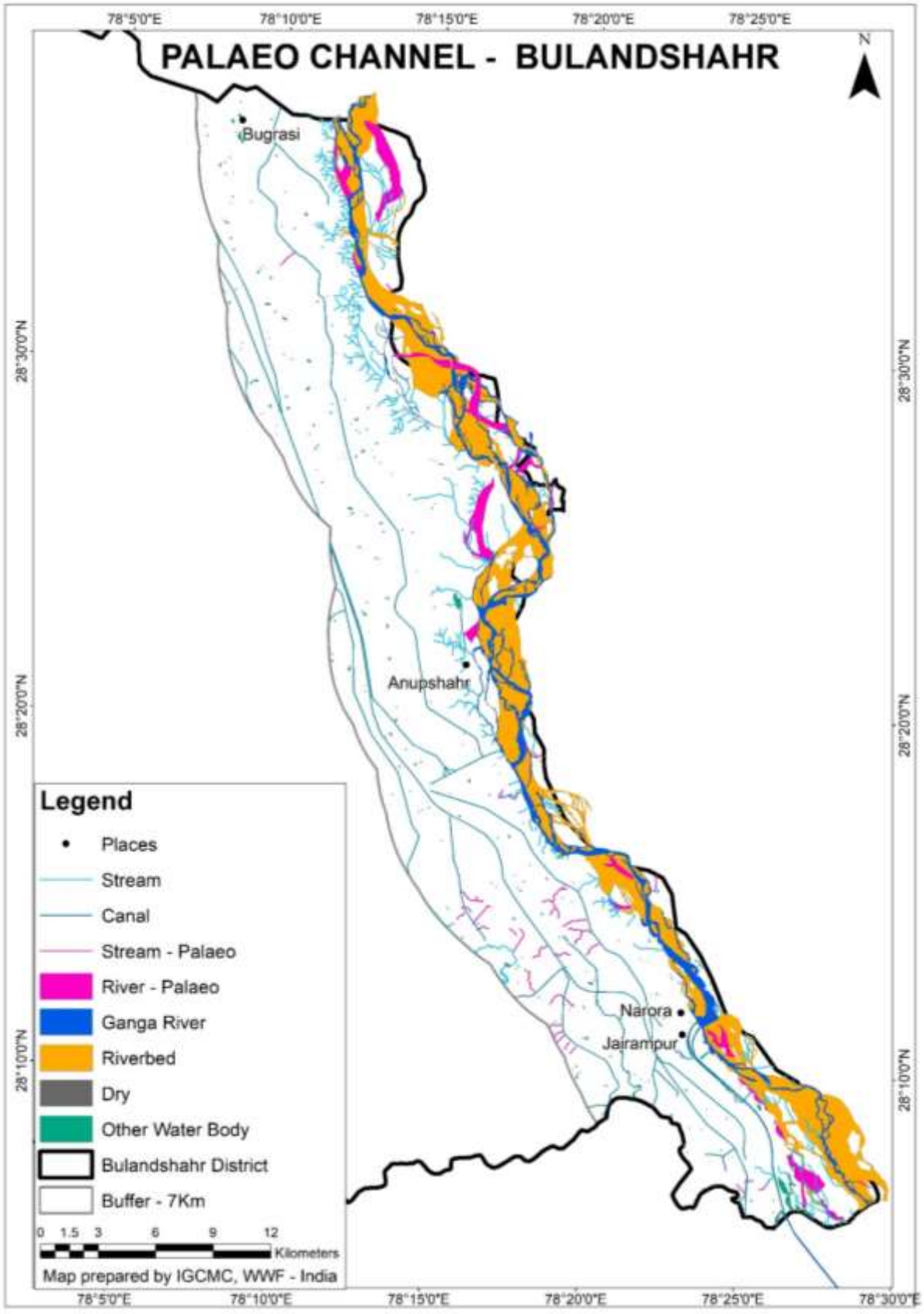
Classes	Area (Ha)	Area (Sq.Km)	Area (%)
Crop Land	29099.10	290.99	48.38
Fallow Land	15740.30	157.40	26.17
Open Forest	388.40	3.88	0.65
Scrub Forest	307.89	3.07	0.51
Plantation	7902.60	79.02	13.14
Water Body	2742.96	27.42	4.56
Open Land/Riverbed/Barren Land	2449.78	24.49	4.07
Built up	1521.03	15.21	2.53
Total	60152.05	601.48	100.00



Map 3 : Land Use Land Cover In Study Area Of Bulandshahr Distt.

6.0 Palaeochannels of Ganga River in Bulandshahr Distt.

6.1 Palaeo-channels are the remnants or old channels of once active rivers or streams, some of which are lie buried under the cover of younger sediments. They are formed when the rivers or streams migrate their courses and form new ones. Paleochannels are important to understand area geology, old river routes, sediment deposition and are considered suitable areas for ground water recharge. Factors such as change in land use pattern, sand mining, agricultural practices, and industrial activities lead to disappearance of such channels along rivers. Generally, such old channels do not carry water during most of the year but may flow during flood events. Such abandoned and silted palaeo-channels can be mapped using old maps and remote sensing techniques. Based on the available satellite data and remote sensing technique, Map No.4 was prepared, which depicts the various palaeochannels in the study area of Bulandshahr Distt..



Map 4 : Palaeochannels In The Study Region

7.0 Floodplain of Ganga River In Bulandshahr Distt.

7.1 The active flood plain of a river is defined as an area on either side of the river channel with regular flooding on a periodic basis. Maintaining active flood plain of a river is critical for assuring equilibrium in ecosystem. The floodplains harbour rich biodiversity including riparian vegetation as well as many other groups of organisms which help in maintaining fertility of this region. Along with this, the floodplains have been of great cultural and economic importance with many early civilizations having risen in these fertile lands. As the rivers naturally meander through the landscape over a period of time, they deposit sand, silt and other soil forming materials in the floodplain region which make them ideal for agricultural production. Throughout history, people have learned to cultivate in the fertile floodplains and use their rich resources for sustaining livelihoods. Even today, in most of the riverine regions especially in India, the floodplains have been occupied by local farmers for carrying out their agricultural activities especially in the non-monsoon season. Ganga River floodplain is one such important floodplain in India which has been extensively utilized in almost all the Distt.s, where it passes through, for agricultural purposes.

7.2 Ganga River floodplains in Bulandshahr Distt. are used for agriculture especially for cucurbits crop such as cucumber, melons, bitter and bottle gourds, tomatoes, pumpkins etc. The agriculture fields could be observed extended up to the edge of the active channel of the river. Agriculture is one of the major sources of income in the Distt. and farmers of floodplain areas are benefitted by the fertile alluvium brought in by the river. Other main crops include rice, wheat, sugarcane, mustard, cabbage, cauliflower, potato, onion, saag etc. Mango orchards are commonly seen around the villages - rarely near the river and are another major source of income for the villagers. Mango varieties such as Chausa, Dushehri, Nadar Manota, Ratol, Ramkela, Husnara, Samarbahist, Langra are grown and sold to local and international market. Trees such as Poplar (*Populus spp.*), *Eucalyptus Spp.,* Teak (*Tectona grandis*), Sheesham (*Dalbergia sissoo*), Peepal (*Ficus religiosa*), Banyan (*Ficus benghalensis*) are also seen in the agriculture fields acting as wind breaks.

Image 2 : Cucurbits Cultivation On River Edge Near Farida Khadar Village
[Note the Sharp Vertical Erosion of the Bank]

Image 3 : Tomatoes And Wheat Fields With Poplar Plantation On Floodplains At Basi

7.3 **Riparian Vegetation:** The floodplains are devoid of any natural riparian vegetation as most of them are being cultivated till the edge of active river channel. At some places patches of floodplain grass *Saccharum spontaneum* L. locally known as 'Kaans' have been observed growing [Image-4]. Saccharum is used to thatch roof in villages at a very small scale – usually for making sheds for cattle or their fodder. They are popularly used for making hedges for cucurbits crop and vegetables [Image-5].

Image 4 : *Saccharum spontaneum* L. Growing On River Bank At Nizampur Khadar

Image 5 : Hedges Of Saccharum In Cucurbits Cultivation On River Island At Anupshahr

Image 6 : Sugarcane Cultivation on Floodplains Near Nizampur Khadar
[Note the Sharp Vertical Erosion of the Bank]

Image 7 : Cauliflower Plantation on Floodplain At Bugrasi Village, Bulandshahr

Image 8 : Mustard Plantation At Bugrasi Village, Bulandshahr

8.0 Wetlands in Bulandshahr Distt.

8.1 Wetlands are highly productive ecosystems and help in maintaining ecological balance by providing food and habitat to large number of living organisms. They also help in controlling floods, recharging groundwater, nutrient recycling, climate stabilization and carbon sequestration. A report 'Wetland Report for Ganga River Basin Management Plan' published in 2012 by consortium of IITs mentions that 57% of the wetlands in Uttar Pradesh are related to river/streams with 181935 ha area approximately followed by 13.6% water logged areas and other wetlands (<2.25 ha). In Distt. Bulandshahr, the total no. of wetlands mentioned are 1243 with 967 wetlands (<2.25 ha) with total area of 9193 ha. River/Stream category constitutes around 54.49% of the total wetland area in the Distt.. Area estimates of Wetlands in Bulandshahr Distt. mentioned in the report is given below in Table No. 2 :

Table 2 : Area Estimates Of Wetlands In Distt. Bulandshahr

S. No.	No. of Wetlands	No. of Wetlands	Total Area	% of Wetland Area
1.	Lakes/Wetlands	37	674	7.33
2.	Ox-bow lakes/cut off meanders	3	49	0.53
3.	Riverine wetlands	2	11	0.12

4.	Waterlogged	134	2101	22.58
5.	River/Stream	10	5009	54.49
6.	Tank/Ponds	90	382	4.16
7.	Wetland (<2.25 ha)	967	967	10.52
	Total	**1243**	**9193**	**100.0**

Source: Wetland Report for Ganga River Basin Management Plan' GRBMP by IITs (2012)

8.2 In current study corridor, a total of 78 wetlands have been mapped with the help of Google Earth satellite imagery and available maps in the study area. The list of mapped wetlands is given in Table No. 3 and their spatial distribution is shown in Map No. 5.

Table 3 : List Of Wetlands In The Study Area

Sr. No.	Wetland Name	Coordinates		Area [in hectares]
		Latitude	Longitude	
01	**01**	28°36'50.60"N	78° 8'22.53"E	4.10
02	**02**	28°36'37.70"N	78° 8'10.40"E	1.53
03	**03**	28°36'11.47"N	78° 8'24.43"E	6.30
04	**04**	28°36'28.37"N	78° 7'17.94"E	0.49
05	**05**	28°36'13.18"N	78° 7'22.19"E	0.54
06	**06**	28°35'50.19"N	78° 9'24.56"E	0.10
07	**07**	28°35'39.37"N	78° 9'35.08"E	1.52
08	**08**	28°35'27.79"N	78° 7'56.59"E	0.39
09	**09**	28°35'14.50"N	78° 8'5.96"E	0.24
10	**10**	28°35'22.64"N	78° 7'49.30"E	1.28
11	**11**	28°34'0.83"N	78° 8'44.35"E	0.58
12	**12**	28°33'59.31"N	78° 8'41.01"E	0.12
13	**13**	28°33'50.24"N	78° 8'55.38"E	1.46
14	**14**	28°33'54.80"N	78° 8'38.12"E	0.24
15	**15**	28°33'46.54"N	78° 8'1.93"E	2.23
16	**16**	28°33'41.79"N	78° 8'53.38"E	0.32
17	**17**	28°33'20.34"N	78° 8'53.71"E	0.23
18	**18**	28°32'59.40"N	78° 8'18.15"E	0.00
19	**19**	28°32'33.28"N	78° 9'14.23"E	0.13
20	**20**	28°32'30.22"N	78° 9'16.95"E	0.18
21	**21**	28°32'12.85"N	78° 9'32.06"E	1.10
22	**22**	28°31'45.80"N	78°11'20.82"E	0.20

23	**23**	28°31'52.46"N	78° 8'24.56"E	0.93
24	**24**	28°31'39.08"N	78° 8'21.79"E	0.57
25	**25**	28°31'47.47"N	78° 8'3.70"E	1.63
26	**26**	28°31'25.13"N	78° 8'15.84"E	0.59
27	**27**	28°31'4.13"N	78° 9'57.86"E	1.64
28	**28**	28°30'56.90"N	78°11'29.05"E	0.71
29	**29**	28°30'11.38"N	78° 8'36.37"E	0.48
30	**30**	28°29'56.55"N	78°10'45.96"E	1.60
31	**31**	28°29'19.25"N	78° 9'3.88"E	2.16
32	**32**	28°29'24.34"N	78°11'32.32"E	0.60
33	**33**	28°29'9.55"N	78°10'46.23"E	1.81
34	**34**	28°28'36.64"N	78° 9'31.70"E	1.58
35	**35**	28°28'38.87"N	78°12'41.70"E	0.79
36	**36**	28°28'17.53"N	78°12'19.29"E	1.37
37	**37**	28°28'0.48"N	78°12'20.08"E	0.20
38	**38**	28°27'55.66"N	78°12'25.98"E	0.46
39	**39**	28°28'0.65"N	78°12'39.40"E	0.36
40	**40**	28°26'51.22"N	78°11'3.82"E	0.45
41	**41**	28°27'25.57"N	78°12'34.51"E	1.96
42	**42**	28°27'14.17"N	78°12'44.02"E	0.31
43	**43**	28°27'1.12"N	78°16'2.11"E	25.6
44	**44**	28°25'36.06"N	78°12'41.48"E	0.22
45	**45**	28°26'4.09"N	78°14'14.93"E	0.77
46	**46**	28°25'23.86"N	78°13'9.86"E	1.14
47	**47**	28°25'9.96"N	78°13'15.20"E	0.67
48	**48**	28°25'50.21"N	78°14'48.72"E	0.47
49	**49**	28°25'12.53"N	78°13'50.46"E	0.63
50	**50**	28°24'25.05"N	78°13'2.23"E	0.73
51	**51**	28°23'15.94"N	78°13'27.18"E	0.89
52	**52**	28°22'36.49"N	78°11'46.26"E	0.40
53	**53**	28°22'30.36"N	78°13'29.01"E	0.96
54	**54**	28°22'9.65"N	78°15'44.21"E	1.51
55	**55**	28°17'50.13"N	78°14'23.71"E	0.41

56	**56**	28°16'35.07"N	78°17'29.04"E	1.22
57	**57**	28°14'36.00"N	78°15'34.03"E	0.63
58	**58**	28°14'50.31"N	78°19'29.81"E	0.34
59	**59**	28°12'53.72"N	78°18'6.16"E	1.32
60	**60**	28°11'35.74"N	78°21'9.48"E	0.39
61	**61**	28°11'1.72"N	78°19'57.17"E	0.33
62	**62**	28°10'59.75"N	78°20'4.93"E	1.66
63	**63**	28° 9'54.51"N	78°19'47.76"E	1.58
64	**64**	28°10'40.41"N	78°21'11.75"E	3.10
65	**65**	28°11'8.77"N	78°23'22.17"E	4.40
66	**66**	28° 8'52.62"N	78°20'38.84"E	0.38
67	**67**	28° 9'42.93"N	78°21'46.91"E	1.23
68	**68**	28°10'36.56"N	78°23'52.69"E	5.65
69	**69**	28°10'35.71"N	78°24'2.42"E	0.55
70	**70**	28° 7'41.88"N	78°24'37.19"E	0.41
71	**71**	28° 6'51.33"N	78°23'29.89"E	1.60
72	**72**	28° 6'43.68"N	78°24'34.67"E	0.50
73	**73**	28°11'49.86"N	78°24'16.56"E	23.1
74	**74**	28°28'53.99"N	78°15'55.35"E	0.62
75	**75**	28°28'43.73"N	78°16'2.83"E	0.76
76	**76**	28°27'3.59"N	78°18'4.06"E	2.90
77	**77**	28° 6'6.70"N	78°26'57.11"E	10.2
78	**78**	28° 7'7.97"N	78°26'40.23"E	0.72
Total Area [in Hectares]				**141.47**

8.3 Unchagaon Talaab : Unchagaon Talaab is located north of Unchagaon village near Unchagaon Fort, right of Jahangirabad-Unchagaon Road [Image-9]. The area of talab is around 2.16 Ha (Lake No. 31 in Table). This is the only waterbody in the village which serve as the waste water absorption pond. The pollution is visible and solid waste was also observed along its edge with the road. There are several trees of Sheesham, Neem, Eucalyptus, and Mangoes along its eastern edge. Several settlements have come up along its southwestern edge along the road which may extend further around the boundary in future. Several resident birds such as Black-winged Stilt (*Himantopus Himantopus*), Common Moorehen (*Gallinula chloropus*), Little Grebe (*Tachybaptus ruficollis*), Indian

Pond Heron (*Ardeola grayii*) and White-breasted Waterhen (*Amaurornis phoenicurus*) were sighted during the field visit. It was reported by the villagers that earlier the size of the pond was comparatively large in size and ducks of various species used to visit during the winters which has become a rare occurrence now.

Image 9 : Location Of Unchagaon Talaab [28°29'19.25"N, 78° 9'3.88"E]

Image 10 : Unchagaon Talaab

Image 11: Black-winged Stilt And Common Moorhen At Unchagaon Talaab

8.4 Pond Near Karanwas : It is a smaller, shallow waterbody located 300 metre from Karanwas village [Southwest] on a smaller road leading to the village [Image-12 &13] . The area of the pond is around 0.40 Ha and rectangular in shape. It is surrounded by the agriculture fields on all its three sides except its north-western edge with the road. There are few trees of Keekar, Sheesham, Eucalyptus, and Mangoes on its edges. The waterbody swells up during monsoon season and the water is drained in the surrounding agriculture fields. Several resident birds such as Common Moorehen (*Gallinula chloropus*), White-breasted Waterhen (*Amaurornis phoenicurus*), Little Grebe (*Tachybaptus ruficollis*), Red-wattled Lapwing (*Vanellus indicus*) and Black-winged Stilt (*Himantopus himantopus*), were sighted during the field visit. Sighting of Bronze-winged Jacana's juvenile indicates the importance of these smaller waterbodies as important habitats in the matrix of agriculture fields. [See Image-14].

Image 12 : Location Of Pond Near Karanwas [28°15'41.44"N, 78°19'18.18"E]

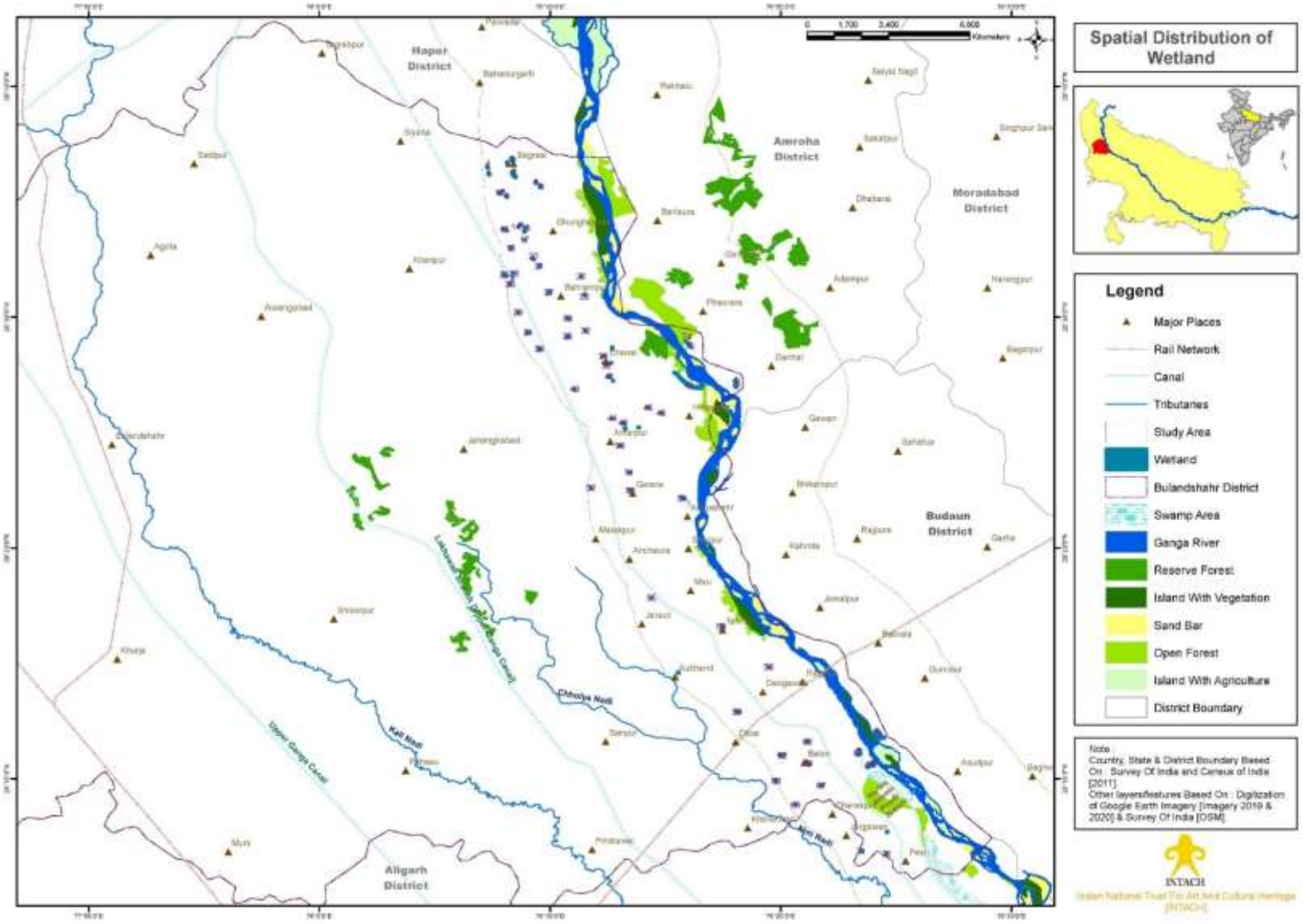

Image 13 : Pond Near Karanwas

Image 14 : Juvenile of Bronze-winged Jacana Sighted At The Karanwas Pond

8.5 Floodplain Lake Near Mohammadpur Khadar : Less than a kilometre, Southeast of Ahar, there is a large floodplain lake at Mohammadpur Khadar village. The area of the lake is around 25.6 Ha (Lake No. 43 in Table). Historical imagery of 1985 on Google Earth reveals that the floodplain lake once was the part of the river which gradually formed by continuous deposition of sand due to sharp curve on the right bank near Ahar [Image-16]. The lake is large and in due course is prone to encroachment by surrounding agriculture fields.

Image 15 : A Large Floodplain Lake Near Mohammadpur Khadar

Image 16 : The Same Floodplain Lake In Year 1985 Was Part Of The River



Map 5 : Spatial Distribution Of Waterbodies In The Study Area

9.0 Riparian Flora Along Ganga River in Bulandshahr Distt.

9.1 The riparian areas, lying between the aquatic and the terrestrial habitats, serve as functional interfaces within the landscapes, mediating energy and matter between these two ecosystems. With dynamic environmental conditions and ecological processes, these areas tend to harbour rich biodiversity. A major component of this biodiversity is the plant communities growing along the river bank which are interacting with both terrestrial and aquatic ecosystems. The riparian vegetation is significant in the overall ecology and environmental aspects of the region owing to its important roles in soil conservation, harbouring faunal diversity and providing livelihood resources [Groffmanet al., 1990; Castelle al., 1994].

9.2 Till some time ago, no proper systematic sampling had been undertaken or record had been maintained for the riparian plant diversity all along Ganga river. There are however, some scattered but significant works of Pallis [1934], Auden [1941], Sahai [1953], Gupta [1960], Bhattacharyya and Goel [1982], Groffmanet al. [1990], Krishanmurti [1991], Castelle al. [1994], Shyam [2008], Gangwar and Joshi [2006] and Gangwar and Gangwar [2011] which have explored the biodiversity of Ganga river basin. Also, a detailed study published in the form of a book titled – "The Ganga – A Scientific Study" edited by Krishnamurti [1991] documents 475 riparian plant species from Rishikesh to Chinasura.

9.3 In Bulandshahr Distt., as mentioned in floodplain section (7.0) of the report above, most of the floodplain area is under agriculture rarely leaving little trace of riparian vegetation. Most of the agriculture fields extend up to the active channel of the river. Patches of floodplain grass *Saccharum spontaneum* L. locally known as 'Kaans' have been observed at some places along the river. The dried grass is used for making hedges, thatch roof and also as fuel for brick kilns. Trees of several species have been noted along the river on the right bank. The list is given below in Table No.4 below:

Table 4 : Main Tree Species Recorded In The Study Area

S. No.	Botanical Name	Common Name	Family
1.	*Ailanthus excelsa*	Maharukh	Simaroubaceae
2.	*Acacia nilotica* L.	Babool/Kikar	Fabaceae
3.	*Azadirachta indica* A. Juss.	Neem	Meliaceae
4.	*Dalbergia sissoo DC.*	Sheesham	Fabaceae
5.	*Ficus religiosa* L.	Peepal	Moraceae
6.	*Ficus benghalensis* L.	Banyan	Moraceae
7.	*Bombax ceiba L.*	Semal	Bombacaceae

8.	*Mangifera indica*	Aam	Anacardiaceae
9.	*Populus spp.*	Poplar	Salicaceae
10.	*Eucalyptus spp.*	Liptis	Myrtaceae
11.	*Phoenix dactylifera L.*	Khajur	Arecaceae
12.	*Tectona grandis* L.f.	Teak/Saagwan	Lamiaceae
13.	*Alsophila dealbata*	Silver Fern	Cyatheaceae
14.	*Delonix regia*	Gulmohar Tree	Fabaceae
15.	*Ziziphus mauritiana*	Indian Jujube	Rhamnaceae
16.	*Melia azedarach*	Bakain	Meliaceae
17.	*Ficus virens*	Pilkhan	Moraceae
18.	*Albizia lebbeck*	Siris	Fabaceae
19.	*Leucaena leucocephala*	Subabool	Fabaceae
20.	*Syzygium cumini*	Jamun	Myrtaceae

Image 17 : Teak Plantation On Banks Of Ganga River At Basi Village

Image 18 : A Banyan Tree Near Ganga River at Narora

Image 19 : Dried Saccharum Grass Kept At A Brick Kiln For Combustion Near Anupshahr

10.0 Faunal Diversity Along Ganga River in Bulandshahr Distt.

10.1 Faunal diversity of the Distt. include common terrestrial mammals such as Nilagai (*Boselaphus tragocamelus*), Indian Jackal (*Canis aureus indicus*), Hyena (*Hyaena hyaena*), Wild Boar (*Sus scrofa*) Hare (*Lepus nigricollis*), Bengal Fox (*Vulpes bengalensis*), Monkey (*Rhesus macaque*) and Langur (*Semnopithecus spp.*). Forests in the Distt. are few and scattered and are not abound in wild animals. As per reports from villagers, Nilgai and wild pig are found in abundance and destroy crops frequently. Monkeys are also found in large numbers and create menace in villages as well as agriculture fields. Some major aquatic fauna found in this stretch of Ganga River stretch have been described briefly below:

10.2 **Gangetic Dolphin** : The Gangetic River Dolphin (*Platanista gangetica gangetica*) is exclusively aquatic and piscivorous, occasionally found in small groups. It is one of the three freshwater dolphin species in the world and is distributed in the Ganga–Brahmaputra–Meghna and Sangu–Karnaphuli River systems in India, Nepal, and Bangladesh (Sinha & Kannan, 2014). It has been declared as the National Aquatic Animal by Govt. of India (Sinha & Kannan, 2014) and is classified as 'Endangered' in the IUCN Red List owing to the decrease in its population in the last 3-4 decades. A joint census[7] carried out in October, 2019 by Uttar Pradesh Forest Department's divisions of 5 Distt.s namely Bijnor, Meerut, Hapur, Amroha and Bulandshahr and WWF-India recorded 36 dolphins which also included 3 calves. Most of them (31) were recorded in Hastinapur Wildlife Sanctuary which stretches from Bijnor Ganga Barrage to Garhmukteshwar.

10.3 Based on the interactions with local people, it was found that most of the dolphins are sighted near Narora and Garmukhteshwar at Hapur. Occasional sightings are reported from elsewhere in the Bulandshahr Distt. stretch of Ganga when the water level is high, especially during monsoon season. Major threats to the dolphin in the Distt. are low flow in the river in summer season and thus decreased depth and pools, fishing using nylon nets and increasing pollution through floodplain agriculture.

10.4 **Gharial** : Indian Gharial (scientifically known as *Gavialis gangeticus*) is the only surviving member of an ancient family of crocodiles found to reside mainly in Indian sub-continent. It derives its popular name – gharial or gavial from the bulbous knob like protuberance on a breeding male's snout which resembles a 'Ghara' meaning an earthen pitcher (Saikia, 2012). This species is endemic to the Indian sub-continent and is considered to be 'Critically Endangered' in the IUCN Red List. Once distributed across

[7] With three calves, Ganges dolphin population up to 36 in UP, Times of India, Oct.16, 2019

several major river systems in India and neighbouring countries, this species has seen an estimated 96-98% decline in its population owing and is now restricted to only few scattered locations in India and Nepal (Sinha, 2018).

10.5 Earlier records of Gharial in Bulandshahr Distt. comes from October, 1994 when three Gharials were reported downstream of Narora Barrage. Later, Rao (1995) conducted a survey in the river Ganga and found a significant record of adult Gharial from Anupshahr in Distt. Bulandshahar. These findings were attributed to the 225 captive reared Gharial released by the Uttar Forest Department in the Ganga river upstream of Bijnor in the Hastinapur Wildlife Sanctuary in the year 1991-92[8]. Later on, another batch of 678 Gharials was released in 2015 near Makhdoompur village in Hastinapur Wildlife Sanctuary – out of which only 16 Gharials survived[9]. During current study, no gharial or crocodile was sighted, however according to local people there were occasional sightings 10-15 years back on the river islands or banks.

10.6 **Turtles :** India is one of the world's hotspots for turtle diversity representing 29 species of tortoises and freshwater turtles among which 13 different species find their abode in the Ganga river system. These turtles play a significant role in the river by scavenging dead organic material and diseases fish, controlling fish population as predators and controlling aquatic plants and weeds (WII, 2017). Variety of habitats such as muddy and sand banks, islands, varying depth of water in Ganga, and floodplain lakes supports chelonian diversity but major threats such as floodplain agriculture, increasing pollution, irregular flow of water and sandmining activities are altering their habitats and thus their population is continuing to decline. During the field visit, during boat survey from Basi village to Mandu, three turtles were sighted – two Indian Flapshell Turtle (*Lissemys punctata*) on river bank and one Brown Roofed Turtle (*Pangshura smithii*) on the river island (See Image No. 20) Near the Brown Roofed Turtle, one snake was also seen which could not be identified. Fishermen revealed, turtles of different types are frequently seen basking on the banks and islands – mostly visible on the sandbars when water recedes.

10.7 **Avian Diversity :** The Distt. seem to have rich diversity of birds. During field survey, the diversity of avian species was recorded using binoculars and identified using field guides (Grimmett et al., 2016 and others). During the field visit, a total of 54 bird species were sighted. Out of which 21 are aquatic species and remaining 33 are terrestrial birds [Table-5].

[8] Status of Higher vertebrates in the Ganga River : Ganga River Basin Environment Management Plan by IITs, June 2012

[9] WWF rescues Gharial trapped in Ganga canal after gates shut monsoon. Oct.28, 2017

10.8 Important observations are:

1. Most of the aquatic species were sighted on rivers islands and exposed riverbeds.

2. Two bird species – Painted Stork and River Lapwing fall under IUCN's 'Near Threatened' category and Black-bellied Tern fall under 'Endangered Category'.

3. Ruddy Shelduck, River Lapwing, White-throated Kingfisher, Grey Heron, Indian Pond Heron, Cattle Egret, Cormorants were frequently sighted in the river.

4. Common Coot, Black-winged Stilt, Little Grebe, Indian Pond Heron, Painted Stork, Purple Swamphen, Common Moorehen, White-breasted Waterhen, Red-wattled Lapwing were sighted in waterbodies and depressions.

5. Black-Ibis, Greater Coucal, Cattle Egret, Indian Peafowl were frequently sighted in agriculture fields.

Table 5 : List Of Birds Sighted During Field Visit

S. No.	Common Name	Scientific Name	Conservation Status
1.	Ruddy Shelduck	*Tadorna ferruginea*	Least Concern
2.	White throated Kingfisher	*Halcyon smyrnensis*	Least Concern
3.	Asian Openbill	*Anastomus oscitans*	Least Concern
4.	Little Cormorant	*Microcarbo niger*	Least Concern
5.	Indian Cormorant	*Phalacrocorax fuscicollis*	Least Concern
6.	White breasted -Waterhen	*Amaurornis phoenicurus*	Least Concern
7.	Indian Pond Heron	*Ardeola grayii*	Least Concern
8.	Cattle Egret	*Bubulcus ibis*	Least Concern
9.	Little Egret	*Egretta garzetta*	Least Concern
10.	Great Egret	*Ardea alba*	Least Concern
11.	Little Grebe	*Tachybaptus ruficollis*	Least Concern
12.	**Painted Stork**	***Mycteria leucocephala***	**Near Threatened**
13.	**River Lapwing**	***Vanellus duvaucelii***	**Near Threatened**
14.	Yellow-wattled Lapwing	*Vanellus malabaricus*	Least Concern
15.	Red-wattled Lapwing	*Vanellus indicus*	Least Concern
16.	Grey Heron	*Ardea cinerea*	Least Concern
17.	Purple Swamphen	*Porphyrio porphyrio*	Least Concern
18.	Common Moorehen	*Gallinula chloropus*	Least Concern
19.	Common Coot	*Fulica atra*	Least Concern

20.	Bronze-winged Jacana	*Metopidius indicus*	Least Concern
21.	**Black-bellied Tern**	***Sterna acuticauda***	**Endangered**
22.	Black Drongo	*Dicrurus macrocercus*	Least Concern
23.	Bank Myna	*Acridotheres ginginianus*	Least Concern
24.	Common Myna	*Acridotheres tristis*	Least Concern
25.	Oriental Dove	*Streptopelia orientalis*	Least Concern
26.	Spotted Dove	*Spilopelia chinesis*	Least Concern
27.	Black-winged Kite	Elanus caeruleus	Least Concern
28.	Shikra	*Accipiter badius*	Least Concern
29.	Asian Koel	*Eudynamys scolopaceus*	Least Concern
30.	Greater Coucal	*Centropus sinensis*	Least Concern
31.	Red-vented Bulbul	*Pycnonotus cafer*	Least Concern
32.	Red-whiskered Bulbul	*Pycnonotus jocosus*	Least Concern
33.	Oriental Magpie Robin	*Copsychus saularis*	Least Concern
34.	Indian Robin	*Saxicoloides fulicatus*	Least Concern
35.	Common Pigeon	*Columba livia*	Least Concern
36.	Coppersmith Barbet	*Psilopogon haemacephalus*	Least Concern
37.	House Sparrow	*Passer domesticus*	Least Concern
38.	Indian Jungle Crow	*Corvus culminatus*	Least Concern
39.	House Crow	*Corvus splendens*	Least Concern
40.	Plain Prinia	*Prinia inornata*	Least Concern
41.	Rose-ringed Parakeet	*Psittacula krameri*	Least Concern
42.	Common Tailorbird	*Orthotomus sutorius*	Least Concern
43.	Indian Silverbill	*Euodice malabarica*	Least Concern
44.	Yellow Wagtail	*Motacilla flava*	Least Concern
45.	White-browed Wagtail	*Motacilla maderaspatensis*	Least Concern
46.	White Wagtail	*Motacilla alba*	Least Concern
47.	Indian Bushlark	*Mirafra erythroptera*	Least Concern
48.	Oriental Skylark	*Alauda gulgula*	Least Concern
49.	Jungle Babbler	*Turdoides striata*	Least Concern
50.	Asian Pied Starling	*Gracupica contra*	Least Concern
51.	Common Stonechat	*Saxicola torquatus*	Least Concern
52.	Black Drongo	*Dicrurus macrocercus*	Least Concern
53.	Common Koel	*Eudynamys scolopaceus*	Least Concern
54.	Indian Peafowl	*Pavo cristatus*	Least Concern

Image 20 : Brown Roofed Turtle and Snake Sighted On An Island Near Mandu

Image 21 : Ruddy Shelducks (*Tadorna ferruginea*) Sighted Near Nizampur Khadar

Image 22 : Black Kite (*Milvus migrans*) Sighted On An Island Near Basi Village

Image 23 : Common Sandpiper, Grey Heron, and Black-bellied Terns On A River Island

11.0 Ganga Riverine Islands in Bulandshahr Distt.

11.1 The riverine fluvial islands are present in many major rivers and are defined as 'land masses within a river channel that are separated from the floodplain by water on all sides and exhibiting some kind of stability' [Osterkamp, 1998]. Such islands may not be permanent on the geologic time scale owing to the river meandering, climate change, etc. but can remain in place over decadal or century time scales and hence exhibit stability [Wyrick & Klingeman, 2011]. Islands are generally formed by sand or sediments mass by currents during higher level of river flow and are exposed during dry season. River islands provide habitat to a large variety of living organisms such as birds, butterflies, insects and smaller mammals.

11.2 During the field visit it was observed that in Bulandshahr stretch of Ganga River, there are many exposed and semi exposed river islands of varying shape and size. As per the fluvial island classification proposed by Wyrick & Klingeman (2011), the islands here would be fall under 'Braided' category – which means many channels divided by islands and bars, which may be washed out in high flows. These islands and sandbars get immersed with the increased water flow in river – especially during monsoon season along with the river channels in between them. Such sand bars make it difficult for motor boats to navigate through as their outboard motor with propellor fan gets stuck in the sand. Local boatmen and fishermen identify these channels with the help of long bamboo or wooden pole which they use to propel their boats [Image-24].

Image 24 : A Farmer Propelling His Wooden Boat By A Bamboo Pole Near Village Basi

11.3 In Bulandshahr, most of the river islands are used for agriculture by local farmers except smaller or less stable ones. They are locally known as *'Taapu'*. Cucurbits such as cucumber, melons, bitter and bottle gourds, tomatoes, pumpkins are grown. Smaller wooden boats are used for to and fro movement from the main land. During boat visit from Basi village to Mandu, it was observed that most of the birds were sighted on smaller islands which act as safe refuge with no disturbance from the farmers. The same islands are used by turtles and snakes. As mentioned in Faunal Diversity section, a Brown-roofed Turtle and a snake were sighted at an island near Mandu. The width of the islands varies between 100-500 m and length 800 m to 1 km as observed via Google Earth's satellite imagery. [See Image 26 and 27]

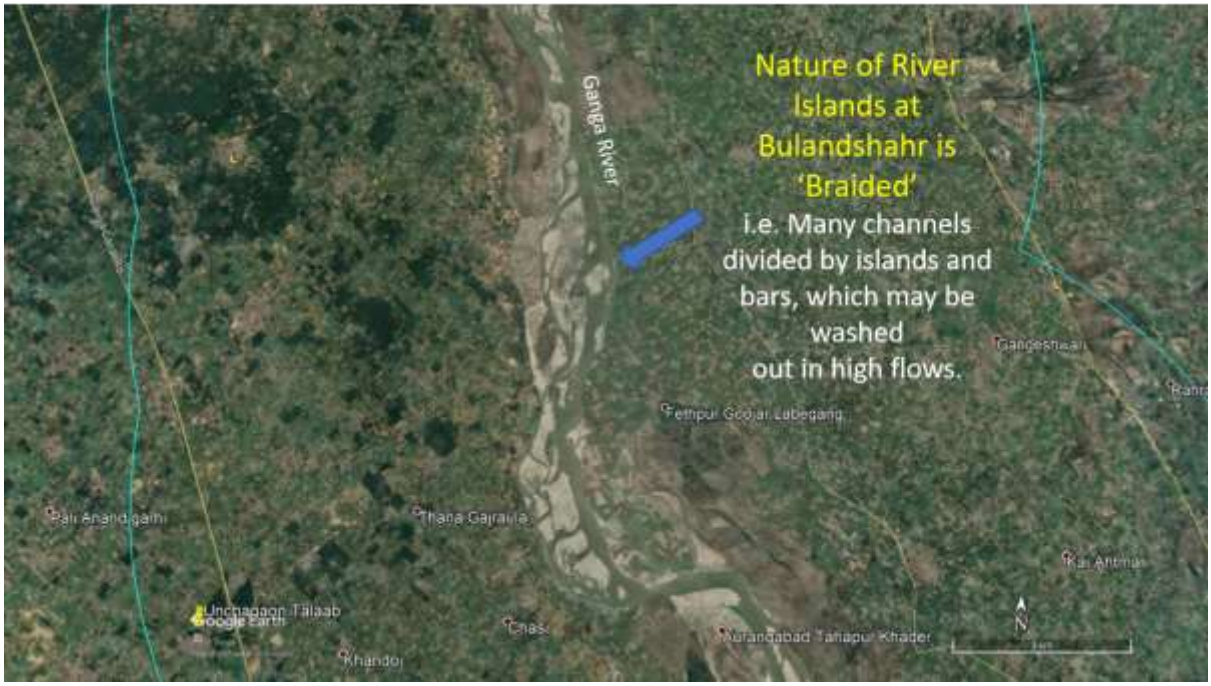


Image 25 : Islands As Seen Through Google Earth Image In Ganga River At Bulandshahr
[Source : Google Earth Imagery, 2020]

Image 26 : Cucurbit Crop Seen On River Island In Ganga River At Bulandshahr
[Source : Google Earth Imagery, 2020]

Image 27 : River Islands And Smaller Channels In Ganga Between Mandu And Chasi
[Source : Google Earth Imagery, 2020]

Image 28 : Cucurbits Cultivation On A Large River Island At Anupshahr
[Note the Sharp Vertical Erosion of the Bank]

12.0 Fishing in Bulandshahr Distt.

12.1 Fish resources of Ganga river have been an important source of livelihood and food security for millions of people residing along its banks. Ganga river supports a diverse fish fauna with about 260 species reported for Indian waters (Sinha and Khan, 2001) among which about 35 species have been identified as having highest commercial value including carps (Cyprinidae), snakeheads (Channidae) and catfish (Siluriformes) (Islam et al., 2006). However, today these rich fish resources are threatened by various anthropogenic activities and resulting water pollution, accumulation of heavy metals, eutrophication, damming, alteration of hydrology and introduction of exotic species (Tripathi et al., 2017).

12.2 Fishing is an important source of income for fishermen and daily wagers in Bulandshahr Distt.. Fishing is also a kind of recreational activity preferred by some young locals. It is done with the help of wooden or iron boats using nets made of jute or plastic ropes. Fishing with the help of spears is also done, which is an evening sport carried out with the help of battery torches especially during summers or post monsoon season. Fishing is also carried out by rods and plastic threads. Fish captured by fishermen are sold in the local markets and occasionally out of the Distt.. The most common fish species are Rohu (*Labeo*

rohita), Catla (*Labeo catla*), Carp (*Cyprinus carpio*), Singhi (*Heteroneustes fossilis*), *Sidhari* (*Puntius sarana*) and Singhara (S. seenghala) [Table No.6]. Mahaseer or Golden Mahaseer (*Tor tor*) is also popularly known to exist in this stretch of Ganga.

12.3 Upon interaction with local fishermen, it was found that the diversity of fish has decreased, primarily due to fluctuation in water availability round the year. The water level goes down significantly during summer season [May-June] and the river swells up during up monsoon season [July-August]. The fish availability and diversity also increase during the monsoon season. Fish species such as Hilsa and Bata were common earlier and are of rare occurrence in the river presently. Other factors known to the local fishermen are over-exploitation of fisheries, barrages and increasing pollution in the Ganga.

Table 6 : Riverine Fish Common in Bulandshahr Distt.

S. No.	Common Name	Scientific Name
1.	Rohu	*Labeo rohita*
2.	Catla	*Labeo catla*
3.	Carp	*Cyprinus carpio*
4.	Garai/Girai	*Channa punctata*
5.	Tengara	*Mystus tengara*
6.	Mahaseer	*Tor tor*
7.	Sidhari	*Puntius sarana*
8.	Gonch	*Bagarius bagarius*
9.	Sauli	*Channa marulius*
10.	Nain	*Cirrhinus mrigala*
11.	Singhi	*Heteroneustes fossilis*
12.	Singhara	*Sperata seenghala*

Image 29 : A Local With A Grass Carp At Bugrasi Village

A B

Image 30 : (A) Thread Fishing Technique Used Locally (B) Indian Carp Near Basi Village

Image 31 : A Cat Fish Caught With A Rope Net

13.0 Groundwater Condition In Bulandshahr Distt.

13.1 Bulandshahr Distt. is a part of Central Ganga alluvial plain where the area is underlain by alluvial deposits of Quaternary age. The thickness of unconsolidated sediments which also include Quaternary alluvium may range between 400m and 600 m as revealed by CGWB drilling records and ONGC data. Mixed sediments occur down to 20 m and support large number of dug wells. The depth of dug wells range between 6-20 m. Ground water flows from NNW to SSE following the general surface drainage pattern. Upper Ganga Canal contributes a substantially to ground water reservoir. Upper Ganga Canal more or less coincides with the ground water divide[10].

13.2 A perusal of depth to water levels for the period of May, 2012 from Distt. Groundwater Brochure of Bulandshahr Distt., CGWB [2012-2013][11] reveals that groundwater level varies from 4.96 mbgl at Nandpur, Dibai block to 11.25 mbgl at Bara Ferozpur in Syana block. Both Syana and Dibai block have their eastern boundaries with Ganga River. As per ground water brochure, the regional subsurface disposition of aquifer system based on lithological logs and electrical logs is as follows :

a) 1st Aquifer – below 120 mbgl – Fresh – Semi-confined to confined
b) 2nd Aquifer – 160-220 mbgl – Fresh – Confined
c) 3rd Aquifer – 240-450 mbgl – Quality not good – Confined

13.3 The irrigation in the Distt. is done by means of minor irrigation structures such as tube wells, cavity tube wells, occasionally dug wells and surface water irrigation systems especially canals. Canal network in the Distt. has a length of 1879 km and there are 466 Govt. tube wells. In the Distt., 90% [240984 Ha] of the area is irrigated by groundwater and only 10% [25575 Ha] area is irrigated by canals. [Distt. Groundwater Brochure, 2012-2013]. Groundwater levels recorded during the survey in some of the villages is given below:

Table 7 : Groundwater Levels of Some Villages in Bulandshahr Distt.

S. No.	Village	Coordinates		Depth to Water Table in Feet
		Lat.	Long.	
1.	Bugrasi	28°36'43.58"N	78° 8'26.87"E	30-40 ft.
2.	Basi	28°36'6.12"N	78°11'11.29"E	15-20 ft.
3.	Ghungrwali	28°33'47.00"N	78°10'9.52"E	30-40 ft.

[10] District Groundwater Brochure, Bulandshahr [2012-2013], CGWB, Lucknow
[11] District Groundwater Brochure, Bulandshahr [2012-2013], CGWB, Lucknow

4.	Mandu	28°31'24.43"N	78°12'15.47"E	10-15 ft.
5.	Ahar	28°27'55.61"N	78°14'54.17"E	10-15 ft.
6.	Anupshahr	28°21'25.09"N	78°16'0.62"E	30-50 ft.
7.	Karanwas	28°16'0.67"N	78°19'28.19"E	20-50 ft.

Image 32 : Upper Ganga Canal – Anupshahr Branch Near Unchagaon
[Note the Siltation of the Canal]

14.0 Ganga Bank Erosion in Bulandshahr Distt.

14.1 Weathering of soils by natural forces is both constructive and destructive. Erosion is the chief agent responsible for the natural topographic cycles as it wears down higher elevations, banks (lateral erosion) and deposits sediments in the plains. However, erosion gets aggravated due to human interventions through change in land use, excessive grazing, extensive farming, cultivation without taking proper conservation measures, destruction of forest and riparian vegetation. It is well known that exposed soil may erode rapidly (Singh et al., 2004).

14.2 In a recent attempt to make river banks greener, the Uttar Pradesh state govt. has planted more than 2.2 Crore trees along river banks as a part of annual plantation drive. The rivers include Ganga, Yamuna, Gomti, Rapti, Ghaghra, Saryu, Sharda, Tamsa, Varuna, Betwa

and others. The Ganga river has got the maximum- around 67 lakh trees and the plantation has been done in all the 27 Distt.s in the state as noted by Times of India [August 20, 2020][12]. ***However, this exercise cannot prevent bank erosion which is preventable only through the binding of an extensive root system as available in native riparian grasses.***

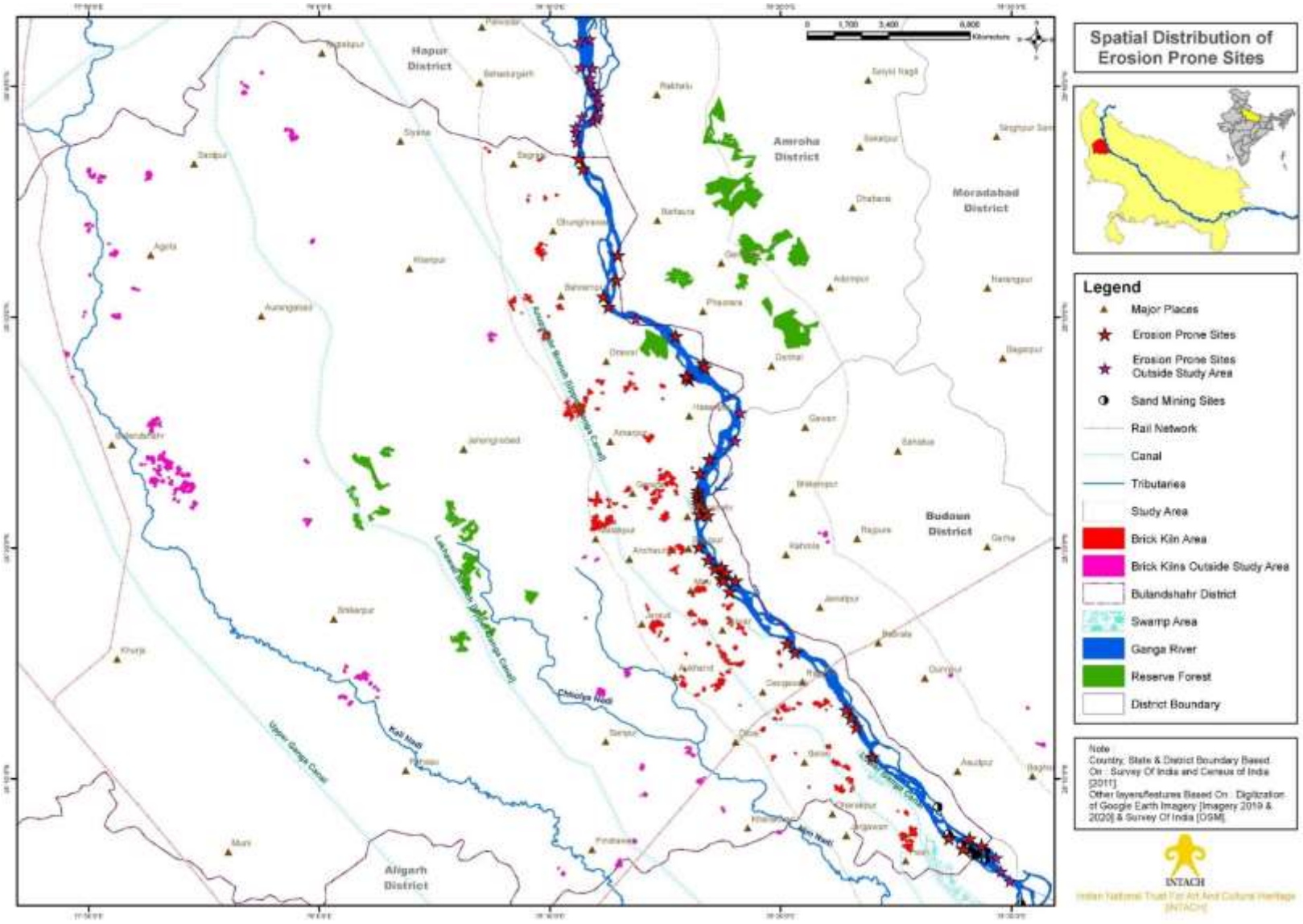
14.3 As assessed from the Google Earth imagery [2020], the major erosion prone sites on Ganga River in Bulandshahr Distt. are located upstream of Anupshahr where Ganga, while flowing Southwest, takes a turn to the south [See Map No.6]. Another erosion prone zone is near Karanwas village where Ganga moves Southeast. During boat survey from Basi to Mandu, many such erosion sites were observed with low to moderate erosion. Absence of riparian vegetation is a major driver for such erosion. The locals informed about the annual inundation of river bank area which erodes enormous parts of their agriculture land. They call it *'Kataav'* which means bank erosion. Due to this reason, the Mango orchards are found away from the river banks, while poplar and eucalyptus trees are grown near to the bank as they require more water for their growth and are good source of secondary income. Many agriculture fields near the river bank were seen with their boundaries dotted with poplar or eucalyptus trees. [See Image No.35]

Image 33 : Lateral Bank Erosion Near Nizampur

[12] River banks made greener in Uttar Pradesh. Aug.20, 2020. Times of India

Image 34 : Bank Erosion Near Farida Khadar

Image 35 : Poplar and Eucalyptus Trees Surrounding Agriculture Fields Near Basi



Map 6 : Spatial Distribution Of Erosion Prone Sites In The Study Region

15.0 Mining And Brick Kilns In Bulandshahr Distt.

15.1 **Sand Mining** : Sand is major mineral resource extracted from the Ganga River, especially in its mid and lower stretch. The demand is ever increasing due to rapid expansion of settlements and their upgradation across the country. Often carried out illegally and excessively to earn large profits, sand mining is altering rivers' overall health. Excessive sand mining results in the destruction of aquatic and riparian habitats and also poses threat to bridges, river banks and nearby structures[13]. In Bulandshahr, sand mining is carried by locals as well as sand mafia and the issue has been in news until last year. However, large scale sand mining activity or mined sand beds were not observed during the field visit – which may be due to better flow in the river in winters. [January, 2021]. Small scale sand mining from river banks by bullock carts was observed near Basi village. [See Image-36]. A few areas of commercially mining have been marked in the map [Map No.6] on the basis of Google Earth satellite imagery [2020] – one of which is near Jasupur Ganj. [See Image-37]

Image 36 : Loading Sand On Bullock Cart Near Ganga Bank at Basi Village

[13] Impacts of Sand Mining. ENVIS Centre on Environmental Problems of Mining, IIT Dhanbad, Jharkhand

Image 37 : Sand Mining Area Near Jasupur Ganj, Downstream of Narora Barrage

15.2 **Brick Kilns:** Brick making is one of the major economic activities in the Distt., providing employment to many daily wage workers. With rapid urbanisation, bricks have become important building material with ever increasing demand. However, the industry has current and future implications for the soil, agriculture land and air quality of the region. Except few, most of the brick kilns were found situated away from the Ganga River – often in a cluster of 2 to 4 units. This is apparently to maintain the distance obligations from roads, railways, villages, mango orchards etc. set in 'The Uttar Pradesh Brick Kilns (Siting Criteria from Establishment) Rules 2011'. However, there is no mention of distance from river, floodplains or a waterbody in these rules.

16.0 Boatmaking in Bulandshahr Distt.

16.1 Boatmaking is not a popular profession or income source in the Distt.. Several fishermen or farmers whose livelihoods depend on the fishing or floodplain farming keep the smaller wooden boats. These are made by local carpenters (wooden boat) and blacksmith (iron boat – thick gauge GI sheet) who get such work occasionally. Upon interaction with the blacksmith, it was learnt that an iron boat with motor costs around Rs. 1,60,000 and without motor between Rs. 70,000-80,000. A simple wooden boat would cost around Rs.

50,000. Now a days, wooden boats are being replaced by boats made up of iron because of their longevity and fewer leakage issues. Some boats owned by local people are used to ferry people during festivals such as '*Chhat Puja*' or other religious ceremonies. These boats are made of iron, and are larger than wooden boats, with a shed and chairs fixed. Several sacred places at Mandu and Ahar are visited by people through these boats.

Image 38 : A Local Blacksmith Making An Iron Boat In Bugrasi, Bulandshahr

Image 39 : A Colorful Metal Boat Parked At Rajghat, Bulandshahr

Image 40 : Motorboat Used During The Ganga Survey At Bulandshahr Distt.

17.0 Sacred Sites in Bulandshahr Distt.

17.1 **Mandu and Siddhwari Sacred Grove :** Two sacred groves i.e. Mandu and Siddhwari are located along the Ganga River in this Distt.. The same have been mentioned by Garg and Singh (2013, a & b) of Botanical Survey of India, Allahabad. Mandu Sacred Grove is located on the right bank, around 6 km from Unchagaon Fort in Bulandshahar Distt. The grove spreads in about 9 ha area with 3 ha core zone of primary forested patch and 6 ha buffer zone. It harbours 11 tree species, 10 medicinally important herbs and 5 species of the climbers. There is a large 'Banyan Tree' (*Ficus benghalensis*) with aerial prop roots which makes this tree visually distinct. The place is considered sacred by villagers and the trees are worshipped. Siddhwari sacred grove is located at a distance of about 8 km downstream of Narora Atomic Power Station on left bank of the river. It occupies an area of about 7 ha with 2 ha core and 5 ha of buffer zone. It harbours 12 different trees species, 4 shrubs, 6 medicinally important herbs and 5 species of climbers. It is also considered sacred by the people and also has a characteristic old Banyan tree (*Ficus benghalensis*) which is locally known as *Siddha Vriksha*.

Image 41 : A Large Banyan Tree With Aerial Prop Roots At Mandu Sacred Grove

Image 42 : Temple Complex At Mandu Sacred Grove

17.2 **Baba Mastram Ganga Ghat :** Baba Mastram Ganga Ghat was constructed by JayPee Group on the banks of Ganga River around 1 km downstream of Anupshahr town. The ghat is popular in the Distt. for having the best features such as properly maintained lawns, statues, separate bathing sections for male and females. It has an area of around 6 Ha. It is named after a locally revered saint 'Baba Mastram' whose 'Samadhi' is located South in the complex. The complex also has a tall 'Shri Hanuman' Statue in the North and of 'Goddess Ganga' in the South. The ghat attracts large crowd during the occasion of Chhat Puja and Kartik Purnima.

Image 43 : Entrance Of Baba Mastram Ganga Ghat

Image 44 : Hanuman Statue At Baba Mastram Ganga Ghat

Image 45 : Samadhi Of Baba Mastram At Baba Mastram Ganga Ghat

17.3 **Har Har Mahadev Mandir :** It is a temple complex situated Southwest to Baba Mastram Ghat. It has also been constructed by JayPee Group. The temple complex has a 'Shivlinga' inside and there are two fountain lawns on its North and South. It has an area of around 0.6 Ha.

Image 46 : Har Har Mahadev Mandir at Anupshahr

17.4 **Rajghat :** It is another popular and comparatively old Ghat on the bank of Ganga River in Bulandshahr. Located around 18 km downstream of Anupshahr along Ganga River. The ghat has a crematorium and a temple known as 'Shri Gangeshwar Mahadev Mandir' dedicated to Lord Shiva. The ghat has many local shops selling ceremonial stuff and food items. There is an old and functional railway bridge here connecting Aligarh and Chandausi.

Image 47 : Entrance At Rajghat With A Statue Of Goddess Ganga

Image 48 : Shri Gangeshwar Mahadev Mandir At Rajghat

18.0 Inland Navigation in Bulandshahr Distt.

18.1 The Ganga river in Bulandshahr Distt. is navigable most of the months except in spring and summers when it becomes shallow at some places with emergent sand bars making navigation difficult. River route is hardly used by people to travel downstream. However, people used to cross river via boats to reach villages situated on the left bank. But with the construction of the bridge at Bhagwanpur, people use river route occasionally. The Bulandshahr Gazetteer of 1903[14] mentions about navigation : "The Ganges is generally navigable all the year round, although in February and March it becomes very shallow in places. Navigation has, however, been greatly impeded of late years by the construction of the headworks of the Lower Ganges Canal at Narora, which practically forms a bar to through traffic."

Image 49 : Villagers Commuting By Boat Near Basi, Bulandshahr

[14] Bulandshahr – A Gazetteer being Volume V of the District Gazetteers of the United Provinces of Agra and Oudh by H.R. Nevill, I.C.S., Allahabad [1903]

19.0 Key Observations and Recommendations

19.1 Cremation : Cremation of dead bodies and immersion of their remains is quite common along the Ganga River. Though are proper cremation centres in major towns such as Anupshahr and Narora, villagers living near to river carry out cremation at their nearest river banks. This, on a daily basis is contributing to the pollution levels in the river. Distt. authorities should encourage villagers to cremate at the designated crematorium facilities.

Image 50 : Villagers Preparing For Cremation Of A Dead Body Near Nizampur Khadar

19.2 Riparian Flora : All along the Ganga River in Bulandshahr, the river banks are devoid of riparian vegetation. Most of the floodplain area is under agriculture rarely leaving any trace of riparian flora except floodplain *Saccharum spontaneum* L. which is retained for its multiple uses. Most of the agriculture fields extend up to the active channel of the river. Absence of riparian vegetation promote biodiversity loss, bank erosion and sand mining. It is recommended that Distt. and state authorities should take a note of it and take measures to regulate use of river banks. Floodplain farmers may be persuaded to adopt agroforestry practices.

19.3 Protection for River Islands : As mentioned in the Faunal Diversity section [10.0], river islands were observed to have better diversity of birds and as safe habitats for turtles and snakes. Such islands and exposed sand-beds should be seen as refuges for biodiversity. River islands must be protected. Agriculture practices on such islands and sand-beds should be curbed and a central 'River Island Policy' must be drafted. Any conservation planning or initiative for rivers in the state should consider protection of islands an important priority.

19.4 Sand Mining : Sand mining should be curbed completely. Small scale mining on a daily basis via bullock carts would alter river banks significantly in long term. Distt. authorities may utilise Google Earth and drones to keep themselves updated. Excessive sand mined areas could be easily spotted from the Google Earth or other satellite imageries.

19.5 Gangetic Dolphin: The Bulandshahr stretch of Ganga is an important habitat of Gangetic Dolphin, which is endangered as per IUCN Red List and comes under Schedule-I of Wildlife Protection Act, 1972. Considering the recent incidents of killing of Gangetic Dolphins in Bulandshar, the Distt. administration along with forest department should consider carrying out an awareness drive on a half-yearly or annual basis. Annual surveys should also be carried out by the Forest Department or Distt. administration.

19.6 Nilgai and Wild Boar : Crop raiding by Blue Bull [Nilgai] Nilgai and Wild Boars has been a regular issue in the Distt. for last some years. Upon interaction with farmers, it was known that population of Nilgai has increased manifold as their hunting is prohibited in the state. They live in a group of 10-20 and destroy crops on a daily basis. Crops such as maize, mustard, potato, tomato, and other vegetables are frequently destroyed. It's a growing concern especially for farmers with small landholdings. The issue has also been highlighted by online and print media[15] in the Distt. The govt. must act and find a solution in order to avert future human-wildlife conflict.

19.7 Temples, Ghats and Sacred Groves on Distt. Tourism Map : Considering the historical importance of the Distt. and presence of various ghats, temples and sacred groves, the Distt. should be highlighted by a Distt. tourism map and brochures. Information on connectivity, distance and itinerary would help the tourist to plan in advance. Such maps and information brochures should be made available at places already frequented by domestic and international tourists in the Distt. such as Unchagaon Fort. Boat rides may

[15] https://www.jagran.com/uttar-pradesh/bulandshahr-nilgai-is-also-wasting-crop-farmers-worried-21317054.html

be considered from Garhmukteshwar to ghats of Mandu, Ahar, Karanwas, Rajghat and Anupshahr.

Image 51 : Unchagaon Fort Attracts Many Foreign Tourists in Bulandshahr Distt.

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