MANAGEMENT PLAN OF ASOLA BHATTI WILDLIFE SANCTUARY

2024-2025 to 2034-2035




Developing Integrated Management Plan of Asola-Bhatti Wildlife Sanctaury (ABWS), South division, New Delhi

भारतीय वन्यजीव संस्थान
Wildlife Institute of India

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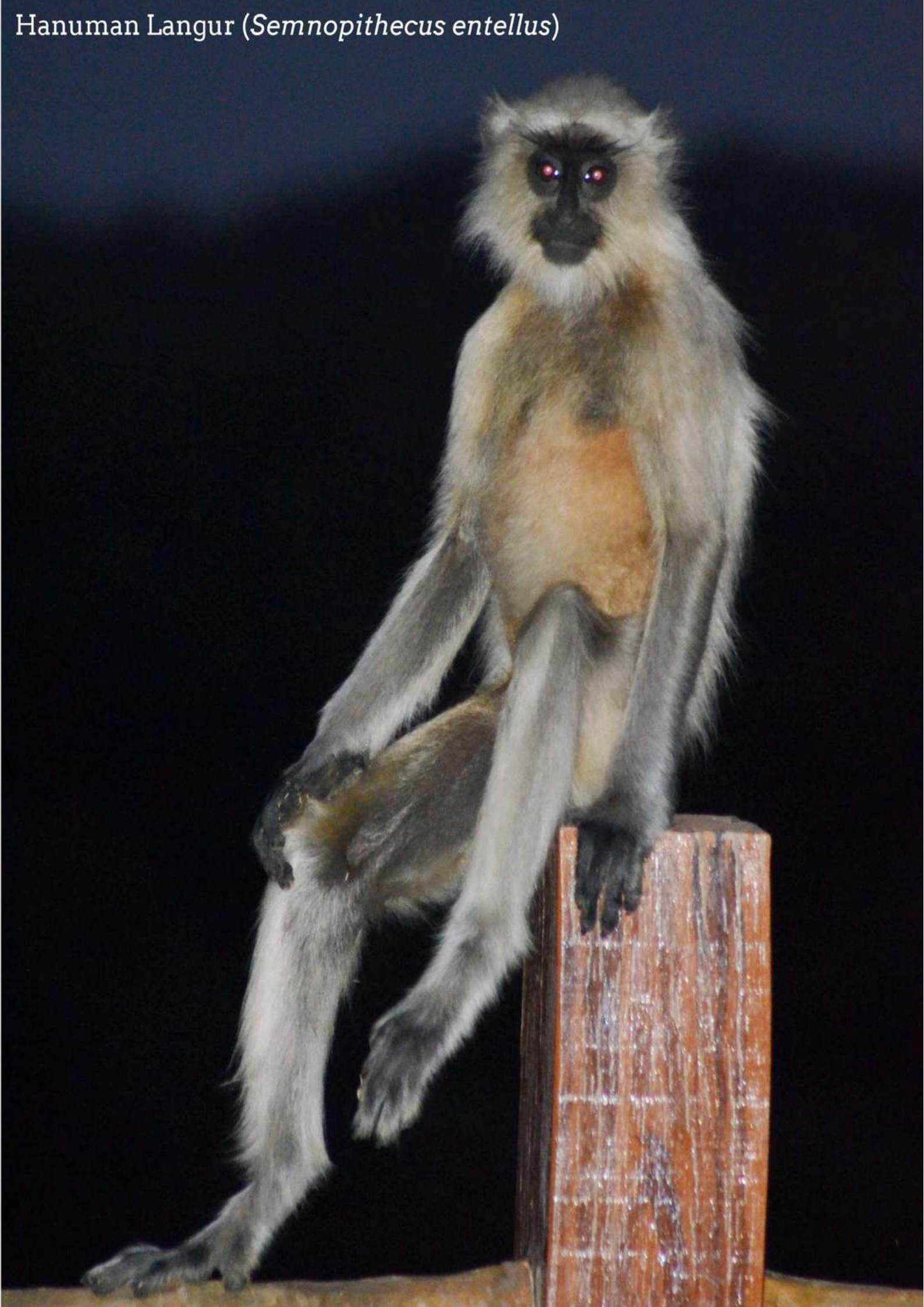

Hanuman Langur (*Semnopithecus entellus*)

Management Planning Team

Advisor

Dr. G.S. Bhardwaj IFS (Director)

Shri. Virendra R. Tiwari, (Ex- Director)

Principle Investigator

Dr. B.S. Adhikari

Co-PIs

Dr. Ruchi Badola

Dr. Parag Nigam

Dr. Bilal Habib

Dr. Gautam Talukdar

Dr. Salvador Lyngdoh

Dr. Abhijit Das

Shri. Ritesh Kumar Gautam

Consultant

Dr. A.K. Bhardwaj

Research Team

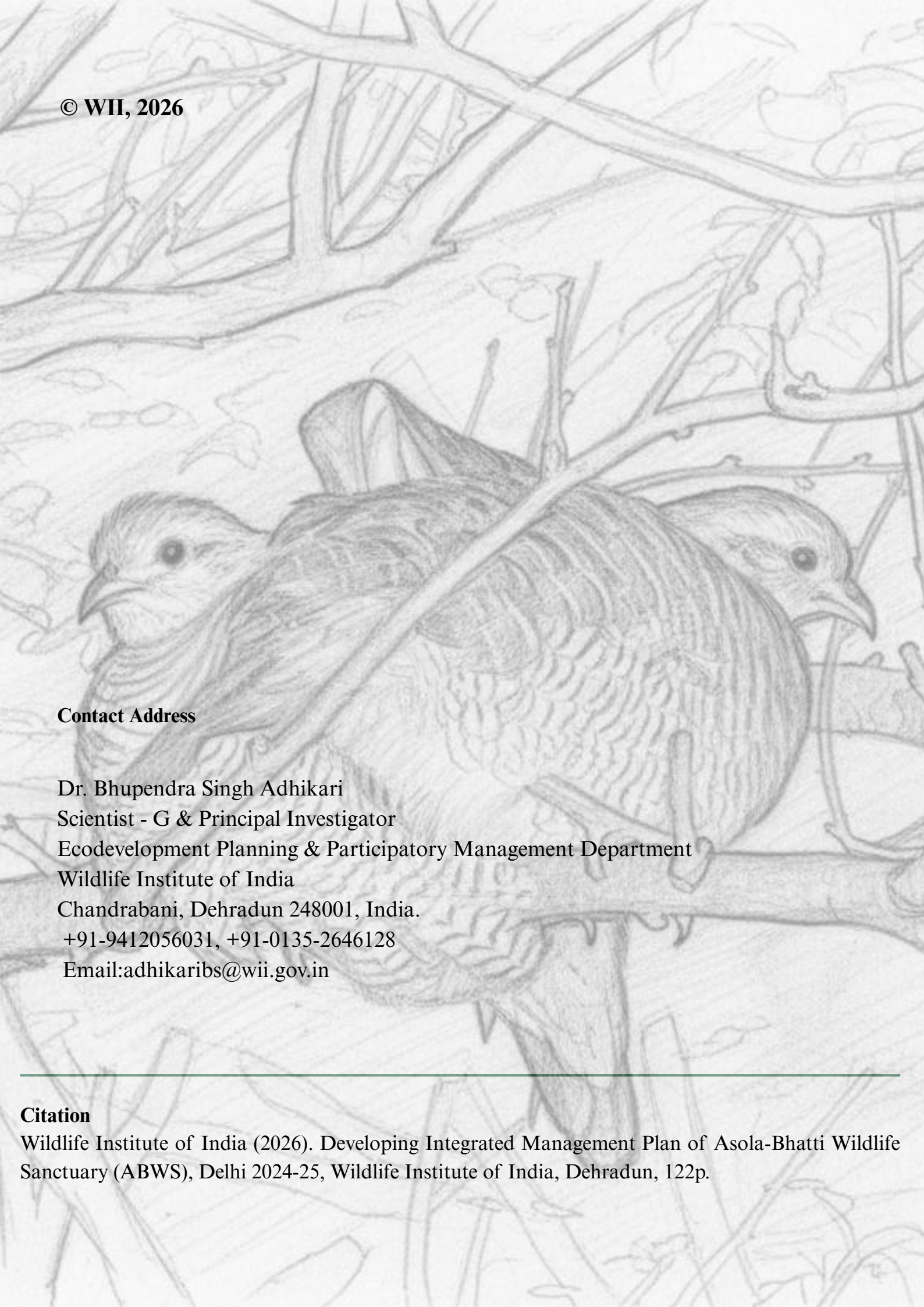
Feba K S-Project Associate I (17.05.2024 to 31.10.2025)

Rashi Nautiyal-Project Associate I (10.05.2024 to 31.10.2025)

Mukesh Chand-Project Associate I (19.12.2023 to 10.03.2025)

Shubham Kumar Maletha-Project Associate I (01.01.2024 to 31.12.2024)

Parvaiz Yousuf-Project Associate I (01.01.2024 to 31.12.2024)



Contact Address

Dr. Bhupendra Singh Adhikari
Scientist - G & Principal Investigator
Ecodevelopment Planning & Participatory Management Department
Wildlife Institute of India
Chandrabani, Dehradun 248001, India.
+91-9412056031, +91-0135-2646128
Email:adhikaribs@wii.gov.in

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Golden jackal *(Canis aureus)*

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LIST OF ABBREVIATIONS

Abbreviation	Full Form / Description
ABWS	Asola Bhatti Wildlife Sanctuary
PA	Protected Area
Z.I / ZOI	Zone of Influence
NCT	National Capital Territory
GoNCTD	Government of National Capital Territory of Delhi
MoEFCC	Ministry of Environment, Forest and Climate Change
DCF	Deputy Conservator of Forests
ACF	Assistant Conservator of Forests
PCCF	Principal Chief Conservator of Forests
RO	Range Officer
DRO	Deputy Range Officer
SO	Section Officer
BNHS	Bombay Natural History Society
ETF	Eco Task Force
WLP Act	Wildlife (Protection) Act, 1972
NCF	National Conservation Foundation
WII	Wildlife Institute of India
CWLW	Chief Wildlife Warden
NGO	Non-Governmental Organisation
ABCF	Asola Bhatti Conservation Foundation
JFM	Joint Forest Management
LULC	Land Use Land Cover
DEM	Digital Elevation Model
NDVI	Normalized Difference Vegetation Index
MODIS	Moderate Resolution Imaging Spectroradiometer
ERA5	ECMWF Reanalysis v5 (Land)
GIS	Geographic Information System
GEE	Google Earth Engine
GPS	Global Positioning System
MSL	Mean Sea Level

NWFP	Non-Wood Forest Produce
SHG	Self-Help Group
FGD	Focus Group Discussion
PRA	Participatory Rural Appraisal
TPD	Tonnes per Day
LST	Land Surface Temperature
NTFP	Non-Timber Forest Produce
FRI	Forest Research Institute
MCD	Municipal Corporation of Delhi
WWF	World Wide Fund for Nature
IMD	India Meteorological Department
EIA	Environmental Impact Assessment
CSR	Corporate Social Responsibility
NTFP	Non-Timber Forest Produce
FSI	Forest Survey of India
IFS	Indian Forest Service
OBC	Other Backward Classes
SC	Scheduled Caste
ST	Scheduled Tribe
CIC	Community Interface Committees
SCC	Stakeholder Coordination Committee
RMTAC	Research, Monitoring, and Training Advisory Committee
ABCF	Asola Bhatti Conservation Foundation

CHAPTER – I

INTRODUCTION TO ASOLA BHATTI WILDLIFE SANCTUARY (ABWS), DELHI

1.1 Name, Location, Constitution and Extent

1.1.1 Name

The protected area is officially known as the Asola Bhatti Wildlife Sanctuary (ABWS). It comprises two contiguous sanctuaries Asola Wildlife Sanctuary (notified in 1986) and Bhatti Wildlife Sanctuary (notified in 1991) which together form a single ecological unit located within the Southern Ridge of Delhi.

1.1.2 Location

The Aravalli Hill Range, a 1.5-billion-year-old mountain system, stretching over 800 km from Gujarat through Rajasthan and Haryana into Delhi. The Aravalli-Delhi Ridge system is among the oldest geological formations on Earth and plays a crucial ecological role in stabilizing soils, recharging groundwater, and acting as a natural barrier against desertification. According to Sinha (2014), The Delhi Ridge, once a continuous stretch of forested hills, is now fragmented into five distinct zones scattered across the National Capital Territory:

- Northern Ridge - about 87 ha near Delhi University, forming the historic heart of the city.
- Central Ridge - around 864 ha extending from Sadar Bazaar to Dhaula Kuan, representing the largest contiguous forest block.
- South-Central Ridge (Mehrauli Zone) - approximately 626 ha surrounding Sanjay Van near Jawaharlal Nehru University.
- Southern Ridge (Tughlaqabad Zone) - the largest segment, covering roughly 6,200 ha, including the Asola and Bhatti areas.
- Nanakpura South-Central Ridge - a smaller fragment of about 7 ha, yet ecologically important.

Together, these five zones cover about 7,784 ha and form the green backbone of Delhi, providing vital ecological functions such as temperature regulation, carbon sequestration, and wildlife refuge within an intensely urban landscape. The Southern Ridge, where ABWS is situated, represents the most extensive and ecologically significant part of the Ridge. It borders the Gurugram and Faridabad districts of Haryana and forms a crucial ecological corridor connecting Delhi's forests with the larger Aravalli landscape. The terrain is undulating and rocky, featuring ridges, ravines, and deep mining pits that have transformed into wetlands and lakes over time.

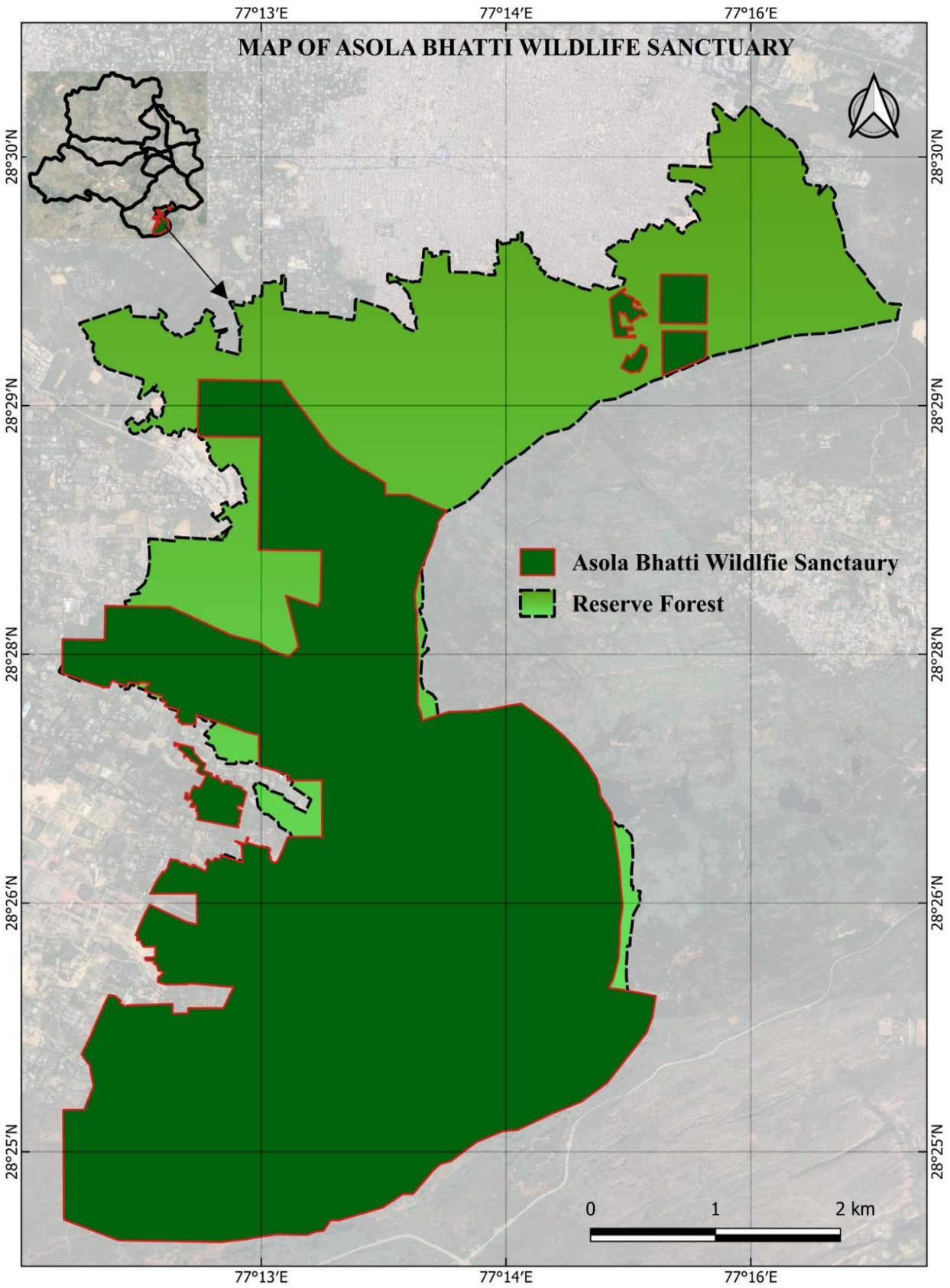

Fig 1.1: Map of ABWS, Delhi

1.1.3 Constitution and Extent

The ABWS was established under Section 18 of the Wildlife (Protection) Act, 1972, through multiple notifications issued by the Delhi Administration (Annexure I). The total notified area of the sanctuary is 1,972.9 hectares, based on the following notifications:

1. Notification dated 09 October 1986 (Asola Wildlife Sanctuary):
    - Asola: 7,827 bigha 17 biswa (659.9 ha)
    - Sahoorpur: 2,845 bigha 17 biswa (239.9 ha)
    - Maidan Garhi: 2,106 bigha 10 biswa (184.3 ha)
    - Subtotal: 1,084.29 hectares
2. Notification dated 15 April 1991 (Bhatti Wildlife Sanctuary):
    - Bhatti village Gaon Sabha land: 2,166.28 acres (876.68 ha)
3. Additional Notification dated 01 June 1992:
    - Land measuring 142 bigha 06 biswa (11.99 ha) in Village Tughlakabad was subsequently included as part of the sanctuary area.
    - Total Sanctuary Area: 1,972.9 hectares.

1.2 Approach and Access

ABWS is located along the interstate border of Delhi and Haryana, forming part of the Southern Ridge of the Aravalli Hills. The sanctuary is conveniently accessible by road, rail, and air, lying within close proximity to major landmarks of the National Capital Territory of Delhi.

There are two main entry points to the sanctuary:

- Karni Singh Shooting Range Gate (Tughlaqabad–Surajkund Road):

This serves as the primary administrative access point where the DCF (South Division) office is currently situated.

- Bhatti Mines Entry Gate:

Located near the Bhatti village area, this entry point provides access to the interior portions of the sanctuary and connects with the Eco-Task Force Camp and Neeli Jheel region. The sanctuary's location offers excellent connectivity for management operations, research, education, and eco-tourism activities.

Approximate Distances from Key Locations:

- Indira Gandhi International Airport (Delhi): ~25 km
- New Delhi Railway Station: ~25 km
- ISBT Kashmere Gate: ~32 km
- Gurgaon (Haryana Border): ~12 km
- Faridabad (Haryana): ~8 km

ABWS lies within the larger landscape of the Delhi Ridge, the northernmost extension of the ancient Aravalli Range, which stretches for about 800 km from Gujarat through Rajasthan and Haryana into Delhi. The Southern Ridge, where ABWS is located, represents the largest and most ecologically significant fragment of this once-continuous geological formation, covering approximately 6,200 hectares. It forms a vital ecological buffer between Delhi's urban sprawl and the adjoining Haryana plains, serving as a green lung, wildlife habitat, and climate regulator for the city.

1.3 State of Significance

ABWS represents a unique ecological and geological entity located on the northernmost extension of the ancient Aravalli Range, one of the oldest fold mountain systems in the world. It occupies a crucial position within the Southern Ridge of Delhi, forming the last remaining natural forest patch in the National Capital Territory. The sanctuary marks the transition zone between the semi-arid Aravalli landscape and the fertile Indo-Gangetic plains, supporting a distinctive blend of flora, fauna, and geomorphological features.

ABWS holds multi-level ecological, environmental, and socio-cultural significance:

1. Ecological and Geographical Importance

- ABWS forms the northern terminal of the Aravalli system, serving as a vital green buffer that prevents desertification and sand intrusion from western Rajasthan.
- The sanctuary's undulating terrain, quartzite ridges, and mining-induced depressions create diverse microhabitats supporting dry deciduous forest, scrubland, and emerging wetlands.
- It functions as a biological corridor linking fragmented forest patches of Delhi and Haryana, enabling movement of species such as Nilgai, Jackal, and Porcupine across state boundaries.
- The restored mine pits now hold perennial water, providing habitat for resident and migratory bird species, making the sanctuary a critical wetland refuge within an urban setting.

2. Climatic and Environmental Role

- ABWS acts as a climate regulator for Delhi, mitigating heat-island effects, sequestering carbon, and improving air quality.
- Its vegetation contributes to groundwater recharge and stabilizes the soil against erosion.
- The sanctuary functions as the green lung of the capital, absorbing pollutants and improving the livability of adjoining urban and rural areas.

3. Educational, Cultural, and Scientific Value

- The area serves as a living laboratory for ecological restoration and biodiversity research. The transformation of degraded mine lands into thriving habitats stands as a model for nature-based recovery within urban landscapes.
- The sanctuary's proximity to major academic and research institutions makes it ideal for conservation education, citizen science, and eco-tourism initiatives.
- It supports interpretation, training, and outreach programmes, promoting awareness about urban ecology and sustainable coexistence.

4. Socio-Economic and Management Relevance

- Strategically located between Delhi, Gurgaon, and Faridabad, ABWS safeguards vital ecological services for over 15 million residents in the Delhi-NCR region.
- Its position as an urban-protected area provides opportunities for community participation, livelihood enhancement through eco-tourism, and awareness-building.
- The area's management and restoration efforts also contribute to employment generation and serve as a demonstration site for habitat rejuvenation under extreme anthropogenic pressures.

CHAPTER-II

BACKGROUND INFORMATION AND ATTRIBUTES

2.1 Boundary

The ridge forests of Delhi often referred to as the "green lungs" of the city serve as a crucial ecological buffer and carbon sink (Naithani et al., 2006). The Delhi Ridge extends over approximately 77.77 km², accounting for nearly 6% of Delhi's total area (Khanna & Sati, 2003). The Asola-Bhatti Wildlife Sanctuary forms an integral part of the Southern Ridge, the largest of the four ridge divisions officially notified as Reserved Forests under Section 4 of the Indian Forest Act, 1927, through the Delhi Gazette Notification dated 24 May 1994. As per the Gazette, the Southern Ridge Reserved Forest encompasses approximately 6,200 hectares, bounded as follows:

- North: From Mahipalpur to Sultan Gauri Tomb, following the telephone line to Sultanpur Gauri Tomb, crossing the main power line and road; the western boundary of Ghatomli and Aya Nagar; the southern boundaries of Jaunapur, Fatehpur Beri, Asola, Sahoorpur, Chandan Hola, Satbari, Maidangarhi, Naib Sarai, Deoli, and Adilabad ruins.

- South and East: Adjoining the State of Haryana, along Surajkund Road and other connecting sectors.

- West: The State of Haryana's eastern boundary, near Rajokari, Malikpur, Kohi, and Rangpuri villages.

Within this notified area lies the ABWS, spreading over approximately 2,700 hectares in the South District of Delhi, forming the core conservation zone of the Southern Ridge system. Geographically, the sanctuary is located between 77°07′–77°15′E longitude and 28°25′–28°30′N latitude, with elevations ranging from 130 m to 320 m above mean sea level. The terrain is undulating, rocky, and dissected, representing a typical landscape of the Aravalli quartzite formations. These ancient landforms, dating to the Precambrian Aravalli-Delhi Orogeny, connect two of India's oldest geological blocks — the Marwar Craton to the northwest and the Bundelkhand Craton to the southeast (Kalpavriksha, 1991). Situated at the junction of the semi-arid Aravalli uplands and the northern Indo-Gangetic plains, Asola-Bhatti functions as a biogeographic transition zone, supporting a unique assemblage of flora and fauna. The area's physiography falls within the Kohi or Pahari division, characterized by scattered quartzite ridges, interspersed plains, and numerous ephemeral streams locally known as galahs. These seasonal drainage channels and exposed boulders create a distinctive micro-topography that governs the sanctuary's hydrology, vegetation pattern, and wildlife distribution. Thus, the boundaries defined under the 1994 Gazette Notification (Annexure II) legally establish the Southern Ridge including the Asola-Bhatti landscape as both a Reserved Forest under the Indian Forest Act, 1927, and an ecologically significant zone warranting sustained protection and restoration efforts under the Wildlife (Protection) Act, 1972.

2.2 Terrain

The terrain of the Asola-Bhatti Wildlife Sanctuary is undulating and hilly. The slopes are gentle, with shallow soil depths a standard feature. Rocky outcrops dot the landscape, adding to the rugged character of the Sanctuary. Among these undulating hills, the highest point is Bhatti, 320 meters above mean sea level.

2.3 Soil

The soil in the Sanctuary is thin, dry, and sandy, with high porosity and low humus content. It supports sparse, scrubby vegetation that is well-adapted to these arid conditions. Soil studies conducted by the Forest Research Institute (FRI) have revealed that the texture of the soil ranges from clayey loam in the Asola mines area to sandy clay loam in the Bhatti mines area. Notably, the soils in the Asola mines exhibit more clayey characteristics than those in the Bhatti mines. This geological and pedological diversity combined with the Sanctuary's unique location at the intersection of distinct physiographic zones, contributes to the rich biodiversity and ecological importance of the ABWS. A comprehensive soil survey was conducted across different habitat types of ABWS to assess the physico-chemical properties, fertility status, and heavy-metal content of soils that support the sanctuary' vegetation and ecological functions. The survey aimed to understand how soil characteristics vary with vegetation type and disturbance level, and to establish a scientific baseline for long-term ecosystem management.

2.3.1 Sampling and Analysis

Fifteen composite soil samples were collected from representative habitat types dominated by *Anogeissus pendula*, *Prosopis juliflora*, and mixed plantation sites across Asola and Bhatti sectors. Physico-chemical parameters (pH, EC, bulk density, CEC, WHC, organic carbon, and NPK) and trace metals (As, Ni, Pb, Cr, Cu, Zn, Fe) were analysed following standard methods (IS 14765:2000; Walkley & Black; ICP-MS).

2.3.2 Key Findings

- Soil Reaction (pH): Ranged from 7.0–9.0, indicating neutral to slightly alkaline conditions typical of dry tropical systems.
- Texture: Predominantly sandy loam to silty loam, with some clayey pockets in depressions and plantation sites.
- Bulk Density & Moisture: *Anogeissus* sites showed the highest compaction (1.26 g/cm³); plantation areas had higher water-holding capacity (≈59%), supporting better root growth and soil moisture retention.
- Nutrient Profile:
  - ✓ Nitrogen: Highest in plantation soils (125–276 kg/ha) suggesting improved fertility under restored vegetation.
  - ✓ Phosphorus & Potassium: Moderate but variable; Prosopis sites showed large fluctuations due to uneven litter and disturbance.
  - ✓ Organic Carbon: Generally low (0.3–1.1%), lowest in rocky and degraded zones, reflecting poor litter accumulation and rapid mineralization

2.3.3 Heavy Metals and Pollution Status

- Concentrations of all trace metals were below global reference limits, with Pollution Index
- < 1, classifying ABWS soils as unpolluted.
- The Potential Ecological Risk Index (PERI) indicates slight to low risk, showing no major contamination concern.
- Spatial mapping revealed slightly elevated As and Cu in parts of the Bhatti region and Fe and Cr concentrations in central zones, but none exceeded safe thresholds.

Table 2.1: Physical properties of soil collected from different sites of ABWS

Sample Site	Soil Texture	pH	EC (µS/cm)	Bulk Density (g/cm^3)	Carbon Exchange Cation Cmol (+)/kg	Water Holding Capacity (%)
Site 1	Sandy Loam	7.57	88	1.328	8.069	56.67
Site 2	Silt Loam	7.45	146	1.218	8.16	63.3
Site 3	Silty Clay Loam	7.89	68	0.819	25.008	70.3
Site 4	Sandy Loam	7.71	104	1.26	9.739	53.3
Site 5	Silty Loam	7.28	74	1.17	25.982	56.67
Site 6	Loam	8.4	46	1.25	18.434	66.67
Site 7	Loam	7.43	94	1.22	7.617	60
Site 8	Silt Loam	9.03	42	1.104	17.043	60
Site 9	Sandy Loam	6.85	164	1.197	13.84	46.67
Site 10	Sandy Loam	7.07	80	1.38	13.84	53.3
Site 11	Sandy Loam	7.11	58	1.316	18.78	50
Site 12	Clayey Loamy	7.02	64	1.299	39.79	60
Site 13	Silt Loam	7.5	164	1.27	30.95	60
Site 14	Loam	7.37	74	1.28	14.44	43.3
Site 15	Silty Loam	7.17	43	1.19	21.23	56.67

Table 2.2: Pollution indices (PI) and integrated Pollution Index of trace metals in different Forests Sites i.e., Mixed Plantation Sites, *Prosopis juliflora* Sites and *Anogeissus pendula* Sites

Forest Sites	**Pollution Index** (PI)								**Integrated Pollution Inde**
	Sample site	As	Ni	Pb	Cr	Cu	Zn	Fe	
Mixed Plantation Sites	Site 1	0.69	0.93	0.35	0.43	0.47	0.62	0.59	0.58
	Site 2	0.33	0.55	0.21	0.30	0.30	0.36	0.37	0.35
	Site 3	0.61	0.64	0.20	0.29	0.28	0.43	0.34	0.40
	Site 4	0.41	0.43	0.22	0.26	0.22	0.38	0.27	0.31
	Site 5	0.97	0.76	0.30	0.37	0.38	0.56	0.45	0.54
P. juliflora Sites	Site 1	0.92	0.87	0.34	0.41	0.48	0.57	0.56	0.59
	Site 2	0.00	0.10	0.10	0.16	0.08	0.11	0.10	0.09
	Site 3	0.00	0.00	0.00	0.06	0.05	0.00	0.04	0.02
	Site 4	0.43	0.38	0.38	0.23	0.29	1.08	0.24	0.43
	Site 5	0.00	0.06	0.08	0.07	0.06	0.07	0.06	0.06
Anogeissus pendula Sites	Site 1	0.00	0.28	0.14	0.28	0.17	0.22	0.21	0.19
	Site 2	0.00	0.48	0.27	0.31	0.27	0.42	0.33	0.30
	Site 3	0.60	0.90	0.38	0.42	0.45	0.71	0.53	0.57
	Site 4	0.00	0.15	0.13	0.15	0.10	0.14	0.13	0.11
	Site 5	0.60	0.51	0.38	0.29	0.30	0.48	0.32	0.41

Table 2.3: Soil trace metal individual ecological risk Index (Er) and Potential Ecological Risk Index values for all sampling sites of different Forests

Forest Sites	**Ecological Risk Index**								**Potential Ecological Risk Index**
	Er	As	Ni	Pb	Cr	Cu	Zn	Fe	
Mixed Plantation Sites	Site 1	6.92	4.65	1.75	0.86	2.37	0.62	0.59	17.77
	Site 2	3.30	2.77	1.04	0.59	1.52	0.36	0.37	9.96
	Site 3	6.08	3.22	0.98	0.58	1.38	0.43	0.34	13.00
	Site 4	4.08	2.15	1.09	0.52	1.11	0.38	0.27	9.60
	Site 5	9.72	3.82	1.51	0.75	1.90	0.56	0.45	18.71
P. juliflora Sites	Site 1	9.18	4.33	1.71	0.81	2.39	0.57	0.56	19.56
	Site 2	0.00	0.51	0.51	0.31	0.40	0.11	0.10	1.94
	Site 3	0.00	0.00	0.00	0.11	0.23	0.00	0.04	0.38
	Site 4	4.30	1.91	1.91	0.45	1.43	1.08	0.24	11.32
	Site 5	0.00	0.31	0.38	0.13	0.30	0.07	0.06	1.24
Anogeissus pendula Sites	Site 1	0.00	1.41	0.72	0.55	0.84	0.22	0.21	3.95
	Site 2	0.00	2.42	1.35	0.61	1.36	0.42	0.33	6.49
	Site 3	5.96	4.51	1.91	0.85	2.26	0.71	0.53	16.72
	Site 4	0.00	0.74	0.66	0.31	0.52	0.14	0.13	2.49
	Site 5	6.00	2.53	1.88	0.59	1.50	0.48	0.32	13.30

2.3.4 Summary

• Vegetation–Soil Link: Soil fertility and texture vary with vegetation type; restoration plantations improve organic matter and nutrient status over time.

• Degradation Pockets: Areas under *P. juliflora* and rocky outcrops remain poor in organic content and moisture - these require targeted soil enrichment and moisture-retention interventions.

• Pollution Baseline: Current low pollution levels provide a good baseline for long-term soil-health monitoring and impact assessment of anthropogenic activities (e.g., tourism, mining scars).

Overall, the soils of ABWS are neutral to alkaline, low in organic matter but largely uncontaminated, showing gradual recovery where plantation and native vegetation cover are improving. Sustaining soil quality through vegetation restoration, organic mulching, and erosion-control measures will be key to maintaining the ecological integrity of this urban-edge protected area.

2.4 Climate

The climate of ABWS reflects the broader continental climate of Delhi, characterized by extreme seasonal variations and semi-arid influences. The region experiences intensely hot summers, a humid monsoon season, and cool winters. The Sanctuary's weather plays a crucial role in shaping vegetation

dynamics and habitat suitability for fauna, especially as rainfall determines the filling of quarry pits and ephemeral ponds that sustain wildlife through the dry months.

2.5 Temperature (2014–2024)

Analysis of MODIS Land Surface Temperature (LST) data from 2014–2024 indicates that the mean annual surface temperature for ABWS ranged between 31.8°C and 34.1°C, with an average of 33.2°Cover the decade. The highest mean temperature (34.1°C) occurred in 2014, while the lowest (31.8°C) was recorded in 2023 (Annexure VI). The data reveal a slight declining trend (~0.15°C per decade), possibly linked to vegetation recovery and canopy expansion after active restoration and plantation activities in the sanctuary. The summers (April–June) remain the hottest period, with average daytime LST exceeding 42°C, while winter months (December–February) record lows around 18–20°C.

2.6 Precipitation (2014–2024)

Annual precipitation derived from ERA5-Land data over 2014–2024 shows substantial interannual variability. The mean annual rainfall for the sanctuary is 742.6 mm, fluctuating between 521 mm (2014) and 890 mm (2020). Notably, 2015 and 2020 were exceptionally wet years (>800 mm), while 2014 and 2018 recorded below-average rainfall. The monsoon months (July–September) account for nearly 80% of the total rainfall, with August typically being the wettest month (Annexure VII). The uneven rainfall distribution across years affects groundwater recharge and ephemeral wetland persistence. The filling of old quarry pits such as Neeli Jheel and Bhatti Lakes has been closely correlated with monsoon intensity, supporting rich seasonal bird diversity during wetter years.

The decadal trend suggests moderate climatic stability, with no significant long-term decline in precipitation, though sporadic extreme rainfall events and heatwave periods have increased in frequency post-2019, consistent with observed climate change impacts in North India.

2.7 Water Sources

Due to the predominantly sandy nature of the soil in the Sanctuary, surface runoff is relatively low, with rainwater quickly seeping down and becoming trapped in the underlying rock formations. The water table depth in the Bhatti area ranges from 35 to 50 meters. This groundwater is utilized for irrigation and drinking in the plains and flat areas surrounding the wildlife sanctuary. Historical records from the District Gazetteer of Delhi (1883-84) indicate that in the latter part of the 18th century, the best drinking water in the region was obtained from natural springs located within the Ridge area. However, there is little evidence to suggest that these springs still exist today, reflecting the grave state of degradation that the region has endured over the centuries. The Neeli Jheel, a water body in Asola near the Haryana border, is the largest perennial water source in the protected area and a vital lifeline for the Sanctuary's diverse flora and fauna.

A detailed water-quality survey was conducted across the major aquatic and groundwater sources of Asola–Bhatti Wildlife Sanctuary to assess the present condition of surface and subsurface water and to understand its role in supporting the sanctuary’s ecology. Samples were collected from Neeli Jheel, three ponds, and five borewells used for irrigation and wildlife watering. The study aimed to evaluate the physical, chemical, and heavy-metal characteristics of these water bodies and identify areas requiring management attention.

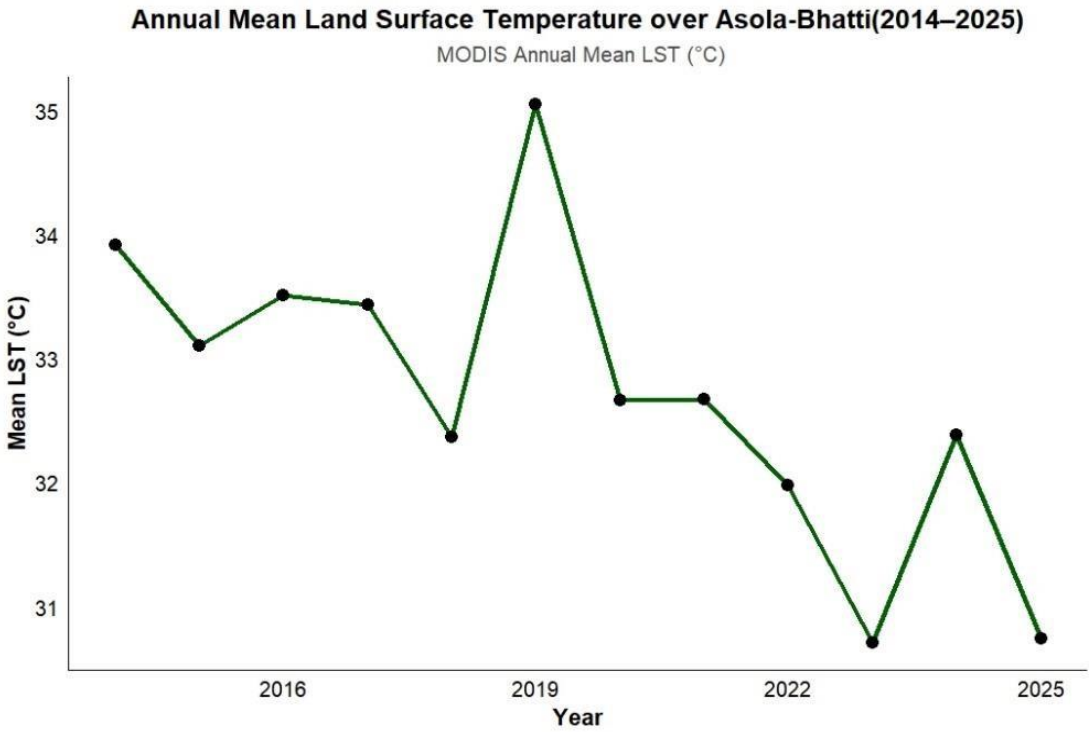

Fig 2.1 Temperature of ABWS Over 10 years

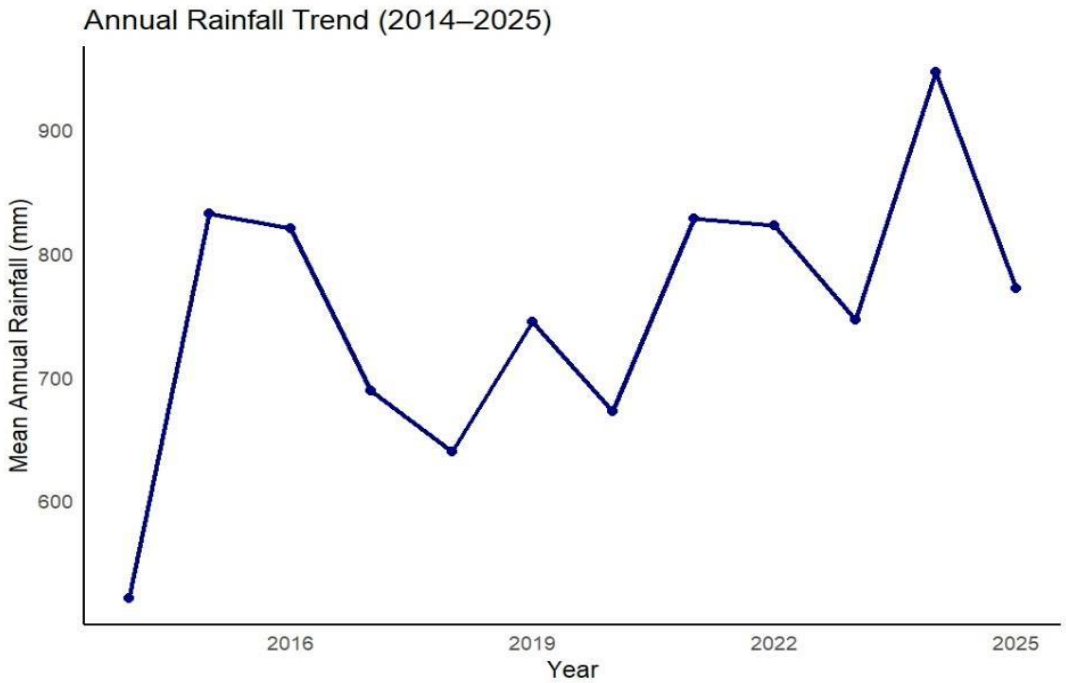

Fig 2.2 Precipitation of ABWS Over 10 years

2.7.1 Sampling and Analysis

Water samples were collected during the pre-monsoon period from twelve representative sites, including four locations within Neeli Jheel, three ponds (Bhatti Village Pond A, Gate 7 Pond B, and Manikarnika Pond C), and five borewells across the Asola and Bhatti sectors. Samples were analysed for major physicochemical parameters such as pH, electrical conductivity (EC), total dissolved solids (TDS), hardness, alkalinity, nitrate, phosphate, sulphate, chloride, fluoride, turbidity, and chemical oxygen demand (COD). Trace-metal concentrations (As, Ni, Pb, Cr, Cu, Zn, Fe, Cd) were measured using ICP-MS following standard APHA and BIS procedures. Weighted Water Quality Index (WQI) and Heavy Metal Pollution Index (HPI) were calculated to assess overall quality status.

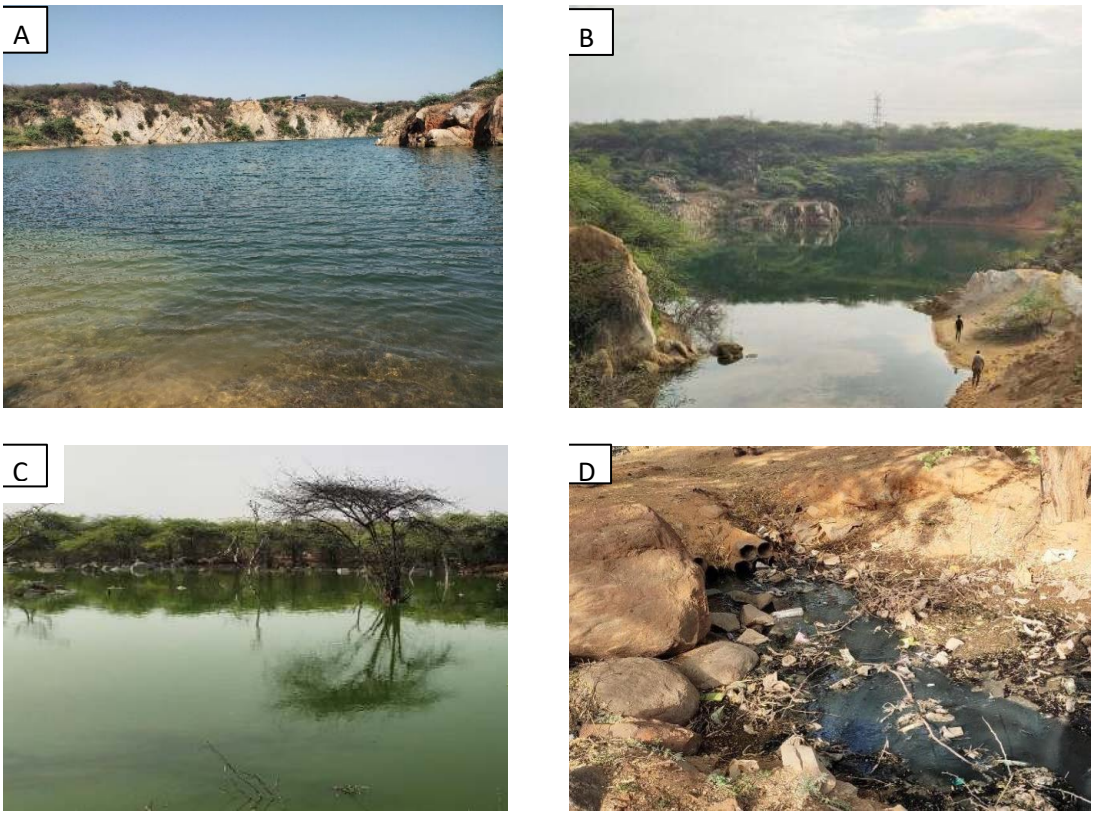

Fig 2.3 : (A) and (B) represent sampling sites of two different sites of Neeli Jheel, (C) representing Bhatti Village Pond having (D) as the source of waste water in Pond

2.7.2 Key Findings

Water characteristics varied considerably among sites due to different sources and levels of human disturbance.

- Neeli Jheel exhibited near-neutral to slightly alkaline pH (5.7 – 8.6) and low EC (~246 µS/cm), indicating generally good quality and minimal contamination.
- Ponds showed extreme variability: Bhatti Village Pond A had very high EC (1746 µS/cm), hardness (450 mg/L), and alkalinity (400 mg/L), pointing to elevated salinity and bicarbonate content; Pond B near Gate 7 showed low hardness (12 mg/L) but high nitrate (15–18 mg/L) and turbidity; Pond C near Manikarnika Temple recorded high phosphate (36.5 mg/L) and sulphate (114 mg/L), indicating nutrient enrichment.
- Groundwater from borewells generally had moderate hardness (168–224 mg/L), neutral pH (6.8–7.5), and low turbidity (<0.2 NTU), suggesting good aquifer quality with limited contamination.

- Chloride concentrations were highest in Pond A (320 mg/L) and moderate in borewells (140–180 mg/L). Fluoride levels across all sites remained within safe limits (0.68–1.11 mg/L).
- Water Quality Index values confirmed excellent water quality for Neeli Jheel (WQI ≈ 15– 19) and borewells (WQI ≈ 8–22), whereas the ponds showed very poor quality (WQI ≈ 76– 93) due to turbidity, nutrient loading, and sewage inflow.
- Heavy Metal Index values for Neeli Jheel and borewells were below 100, indicating absence of significant heavy-metal pollution. In contrast, Pond B (HPI = 314) and Pond C (1456) showed severe contamination, while Pond A (HPI = 99) approached the threshold limit.

Table 2.4: Physical properties of water collected from different sites of ABWS

Sample	Sample Type	pH	EC (µS/cm)	TDS (mg/L)	Turbidity (mg/L)	Hardness (mg/L)	Alkalinity (mg/L)
Neeli Jheel Lake	Site 1	8.61	248	104	0.077	70	224
	Site 2	8.49	246	120	0.086	104	100
	Site 3	6.17	246	120	0.099	76	116
	Site 4	5.72	246	122	0.069	76	104
Pond	Pond A	7.98	1746	940	0.748	450	400
	Pond B	6.15	226	113	0.927	12	16
	Pond C	7.49	1076	536	1.013	60	240
Ground water	Borewell A	7.28	404	197	0.054	168	168
	Borewell B	7.04	404	200	0.126	168	184
	Borewell 3	7.4	534	263	0.198	190	244
	Borewell 4	7.5	514	257	0.141	200	256
	Borewell 5	6.86	576	288	0.153	224	276

Table 2.5: Water Quality and Heavy Metal Index of different sampling sites

Site	Sample	Water Quality Index	Heavy Metal Index
Lake	Neeli Jheel 1	18.62	8.65
	Neeli Jheel 2	18.44	0.49
	Neeli Jheel 3	15.18	0.51
	Neeli Jheel 4	15.66	75.69
Pond	Pond A	75.75	98.95
	Pond B	86.77	314.12
	Pond C	93.25	1455.73
Groundwater	Borewell A	8.27	3.09
	Borewell B	12.83	4.31
	Borewell C	22.04	30.22
	Borewell D	17.53	5.91
	Borewell E	16.35	5.96

2.8 Status and distribution of wildlife and its habitats

The Wildlife sanctuary falls within Rodger's and Panwar's biogeographic classification, which includes the semi-arid Punjab plains. The transition from the Semi-Arid category to the Upper Gangetic Plains category is a significant feature of the sanctuary's location. According to a study report by WII in 1996, the western boundary of the Gangetic plain is marked by the 230-meter contour line of the Ridge (Sawarkar, 1996).

2.8.1 Status of Vegetation

2.8.1.1 Bio-geographic Classification

ABWS lies within the 4A Semi-Arid Punjab Plains biogeographic province (Rodger & Panwar, 1988). The area forms a transition between the Semi-Arid and Upper Gangetic Plains categories, representing the northernmost extension of the ancient Aravalli system within Delhi. The Aravalli ridge forms the western boundary of the Gangetic Plain and is divided into four ridge segments: Northern, Central, South-Central, and Southern Ridge. The South-Central and Southern Ridge, encompassing the Mehrauli and Bhatti areas, constitute the Asola–Bhatti Wildlife Sanctuary. The terrain is mainly rocky and undulating, with shallow depressions, old mine pits, and dry drainage lines that influence local vegetation patterns.

2.8.1.2 Forest Type and Vegetation Character

According to Champion and Seth (1968), the vegetation of ABWS falls under the Northern Tropical Thorn Forest (6B/C). It is typically dry, open, and dominated by xerophytic shrubs and thorny trees capable of surviving arid conditions. The natural vegetation comprises drought- resistant species with small leaves, waxy coatings, and thorns to minimize transpiration losses. The canopy is sparse, with trees and shrubs growing widely spaced.

Native species such as *Anogeissus pendula, Vachellia nilotica, Vachellia leucophloea, Balanites aegyptiaca*, and *Dalbergia sissoo* are common, while invasive *Prosopis juliflora* dominates large parts of the sanctuary. Introduced and naturalized species such as *Azadirachta indica, Cassia fistula,* and *Albizia lebbeck* also occur. Shrub species include *Ziziphus nummularia, Lantana camara, Calotropis sepiaria*, and *Capparis decidua*. Grasses and herbs are interspersed between open scrublands, providing ground cover and forage.

2.8.1.3 Vegetation Status and Structure

A detailed vegetation assessment was carried out from April to June 2024 across five habitat types: Plain Area, Rocky and Undulating Terrain, Ridge and Mines, Surrounding Waterbody, and Plantation Area. A total of 37 tree species and 13 shrub species were recorded. Tree density was highest in the Ridge and Mines (730 ± 34 trees/ha), followed by the Rocky and Undulating terrain (704 ± 39 trees/ha). The Plain Area had 636 ± 47 trees/ha, and the Surrounding Waterbody habitat 489 ± 54 trees/ha. *Prosopis juliflora* showed the highest mean dominance (IVI> 120) in all habitats, followed by *Terminalia pendula, Vachellia nilotica*, and *Balanites aegyptiaca.*

The Total Basal Area (TBA) was highest in the Ridge and Mines habitat (44.0 ± 3.3 m²/ha), followed by the Rocky and Undulating Area (42.7 ± 2.5 m²/ha). Shannon Diversity Index ranged between 1.53 and 1.97, showing moderate diversity. Sapling density was highest in the Ridge and Mines (163 ± 11 saplings/ha), indicating good regeneration potential.

Fig 2.4 . A: Plain Area, B: Rocky and Undulating, C: Ridge and Mines, D: Surrounding waterbody, E: Plantation Area

2.8.1.4 Floristic Composition

A. **Trees** : *Acacia leucophloea, Acacia nilotica, Anogeissus pendula, Azadirachta indica, Balanites aegyptiaca, Bauhinia variegata, Bombax ceiba, Butea monosperma, Cassia fistula, Cordia myxa, Dalbergia sissoo, Diospyros montana, Ehretia laevis, Ficus religiosa, Ficus benghalensis, Ficus racemosa, Holoptelea integrifolia, Limonia acidissima, Morus alba, Neolamarckia cadamba, Phoenix sylvestris, Phyllanthus emblica, Pongamia pinnata, Prosopis cineraria, Prosopis juliflora, Prypetes roxburghii, Senegalia senegal, Syzygium cumini, Tamarix indica, Tectona grandis, Terminalia arjuna, Terminalia pendula, Trichosanthes cucumerina, Vachellia nilotica, Vachellia leucophloea, Delonix regia, Albizia lebbeck.*

B. Shrubs: *Capparis sepiaria, Grewia tenax, Securinega leucopyrus, Carissa opaca, Flacourtia indica, Maytenus senegalensis, Clerodendrum phlomidis, Lantana camara, Ziziphus nummularia, Calotropis procera, Hibiscus nummularius, Pavonia zeylanica, Ricinus communis, Jatropha gossypiifolia, Euphorbia hirta.*

C. Herbs: *Achyranthus aspera, Vernonia cinerea, Boerhavia diffusa, Cassia tora, Sida cordata, Parthenium hysterophorus, Physalis minima, Blumea lacera, Ageratum conyzoides, Argemone mexicana, Borreria articularis, Tephrosia purpurea, Tridax procumbens, Corchorus aestuans, Amaranthus viridis, Commelina benghalensis, Solanum nigrum, Withania somnifera, Euphorbia hirta, Triumfetta rhomboidea, Aerva scandens*.

D. Grasses and Ground Flora: *Heteropogon contortus, Cynodon dactylon, Cenchrus ciliaris, Dactyloctenium aegyptium, Eragrostis tenella, Eragrostis viscosa, Saccharum spontaneum, Vetiveria zizanioides, Chloris dolichostachya, Setaria verticillata, Desmostachya bipinnata, Digitaria ciliaris, Sporobolus diander, Oplismenus burmanii, Cyperus compressus, Cyperus triceps, Phyllanthus simplex.*

2.8.1.5 Plantation Areas

As part of the restoration efforts, certain degraded areas have been rehabilitated through plantation, particularly in zones dominated by *Prosopis juliflora*. The plantation survey across ten sites recorded 28 native species, with an average species richness of 17.5 ± 1.0 per site and sapling density of 1815 ± 103 saplings/ha. Prominent plantation species include *Tectona grandis*, *Dalbergia sissoo*, *Terminalia arjuna*, *Azadirachta indica, Phyllanthus emblica, Albizia lebbeck, Ficus religiosa, Syzygium cumini*, and *Pongamia pinnata*. These species have improved canopy cover and ecological stability in previously mined areas.

2.8.1.6 Shrub and Understorey Layer

Shrub density was highest in Ridge and Mines (424 ± 17 ind/ha), followed by Plain Area (423 ± 16 ind/ha). Dominant shrubs include *Ziziphus nummularia*, *Lantana camara*, *Calotropis sepiaria*, and *Capparis decidua*, which provide cover and forage for herbivores and small fauna.

2.8.1.7 Land Use / Land Cover (LULC)

Supervised classification of Landsat-8 imagery (2024) revealed eight land-use classes: *Prosopis juliflora* (63.48%), forest plantation (5.46%), built-up area (14.07%), *Anogeissus pendula* (0.26%), rock outcrop (1.55%), bare ground (0.28%), scrub (0.17%), and waterbody (0.76%). The results highlight the dominance of Prosopis juliflora across most of the sanctuary and the limited but increasing extent of native plantation zones.

Table 2.6: Land Use and Land Cover Classes by Area of ABWS

Land	Area (Km^2)	Percentage (%)	Pixel count
Prosopis juliflora	18.41	63.48	20451
Built-up	4.08	14.07	4529
Forest plantation	5.46	18.83	6067
Anogeissus pendula	0.26	0.90	291
Rock outcrop	0.45	1.55	503
Bare ground	0.08	0.28	88
Scrub	0.05	0.17	53
Waterbody	0.22	0.76	248

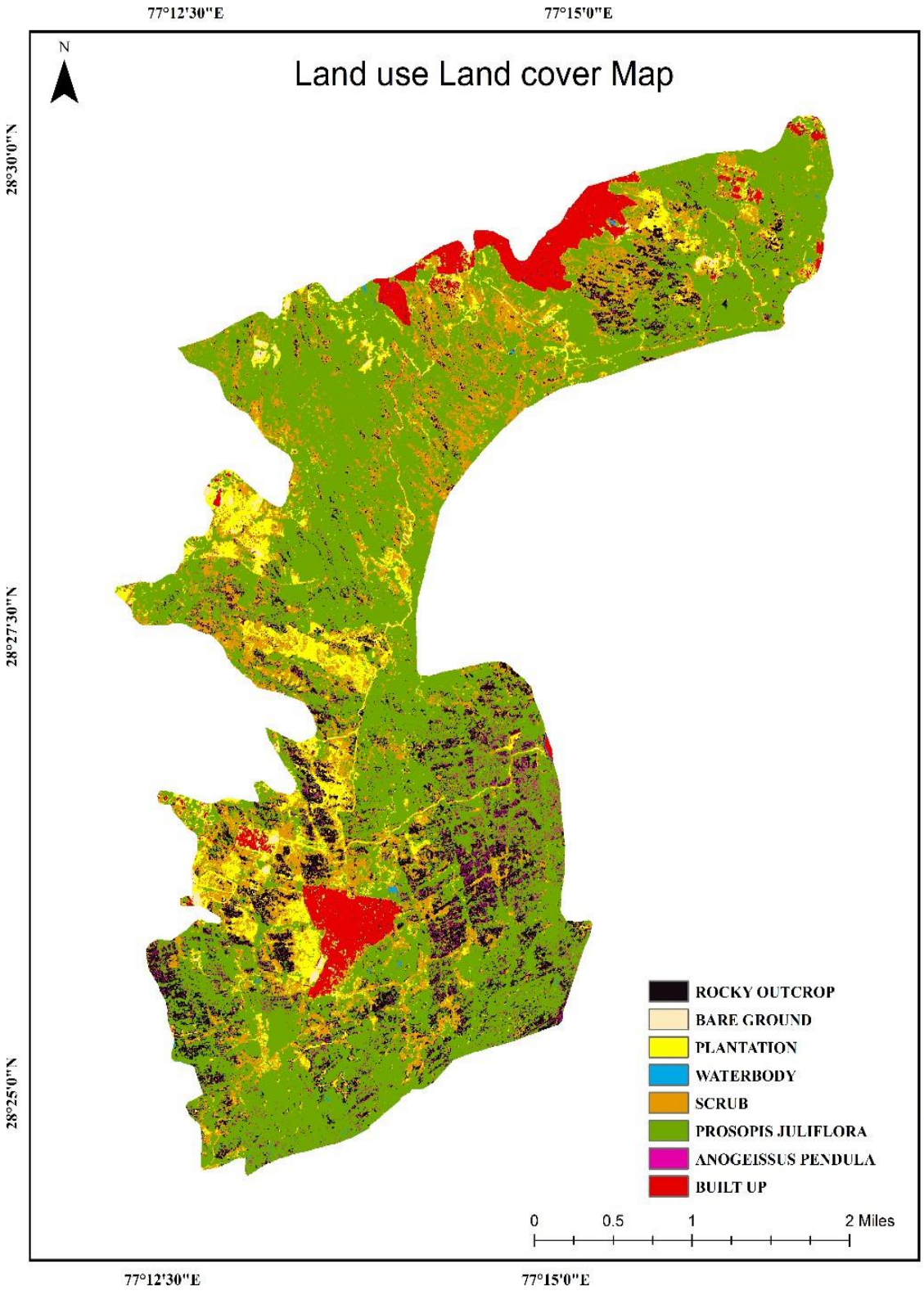

Fig 2.5: Land use Landover map

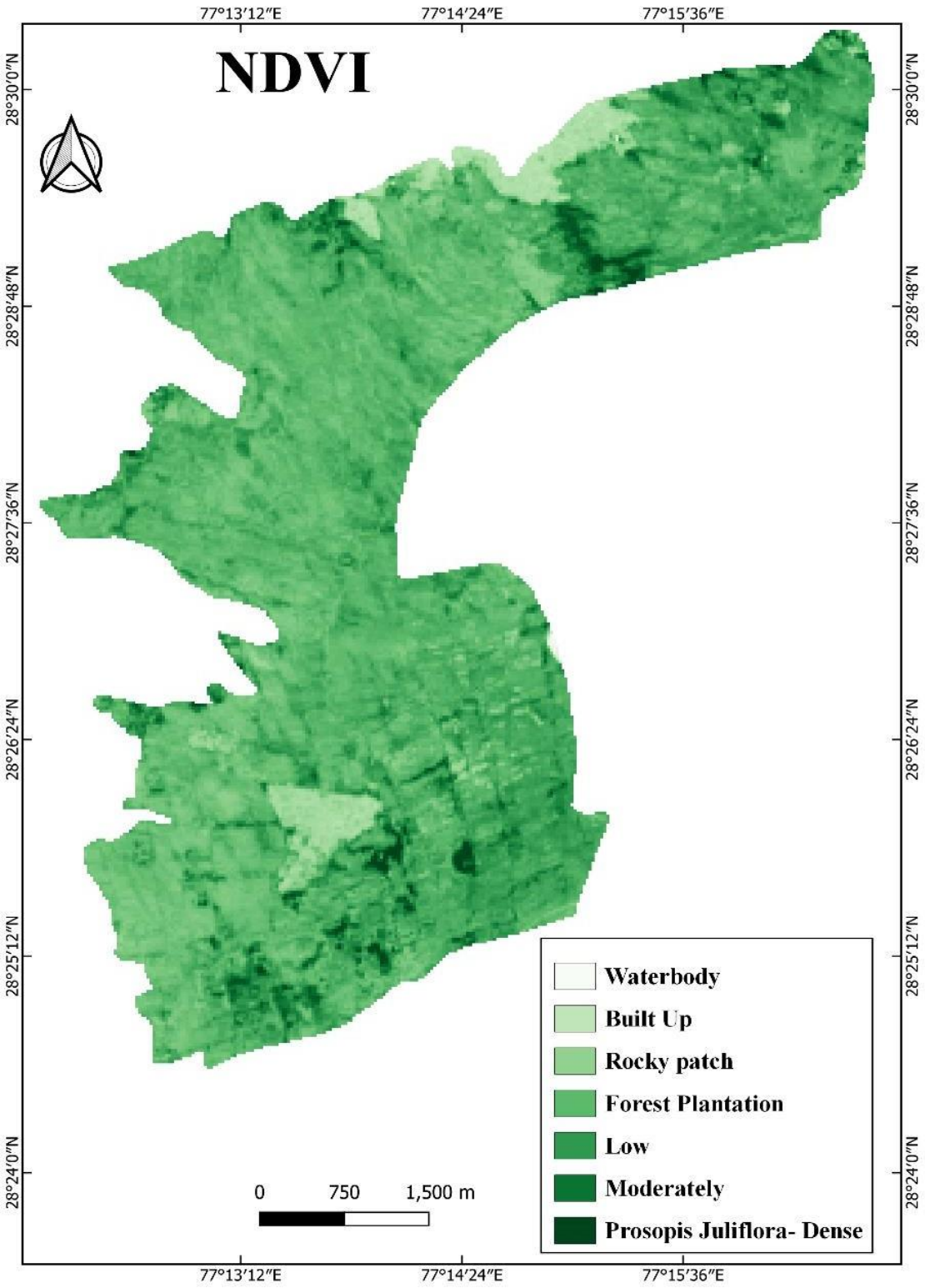
NDVI
77°13′12″E
77°14′24″E
77°15′36″E
28°30′0″N
28°28′48″N
28°27′36″N
28°26′24″N
28°25′12″N
28°24′0″N
Waterbody
Built Up
Rocky patch
Forest Plantation
Low
Moderately
Prosopis Juliflora- Dense
0
750
1,500 m

Fig 2.6 : NDVI

The sanctuary exhibits a mosaic of semi-arid scrub, open thorn forest, and plantation habitats. Vegetation recovery is evident in many areas, yet invasive *Prosopis juliflora* and human disturbance remain challenges. Management should prioritise:

- Progressive reduction and control of *Prosopis juliflora*.
- Assisted regeneration of native species in mined and rocky areas.
- Expansion of native plantations with drought-tolerant species.
- Periodic LULC and NDVI monitoring for vegetation change detection.
- Protection of ridge slopes and soil moisture retention structures to sustain native flora.

2.9 Faunal Status and Key Areas

The Sanctuary and the adjacent ridge forest are home to many mammals, birds, amphibians, insects, and more. You can find a detailed list of these species in the annexure attached to the report. Here are some of the notable and frequently encountered animals among them**:**

2.9.1 Mammals

Following the declaration of the area as a wildlife sanctuary, numerous studies were conducted over a span of three decades, from 1990 to 2022, to assess the status and presence of mammalian species within its boundaries. These investigations aimed to shed light on the rich biodiversity harbored within this protected haven.

In 1997, Biswas *et al*., through their publication "The Fauna of Delhi," provided a comprehensive review of the studies conducted thus far on the mammals of the region. Earlier, in 1991, Kalpavriksha, an environmental organization, reported the presence of 29 mammalian species within the ridge area, highlighting the area's ecological significance (Kumar and Khanna, 1997).

Between 1996 and 1999, the Zoological Survey of India, based in Dehradun, conducted extensive surveys within the sanctuary area. Their findings revealed the existence of 18 mammalian species belonging to 10 families and 7 orders, further underscoring the Sanctuary's vital role as a habitat for a diverse array of mammalian life.

In 2022, the Bombay Natural History Society (BNHS) published a detailed report titled "Status of the Indian Leopard and Other Mammals in Asola Bhatti Wildlife Sanctuary, Delhi." This comprehensive study unveiled the remarkable resilience of the Sanctuary's mammalian inhabitants, even in the face of encroaching urbanization and degradation in the surrounding areas.

Despite the challenges posed by rapid development and urbanization in the nearby regions, the Sanctuary continues to serve as a vital haven for a diverse range of mammalian species. The report documented the presence of various mammals, including the majestic Nilgai (*Boselaphus tragocamelus*), the golden jackal (*Canis aureus*), the Indian crested porcupine (*Hystrix indica*), the black-naped Hare (*Lepus nigricollis*), the Rhesus macaque (*Macaca mulatta*), the Hanuman langur (*Presbytia entellus*), the spotted deer (*Axis axis*), the blackbuck (*Antilope cervicapra*), the Asian palm civet (*Paradoxurus hermaphroditus*), and the Indian grey mongoose (*Urva edwardsii*).

One species that has been the subject of much debate and speculation over the years is the presence and abundance of the iconic Indian leopard (*Panthera pardus*) within the Sanctuary's boundaries. The report sheds light on this contested issue, providing insights into the elusive yet crucial presence of this apex predator within the ecosystem.

2.9.1.1 Status of Mammalian Fauna

Fig 2.7: Leopards drinking water

A detailed mammalian survey was carried out in ABWS between April and June 2024 using systematic camera-trap deployment and field observations to document mammal diversity, abundance, and distribution across the sanctuary. A total of 23 camera traps were installed across representative habitats covering dense scrub, open woodland, rocky terrain, plantation areas, and grasslands. The study aimed to generate an updated inventory of mammalian fauna and assess habitat use by different species. Camera traps recorded a total of 23 mammal species, including 18 wild and 5 stray/domestic species. The wild mammals included Rhesus Macaque (*Macaca mulatta*), Nilgai (*Boselaphus tragocamelus*), Golden Jackal (*Canis aureus*), Chital (*Axis axis*), Indian Boar (*Sus scrofa*), Indian Hare (*Lepus nigricollis*), Indian Crested Porcupine (*Hystrix indica*), Five-striped Palm Squirrel (*Funambulus pennantii*), Ruddy Mongoose (*Herpestes smithii*), Indian Grey Mongoose (*Herpestes edwardsii*), Common Palm Civet (*Paradoxuru hermaphroditus*), Small Indian Civet (*Viverricula indica*), Striped Hyena (*Hyaena hyaena*), Jungle Cat (*Felis chaus*), Sambar (*Rusa unicolor*), Hanuman Langur (*Semnopithecus entellus*), and Common Leopard (*Panthera pardus*), among others.

Fig 2.8: Striped hyena

Among these, Rhesus Macaque, Nilgai, and Golden Jackal were the most frequently captured species, showing wide habitat tolerance. Rare detections included Leopard, Striped Hyena, Common Palm Civet, and Sambar, indicating their lo densities and restricted distribution. The presence of stray cattle and dogs was also recorded and continues to pose competition and disturbance to native fauna. Habitat-wise distribution showed higher mammal activity in the central and southern zones of the sanctuary, particularly in areas with mixed scrub, waterholes, and minimal human disturbance. Predators such as Leopard and Hyena were mostly recorded from these less-disturbed patches, while herbivores such as Nilgai and Chital were widespread across open scrub and plantation zones.

Fig 2.9: Sambar drinking

The study reaffirms the importance of ABWS as a critical refuge for mammals within Delhi's urban matrix, supporting both large and small mammals typical of the northern Aravalli landscape. Continuous monitoring and management interventions are essential to address stray animal intrusion, habitat degradation, and water scarcity during the dry season.

A comprehensive list of all mammal species recorded during the 2024 survey, along with earlier published records, is provided in Annexure.

2.9.2 Status of Stray Cattle

Camera-trap data from the survey revealed that stray cattle were widely distributed across Asola– Bhatti Wildlife Sanctuary and occurred in considerable numbers. They accounted for about 15.1 percent of all

mammal detections, making them the second most abundant mammal group after Rhesus macaques. Four main types of livestock were recorded: cows, buffaloes, camels, and domestic pigs. Cows were the most common, contributing about 7 percent of total detections, followed by buffaloes (4 percent), pigs (0.6 percent), and camels (0.4 percent). Cows were present throughout the sanctuary, especially near monkey-feeding points and waterholes, where they fed on grass, leaves, and leftover food. Spatial mapping showed that stray cattle were concentrated mainly in the central part of the sanctuary, where the largest hotspot occurred. These areas coincided with high animal activity and easy access to food and water. Bulls were frequently observed displacing native herbivores such as Nilgai and Chital from feeding and resting areas. The presence of cattle around waterholes often led to rapid depletion of available water, reducing access for wild animals. Overall, the study indicated that stray cattle are widespread in the sanctuary and exert a strong influence on the distribution and resource use of native mammals.

Fig 2.10: Cows drinking water

Fig 2.11: Camel drinking water

2.9.3 Status of Avifauna

A systematic avifaunal survey was carried out across all major habitat types of Asola–Bhatti Wildlife Sanctuary during 2024 using line transects and point counts. The study recorded a total of 121 bird species belonging to 46 families. Species richness varied across habitats, with the highest diversity observed in wooded and mixed shrubby areas and comparatively lower richness in open and Lantana-dominated patches. The avifaunal community included both resident and migratory species, highlighting the sanctuary's ecological importance as a refuge for urban and semi-arid birds. The detailed list of recorded bird species is provided in Annexure IX.

2.9.4 Status of Herpetofauna

The Zoological Survey of India found one species of snake and four species of lizard in Dehradun from 1996 to 1999. However, few studies of reptiles have been conducted in the sanctuary areas. The Spiked Worm Snake (*Typhlops parents*) is the most common type of snake. The four lizard species that were seen are the Spotted Brook Gecko (*Hemidactylus brookii*), the Snake-eyed Lizard (*Ophisops feiloní*), and the Striped Kukri Snake (*Riopapunctata*). The Zoological Survey of India conducted the latest survey of amphibians in the sanctuary area. The survey discovered five amphibian species: *Bufo melanottietne* (Common Toad), *Bufo aromaticus* (Marbled Toad), *Microlyla ornate* (Ornate Frog), *Rana cyanophlyeniz* (Skipping Frog), and *Rana hammochariziare* (Cricket Frog). According to the literature, three types of fish have been identified in the sanctuary area: Spot-in Cash (*Puntius sophomore*), Brown Snakehead (*Channa Dachau*), and Mosquito Fish (*Gambusia affinis*). A systematic herpetofaunal survey was conducted across major habitat types of ABWS. Visual Encounter Surveys (VES) and opportunistic searches were employed in plantation areas, rocky patches, waterbodies, and Prosopis juliflora thickets during both day and night. The study recorded a total of 30 species of

herpetofauna, comprising 8 amphibians (3 families) and 22 reptiles (12 families). Among amphibians, *Euphlyctis cyanophlyctis* and *Hoplobatrachus tigerinus* were the most abundant, while among reptiles, *Calotes versicolor, Eutropis trivittata,* and *Hemidactylus brookii* showed the highest encounter rates. Seven species were listed under Schedule I of the Wildlife (Protection) Act, 1972 (as amended in 2022), and two species (*Python molurus and Eryx johnii*) were categorised as Near Threatened under the IUCN Red List. The detailed species list is provided in Annexure X

2.9.5 Status of Butterflies

A recent survey by Pramod Kumar and S.K. Gupta from the Zoological Survey of India in Dehradun provides information on butterflies in the sanctuary area. The survey identified 25 butterfly species belonging to 5 families. Each plant and animal species in this unique protected area of Delhi Ridge, serving as a transition zone between the ancient Aravalli's and the Indo- Gangetic plains, holds conservation significance. Despite recognizing the biological and ecological importance of the area and its species, previous management planners did not feel an immediate need to prioritize the conservation of specific flora and fauna species within the protected area.

A butterfly survey was conducted in ABWS during September to November 2024 across four major habitat types-rocky area, mixed plantation, *Prosopis juliflora*- dominated area, and open area. Line-transect and opportunistic survey methods were employed for documentation, and species were identified using standard field guides and photographic records. The study recorded a total of 53 butterfly species belonging to 39 genera and five families. The detailed species list is provided in Annexure XI.

Fig.2.12 Deploying camera trap in the sanctuary

Fig.2.13 Butterfly survey in the sanctuary

CHAPTER III

HISTORY OF MANAGEMENT

3.1 Management of Delhi Ridge before British period

Delhi is one of the most historic capitals in the world, finding mention in the ancient epic Mahabharata. Efforts to manage and conserve forested areas in Delhi predate British interventions by several centuries. Around the 14th century, Emperor Firoz Shah Tughluq of the Delhi Sultanate, who was fond of hunting, established one of the earliest known conservation efforts by fencing a section of the Ridge, planting trees, and building hunting lodges in a park known as Kushak-i-**S**hikar (Ganguli, 1975). This site, located in what is now Old Delhi near Hindu Rao Hospital, reflects early recognition of the Ridge's ecological and recreational value. He was very fond of hunting, afforested the rocky southern part of the Ridge on which Ghiyas-ud-Din Tughlaq built the fort city of Tughlaqabad. Later, during the Mughal period, forests in and around Delhi continued to be maintained for both utilitarian and royal purposes**.** Babur, in his memoir *Baburnama*, described the forests as rich in wildlife and used them for royal hunts (Babur, 1526). Under Akbar's rule, the *Ain-i-Akbari* documented forested lands as part of land classification and emphasized regulated use of natural resources, including protection of trees in sacred areas (Abul Fazl, 1595).

3.2 Delhi Ridge/ Forest Management during British Period

The Delhi Ridge, a northern extension of the ancient Aravalli Hills, has played a vital ecological and strategic role in shaping Delhi's landscape. In pre-colonial times, the Ridge supported diverse native vegetation and Mughal-era gardens like Roshanara Bagh and Tal Katora, serving both ecological and recreational purposes. However, with increasing settlement, cultivation, and political transitions, Delhi's green cover began to degrade. By the early 19th century, British administrators noted that forests in Delhi had been extensively cut for fuel, grazing, and construction, leaving only sparse vegetation on the Ridge dominated by hardy species like *kikar* and *karil*. During the British period, large-scale afforestation of the Delhi Ridge was initiated as part of imperial urban planning and ecological control. While the Ridge was originally a natural scrubland dominated by native species like *Kikar* (*Acacia* sp.), *Neem* (*Azadirachta indica*), and *Babul* (*Acacia nilotica*), municipal records show that afforestation efforts began in earnest after 1878, with around 3000 trees planted between 1878-79. The process gained momentum in 1912 when Delhi was designated the new Imperial capital. The British envisioned the Ridge as a majestic green backdrop for Lutyens' city and took up extensive planting through the Delhi Town Planning Committee. Under the supervision of William Robertson Mustoe, indigenous species such as *Prosopis cineraria*, *Salvadora oleoides*, and *Salvadora persica* were planted, followed by the controversial introduction of the exotic *Prosopis juliflora* (vilayati kikar), which later formed invasive monocultures.

Afforestation efforts were also undertaken in the Northern Ridge from 1883 to 1909 by colonial officials like J.R. Maconachie, Reverend G.A. Lefroy, and Deputy Commissioner C.A. Barron (Mann & Sehrawat, 2009). While early efforts involved community engagement, later plans increasingly excluded villagers and fenced off the Ridge. The British focus shifted to beautifying the Civil Lines and improving microclimatic conditions for European residents. The Southern Ridge was officially declared a Reserved Forest under the Indian Forest Act of 1878 in 1913, and the Central Ridge followed in 1915. Forest Settlement Officers were appointed, and access to local communities was restricted under colonial forest laws. These afforestation schemes served aesthetic and political purposes framing the imperial architecture of New Delhi within a green, orderly backdrop inspired by English landscape gardening (Department of Forest & Wildlife, GNCT of Delhi, 2022). Despite these efforts, urbanization pressures rapidly undermined British conservation ideals. In the 1920s and 1930s, blasting of Ridge land

for road expansion and new colonies like Karol Bagh led to widespread ecological damage. Later, the administrative fragmentation of Delhi's forest governance in the 1960s resulted in piecemeal destruction and lack of cohesive oversight. Though afforestation did contribute to Delhi's green cover, British forest management followed a top-down colonial model that restricted community rights, altered native ecology, and left behind unresolved governance challenges that persist today (Ganguli, 1975).

3.3 Post-Independence Management and Decline of the Delhi Ridge: An Overview

After India's Independence in 1947, Delhi rapidly transformed into a sprawling megacity, placing immense pressure on its natural ecosystems. The Delhi Ridge once a contiguous arid scrub forest and an essential ecological buffer-became increasingly fragmented due to rapid urbanization, road widening, quarrying, and widespread encroachments. Both legal and illegal intrusions devoured large parts of the Ridge. Land was allotted to refugees in the Central and Southern Ridge areas, leading to unregulated deforestation and blasting of plateau-like ridges to accommodate new settlements. These changes disrupted the natural topography, caused erosion, destroyed water channels, and led to significant biodiversity loss.

In response to the ecological deterioration, the Delhi Administration established a forest wing in 1950. A formal notification on 19 November 1958 appointed the Soil Conservation Officer (SCO) as the Forest Officer, and the Development Department was entrusted with managing the Ridge. Initiatives such as fencing, removal of encroachments, and afforestation were launched. In the 1960s, parts of the Ridge underwent administrative transfers - Southern Ridge was handed to the Central Public Works Department (CPWD) in 1963 for beautification, and the Northern Ridge to the Delhi Development Authority (DDA) in 1968. However, some sites like Kamla Nehru Ridge and the Birla Temple nursery remained under the Forest Department due to intervention by senior officials.

Despite the establishment of institutional mechanisms, violations persisted. By the late 1970s, environmental degradation drew attention from citizens and conservation groups. On 10 April 1980, the Lieutenant Governor of Delhi declared 25 sites across the Northern, Central, and South- Central Ridges as Protected Forests under the Indian Forest Act, 1927. Yet, a 1982 study by the Delhi School of Planning and Architecture (cited by the Town and Country Planning Organisation) estimated that nearly 40% of the Ridge had already been lost to encroachments and non-forest use. What remained was a degraded landscape dominated by scattered *Prosopis juliflora* trees. A turning point came in 1986 when 1,880 hectares of the Southern Ridge were notified as the Asola Wildlife Sanctuary. This protection expanded in 1991 to include 840 hectares of the Bhatti Mines area. Nevertheless, large portions of the Ridge remained outside formal legal protection and continued to face intense development pressure.

By the early 1990s, Delhi's green cover had dropped below 5%, and the Yamuna River had turned into a polluted drain. These crises mobilized a coalition of NGOs and civil society organizations-such as Kalpavriksh, WWF, Srishti, Development Alternatives, and the Conservation Society to form the "Joint NGO Forum to Save the Delhi Ridge." Their advocacy raised public awareness and led to government action. In 1993, the Delhi government appointed a 10-member expert panel known as the Lovraj Committee (named after Mr. Lovraj Kumar of the Planning Commission) to create a comprehensive Ridge management plan. The committee recommended that key Ridge areas be notified as Reserved Forests, irrespective of their administrative jurisdiction. Consequently, on 24 May 1994, these areas were formally declared deemed Reserved Forests under Section 4 of the Indian Forest Act, 1927. However, legal protections sparked fresh tensions. Evictions disproportionately targeted ragpickers and shanty dwellers in the Central Ridge, while elite institutions such as police camps and the President's Bodyguard polo club were allowed to remain highlighting class-based enforcement biases. At Bhatti Mines, where over 30,000 Oad tribal residents lived, the Supreme Court ordered mass evictions based

on a 1996 affidavit, even as nearby affluent farmhouses remained untouched. A later proposal by the Municipal Corporation of Delhi to convert Bhatti into a landfill further underscored the risk of environmental injustice.

Through the late 1990s and 2000s, several legal battles emerged. Environmental groups opposed the DDA's plan to build luxury hotels and shopping malls on the ecologically sensitive Vasant Kunj Ridge, a key groundwater recharge zone. While parts of the project were blocked, other portions were exempted, and commercial development proceeded, irreversibly altering the landscape. These disputes highlighted systemic governance failures and inter-agency conflicts among the DDA, CPWD, Forest Department, and Delhi Police.

To streamline oversight, the Supreme Court in October 1995 facilitated the creation of the Ridge Management Board (RMB). Though empowered to evaluate land diversion proposals, the RMB often faces conflicts of interest, as most proposals originate from state bodies claiming "public purpose." While private development is generally blocked, government-backed projects such as Delhi Metro expansions, Commonwealth Games infrastructure, CPWD parking, or transmission lines have frequently been approved, often bypassing environmental assessments.

Despite decades of legal protections and citizen-led campaigns, many challenges persist. The exact boundaries of the Ridge's notified forests remain unverified on the ground, and much of the area has been converted into institutional complexes or manicured parks, diminishing its natural integrity. Invasive species like *Prosopis juliflora* dominate, garbage dumping continues, and public awareness remains low. Ironically, some of the best views of the Ridge's remaining canopy are now seen from the elevated tracks of Delhi's Metro perhaps a symbolic reminder of what survives and what is still at risk. The Delhi Ridge today stands not only as a fragmented remnant of a once vast forest but also as a battleground for environmental justice, urban sustainability, and participatory governance. Its protection remains one of India's most iconic urban ecological struggles.

3.4 Asola Bhatti Wildlife Sanctuary

3.4.1 Historical Background of Asola Bhatti and Its Transition into a Sanctuary

The Asola Bhatti region, located on Delhi's Southern Ridge, has undergone a remarkable transformation from a heavily mined landscape to a protected ecological zone. From 1965 to 1990, the area was known as Bhatti Mines, a quarrying zone that supplied red sand, silica, and stone for Delhi's growing infrastructure. After a tragic accident in May 1990, where seven miners were killed in a pit collapse, the Union Ministry of Labour shut down the mines in June 1990, citing gross violations of safety norms. The final closure came in April 1991, when the Lieutenant Governor of Delhi declared the area a wildlife sanctuary under the Wildlife (Protection) Act, 1972. This led to the establishment of the Asola Wildlife Sanctuary, later expanded to include the Bhatti Mines area, totaling over 2,700 hectares. The area also became part of the Northern Aravalli leopard corridor, serving as a critical ecological buffer.

3.4.2 Community History: Settlements in Bhatti Mines and Bhagirath Nagar

The Bhatti region, now part of the Asola Bhatti Wildlife Sanctuary, has a long and complex history of human settlement, labor migration, and contested land use. After the Partition of India in 1947, over 20,000 refugees-including large numbers from the Oad nomadic tribe settled in the Bhatti Mines area. The Oads, historically known as indigenous earth masons and canal builders, became quarry workers in the Bhatti bajri mines, which operated from 1975 to 1992.

Settlements such as Bhagirath Nagar, Indira Nagar, and Balbir Nagar gradually evolved into full-fledged villages, complete with schools (1977, 1985), a hospital (1980), a veterinary clinic, community

infrastructure, and bus services. These communities received government-issued ration cards (1980–81), elected local leaders (1983), and land titles under development schemes (1987), confirming their legal status as recognized residents.

However, after the official closure of the mines in 1990 (following a fatal pit collapse), the Delhi government, citing an April 1991 wildlife sanctuary notification, halted all developmental support to these villages. Matters escalated when an affidavit filed by the Chief Secretary of Delhi in 1996 led to the Supreme Court labelling over 30,000 residents as 'encroachers', despite their long- standing settlement. Under court direction, they were ordered to relocate while adjoining private farmhouses and estates on the Ridge faced no such action, exposing stark inequalities in enforcement. Demolitions followed. On 20 April 2006, the Municipal Corporation of Delhi (MCD) demolished over 1,500 homes, displacing residents without proper rehabilitation. Many families were forcefully moved to Savda Ghevra, an undeveloped area nearly 50 km away, lacking basic infrastructure. The Supreme Court's 1996 relocation directive, originally proposing resettlement at Jaunapur, was contradicted by the government's claims that land was unavailable. Meanwhile, the MCD's slum wing underestimated the population claiming only 3,100 families lived in the area and proposed alternative plots for just half of them. Further controversy arose when MCD proposed converting the Bhatti Mines area into a city landfill, thereby threatening to turn a designated forest and wildlife sanctuary into a dumping ground. This proposal, while seeking to remove impoverished communities from the forest boundary, allowed elite landholders to remain untouched. The issue is now under judicial scrutiny, following a counter petition challenging the landfill plea in the Supreme Court. Presently, some colonies survive due to political patronage, but their future remains uncertain. Community members have continued to protest organizing relay hunger strikes (2006) and public hearings and have also contributed to the sanctuary's ecological recovery by planting over 5,000 saplings under green initiatives like Dera Sacha Sauda's plantation mission (2006). The situation at Bhatti Mines thus illustrates how conservation, when misaligned with social justice, can perpetuate displacement while ignoring powerful landholders and ecological double standards.

3.4.3 Macaque Relocation and Human-Wildlife Conflicts

In response to the rising monkey menace in Delhi during the early 2000s, the Delhi High Court ordered the relocation of rhesus macaques (Macaca mulatta) to Asola Bhatti. Between 2007 and 2014, over 18,000 macaques were translocated to the sanctuary. A 45-foot plastic wall was erected to contain them, though many escaped. The sudden influx placed immense stress on the sanctuary's ecosystem and raised concerns over both animal welfare and ecological balance. Feeding programs were inconsistently maintained due to budget issues, further complicating the situation.

3.4.4 Restoration and Governance Challenges

To rehabilitate degraded land, the Forest Department planted over 700,000 saplings between 2000 and 2006, and converted abandoned mining pits into water reservoirs. In 1995, the Ridge Management Board (RMB) was created under Supreme Court supervision to regulate land diversion. However, many projects especially those backed by government agencies for "public purposes" such as infrastructure, parking, or sporting events—were approved without proper environmental clearance. Citizen campaigns, legal interventions, and NGO-led movements like the "Joint NGO Forum to Save the Ridge" have played a major role in safeguarding what remains of Delhi's green lungs.

3.4.5 Restoration and Eco-Task Force Initiatives (2000–2010)

The Eco Task Force is a special unit of the Territorial Army (TA) that works in collaboration with the Ministry of Environment, Forest and Climate Change (MoEFCC) and various State Forest Departments. It focuses on afforestation, ecological restoration, and environmental protection,

especially in degraded and ecologically sensitive areas (Rajak & Dhyani, 2024). The Eco Task Force (ETF) was set up in 1982 because the environment in the Shivalik Hills and other parts of Uttarakhand. The Indian Army, with help from Dr. Norman Borlaug, form the ETF. It was made up mostly of ex-army soldiers and had two main goals: to help fix the damaged environment and to provide new jobs and settlement options for retired soldiers in the affected areas (Press Information Bureau, 2007). In 2000–2001, the Delhi government initiated a project to rehabilitate 2,100 acres of degraded land in Bhatti Sanctuary, in collaboration with the Eco-Task Force of the Territorial Army and CEMDE, Delhi University. The project aimed to restore the area through afforestation, grassland development, habitat improvement, groundwater recharge, and biodiversity enhancement. Though initially planned for five years, the project continues, contributing to increased forest cover, improved wildlife habitat, and acting as a shelterbelt against desertification. The Territorial Army's efforts in planting indigenous species have significantly reduced biotic pressure and illegal mining. Since October 2000, the Department has undertaken an eco-rehabilitation project for 2,100 acres of degraded and abandoned Bhatti Mines in the Southern Ridge (Bhatti Wildlife Sanctuary), in collaboration with the 132 Infantry Battalion (TA) ECO Rajput (Eco Task Force). Department of Forest and Wildlife, n.d.). Year-wise plantation data by ETF from 2001 to 2010 is given below:

Table 3.1- Year-wise plantation data by ETF from 2001 to 2010

Years	Area (in Acres)	Plantation Raised
2001-02	300	58800
2002-03	600	92600
2003-04	400	150000
2004-05	400	128000
2005-06	400	130000
2006-07	400	140000
2007-08	400	171000
2008-09	427	141703
2009-10	429	104632*

3.5 MANAGEMENT PLAN 1994

The initial management plan was established by WII in 1995 following the establishment of a wildlife sanctuary. Its primary aim is to rehabilitate and safeguard the distinctive biological, non- living, a n d other related features in the Aravalli Mountain range outlier. This effort aims to create a dynamic system for interpreting and educating about nature to promote meaningful experiences in the wilderness that coincide with the country's conservation principles. Additionally, the objective is to implement a system of ecologically sustainable biomass utilization that aligns with the above conservation objectives, all while actively involving and garnering the cooperation of local communities in the management of the area. Furthermore, recommendations will be proposed to enhance the initiative's overall management capabilities. However, numerous challenges stand in the way of realizing these noble objectives. Foremost among these challenges is the degradation and subsequent loss of habitat diversity, which poses a significant threat to the delicate ecological balance of the area. This degradation also results in

reduced groundwater recharge, further exacerbating environmental concerns. Moreover, uncontrolled removal of biomass, stemming from unrestricted grazing by cattle, goats, and sheep, as well as unchecked fuelwood harvesting, poses a grave threat to the sustainability of the ecosystem. Encroachment onto protected lands further compounds these challenges, jeopardizing the integrity of the Sanctuary.

Additionally, the unrestricted movement of people, domestic animals, and vehicles within the area has led to the accumulation of rubbish and unhygienic conditions, detracting from the overall wilderness experience and posing potential health hazards. Furthermore, the detrimental impact of nearby mining activities in the Badarpur area casts a shadow over the Sanctuary's conservation efforts, presenting a formidable obstacle to overcome. In light of these challenges, strategies are being diligently developed to address each issue comprehensively, with the ultimate goal of surmounting these obstacles and realizing the stated objectives. Through strategic planning, community engagement, and concerted conservation efforts, it is hoped that the initiative will overcome these challenges and thrive in its mission to promote nature conservation and sustainable wilderness experiences. However, over 20 years after WII's implementation of the management plan in 1995, many of the objectives were not followed or fully accomplished. In its 2015-16 management plan, the Forest Research Institute (FRI) acknowledges that all the objectives from the previous management plan were still not achieved, except the restoration of highly impacted habitats, which has been accomplished to a significant extent. The area now looks like a green patch of forest, and the scarred mine pits of Bhatti present a canyon-like topography full of greenery at the bottom and lower slopes of pits." Due to the undisturbed habitat in these areas, the restoration process has advanced rapidly. Consequently, they now support the lush vegetation characteristic of primary succession stages and a diverse array of wild mammals, both vertebrates and invertebrates, in substantial numbers. This phenomenon was noted during the excursions by researchers and scientists as a component of the comprehensive study.

3.6 MANAGEMENT PLAN 2014

The Forest Research Institute (FRI) prepared the following management plan in 2015-2016, 20 years after the previous plan. The objective of the new plan is to achieve many goals. First and foremost, its objective is to revive and preserve the various biological and non-living characteristics that are distinct from the Aravalli Mountain range. Furthermore, the plan seeks to revitalize and increase plant life in badly affected environments to improve wildlife's natural food sources. Another goal is to create a dynamic system for interpreting and educating about nature, promoting meaningful environmental experiences, and improving management capacities. However, achieving these objectives is fraught with challenges; rejuvenating the food base for fauna faces obstacles such as overgrazing by livestock, shallow soil depth, and overexploitation of certain plant species for fodder and fuel. Additionally, inadequate water conservation efforts and lesser protection infrastructure pose further challenges. The establishment of nature interpretation and conservation education programs is impeded by unsanitary activities carried out by neighbouring settlers, rubbish disposal in close proximity to the boundaries of the wildlife sanctuary, and unregulated human and motor activity within the area. Furthermore, the absence of promotional materials, training, and interpreting facilities exacerbates the challenge. Enhancing management capability also faces challenges, including staff shortages, inadequate training for field staff, an ageing workforce, and a lack of empowerment under relevant laws. The existing staff also grapples with additional responsibilities, such as feeding and maintaining a large population of rehabilitated monkeys, which diverts attention from core management issues. The management plan noted that these challenges will require concerted efforts, community engagement, improved infrastructure, and practical training programs to ensure the successful implementation of the management plan and the achievement of its objectives in preserving the unique biodiversity and

ecological integrity of the Aravalli Mountain range.

Understanding the critical importance and urgency of preserving the biodiversity and ecological integrity of the ABWS), the Forest Research Institute (FRI) has meticulously devised a comprehensive management plan. Recognizing the significance of zonation and zone plans, Planners have prescribed delineating areas based on specific management objectives. In this regard, zonation involves spatially separating different management categories to address varying objectives effectively. Presently, no distinct demarcation of core and buffer zones exists within ABWS. However, with the prohibition on biomass removal from the sanctuary area, the distinction between core and buffer zones has become negligible. The area not only serves as a crucial carbon sink but also acts as vital green lungs for the densely populated city. Hence, preserving the entire Sanctuary as a cohesive unit is imperative. In light of these considerations, the zonation strategy for ABWS must be strategic rather than conventional, ensuring the entire area remains disturbance-free. To meet the diverse management needs and objectives, the Management planner has prescribed establishing specific zones within ABWS, including the core zone, eco-tourism zone, habitat restoration zone, and monkey rehabilitation zone (which may overlap). We ensure practical conservation efforts and maximize the Sanctuary's biodiversity and ecological resilience.

3.7 Community Interface and Social Aspects

The sanctuary is surrounded by densely populated urban and rural settlements such as Sangam Vihar, Devli, Fatehpur Beri, Satbari, Anangpur, Surajkund, and Maidan Garhi. Within the fringe zones, colonies like Sanjay Colony and Indira Colony continue to exert anthropogenic pressure through fuelwood collection, grazing, and waste dumping. The social survey conducted in 2024 by the Wildlife Institute of India and Department of Forest & Wildlife, GNCTD, revealed that the majority of local residents are non-traditional forest users, with limited direct dependency on forest produce but frequent interaction through grazing and open access movement. The survey also highlighted the presence of migrant and economically weaker households, for whom the sanctuary serves as a space for informal activities such as cattle tethering, small-scale resource collection, and open defecation. Unmanaged stray cattle and feral dogs have emerged as major threats to regenerating vegetation and ground-nesting wildlife (Detailed in Chapter 4).

3.8 Tourism and Interpretation

The BNHS Interpretation Centre continues to play a central role in environmental education and awareness. Regular nature walks, birdwatching events, and butterfly festivals have been conducted, engaging Delhi’s urban public and students. The center also maintains updated checklists of birds, butterflies, and plants and provides training for eco-guides. The area offers high potential for developing controlled eco-tourism and education-based visitation, which could generate livelihood opportunities for nearby communities while ensuring minimal ecological disturbance.

3.9 Research works taken up in the past

PA management has not carried out any research work in the Sanctuary. The scientists of the Zoological Survey of India (ZSI) have researched the diversity of animals in the Sanctuary. A vegetation survey by the scientist of FRI, Dehradun, has also been taken up. The research work done in the past is listed below:

1. A research note presented by Kalpavriksh (1-49) New Delhi (1901) titled "The Delhi Ridge Founts Decline and Conservation.
2. Research study taken by Mahashman 1.K. (1963) leading to the publication of the flora Of Delhi (1-947) CSIR, New Delhi

3. Sawarkar V.B. and Uniyal V.K. (1995) from the Wildlife Institute of India, Dehradun, conducted a research study to prepare the Management Plan for Asola-Bhatti WLS.
4. Kumar & Khanna (1997) published a fauna profile of ABWS based on the work of Kalpavriksha (1991), Sawarkar and Hussain (1991), and the Zoological Survey of India (1997). The comprehensive and updated faunal profile incorporated an inventory of 246 spp. of fauna, including 35 app. from invertebrates, two spp. of Amphibian, three spp. of Reptile, 196 app. of Aves and ten spp. of Mammalia from Vertebrata
5. The research team from ZSI, headed by Dr. N.K. Sinha (1997), Dr. S.K. Gupta (1998), Dr. Vinod Khanna (1998) and Sh. J.P. satı (1999) came out with an additional record of 64 more spp, which include 44 spp. from invertebrates and three app. from Pisces, three spp. of Amphibia, four spp. of Reptilia, two spp. of Aves and s spp. of Mammalia from Vertebrata.
6. A checklist of Mammals prepared by Alfred, J.R.B, Sinha N.K., and Chakraborty 5. (2002) has a boon published by 251, an accessional paper no. 199. 1-289 (2002).
7. Chaudhary, P., Kumar, A., Madan, S., Mittal, M., & Dookia, S. Urban Leopards of National Capital: Estimating Density and Occupancy of Leopard (Panthera pardus) in Asola Bhatti Wildlife Sanctuary, New Delhi, India.
8. Kushwaha, S. P. S., Nandy, S., & Tomar, S. (2024). Nilgai (Boselaphus tragocamelus) Habitat Evaluation in Asola-Bhatti Wildlife Sanctuary, Delhi Using Multi-Criteria Analysis. International Journal of Ecology and Environmental Sciences.
9. Ganguly, I., & Chauhan, N. S. (2018). Dietary preference and feeding patterns of the urban rhesus macaque Macaca mulatta (Mammalia: Primates: Cercopithecoidea) in Asola-Bhatti Wildlife Sanctuary in India. Journal of Threatened Taxa, 10(15), 12907-12915.
10. Ganguly, I., Chauhan, N. S., & Verma, P. (2018). Assessment of human–macaque conflict and possible mitigation strategies in and around Asola–Bhatti Wildlife Sanctuary, Delhi NCR. Environment & Ecology, 36(3), 823-827.
11. Kushwaha, S. P. S., Nandy, S., & Gupta, M. (2014). Growing stock and woody biomass assessment in Asola-Bhatti Wildlife Sanctuary, Delhi, India. Environmental Monitoring and Assessment, 186, 5911-5920.

3.10 Monitoring and Evaluation

Although systematic monitoring protocols remain limited, the department has initiated biodiversity documentation through periodic surveys, camera trapping, and vegetation sampling with the help of academic partners. The sanctuary's inclusion in research projects by the Wildlife Institute of India, Delhi University, and JNU has enhanced data availability for management planning.

3.11 Administrative and Institutional Framework

The administrative setup of the sanctuary is under the Deputy Conservator of Forests (South Division), Department of Forests and Wildlife, GNCTD. On-ground protection and maintenance were managed by one Range Officer, five Forest Guards, and a limited number of regular and contractual laborers. The shortage of staff continues to constrain effective patrolling, vegetation management, and control of encroachments. A significant portion of manpower were remains engaged in monkey management-feeding, care, and rehabilitation of Rhesus macaques translocated from Delhi city. The lack of beat demarcation and sanctioned posts identified in the earlier management plan persists (Detailed in Chapter 10).

CHAPTER 4

THE PROTECTED AREA AND THE INTERFACE LAND USE SITUATION

4.1 The Existing Situation in the Zone of Influence

4.1.1 The location, extent, boundaries and natural attributes of the Zone of Influence

ABWS lies in the southern part of the National Capital Territory of Delhi and forms a part of the northern extension of the Aravalli hill system. The sanctuary covers an area of approximately 6873.28 acres (about 32.71 km²) and represents the last major natural forest of Delhi's ridge ecosystem. It is bordered by the rapidly urbanizing settlements of Bhatti Mines, Sangam Vihar, and Fatehpur Beri in Delhi, and Pali, Mangar, and Bandhwari in Haryana. The terrain is rugged, with undulating quartzite hills, depressions, and old mine pits now converted into artificial lakes. The area supports dry deciduous thorn scrub vegetation and forms an important ecological refuge amidst the expanding urban landscape.

4.1.2 Villages inside and outside the Protected Area, ethnic identities, traditions and customs

There are no officially recognized villages inside the sanctuary, but three unauthorized colonies—Sanjay Colony, Indira Colony, and Balbir Colony-exist within its boundaries. Villages located immediately outside the boundary include Asola, Bhatti, Satbari, Sahoorpur, and Maidan Garhi on the Delhi side and Pali, Lakadpur, and Mangar on the Haryana side. The residents are primarily of the Odh Rajput and Gujjar communities, with many families tracing their roots to Rajasthan and migration during the partition era. The population is largely Hindu with a few other groups, and community life is closely linked to agriculture, animal rearing, and daily wage labour. Traditional knowledge of the local flora and fauna remains, but dependence on forest produce has declined due to restrictions following sanctuary notification.

4.1.3 The state of people's economy, use of forest and non-forest-based natural resources

The social component survey covered 200 households from fringe villages such as Bhatti, Asola, and Maidan Garhi. The study revealed that 49 percent of respondents depend on the forest for some form of resource, mainly fuelwood, grazing, and minor forest produce. About 25 percent reported using the forest for firewood, while 40 percent depended on it for fodder.

Only 3 percent derived direct employment from forest-based work such as plantation maintenance or watch and ward. Agriculture, private employment, and labour in nearby urban areas were the main sources of income. Women play an active role in household waste management and livestock care but have limited participation in formal conservation programmes. The survey found that most families have resided in the area for over 30 years, indicating stable settlement patterns. Education levels remain low, with only 15 percent of the population educated beyond secondary level. Monthly household income ranges from Rs. 8,000 to Rs. 15,000, and fuelwood and cattle grazing remain supplementary livelihood activities. Despite restrictions, forest dependency continues indirectly through collection of twigs, leaves, and use of forest paths for cattle movement.

4.1.4 Implications of land use and resource dependency for the conservation of the Protected Area

The proximity of densely populated villages and unplanned development has created significant anthropogenic pressure on the sanctuary. Illegal grazing, fuelwood collection, stray cattle, and dumping of waste from Sangam Vihar and Bhatti areas are major threats. Resource extraction and encroachments have altered natural habitats and disrupted wildlife movement. The construction of boundary walls and fences has reduced large-scale intrusions, but daily entry of cattle and people persist through breaches. Continuous monitoring and enforcement are essential to prevent further degradation of vegetation and soil. The land-use pattern around ABWS has also been regulated by the Eco-Sensitive Zone (ESZ)

notification of the Ministry of Environment, Forest and Climate Change (2022) (Annexure III). The ESZ extends from 100 m to 1000 m around the sanctuary and covers 12.17 km², including parts of Faridabad and Gurugram districts of Haryana. The ESZ notification restricts quarrying, polluting industries, and large-scale construction while promoting eco-restoration and livelihood-linked conservation activities.

4.1.5 Encroachment and litigation

Encroachment remains one of the most serious challenges in the management of the sanctuary. Historical mining and subsequent settlement expansion led to occupation of forest land, especially near Bhatti Mines, Rajokri, and the southern boundary adjoining Haryana. Several encroachments have been identified and are under litigation in the Hon'ble High Court of Delhi and before the Revenue Department. Notable cases include Radha Soami Satsang vs. GNCTD, Ravindra Dhariwal & Anr vs. GNCTD, and Yogen Khosla vs. GNCTD, among others. In several areas, encroached plots have been vacated by the Forest Department. However, new instances continue to emerge, requiring periodic joint inspections with the Revenue Department. The encroached areas contribute to habitat fragmentation and restrict movement of animals such as leopard, nilgai, and hyena between Delhi and Haryana (Annexure IV).

4.1.6 Human-wildlife conflict

Human–wildlife conflict remains a recurring concern in the sanctuary's interface areas, with nearly 95% of households reporting monkey-related incidents due to overfeeding by devotees and tourists, leading to property damage, crop loss, and minor injuries. Crop depredation by nilgai and wild pigs is also reported near Asola and Sahoorpur villages. Stray cattle intrusion is a major issue, accounting for about 15% of mammal detections in camera traps, resulting in overgrazing, water competition during summer, and disease risks to native species like chital and sambar. A formal coordination mechanism has been established with the Municipal Corporation of Delhi (MCD) for systematic removal of stray cattle and preventive measures; however, this mechanism needs to be significantly strengthened for more effective implementation and long-term mitigation.

4.1.7 Infrastructure and sanitation

Most households in the fringe villages lack adequate sanitation and waste management facilities. Ninety-five percent reported absence of proper drainage, while 63 percent used open drains and 32 percent used unlined channels. Only 6 percent had a pucca drainage connection. Solid waste is often dumped near the forest edge or drainage lines, leading to pollution of soil and water. Greywater inflow into the sanctuary has been observed from Sangam Vihar and Bhatti side. Poor infrastructure increases the dependency on forest space for open defecation, washing, and cattle watering. Awareness on waste segregation and cleanliness remains low, and coordination between local bodies and forest staff is limited.

4.1.8 Cultural and social linkages

The sanctuary holds high cultural and spiritual importance for the surrounding community. Around 68 percent of respondents considered it moderately significant for traditional and religious reasons, while 32 percent regarded it as highly important. The area is associated with several temples and shrines situated near its periphery. Residents perceive the sanctuary as a place of peace and natural beauty that provides cleaner air and relief from urban stress. Many villagers expressed a sense of pride in living close to a natural area and showed willingness to participate in conservation activities if properly guided.

4.2 Development Programmes and Conservation Issues

4.2.1 Evaluation of government and non-government programmes for development and implications for the Protected Area and people

The Department of Forests and Wildlife, GNCT of Delhi, has been implementing various activities for protection and eco-restoration. The Eco-Task Force under the Territorial Army continues to carry out plantation and soil-moisture conservation work. The BNHS Nature Education Centre inside the sanctuary functions as an interpretation and awareness hub, conducting nature education programmes, guided trails, and community workshops. Collaboration between BNHS, Delhi Forest Department, and NGOs has improved awareness and provided short-term employment to local youth. Under the Greening Delhi Action Plan, plantation drives were carried out in degraded patches, mine areas, and boundary zones using native species such as *Anogeissus pendula*, *Balanites aegyptiaca, Acacia nilotica,* and *Terminalia arjuna*. In addition, capacity-building programmes for Stakeholders and field staff and awareness campaigns were conducted in 2024- 25.

4.2.2 Summary of problems faced by people that affect the management of the Protected Area and Zone of Influence

The key issues emerging from the social survey include Human macaque conflict, poor infrastructure, poor waste management etc. Open dumping of waste and greywater inflow continue to degrade the sanctuary environment. Encroachments and stray cattle pose additional challenges. Unemployment and lack of livelihood alternatives have increased indirect dependence on forest resources. Limited coordination among government departments and low awareness among residents hinder effective implementation of conservation policies. Efforts are needed to integrate livelihood opportunities with conservation through eco-development activities, skill development, and community engagement.

PART II
PROPOSED MANAGEMENT

CHAPTER - 5

VISION, OBJECTIVES AND PROBLEMS

Purpose of management plan of a protected area is to understand its conservation values and then suggest appropriate strategies for protecting and enhancing these values. This process has been adopted for drafting of objectives and strategies for ABWS too.

5.1 Conservation values ABWS: Conservation values of Asola-Bhatti Wildlife Sanctuary were evolved through a stakeholders' workshop and subsequent discussions with officers and frontline staff of the area from 15th to 18th July 2025. These exercises revealed that ABWS holds significant values across multiple levels of the landscape, serving important ecological, environmental, and social functions.

5.1.1 Global Level: ABWS is located on the northern most tip of the Aravalli hills, one of the oldest mountain ranges in the world, which possess immense geological and ecological values, making the conservation of this landscape all the more crucial. Even though this area has suffered heavy degradation in the past, it holds immense potential for restoration of these habitats as a representative ecosystem of Aravalli, adjoining to the expanding urban landscape of Delhi.

5.1.2 National Level: Because of its unique biogeographic location, as a transition zone from semi-arid forests of Aravalli's to the Punjab plains and rich unique historical legacy, ABWS forms one of the important conservation areas in the urban settings in India

5.1.3 Regional Level: ABWS forms edge of the northern Aravalli's forests and is located at the confluence of three states i.e., Delhi, Haryana and Rajasthan. It has it crucial role for ecological connectivity of fragmented forest patches across these states for movement of wildlife, buffering against desertification from western Rajasthan and serving as important catchment for hydrological values of this region. It is also the last remaining forest patch in Delhi, and the only protected area between Delhi and the rapidly urbanizing regions of Haryana, which acts as a vital green buffer between dense urban settlements and fragile ecosystems.

5.1.4 Local Level: ABWS is a vital ecological asset for the Delhi-NCR region. It plays its role for improving air quality, regulating local temperature and acting as a carbon sink in this region, thereby helping in regulation of microclimate of the area. Water bodies like Neeli Jheel, add in terms of ground water recharge and support local as well as migratory birds. Sanctuary provides immense opportunities of nature education for students and researchers. It is also emerging as an important destination of recreation for local people of Delhi.

5.2 Vision:

Stakeholders' workshop provided an opportunity to understand the long-term aspirations of different groups for this area. These aspirations were used to synthesize as a collective vision of the sanctuary, which is provided as follows:

To develop Asola Bhatti Wildlife Sanctuary as a model Protected Area of Aravalli landscape which can serve as a green lung for National Capital of Delhi and a unique ecosystem for nature education, recreation and coexistence.

5.3 Goal:

Given, the dynamic ecological values and complex socio-cultural settings of ABWS, and unique opportunities and challenges of the area, the overarching goals of this integrated Management Plan are as follows:

1. The immediate goal of the current plan is to develop ABWS as a model Protected Area in urban settings of NCR through the process of ecosystem regeneration, scientific management and effective stakeholder engagement.

2. The long-term goal of the plan is to use this area for building a large constituency for conservation of ABWS and the Aravalli landscape, of which this sanctuary forms a part.

5.4 Objectives:

Specific objectives of this plan are as follows:

1. To conserve the ecological status of ABWS with a focus on rare, endangered, and endemic species of flora and fauna; associated habitats; and geomorphological features of Aravalli landscape.

2. To restore and rejuvenate degraded forests and vegetation of the sanctuary in conformity with the elements of Aravalli ecosystem, improving habitat structure and the natural food base for native fauna.

3. To enhance the ecological integrity of the sanctuary by protecting and improving its watershed values.

4. To strengthen protection and enforcement through improved staffing, training, infrastructure, inter-agency coordination, and capacity building.

5. To promote human–wildlife coexistence by reducing conflict through community awareness, scientific handling animals, and responsive conflict mitigation systems.

6. To develop Asola Bhatti as a Centre for nature interpretation, conservation education, and public engagement.

7. To promote responsible ecotourism in ABWS for rich wilderness experiences thereby building a constituency for conservation.

8. To promote and institutionalize long-term research, monitoring, and data-based decision-making for effective sanctuary management.

5.5 Problems

To achieve the set objectives, a number of challenges are visualized. A brief account of various problems against each objective are documented as follows:

Objective 1: To conserve and restore the ecological status of ABWS with a focus on rare, endangered, and endemic species of flora and fauna; associated habitats; and geomorphological features of Aravalli landscape.

Problems:

a) Inadequate information on rare, endangered, threatened and endemic species, and their distribution patterns

b) Invasive species (*Prosopis juliflora*, *Lantana Camara*)

c) Encroachment and habitat degradation

d) Inadequate protection- trespass, illegal entry of cattle and biotic pressure

e) Lack of a system for scientific research and monitoring.

f) Inadequate organizational capacity for scientific managements.

g) Poor coordination with scientific institutions and other conservation organizations

Accumulation of non-degradable pollutants

Objective 2: To restore and rejuvenate degraded forests and vegetation of the sanctuary in conformity with the elements of Aravalli ecosystem, improving habitat structure and the natural food base for native fauna.

Problems:

a) Lack of a long-term plan for restoration of the area

b) Poor soil conditions and inadequate soil & water conservation initiatives

c) Encroachment, Trespassing and illegal entry of cattle

d) Biotic Interference

e) Pollution and dumping

f) Lack of monitoring system

g) Inadequate coordination between staff and Eco Task Force personnel

***Objective 3: To enhance the ecological integrity of the sanctuary by protecting and improving its watershed values*.**

Problems:

a) Degraded Catchments and Drainage

b) Inadequate soil & water conservation initiative

c) Lack of long-term plan and monitoring

d) Inadequate organizational capacity about watershed management

Objective 4: To strengthen protection and enforcement.

Problems:

a) Inadequate field staff

b) Inadequate Capacities

c) Poor equipment and infrastructure

d) Lack of Motivation among staff

e) Weak interagency coordination

Objective 5: To promote human–wildlife coexistence by reducing conflict through community awareness, scientific handling animals, and responsive conflict mitigation systems.

Problems:

a) Unscientific release of rescued animals

b) No SOPs for handling animals

c) Inadequate staff and capacity in animal handling

d) Lack of awareness among people

e) Feeding of animals by people

f) Inadequate infrastructure and equipment for handling rescue and release operations

g) Lack of monitoring of released animals and their health.

Objective 6: To develop Asola Bhatti as a Centre for nature interpretation, conservation education, and public engagement.

Problem:

a) Lack of long-term vision and plan

b) Weak Interpretation facilities, inadequate infrastructure and resource allocation

c) Lack of effective education programs

d) Lack of specialized staff

e) Inadequate capacities

f) Lack of research support and database

Objective 7: To promote responsible ecotourism in ABWS for rich wilderness experiences thereby building a constituency for conservation.

Problems:

a) Inadequate visitor facilities

b) Poor visitor management

c) Lack of trained staff

d) Poor capacities

e) Shortage of eco-carts

f) Illegal Entry of Tourists

g) Uncertain resource allocation

Objective 8: To promote and institutionalize long-term research, monitoring, and databased decision-making for effective sanctuary management.

Problems:

a) Non-institutional mechanism

b) No long-term planning and vision

c) Inadequate human and financial resources

5.6 Strengths, Weaknesses, Opportunities and Threats (SWOT) Analysis:

In order to manage this evolving and complex area, the management will have to make use of existing strengths while minimizing the weaknesses. Similarly, they will have to keep in mind, both the threats and available opportunities of the area. Accordingly, the SWOT Analysis of ABWS is detailed below:

Table 5.1 – SWOT Analysis

Strengths	Weaknesses
• The only forest patch that uniquely represents the Aravalli ecosystem in urban Delhi landscape, blending ecological and cultural heritage with proximity to historical sites. • Area receives strong support from civil society, multiple stakeholders, local communities, Government and judiciary. • Acts as Delhi's green lung, sequestering carbon and mitigating urban heat. • Functions as an education and research hub for biodiversity and conservation studies, owing to its unique status as a preserved patch of the Aravalli range within urban Delhi. • Provides a buffer zone between urban sprawl and ecologically sensitive regions like the Gurgaon-Faridabad highway. • Hosts many scheduled species even within an urban setting. • Ensures ecological connectivity between Delhi and Haryana forests, aiding wildlife movement. • Involvement of Eco-Task Force for eco-restoration of habitats.	• Past mining has led to habitat degradation, soil erosion, and fragmentation. • Dominance of invasive species like *Prosopis juliflora* suppressing native flora. • Narrow functional buffer zone exposing the sanctuary directly to urban and rural pressures • Illegal grazing, firewood collection, encroachment, and trespassing leading to frequent habitat disturbance in the sanctuary • Waste dumping and sewage runoff polluting water bodies and degrading ecosystem health • Weak research-based management and monitoring. • Ineffective eco-tourism strategies and inadequate interpretation facilities. • Lack of training among frontline and other technical staff hampering coordinated conservation efforts, leading to gaps in habitat management, wildlife rescue, monitoring, and community engagement. • Limited awareness programs for surrounding communities to deal the problem of with human wildlife conflict • Institutional gaps such as staff shortages, low morale of staff and lack of SOPs for effective management.
Opportunities	**Threats**
• Presence of various research institutions and conservation organization in Delhi, which could support sanctuary, programs. • High potential for ecotourism, birdwatching and nature education and extension. • Support of Haryana Forest Department for conservation of the larger landscape. • Learning from successful biodiversity parks can guide effective landscape restoration in the sanctuary. • Availability of motivated youth who could build a strong volunteer base for conservation activities. • Availability of modern technology opportunities which can be used for management and extension • Collaborative conservation through public-private partnerships and citizen science platform	• Growing urbanization and risks of encroachment • Increasing vehicular traffic (e.g., Gurgaon-Faridabad Road) leading to road kills and disruption of ecological connectivity. • Risk of diseases due to waste and sewage pollution. • New invasive species. • Possibilities of increasing human-wildlife conflict due to growing wildlife populations (particularly monkey and leopard). • Growing anthropogenic pressures due to increasing human population. • Climate change and extreme weather events threatening forest ecosystem stability.

CHAPTER - 6

THE MANAGEMENT STRATEGIES

6.1. General:

The ABWS lies in the south-eastern part of the Delhi South Ridge and forms an integral part of the Aravalli hill range. This patch of forests is often referred as the lungs of Delhi and its adjoining regions. The sanctuary was established in 1986 by integrating 1904 hectares of village lands. Subsequently in 1991, the Bhatti area covering 852.6 hectares, was again added and notified as part of the sanctuary.

Over centuries, and particularly in recent decades, the sanctuary's landscape has undergone significant changes due to intense anthropogenic pressures. Illegal mining, habitat fragmentation, poor soil quality with low water retention, loss of native vegetation, and the invasion of non-native species have collectively degraded the ecosystem. Its proximity to several villages has also led to frequent trespassing and unregulated resource use.

Despite these challenges, the sanctuary has shown signs of capacity to recover. In certain areas, abandoned mining sites have been transformed into green patches through natural succession and human intervention, leading to the gradual return of wildlife due to current management. Past management plans (1996 and 2014) have provided for eco-restoration measures and other protection strategies for development of this sanctuary. However, a comprehensive and scientific approach of management is still lacking.

As a unique ecological asset of Delhi, the ABWS requires targeted restoration and conservation strategies that not only address ongoing degradation but also secure the long-term health and resilience of its ecosystems. The current management plan is guided by a set of core principles that emphasize ecological sustainability, scientific planning, and community participation. These core principles are explained as below:

6.1.1. Geographic Scope of Management Plan:

The ABWS is limited to an administrative extent of 19 km². However, currently managed wildlife reserve of 32 km^2 (19 km² of notified WLS and 13 km^2 of RF) forms an integral part of the larger Aravalli landscape and it lies within the North Aravalli Leopard Wildlife Corridor.

Despite its long history of exploitation including heavy anthropogenic pressures, habitat fragmentation, restricted wildlife movement, and its location within dense urban settlements, the Asola Bhatti Wildlife Sanctuary (ABWS) continues to maintain a diffused but significant landscape connectivity beyond its boundaries. This connectivity links the sanctuary to the Sariska Tiger Reserve through a chain of fragmented forests in Haryana and potentially extends further toward the Ranthambore Tiger Reserve via additional Aravalli linkages, as noted in the ECZ notification of 2017 along the Haryana border. However, urban expansion and roads, especially the Gurugram - Faridabad highway, have led to increasing habitat fragmentation, posing a significant threat to leopard movement. The Bombay Natural History Society (BNHS) and the Department of Forests & Wildlife, Government of National Capital Territory (GNCT) of Delhi have also underscored this concern in their report "*Status of the Indian Leopard and Other Mammals in Asola Bhatti Wildlife Sanctuary, Delhi (2022)"*. Restoring and safeguarding these ecological corridors is vital for facilitating wildlife movement, maintaining genetic exchange, and ensuring the long-term survival of species. This strategic location allows for the movement of wildlife across state boundaries, reinforcing the ecological integrity of the entire landscape.

6.1.2.Rationalization of Land Use

The ecological integrity of ABWS has long been under threat due to persistent anthropogenic activities. Over the decades, the sanctuary has experienced multiple biotic pressures, including unsustainable extraction of resources, illegal trespassing, encroachment, dumping of unproductive stray cattle, and pollution from adjoining urban areas. Adding to these pressures, *Prosopis juliflora* introduced by the British in the late 19th century and later extensively planted during the early 20th century under the redevelopment of Lutyens' Delhi to enhance greenery and aesthetics has now turned into an aggressively invasive species. Over time, its dominance, along with that of *Lantana camara, Subabul (Leucaena leucocephala)* and *Eucalyptus spp.*, has severely suppressed the regeneration of native vegetation, thereby altered the natural habitat structure, and disrupted the ecological balance of the sanctuary.

Previous management plans recognized these threats and emphasized the need to reduce biotic pressures while initiating ecological restoration and rational land-use measures. Building on this foundation, the present plan seeks to address these challenges more scientifically through targeted habitat restoration, systematic management of invasive species, reduction of human-induced pressures, and inclusive conservation strategies with local communities.

Collectively, these actions aim to restore ecological resilience and ensure that Asola Bhatti Wildlife Sanctuary thrives as a vital green refuge within the rapidly urbanizing landscape of the National Capital Region.

6.1.3. Effective Stakeholder Engagement

Active stakeholder engagement is critical for the long-term protection and management of ABWS. At present, the Wildlife Department plays a central role in over-all management of the reserve, wildlife rescue, monitoring, and conflict mitigation, while the Eco-Task Force and Forest Department share responsibilities for habitat regeneration and ecological restoration. Given ABWS's strategic location along the Delhi–Haryana border, close coordination with the Haryana Forest Department and other relevant agencies is essential for effective landscape-level conservation.

Being in the National Capital Region, ABWS is uniquely positioned to benefit from the expertise and active participation of research institutions, environmental NGOs, nature groups, citizen-led forums, and vibrant birdwatching societies such as the Delhi Bird Group and Delhi Bird Club. These groups can contribute critical support through field observations, citizen science data, and public awareness initiatives. However, at present, these stakeholders operate largely in isolation, with limited coordination and inadequate resource sharing, leading to fragmented conservation outcomes. Associating them into a formal management structure would not only enhance scientific research and ecological monitoring but also strengthen public engagement and foster a broader culture of conservation stewardship around ABWS. The management plan seeks to replace the existing sporadic and fragmented approach with a collaborative conservation network that brings together government agencies, research institutions, NGOs, eco-clubs, bird societies, and local communities within a cohesive management framework. This integrated network will enable the pooling of expertise, sharing of resources, and establishment of transparent communication channels to safeguard biodiversity, enhance ecological resilience, and ensure the sustainable management of the sanctuary for future generations.

6.1.4. Science Based management (followed in CHAPTER 8)

Ongoing eco-restoration practices have often lacked a sound scientific foundation and clear management strategies. The uprooting of invasive species has at times been carried out in ways that disturb the entire ecosystem, while plant introductions have been made without sufficient ecological studies. Restoration efforts must be guided by evidence-based approaches that prioritize the selection of native and culturally significant plant species. Such species should be capable of adapting naturally to the local environment, providing dependable food and shelter for animals and birds, improving soil fertility, and enhancing the area's catchment and water-holding capacity. Solid waste management in fringe areas should also be a priority, as poor waste handling can increase the risk of disease transmission to wildlife, threatening both animal health and ecosystem stability. The vision of this plan is to restore the area into a thriving natural system where native plants and wildlife thrive year-round, soil and water stay healthy, and nature regenerates on its own.

6.1.5. Management Capacities

At present, the sanctuary has a team of old staff who bring valuable experience and knowledge of the area's history and challenges, as well as new recruits in adequate numbers whose energy could be used effectively for improvement of the sanctuary. However, most of staff members have not received proper training in wildlife management, handling of wild animals, restoration, and rescue operations. As a result, many conservation efforts lack a scientific and systematic approach. The management of the sanctuary also lacks an institutional mechanism for an effective inter- agency coordination, which is critical for long- term conservation actions. There are no structured training programs or regular awareness initiatives, and coordination between departments is poor. Field operations are further affected by shortage of equipment and inadequate infrastructure. In addition, the absence of incentives, recognition, and clear career growth opportunities reduces staff motivation, affecting their performance and long-term commitment. To improve this situation, institutional mechanisms such as a dedicated management committee, inter-departmental coordination cell, and regular monitoring systems are proposed to be established under the management framework. These will be supported by structured training and capacity-building programs, upgraded infrastructure and modern equipment, and recognition and reward systems for staff.

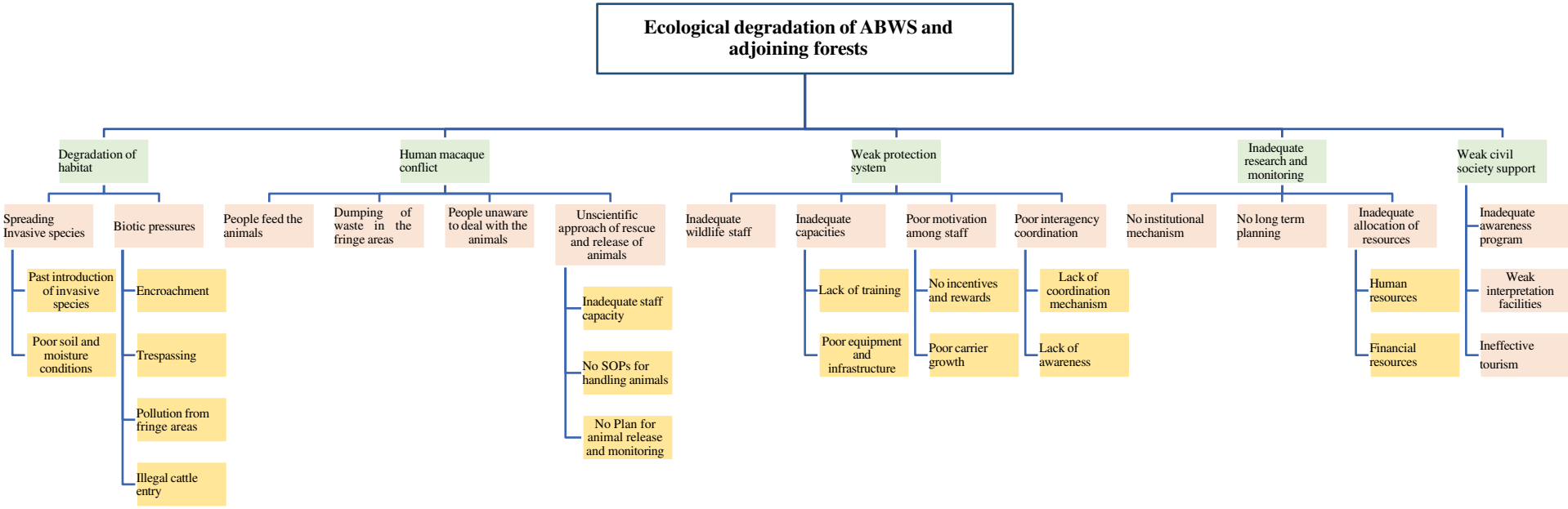

Fig.6.1: Problem tree of AWB

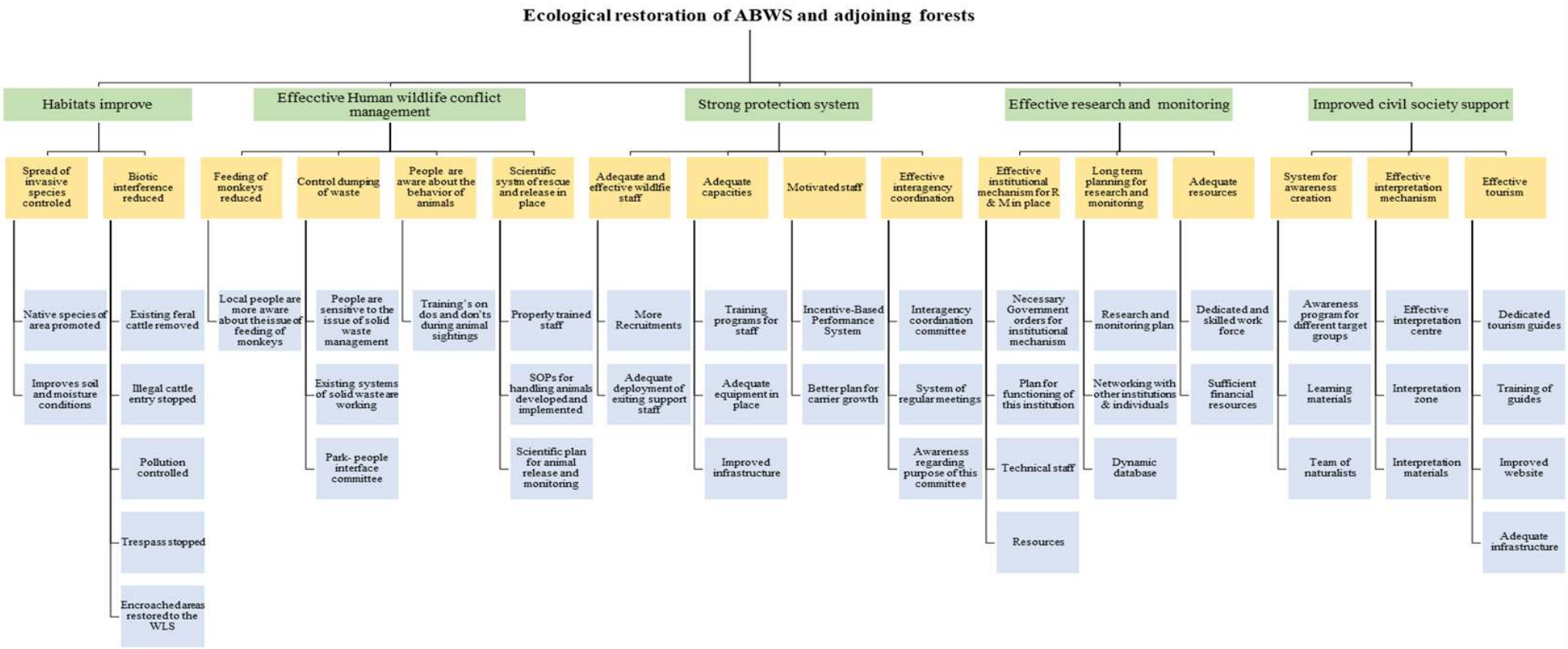

Fig 6.2: Solution tree of ABWS

6.2. Major Management Strategies:

The broad strategies of this management plan are derived from the outcomes of a two-day workshop (15–16 July) organized with stakeholders and the Forest Department. The first day focused on understanding the major issues faced by local communities, staff and other stakeholders, identifying management challenges, and exploring possible solutions along with monitoring protocols. The second day emphasized strengthening staff capacity in field-based operations. Building on these discussions, a participatory problem analysis and strategy formulation exercise was conducted in July 2025 using the logical framework approach. The strategies developed through this process were further discussed and refined in consultation with the planning team at the Wildlife Institute of India. The details of this analysis are presented in Figures 5.1 and 5.2. This participatory approach not only ensured that diverse perspectives were incorporated but also helped to build ownership of the planning process among stakeholders, making the strategies more practical, inclusive, enable and scientific.

6.2.1. Zonation

Based on the carnivore movement patterns, ecological restoration requirements, tourism activities and the complexities of managing urban fringes, the sanctuary has been divided into five distinct zones. This zonation framework is designed to balance conservation priorities, scientific research, sustainable tourism and with community engagement (Fig.5.4)

1. **Core Zone:** This zone will be strictly protected for biodiversity conservation, particularly for maintaining carnivore movement and strengthening prey- predator relationships.
2. **Conservation Zone:** This zone surrounds the core and acts as a buffer against urban pressures. Focus on habitat restoration, control of invasive species, reducing biotic interference, and supporting ecological processes.
3. **Tourism Zone:** This zone is designed to regulate and channelize tourism in a sustainable manner.
4. **Interpretation cum Education Zone**: Zone will function as the primary interface between the sanctuary and civil society.
5. **Extended Buffer Zone**: Extends beyond the immediate sanctuary boundaries into adjoining landscapes and urban fringes and has significant future ecological values.

1. Core Zone:

Our study documented active leopard and jackal movement in some stretches, with minimal signs of human disturbance, making these suitable to designate as the core zone of ABWS and adjoining reserve. Spanning roughly 9 km², the area extends from Neeli Jheel through the abandoned Bhatti mines to below Bhatti village and functions as a key carnivore corridor linking directly with Haryana's forests. Given its ecological importance and relatively undisturbed condition, it requires strict protection, with no human interference and limited eco-restoration activities. The zone borders the Aravalli forests of Faridabad and Gurugram districts on the south, south-east, and south-west, further underscoring its role as a critical passage for wildlife.

Given its ecological importance, the corridor must be managed to safeguard habitat connectivity and minimize anthropogenic pressures. Intersection of sanctuary with the Gurugram- Faridabad Highway is an area of critical concern as this site has recorded repeated incidents of road kills involving leopards and other wildlife. To address this threat, the development of a dedicated wildlife underpass along this stretch is proposed. Such and intervention would facilitate safe animal movement, preserve genetic exchange between populations, and substantially reduce road mortality and human-wildlife conflict. Establishing this underpass would therefore represent a long-term conservation measure, securing both ecological integrity of ABWS and public safety.

2. Conservation Zone:

It is proposed that this wildlife reserve will have a Conservation Zone, spanning over nearly 24 km². This zone, comprising of about 10 km² of WLS and 14 km² of RF, will play a pivotal role as a buffer to core zone and will support the continuity of ecological processes to help in maintaining the sanctuary's overall integrity. This zone will act as a crucial area for habitat restoration, species protection, and long-term ecological monitoring.

Over the years, area under this zone has been the focus of extensive eco-restoration work, much of it carried out by the Eco-Task Force (ETF). While these efforts have contributed significantly to reviving degraded habitats, the heavy reliance on mechanical interventions have at times caused ecological disturbances. Moreover, this area continues to face pressures from nearby urban settlements such as Sangam Vihar and Tughlaqabad and grapples with multiple threats like sewage inflow, waste dumping, grazing, fuelwood collection, and encroachment, all of which place immense strain on its ecological stability. Yet, despite these challenges, it plays an essential role in soil and water conservation, helping to regulate hydrological cycles and stabilize the fragile Aravalli ecosystem. Recognizing its ecological and socio-environmental importance, the management focus in this zone will be to restore habitat quality through large-scale revegetation using native species, strengthen ecological resilience, and reduce anthropogenic pressures through community participation & improved protection measures. With sustained efforts, this zone will act as a living example of how degraded landscapes can be revived to support biodiversity, ecological balance, and the well- being of the wider sanctuary landscape. Guided by restoration priorities and lessons learned from past efforts, the zonation aims to bring a systematic and focused approach to habitat rehabilitation and ecological management. The central goal is to accelerate natural recovery processes, restore ecological balance, and ensure that the sanctuary continues to provide essential ecosystem services. Strengthening these habitats will not only enhance biodiversity but also build ecological resilience, benefiting both nature and the communities at large. The restoration works previously carried out by ETF is shown in figure below (Fig 5.3).

3. Tourism Zone:

The Tourism Zone, overlapping the area of core and conservation zone, serves as the primary gateway to the sanctuary, integrating conservation, learning, and recreation. This zone will cover about 7.6 sq. km, extending from the main entrance to Neeli Jheel. This stretch of area combines structured nature education programs with designated tourism sites, providing visitors opportunities for awareness, learning, and low-impact recreational experiences. It includes visitor orientation facilities and stretches of ecologically restored landscapes, designed to balance environmental education with sustainable tourism. The zone also accommodates essential administrative and operational facilities, including the DCF office, Range Officer's office, staff offices, the Rescue and Rehabilitation Centre, and the Foundation office, ensuring effective management and support for sanctuary operations.

4. Interpretation cum Education Zone

The Interpretation cum Education Zone includes areas designed for visitor engagement, learning, and nature-based recreation. It extends from the sanctuary's main gate to include the butterfly garden, Aravalli Forest Park, souvenir shop, ticket center, nurseries, cycle track, nature education center and jungle trails, covering about 5 km² and overlaps with the tourism zone. This zone is designated for providing educational and recreational facilities to the visitors and is planned to

manage and guide tourist activities while protecting sensitive habitats. It provides visitors with opportunities to learn about biodiversity, enjoy nature, and experience the sanctuary in a structured manner. The zone fosters a strong conservation constituency by engaging citizens, schools, corporates, and local communities. By concentrating facilities, trails, and educational activities here, the sanctuary can promote awareness and sustainable visitation, while keeping the core and conservation zones undisturbed.

5. Extended Buffer Zone:

The Extended Buffer Zone of the reserve encompasses several small, relatively unmanaged forest patches that are currently outside the sanctuary boundaries. These patches of forests remain poorly studied and lack comprehensive ecological data. Notably, one patch lies to the north of the sanctuary near Tughlaqabad, covering approximately 2.4 sq. km, while another extends to the southwest beneath Bhatti village, spanning about 9.7 sq. km. Despite their fragmented condition, these patches hold critical ecological significance and with many water bodies, can serve as potential corridors for carnivore movement and linking the sanctuary with adjoining forests in Delhi and Haryana, as well as forested stretches toward Tughlaqabad. Integrating these patches into the sanctuary's conservation zone will enhance habitat connectivity; facilitating wildlife dispersal, and strengthen regional biodiversity conservation. Over time, these areas could be gradually integrated into the sanctuary, creating a more resilient, ecologically connected, and functionally robust landscape that benefits both biodiversity and the surrounding human communities.

Table 6.1. Proposed zonation of ABWS

Zone	Area (sq. km)	Overlapping	Description
Core Zone	≈9	--	Ecologically most sensitive area with minimal human activity, critical wildlife habitat and wildlife corridor.
Conservation Zone	≈24	Surrounds the Core Zone	Focuses on large-scale habitat restoration, species conservation, and management of anthropogenic pressures while maintaining ecological connectivity.
Tourism Zone	≈7.6	A small part of this overlaps wi core zone	Designed for regulated nature-based tourism and visitor facilities that promote conservation awareness.
Interpretation cum Education Zone	≈5	Overlaps with Tourism Zone	Dedicated to environmental education, awareness, and interpretation of biodiversity and conservation efforts.
Extended Buffer Zone	≈12.1	Includes Tughlaqabad (≈2.4) Bhatti (≈9.7) patches	Serves as an ecological buffer linking the Sanctuary with surrounding landscapes and reducing edge effects.

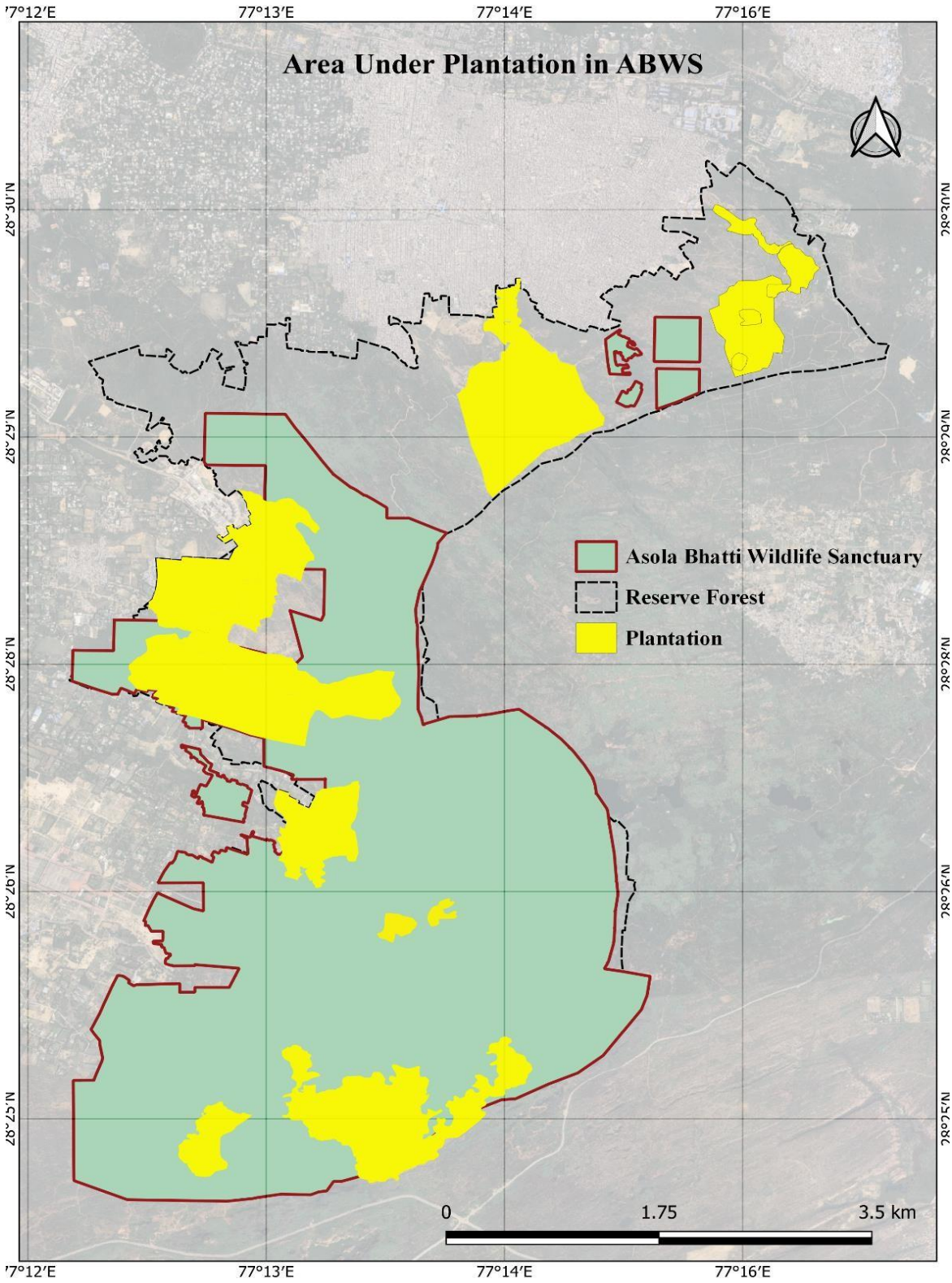

Fig.6.3. Previous Eco-Restoration Area – Eco-Task Force (ETF) Interventions

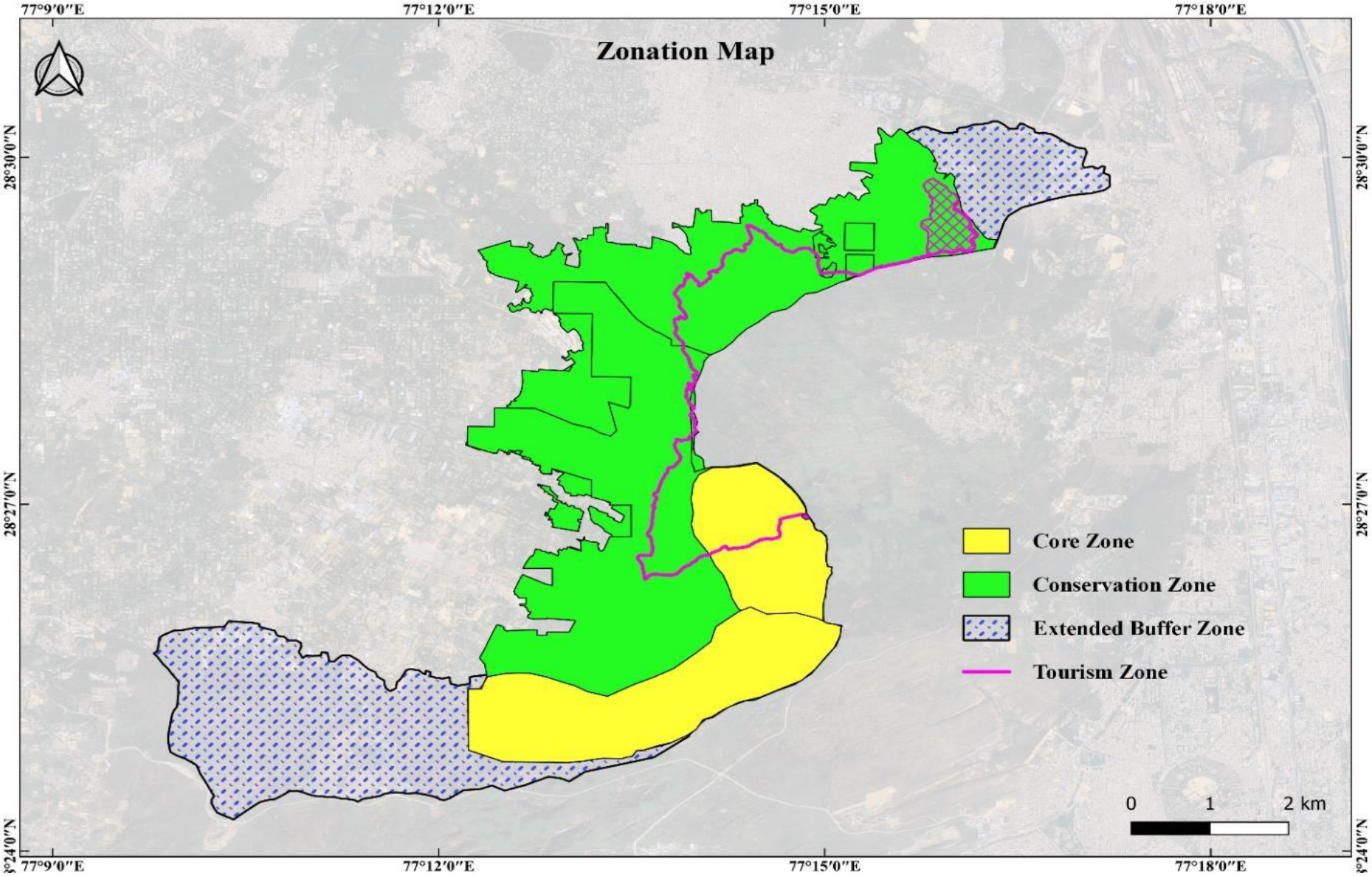

Fig.6.4: Zonation of AWBS.

6.2.2. Zone Plans

Looking at the priority of different zones, five zone plans are proposed for ABWS as follows

6.2.2.1. Core Zone plans

Based on its conservation importance and ecological security, the Core Zone has been identified as the highest priority area of the sanctuary. It serves as the biodiversity nucleus, representing the most pristine and ecologically vital region with minimal human interference. Functioning as a critical wildlife corridor, the Core Zone enhances connectivity between fragmented patches of the Delhi Ridge and adjoining forested landscapes, facilitating the free movement of fauna across the region. The Core Zone is the ecological backbone of the sanctuary, ensuring gene flow, species survival, and landscape connectivity. With high biodiversity and minimal disturbance, it is the top conservation priority, focusing on habitat restoration, invasive control, and strict protection to maintain its wilderness and ecological integrity.

Management Focus and Activities of Core Zone are:

1. **Ecological Mapping and Habitat Identification**
   - Conduct GIS and remote sensing-based ecological mapping to identify and monitor key habitats such as wetlands, breeding sites, and sensitive vegetation patches.
   - Use habitat data to prioritize conservation interventions and restoration planning.
2. **Regulation of Human Access**
   - Human entry to be strictly restricted to authorized personnel for patrolling, ecological monitoring, and research.
   - All activities to be in accordance with the Wildlife (Protection) Act, 1972 and international conservation standards (IUCN, 1994; MoEFCC, 2011).
3. **Conservation and Protection Priorities**
   - Ensure protection of threatened, rare, and keystone species.
   - Promote habitat restoration and regeneration of native vegetation.Implement a phased and careful removal of invasive species such as *Prosopis juliflora*, *Leucaena leucocephala*, *Eucalyptus spp.*, and *Lantana camara* and non-native species.
   - Control fires by establishing effective fire management systems, including fire lines and early warning measures.
4. **Surveillance and Monitoring**
   - Reinforce protection through regular patrolling, establishment of check-posts, Watch towers and deployment of modern technologies such as camera traps and drones.
   - Strengthen anti-poaching operations and surveillance infrastructure.
   - Prohibit all forms of settlements, and extractive activities to maintain the natural wilderness character
   - Prevent grazing, fuelwood collection, and illegal entry within the core area.
5. **Promote Ecological and Climate Benefits**
   - Enhance ecological resilience through habitat protection and natural regeneration.
   - Support carbon sequestration and groundwater recharge functions.
   - Strengthen landscape-level connectivity with the Delhi Ridge and adjoining forest patches.

6.2.2.2. Conservation Zone Plan:

Conservation Zone has been delineated within the reserve to address ecological needs and prioritize habitat restoration initiatives. This zone covering about 24 sq. km area has been the primary focus of eco-restoration activities in the past, largely implemented by the Eco-Task Force (ETF). These efforts,

involving extensive mechanical uprooting, have significantly altered the natural structure of the landscape. While these interventions contributed to greening and stabilization, they also led to certain ecological disturbances, reducing natural resilience of the ecosystem, and affecting habitat diversity. In the current management plan, it is proposed to continue habitat restoration activities. However, use of heavy machinery has to be carefully planned and minimized to ensure least damage to the edaphic and hydrological values of the ecosystem. Simultaneously, efforts have to be made for minimizing biotic pressures and promoting the growth of native vegetation. Conservation zone has been designed to restore degraded parts of the landscape and strengthen ecological resilience of the area to maintain continuity with the core zone.

Management Priorities and Action Plan for Conservation Zone:

a. Boundary Protection and Encroachment Control

- Implement intensive boundary demarcation and protection measures.
- Prevent encroachments and regulate external disturbances.

b. Habitat Restoration and Rehabilitation

- Continue restoration efforts with priority on removal of invasive and non-native species and long-term environmental protection
- All interventions, including plantation, assisted natural regeneration, invasive species removal, soil and moisture conservation, and habitat improvement measures, shall be undertaken strictly in accordance with the provisions, prescriptions, and monitoring frameworks of the Protection-cum-Improvement Working Circle under the approved Working Plan (2026–27 to 2036–37) of the Government of NCT of Delhi (GNCTD).
- After removing invasive species, plantation of suitable native tree and shrub species will be undertaken to restore habitat quality. Species selection, spacing, and plantation techniques will be planned based on soil type, moisture, and topography.
- Preference will be given to indigenous and fruit bearing species that support native wildlife and enhance ecosystem resilience.
- Mixed plantation patterns will be encouraged to promote biodiversity and ecological balance.
- Regular monitoring and maintenance will be carried out ensuring healthy growth and successful habitat restoration.

c. Development of Grasslands and Shrub-lands

- Establish and maintain native grasslands and shrub habitats using palatable indigenous species to support herbivore populations, enhance biodiversity, and strengthen trophic balance within the Conservation Zone.

d. Water and Soil Conservation

- Undertake contour trenching, check dams, and percolation pits.
- Enhance groundwater recharge, reduce soil erosion, and support natural regeneration.

e. Reduction of Biotic Pressure

- Systematically remove stray cattle.
- Strictly remove the pressures of grazing and fuelwood collection.

f. Waste and Pollution Management

- Control the damages of the sewage discharge, solid waste dumping, and other forms of pollution by diversion and scientific treatment.
- Establish proper solid waste collection and disposal systems in collaboration with local civic bodies.
- Prevent illegal dumping and reduce environmental contamination.

g. Monitoring and Adaptive Management

- Conduct regular ecological monitoring to assess vegetation recovery, habitat health, and wildlife presence.
- Use monitoring data to guide adaptive management strategies.

h. Community Engagement

- Involve residents in conservation initiatives through awareness programs.
- Reduce biotic pressures through community participation and education.

i. Ecological Buffer Function

- Maintain the zone as a critical ecological buffer supporting water and soil conservation.
- Gradually restore natural resilience and biodiversity to strengthen landscape connectivity with the Core.

j. Integration with Core Zone

- This area holds potential for future integration or upgrading into the Core Zone after sustained ecological improvement.

6.2.2.3. Tourism Zone Plan:

The Tourism Zone of ABWS (7.6 sq. km, including the Interpretation cum Education Zone) will serve as a multi-functional area integrating conservation education, nature-based recreation, and administrative facilities. Extending from the main entrance to Neeli Jheel, it will utilize an existing kaccha road with 20-meter buffer to minimize habitat disturbance. The zone will act as the primary public interface, promoting awareness and appreciation of biodiversity. Outreach efforts will include social media and a dedicated website to enhance visitor engagement and provide high-quality information. Broad strategies for this zone will include:

- Structured nature education programs and guided trails for visitors.
- Eco-interpretive activities to promote responsible tourism and environmental stewardship.
- Maintenance of areas under ecological restoration as demonstration sites, showcasing native species and habitat recovery processes to reinforce conservation messaging.
- Creation of supportive infrastructure.

The Tourism Zone will try to harmonize the objectives of visitor engagement and habitat protection, providing opportunities for experiential learning while safeguarding sensitive areas. A more detailed discussion of this zone is presented in Chapter 7 of this management plan.

6.2.2.4. Interpretation Zone Plan:

The Interpretation Zone (≈5 sq. km) overlaps with the Tourism Zone and is designed as a dedicated space for conservation education and environmental awareness. It provides carefully planned areas and infrastructure for learning, interpretation, and responsible visitor engagement, fostering appreciation of biodiversity while supporting conservation of the area. Essential administrative and operational infrastructure in the zone will include watch-towers, check posts, ticketing counters, cafeteria, public toilets and offices.

Key components of the Interpretation Zone will include:

- **Ticketing Facilities:** To regulate visitor entry and manage carrying capacity effectively.
- **Guided Tours:** Led by trained naturalists to provide educational experiences while minimizing ecological impact.
- **Visitor Infrastructure:** Including nature trails, signage, seating areas, and eco-friendly amenities.

- **Thematic Gardens:** Showcasing native Aravalli species and habitats as living classrooms for biodiversity education.
- **Souvenir Shops:** Offering eco-friendly products and educational materials to promote conservation awareness and support sanctuary management.
- **Nature Education Programs:** Structured activities to engage visitors in learning about biodiversity and ecosystem conservation.
- **Citizen Science Clubs:** Encouraging community participation and fostering interest in local wildlife and habitat conservation.

Together, these facilities will provide a structured visitor experience that balances recreation with conservation, positioning ABWS as a model for urban biodiversity education and sustainable eco-tourism. Detailed visitor management and interpretation strategies are presented in Chapter 7.

6.2.2.5 Extended Buffer Zone Plan:

The Extended Buffer Zone comprises of two forest patches beyond the limits of current wildlife reserve. This includes, a 2.4 sq. km patch near Tughlaqabad (north) and a 9.7 sq. km patch below Bhatti village (southwest). Though fragmented and largely data deficient, these patches host multiple seasonal water bodies and can serve as key ecological corridors for carnivore movement, linking the sanctuary with nearby forests in Delhi and Haryana. The primary objective of creating this zone is to maintain and enhance ecological connectivity within the sanctuary by conserving critical habitats, improving continuity across fragmented landscapes, and facilitating the safe movement of wildlife. In the long term, this zone can be included within the sanctuary boundaries to strengthen overall landscape integrity and biodiversity conservation.

Key strategies for the Extended Buffer Zone are as under**:**

a. Protection

- Define and demarcate clear boundaries to secure the area and regulate access.
- Enforce strict measures to prevent encroachment, new habitation, and unauthorized activities.

b. Ecological Mapping

- Developing a comprehensive database and management system through systematic mapping of habitats, species distributions, and potential threats, using integrated ecological and socio-environmental research.

6.2.3. Theme Plans:

These are overarching plans, irrespective of zones, which outline the strategic approach and priority actions for the reserve. Seven theme plans are proposed to guide sanctuary management:

1. Protection Plan
2. Eco-restoration Plan
3. Management Plan for rescued wildlife management
4. Fire Management plan
5. Wildlife Health Monitoring plan
6. Community Interface plan
7. Research and monitoring plan

6.2.3.1. Protection Plan: Protection is the most critical issue for the effective management of any reserve. Current protection efforts of ABWS are sporadic and fragmented, lacking a coordinated approach. This plan provides for reorganization of areas, adequate deployment of staff, clear roles & responsibilities, effective patrolling schedules, reporting systems and supportive facilities to the staff for functional efficiency. Broad strategies for this plan are provided as follows:

a) Boundary demarcation, maintenance:

Notification of the WLS as well as RF is based upon specific Khasra numbers only. Same Khasra numbers were used during our field surveys to arrive at the approximate boundary of the reserve. Therefore, a clearly marked physical boundary of the reserve is largely absent. In 1994 the Delhi Administration's Flood and Irrigation Department constructed a 48 km wall around the reserve forest on the Delhi side. Over the time, this wall has been breached in several places due to illegal encroachments. In many stretches, the existing boundary wall is damaged or broken, leaving both the sanctuary and adjoining reserved forests vulnerable to encroachment and unauthorized activities. Consequently, these areas remain inadequately demarcated, making the habitats vulnerable from protection point of view.

To address these challenges, the following steps are proposed:

1. **Joint Ground Verification**: Conduct a joint survey of the area by the Forest Department and revenue Department to accurately demarcate the boundary of WLS and larger reserve using official records and *Khasra* numbers.
2. **Permanent Boundary Demarcation:** Install durable boundary pillars/structures at regular intervals, accompanied by clear signage.
3. **Wildlife Passages:** Provide adequate passages at appropriate places to allow safe and uninterrupted movement of wildlife across the reserve.
4. **Encroachment and Rehabilitation Plan:** Bhatti village forms a major encroachment within the sanctuary. However, during our surveys with the communities it was revealed that some families were given pucca houses under government scheme in 1976. Similarly, under Twenty-Point Programme, government had issued few pattas to Bhatti Gram Sabha in this area during 1987. Later discussions with the department officials have revealed that in-spite of all these claims by the local people in this area, there is still some area under encroachment. Overall, it is seen that families settled in this area belong to migrant labour community or refugees and are mostly poor section of the society. Under these circumstances, it is proposed the after due ground verifications, department could consider to implement a special government-supported rehabilitation package for resettling these families so as to restore this area into the reserve for long-term ecological gains. As this issue is already under judicial purview of NGT, due permission from NGT will also be required before implementation such a proposal. Remaining encroachments from Bhatti and Sangam Vihar areas should dealt with as per the current directions of Hon. High Court. Simultaneously, attempts should be made to identify more and more ecologically important forest patches adjoining to the wildlife reserve and add these areas to expand the limits of the sanctuary for enhancing the long-term ecological integrity of this area.
5. **Regular Monitoring and Maintenance:** Conduct routine inspections and timely maintenance of boundary walls and pillars to prevent breaches and structural damages.
6. **Technology Integration**: Equip field staff with digital maps and GPS devices to empower the staff for effective patrolling, boundary verifications, and other protection activities.

b) Reorganization of Beats:

The reserve is currently divided into eight beats- Bhatti, Asola, Sahoorpur, Satbari, Maidan Garhi, Devli, Tughlaqabad, and Pul Pehladpur. The administrative boundaries of these beats extend far beyond the notified sanctuary area, covering both reserve and settlement areas. As a result, each beat comprises of approximately half of the area from wildlife reserve and the remaining area of adjoining urban or semi-urban settlements. Therefore, the beat staff is not able to give required focus on protection duties of wildlife reserve (Fig.5.5).

Moreover, currently Asola Bhatti range, which comprises of wildlife area as well as areas outside the wildlife reserve, is being managed by a single Range Officer. Due to excessive workload and

overlapping responsibilities of Asola Bhatti Range Officer, he is not able to give his full attention to protection and development of the sanctuary. To overcome these operational difficulties, it is proposed to reorganize and redefine the existing beats based on land-use and functional criteria. Beats coming under wildlife reserve areas are proposed to be brought under Asola Bhatti Range and the remaining beats covering non wildlife areas are proposed to be included in South Forest range. Accordingly, staff is proposed to be reorganized in a manner that each beat is under the charge of individual beat officer. For this it is proposed that existing vacancies are filled and new staff positions are created to man all the field units for strengthening on-ground management. Clear role demarcation and adequate manpower deployment will not only reduce administrative burden but also enhance protection, monitoring, and coordination among the staff. Details of reorganization and staff deployment are provided in Chapter 9.

c) Capacity Building:

At present, the department comprises both a team of old experienced staff and newly recruited personnel. Most of the staff have undergone regular forestry training. However, they lack specialized exposure to wildlife management. To strengthen their wildlife management skills, a short-term wildlife induction-training program is proposed for all staff. In addition, regular refresher trainings and thematic workshops on different aspects of wildlife conservation are also proposed. Details of capacity building initiatives are provided in Chapter 9.

d) Patrolling Trails:

At present there is only one major road from Entry Gate to Neeli Jheel which is used for tourism as well as protection. From this road there are small side roads used by staff for visiting the areas under habitat improvement program. Rest of the areas of the reserve are not accessible through any roads or dedicated patrolling paths and this hampers the field mobility, leading to weak surveillance and reduced protection. Problem becomes acute during fire season. To strengthen the routine surveillance and fire prevention within the sanctuary, following strategies are proposed:

- **Develop Continuous Boundary Trails:** Establish foot patrolling trails (5.2 m width) along all beat boundaries to facilitate effective patrolling, boundary monitoring, and rapid response to any incidence. These trails would also serve as fire lines during fire season and will act as effective barriers to prevent the spread of forest fires across beats.
- **Anti-Poaching Camps:** To strengthen protection measures within the sanctuary, strategically located Anti-Poaching Camps established to enhance surveillance coverage, ensure sustained field presence of frontline staff, and effectively prevent illegal activities such as poaching, illicit grazing, timber extraction, and encroachment
- **Construct Watchtowers and Strengthen Check Posts:** Construct six new watchtowers at critical and vulnerable points, strategically aligned with patrolling routes and proposed section chowkis & guard sheds to enhance visibility, surveillance, and overall protection coverage which is well included in the proposed Creating protection infrastructure plan.

e) Patrolling System:

Currently, there is no organized and properly regulated patrolling system for the reserve. Patrolling activities are irregular and conducted as per the need of the area. There are no clearly designated teams and well-defined responsibilities leading to poor accountability. Lack of proper patrolling schedules often leads to inconsistent field presence of the staff. This seems to be the main reason for encroachments, breaching of boundaries, illegal dumping livestock in the reserve, unauthorized grazing, fuelwood collection, and trespass; particularly along the vulnerable fringe areas adjoining human

settlements. To strengthen the protection and improve overall vigil of the area, a comprehensive patrolling system is proposed as follows:

i. Regular Patrolling:

- Beat Officers will conduct daily day patrolling of their beat areas and check boundaries. They will also undertake periodic night patrolling to have a strict vigil of their areas.
- They will ensure that there are no illegal activities in their areas and record all their observations in the official diaries.
- During this patrolling, they will also record sightings of wild animals as per the wildlife monitoring protocols as provided in the chapter 8 on Research and Monitoring.

ii. Joint Patrolling:

- Joint patrolling will be carried out for each section by pooling all the staff of concerned beats under the leadership of concerned Section Forest Officer. Such patrolling will be conducted at least once in a week or as per the need of the area, particularly covering vulnerable areas.
- Reports of these patrolling drives will be submitted to the Range Officer (RO) for review and further directions.

iii. Special Patrolling:

- Staff will carry out special joint patrolling by pooling staff from different sections of the reserve under the leadership Range Officer during festive seasons, monsoon months, and other high-risk periods.
- These special patrolling drives will particularly focus on preventing illegal activities such as encroachment, poaching, and wood extraction.

f) Reporting Systems:

Absence of an effective and structured reporting system is often leading to weak information flow and communication gaps. This limits timely decision making and delayed responses in field operations. To overcome this problem, it is proposed to establish a clear chain of reporting and accountability at all levels. An official diary will be maintained at every level to record daily patrolling details, observations, activities and any incidents which come to the notice of staff. Each Beat Officer will record daily field activities, wildlife sightings, incidents, and any irregularities noticed by him in his area & steps taken by him, in his daily diary. This diary and other designated formats of monitoring will be submitted by Beat Officer to Range Officer (RO) weekly, after due verification of concerned Section Officer. Similar diaries will also be required to be prepared by each Section Officer. Ensuring accuracy and timely submission to daily dairies and other formats the Range Officer (RO) will be the duty of each Beat Officer / Section Officer. Submission of daily diaries will be a pre-condition for processing of salary bills for all field staff. The RO will consolidate information from all beats under his jurisdiction, take appropriate actions in response to the field requirements and submit a detailed quarterly report to the Assistant Conservator of Forests (ACF) for his directions. This report will be further forwarded to Deputy Conservator of Forests (DCF) for review, planning, and necessary actions. This structured hierarchy is likely to promote better communication, coordination, and operational efficiency in the division.

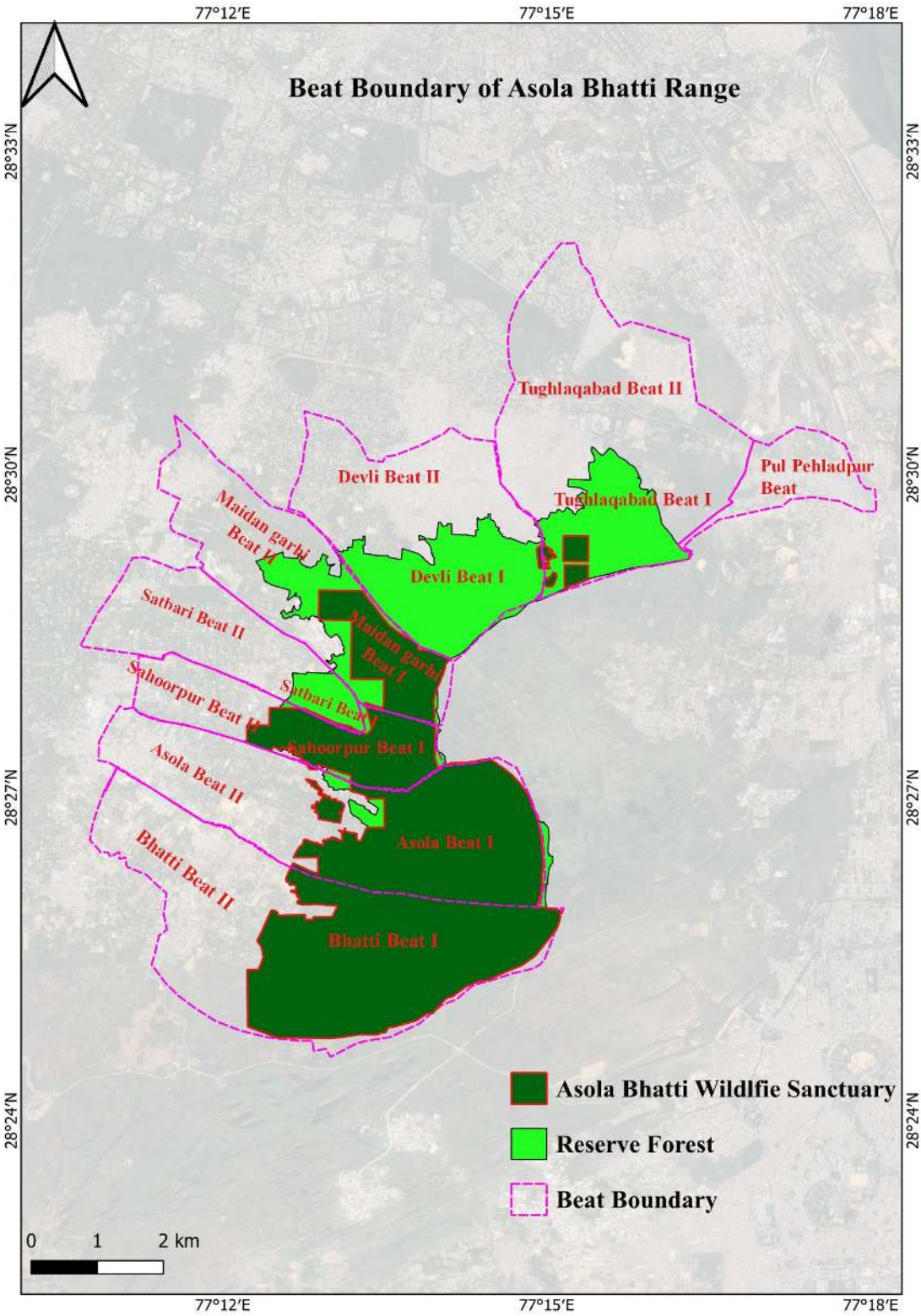

Fig. 6.5: Map showing proposed Beat Boundaries

g) Creating protection infrastructure:

The existing protection infrastructure within ABWS is inadequate and partially non-functional, limiting effective surveillance, law enforcement, and rapid response operations. It is proposed to repair all the available infrastructure and also create additional facilities for effective protection. All existing and proposed infrastructure will emphasize on environmental sensitivity, ensuring that all constructions are modest in scale and blend seamlessly with the natural surroundings. Currently, there are seven watchtowers located in different parts of the reserve. Many of these require maintenance and upgradation for making these full functional.

To improve protection and observation efficiency, existing watch towers, as indicated on the map are proposed to be repaired and upgraded. Six additional watchtowers are also proposed at strategically important and vulnerable locations, including Chhatarpur Trail (near the Faridabad–Gurugram Highway), Leopard Point, Sangam Vihar, Shams Han Ghatt, and Neeli Jheel. The exact location of these towers will be determined based on site-specific needs and departmental understanding. It is also proposed to construct one chowki each for all sections and one guard shed each for all beats. Other proposed infrastructure includes additional Guard Stations for staff operations, basic observation tools, information boards and Fire Control Posts with ready-to-use firefighting equipment at critical locations. Further details of this infrastructure are provided in Chapter 9.

h) Communication facilities and Mobility infrastructure:

Currently, the department in short of adequate number of patrolling vehicles, navigation and field tools, and communication equipment. This shortage significantly limits the efficiency of surveillance, field coordination, and rapid response during emergencies. To address this gap, it is proposed to purchase 8 new patrolling four-wheel vehicles and 15 number of motorbikes. Each Beat Officer as well Section Officer will have to be equipped with motor bike for his efficient mobility in the field. For real-time coordination and response, it is also proposed to provide adequate number of walkie-talkies and other communication devices to all the field staff.

Together, these measures will greatly strengthen operational efficiency, rapid response capacity, and overall protection within ABWS. Detailed plans of implementation strategies for these facilities are provided in Chapter 9.

6.2.3.2 Management Plan for rescued wildlife management:

Asola-Bhatti Wildlife Sanctuary faces multiple ecological pressures and limited carrying capacity for sustaining diverse species. Habitat of the reserve has already been degraded and altered due to introduction of exotic species like *Prosopis juliflora*, infestation of invasive species and deterioration of soil & water conditions. Due to increasing population of rhesus macaque in Delhi and the growing conflicts, Hon. Delhi High Court banned monkey feeding and ordered the translocation of macaques to the ABWS. Over the past 15 years, around 20,000 macaques have been already been captured and relocated in ABWL. Large number of rescued snakes, cheetal and other faunal species have also been released in the reserve. The tropical thorn forest in the sanctuary has limited capacity to meet the natural food requirements of wildlife, particularly macaques. As an immediate response, the management has resorted to a system of artificial feeding of macaques, spending nearly about ₹1 crore every year to feed macaques at 18 designated points inside the sanctuary. Due to absence of sufficient natural predator population and a steady artificial supply of food, their population has grown rapidly over time, exceeding the sanctuary's ecological carrying capacity and creating major management challenge. Due to limited natural food sources and altered behavior of animals, macaques often stray out of the reserve to adjoining human habitations. It is increasingly being realized that the current approach of artificial feeding of macaques is neither ecologically sustainable nor financially viable. On one hand it

is disrupting the natural foraging behavior of animals and on the other hand imposing a heavy recurring financial burden on the management. Further, the existing Rescue and Rehabilitation Centre may be modernized with appropriate veterinary facilities, quarantine infrastructure, and post-release monitoring mechanisms, subject to approval of the Central Zoo Authority (CZA). Strengthening institutional infrastructure alongside habitat restoration measures will be critical in transitioning the sanctuary toward a more self-sustaining and ecologically resilient ecosystem. To ensure long- term ecological balance and sustainable management of the wildlife population, the following strategies are proposed:

a) **Population Estimation & Carrying Capacity:**
   Conduct scientific assessments to estimate macaque populations and evaluate the sanctuary's carrying capacity for maintaining ecological balance.

b) **Phasing Out Artificial Feeding:**
   Gradually phase out the practice of artificial feeding of macaques to minimize dependence on human-provided food. This has to be simultaneously, supported by habitat enrichment by planting native fruit-bearing species and progressively reducing existing feeding points.

c) **Population & Habitat Management:**
   Undertake regular monitoring of macaque populations to understand its health status, habitat conditions, assess the sanctuary's sustainable population limit, and adopt ethical, science-based regulation measures in consultation with experts.

d) **Sterilization Program**:
   Implement a humane, scientifically managed sterilization program for population management without disturbing the ecological equilibrium.

e) **Further Release of Animals:**
   Any further release of rescued animals has to be done following proper health screening and scientific sterilization of males following all technical protocols of IUCN under the supervision of trained vegetarians.

6.2.3.3. Habitat Restoration Plan

The soil in the sanctuary is generally thin, dry, and sandy, with high porosity and low humus content due to past excessive exploitation, which has degraded land fertility. Heavy rainwater flows often wash away the topsoil, leaving the land barren and dry. Soils in the Asola mines are more clayey than those in Bhatti mines, while the predominant sandy nature across the sanctuary results in high water percolation, making the area a key groundwater recharge zone. Groundwater depth in Bhatti ranges from 35 to 50 meters, and the sanctuary contains multiple seasonal water holes and lakes used by wildlife. Over the years, the sanctuary landscape has become increasingly dominated by several non-native and exotic species, primarily *Prosopis juliflora* and *Lantana camara*. These invasive species have proliferated extensively, outcompeting native flora and significantly altering the sanctuary's natural ecological composition. The dominance of such species has led to a decline in native biodiversity and the loss of the area's authentic ecological character. The proposed plan to build on earlier interventions is focused on long-term ecological stability, soil & water conservation, and vegetation restoration. Broad components of this plan are as follows:

i. Soil and Moisture Conservation

- **Check dams and percolation tanks**: Construct small earthen or stone check dams in seasonal streams and gullies to slow down the water flow, reduce erosion, retain soil, and enhance groundwater recharge. The existing stream order of the sanctuary is given below (Fig 5.6)
- **Creation of Water Bodies and Conservation Measures:** Develop few large water bodies in natural depressions to provide water for wildlife and improve habitat quality.

- **Contour trenches and bunds**: Dig staggered contour trenches along slopes to reduce runoff, retain topsoil, and conserve moisture for soil and vegetation.
- **Mulching and organic amendments**: Apply leaf litter, compost to improve humus content, soil fertility, and water-holding capacity.
- **Groundwater recharge pits**: Create recharge shafts in strategic locations to facilitate percolation and maintain soil moisture for vegetation.
- **Enhancement of water bodies**: Deepen or desilt seasonal lakes and water holes to improve water availability and support both soil and vegetation.

ii. Vegetation Improvement

Phased Planting Approach: At present, *Prosopis juliflora* covers a substantial portion of the sanctuary. This is an exotic species, which gradually should be removed and replaced by native vegetation for long-term ecological development of the sanctuary. However, currently the large cover of this species is playing certain important roles within the existing landscape. Species has contributed to soil stabilization, provided a dense canopy, and is serving as a sub optimal habitat for some wildlife species. Current system of random or complete removal of *Prosopis juliflora* could disrupt the available habitat dynamics and negatively impact some of the native species that have gradually adapted to these conditions. Therefore, removal and replacement of Prosopis has to be done in a scientific and phased manner, backed up with continuous monitoring for adaptive management. This has to be simultaneously supplemented with intensive restoration of native species. This approach will help maintain ecological stability while promoting the natural regeneration of indigenous vegetation and enhancing overall habitat quality.

- **Native, soil-binding species**: Restoration has to also include planting of grasses, shrubs, and trees with fibrous root systems such as *Vetiveria zizanioides* (Vetiver), *Saccharum munja* (Munja), *Anogeissus pendula* (Dhauk), *Butea monosperma* (Flame of the Forest / Palash), *Acacia senegal* (Gum Acacia), and *Boswellia serrata* (Indian Frankincense / Salai) to stabilize soil and retain water.
- **Plant-soil-water interaction**: Introduce nitrogen-fixing species like *Acacia nilotica* (Babul), *Indigofera tinctoria* (Indigo plant), *Sesbania sesban* (Jayanti) and *Albizia lebbeck* (Siris) to improve soil fertility, moisture retention, and ecosystem resilience.
- **Assisted natural regeneration (ANR)**: Steps should be taken to protect natural seedlings and saplings from grazing, fire, and anthropogenic pressures to accelerate regeneration.
- **Silvicultural Deviations and Decision Authority:** A flexible silvicultural approach will be necessary for adapting plantation methods to site conditions. Approval for any silvicultural deviation shall vest with the Circle Head**,** and expert consultation should be sought, wherever required, to finalize appropriate restoration protocols and management interventions.
- **Maintenance of Eco-Restoration**: Regular maintenance and monitoring will be needed for ensuring plant survival, control invasive species, and promote natural regeneration. Maintenance period and protocols will have to be adjusted as per site needs as per technical evaluation by CF. Prompt casualty replacement will have to be included in the restoration program to ensure good results.
- **Integration with hydrological measures**: Restoration has to be supplemented by sound soil and water conservation measures in the form of check dams, trenches, and recharge structures to maximize soil moisture retention and ecosystem health.

6.2.3.4 Fire Management Plan:

Fire is one of the major ecological threats to Asola Bhatti Wildlife Sanctuary (ABWS), particularly in regions characterized by dry vegetation, degraded grasslands, and scrub forests. At present, there is no

official record documenting fire-prone areas or past fire incidents, which makes effective management and preventive action challenging. Additionally, the absence of adequately equipped and dedicated fire management units further limits the sanctuary's ability to respond promptly and efficiently to fire outbreaks. The sanctuary's vulnerability is further intensified by human habitation and settlement pressures along its fringes. Field assessments and ecological observations reveal that the most fire-prone zones are concentrated along the periphery especially in the semi-arid stretches of Bhatti and Asola where vegetation becomes highly flammable during the dry season. These areas are also exposed to various human-induced pressures, including grazing, fuelwood collection, and accidental fires from nearby villages. Together, these factors significantly increase the risk of wildfires, threatening both biodiversity and habitat stability within the sanctuary.

To mitigate fire risks and strengthen protection measures, following fire management strategies are proposed as part of this plan:

i. Fire Surveillance and Protection Paths

- **Creation of Fire line**: Proposed Beat boundary patrolling trails will also be maintained as fire lines during fire season. These will be used for surveillance and will also act fire breaks, to control and prevent the spread of forest fires between beats.
- **Internal fire breaks and watch routes**: It is also proposed to develop additional internal fire trails through fire-prone areas to allow early detection and quick response to emerging fires. These paths will also facilitate movement of firefighting teams and equipment. Location of these fire breaks can be decided by the management, looking at the vulnerability of areas.
- **Signage and monitoring points:** Appropriate fire hazard warning signs and observation points along the trails to alert staff and visitors during high-risk periods are also proposed to be created.

ii. Rapid Response Fire Units: Formation of three specialized fire response units is proposed, one for each section of the sanctuary, equipped with firefighting tools and safety gear. Each unit will maintain an official fire recording system and daily activity diary to ensure timely response, monitoring, and documentation of fire incidents. The composition of these unit involves**:**

- **Section Officer (Unit Head):** Overall, in charge of the unit. Makes strategic decisions during fire events.
- **Beat Officers:** Lead patrolling teams and ground-level firefighting activities. Execute the Section Head's directives.
- **Recruited Staff (Temporary/Seasonal Fire Fighters):** Deployed during high-risk periods and assist Beat Officers in fire suppression and field operations.
- **Forest Guards/ Existing Field Staff:** Support all firefighting activities. Help in monitoring, patrolling, and rapid response.
- **Training and drills**: Conduct regular fire-fighting training programs, including mock drills, to ensure preparedness and coordination between units, forest staff, and emergency responders.
- **Awareness Programmes for fringe areas communities**: Immediately before the fire season, awareness and sensitization programmes may be organized for fringe area communities to get their support in prevention and detection of fires. A dedicated phone number if made available to public, can go a long way in getting timely information about fires.
- **Communication facilities**: Equip each unit with walkie-talkies, mobile communication devices, and GPS tools for real-time coordination with the control room and other teams.

i. Fire-Fighting Equipment

- **Water pumps and hoses**: It is proposed to deploy portable water pumps and hose systems to targeted fire-prone zones for immediate firefighting.
- **Hand tools and protective gear**: Equip teams with fire beaters, shovels, rakes, axes, fire-

resistant clothing, helmets, and gloves to safely combat fires in various terrains.

- **Fire retardant materials**: Maintain a supply of fire-retardant chemicals or foam for strategic application in high-risk areas during extreme fire seasons.

By implementing this comprehensive fire protection and surveillance strategy, ABWS will be able to detect, respond to, and manage fires efficiently, reducing the risk of large-scale habitat loss, protecting biodiversity, and maintaining ecological stability.

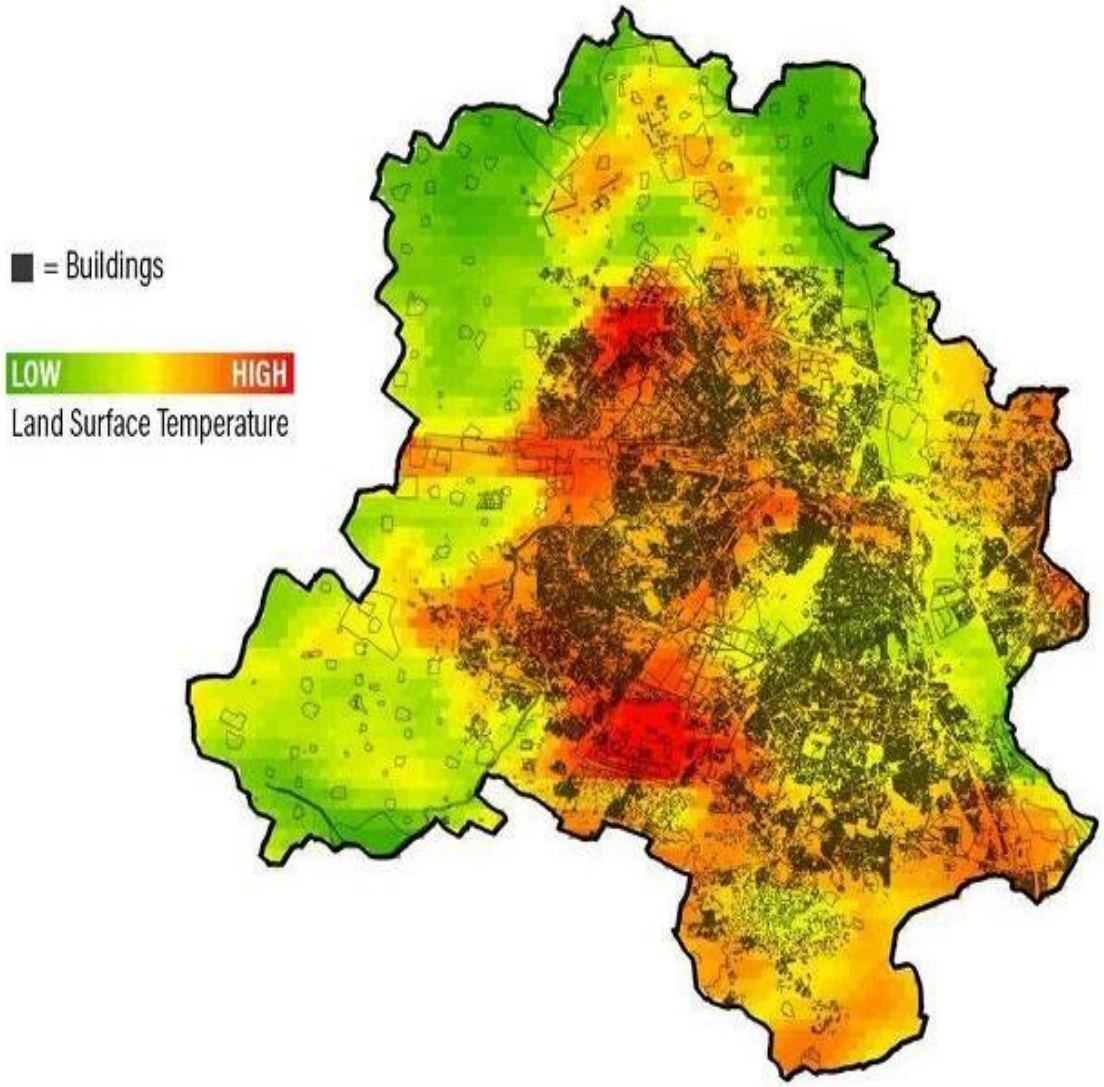

Fig 6.6. Fire prone areas of AWBS -Delhi.

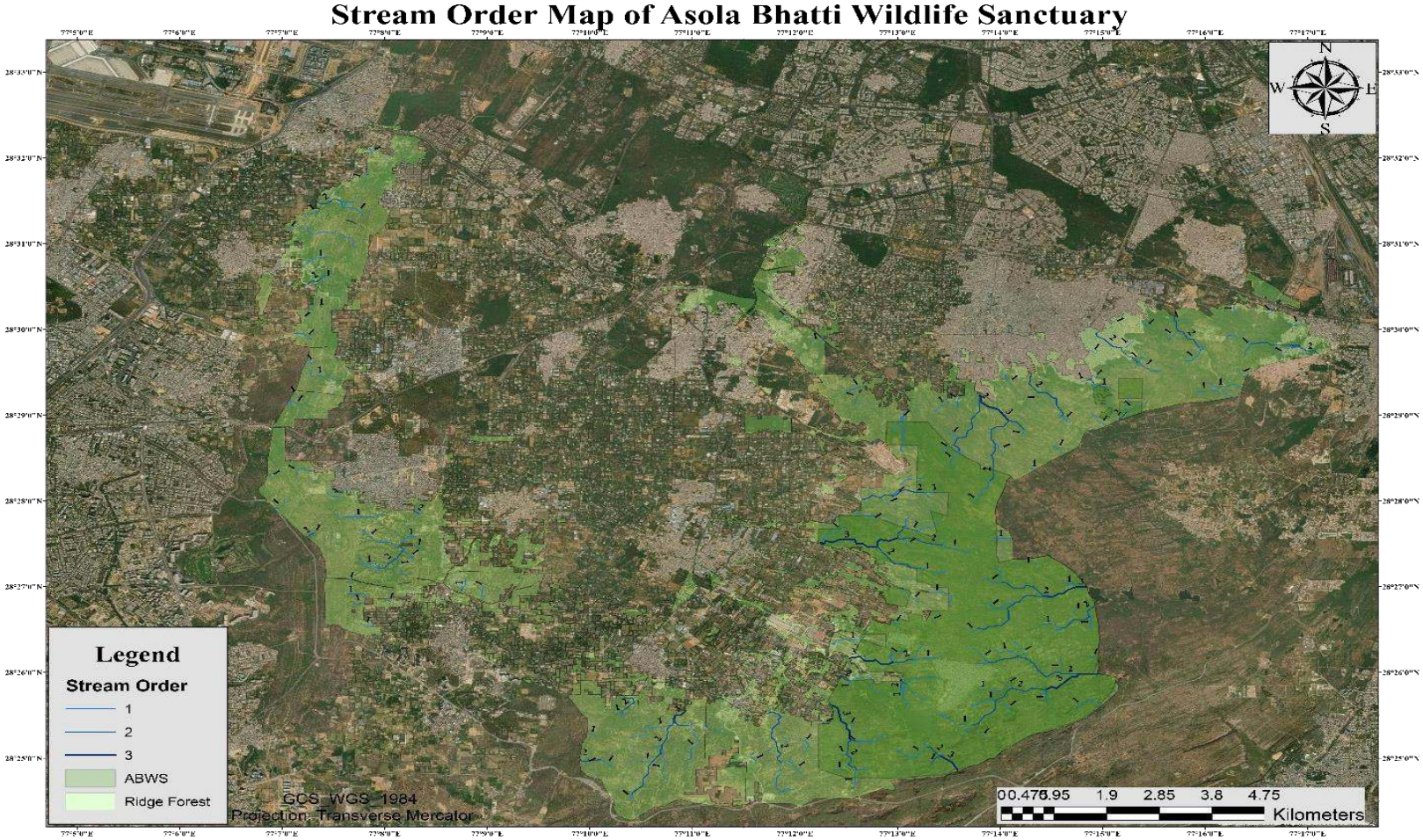

Fig 6.7 Existing Streams Order of AWBS.

6.2.3.5 Wildlife Health Monitoring Plan:

The Wildlife Health Monitoring Plan aims to ensure the well-being, population stability, and disease prevention of species within the sanctuary. Given the urban-fringe location of ABWS and interactions between wildlife, humans, and domestic animals, monitoring wildlife health is critical for both conservation and public safety.

Our survey findings indicate that the fringe areas surrounding the sanctuary face significant environmental challenges, particularly due to extensive solid waste dumping and contamination of nearby water bodies by drainage water. These polluted sites have become feeding grounds for both wildlife and stray cattle that enter the sanctuary and share the same habitat. Additionally, artificial feeding points and common waterholes further contribute to close contact between different species. Such interactions heighten the risk of zoonotic disease transmission and other infections among wildlife populations. To effectively address and monitor these emerging threats, proposed implementing targeted management strategies focused on waste regulation, water quality monitoring, controlled access of stray cattle, and health surveillance of wildlife.

i. Wildlife Health

- The wildlife health component will be jointly managed by the veterinary staff and wildlife guards.
- Wildlife guards and veterinarians will collect field data on animal health, injuries, mortalities, and any signs of illness or abnormal behavior.
- The veterinary team will carry out necessary sampling and laboratory analysis (e.g., feces, blood, or tissue samples) to assess the health status of wild animals.
- A wildlife health protocol will be maintained by the wildlife guards in their field diaries, where they will regularly record observations on the health and behavior of key species.
- Data collected from field observations and lab analyses will be compiled and reviewed periodically to identify emerging health concerns and take timely mitigation measures.

ii. Wildlife Disease Surveillance

- A structured disease surveillance program will be implemented and monitored by the veterinary staff.
- Surveillance activities will be conducted every three months, focusing on early detection of diseases in wildlife populations.
- Routine monitoring of waterholes will be undertaken to check for pathogen load and contamination levels.
- Vaccination programs will be carried out in the fringe villages to immunize livestock against potential zoonotic and transboundary diseases, reducing the risk of disease transmission between domestic animals and wildlife.
- All findings from surveillance and vaccination drives will be documented and reviewed to guide adaptive management and health response strategies.

This Wildlife Health Monitoring Plan will ensure that ABWS maintains a healthy and resilient wildlife population, mitigates disease risks, and provides early warning systems to protect both wildlife and surrounding human communities.

6.2.3.6 Community Interface plans:

The interface between local communities and ABWS is vital for effective conservation. Residents are currently do depend upon the sanctuary for resources like fuelwood, fodder, grazing, and water. This dependence is proposed to gradually minimized. Sanctuary also provides essential ecosystem services

such as groundwater recharge, climate regulation, and biodiversity conservation. Strengthening this relationship of ABWS and fringe areas communities requires participatory approaches, with Eco-Development Committees (EDCs), Self-Help Groups (SHGs), and youth club initiatives. Engaging communities in restoration, raising ecological awareness and facilitating some of community welfare programe with support of other departments or NGOs will be the key strategies, detailed of which are provided in Chapter 6.

6.2.3.7 Research and monitoring plan:

Despite previous management efforts, ABWS lacks comprehensive ecological data and long- term scientific studies, creating a major research gap. This limits the ability to guide effective, science-based management and adaptive conservation interventions. A structured research and monitoring plan, using baseline studies, modern tools (GIS, remote sensing, camera traps), and community-based monitoring, will provide data to assess wildlife, habitat, and ecological changes, enabling flexible, science-based, and sustainable management. Details of Research and Monitoring Plan are discussed in Chapter 8 of this plan.

Fig 6.8: Field visit with officials

CHAPTER - 7

COMMUNITY ENGAGEMENT AND ECODEVELOPMENT

7.1 Introduction

The ABWS has a layered history. Originally, this area was declared as protected by the British in 1913. After independence and Partition, mass migrations and social upheavals reshaped Delhi, and the areas around the sanctuary began experiencing urbanization. With Delhi as the capital, industrialization accelerated, attracting migrants from across the country, including families displaced during Partition. Many settled in the ridge and fringe areas, both legally and illegally. Over the time, this human presence left deep impacts of quarrying, road expansion, encroachments and degradation of the Ridge forests. Blasting of plateaus further altered the topography, disrupted water channels, and caused serious ecological imbalances.

The sanctuary gradually took its current shape through the integration of adjoining village lands. Its legal recognition began in 1986, when the Delhi Administration, vide Notification No. F.31(116)/CWLW/84/897-906 dated 09.10.1986, brought 1,880 hectares of the Southern Ridge under protection. This included 7,827 bigha 17 biswa (about 1963 hectares) of Gaon Sabha (Village Panchayat) land in Asola, 2,845 bigha 17 biswa (about 714 hectares) in Sahoorpur, and 2,186 bigha 10 biswa (about 548 hectares) in Maidan Garhi, all declared as a Wildlife Sanctuary under Section 18 of the Wildlife (Protection) Act, 1972, and formally named the Asola Wildlife Sanctuary. The area was later expanded in 1991, when the Delhi Administration, vide Notification No. F.22(19)/DCF (90-91)/1383-91 dated 15.04.1991, included 840 hectares from the Bhatti Mines spread across designated khasra numbers of Bhatti village on similar ecological grounds. At that time, however, the sanctuary had no physical boundary. Without clear demarcation, the land remained intertwined with the lives of people from neighboring villages. For generations, they had roamed these landscapes freely, and what had once been customary use of the land for them now came to be regarded as trespassing.

As urbanization grew, the lack of vegetation left the sanctuary with limited resources, forcing monkeys to move into nearby settlements and triggering the human–wildlife conflicts as seen today. Over time, pressures on the sanctuary multiplied. Official records including departmental status reports, compliance notes, and court proceedings consistently highlight the issue of encroachment across several parts of the sanctuary. However, the nature and scale of these encroachments vary.

- Revenue villages such as Asola, Bhatti, Rajpur Khurd, Shahpur, and Devli have historically expanded into the sanctuary through grazing, settlement sprawl, and farmhouse development. Bhatti village, in particular, has been at the center of landmark litigation (MC Mehta WP 4677/1985) and continues to be a critical encroachment hotspot. According to the Socio-Economic Profile of Bhatti Village *(*Business Standard*)*, the settlement includes Bhatti Kalan, Bhatti Khurd (Chhotti Bhatti), Sanjay Colony, and Har Swarup Colony, and is primarily inhabited by the Gujjar community. With limited agricultural land ownership, most households depend on livestock rearing. This socio-economic profile underscores the complex tensions between community livelihoods, unauthorized settlement growth, and conservation imperatives within the sanctuary's contested landscape.
- Unauthorized colonies such as Sanjay Colony and Sangam Vihar (Asia's largest unauthorized settlement) represent the most intense forms of urban encroachment on Asola Bhatti Wildlife Sanctuary. These areas are characterized by dense housing clusters, pucca lanes, permanent structures, and continuous population inflow. Their proximity to the sanctuary boundary has repeatedly been flagged in GNCTD's (Government of National Capital Territory of Delhi)

encroachment surveys (Department of Forests & Wildlife, GNCTD, 2023) and cited in multiple Delhi High Court cases (Court on its Own Motion v. Union of India & Ors., W.P.(C) 1346/2015; M.C. Mehta v. Union of India, W.P. 4677/1985) as major violations of forest land. The Kabristan (Burial ground) area within this stretch has also been officially mapped as illegal encroachment (GNCTD, 2024), with permanent structures constructed inside notified forestland. Together, these colonies contribute to severe habitat fragmentation, human - wildlife conflict incidents, and long-term ecological degradation. Despite repeated demolition drives and court interventions, the colonies continue to expand, reflecting the larger challenge of urban sprawl, governance gaps, and the socio-political sensitivity of rehabilitating thousands of households.

- Hybrid settlements such as Devli, and peri-urban expansions near Tughlaqabad, further complicate the land-use dynamics by creating overlapping pressures on the sanctuary's periphery. These Settlements surrounding the sanctuary have emerged as significant sources of anthropogenic pressure. Free-ranging cattle regularly graze within the reserve, while abandoned mining pits are frequently used for garbage and sewage disposal, creating acute ecological risks. Household-level surveys indicate that much of the resident population comprises migrants, particularly from Rajasthan and Pakistan (notably in Bhatti village). Predominantly daily wage earners or small-scale entrepreneurs, their direct subsistence dependence on forest resources remains limited. However, given that many households are located on encroached land, their engagement in conservation initiatives is weak, perpetuating mistrust between communities and management authorities.

As Delhi expanded, farmhouses, resorts, and sprawling colonies crept into the Ridge, breaking apart the once-unbroken forest that had long shielded the city. What was once a compact area, slowly splintered, caught between the will to preserve and the push to expand. In this struggle, community engagement offers a way forward by bringing genuine and needy people into the process, creating some livelihoods, and building trust, it holds the promise of keeping the sanctuary alive as Delhi's green lung

Table 7.1: Encroachment around ABWS

Village / Colony	**Type**	**Location w.r.t Sanctuary**	**Encroachment Nature**	**Litigation / Notes**
Asola Village	Revenue Village	South-East boundary	Grazing, agriculture, construction	Mentioned in Delhi Gazette Notification (1986) and Delhi High Court W.P.(C) 1346/2015 status reports.
Bhatti Village	Revenue Village	South boundary	Agriculture, farmhouses, expansion of settlement	Cited in M.C. Mehta v. Union of India (W.P. 4677/1985) and Forest Dept. reports in W.P.(C) 1346/2015.
Rajpur Khurd	Revenue Village	North-West side	Illegal farmhouses, agriculture	Reported in Delhi High Court W.P.(C) 1346/2015 encroachment affidavits.

Sahoorpur Village	Revenue Village	South-West boundary	Agriculture, houses, gradual sprawl	Mentioned in Delhi Gazette (1989 extension notification) and Forest Dept. encroachment maps in W.P.(C) 1346/2015.
Sanjay Colony	Unauthorized Colony	North-East boundary	Dense illegal housing, pucca lanes	Identified in Delhi High Court W.P.(C) 1346/2015 as major encroachment.
Sangam Vihar	Unauthorized Colony	North-East boundary (adjacent to Sanjay Colony, Devli side)	Continuous urban sprawl into forest edges	Explicitly mentioned in Delhi High Court W.P.(C) 1346/2015; also discussed in Dev Aditya Khosla v. GNCTD (W.P.(C) 9606/2022).
Kabristan area (Burial Ground settlement)	Encroached land	North-East inside forest Edge (near Sangam Vihar)	Permanent structures inside forest	Marked illegal in Forest Dept. survey submitted in W.P.(C) 1346/2015.
Devli Village	Revenue + Unauthorized extensions	North boundary	Village settlement + unauthorized colony expansion	Overlap into ABWS noted in Delhi High Court W.P.(C) 1346/2015 submissions.
Tughlaqabad (adjacent settlement)	Historic settlement	North-East (near shooting range)	Encroachment pressure via urbanization	Highlighted in Forest Dept.reports (W.P.(C) 1346/2015) as buffer stress.

7.2 Goals and Objectives

Primary goal of ecodevelopment in this plan is to develop a constitutional and participatory governance mechanism for Asola Bhatti Wildlife Sanctuary by creating a structured platform for dialogue between forest department and local communities. This approach seeks to secure community trust and support, foster mutual understanding, and open future possibilities for inclusive participation of local stakeholders in sanctuary management and conservation.

The main objectives of ecodevelopment will be as under:

- To create an institutional mechanism for engagement with community for better management of conflict and to build local stewardship for conservation of the area.
- To cultivate youth-led initiatives for biodiversity conservation and habitat restoration.
- To create limited livelihood opportunities for the local youth in ongoing conservation programmes of Sanctuary

7.3 Strategies

The stakeholder meetings held on 15–16 July, along with discussions with community members, revealed that the major challenges include limited community participation and decision-making in sanctuary management, concerns over human-wildlife conflicts, and weak systems for engaging residents in conservation activities. Linking the benefits of the Asola-Bhatti Wildlife Sanctuary management plan to the local community is an important consideration for planning ecodevelopment initiatives. The broad strategies for community engagement and ecodevelopment are provided as follow:

7.3.1 Establishment of Community Interface Committees (CIC)

To improve cooperation between local people and ABWS management, it is proposed to constitute five Community Interface Committees (CICs) for the villages and the vulnerable fringe areas which are located along the sanctuary boundary and face frequent issues of wildlife conflict, and settlement pressures, often lead to conflicts with the Forest Department

Each seven member CIC will have following structure:

- Range Officer - Chairperson
- Community representatives (five members to be nominated by villages and at least two women representatives)
- Forest/Wildlife Guard - Member Secretary

The main role of CIC will be to hold regular dialogues with villagers, suggest strategies for better management of conflict, generating conservation awareness, exploring possibilities of livelihoods for local youth in sanctuary programmes. By creating CICs the process of dialogue and participation can remain focused and locally relevant, ensuring that conservation becomes a shared responsibility between people and authorities

7.3.2 Stakeholder Coordination Committee (SCC):

The Stakeholder Coordination Committee will serve as a platform to ensure balanced coordination between government agencies, community groups, and other stakeholders Engaged in sanctuary management. The SCC will convene formal meetings once every month, where members will present updates, identify issues, and propose solutions in a transparent manner. The committee will also be responsible for analyzing recurring problems, monitoring progress of agreed actions, and setting priorities for upcoming initiatives. Its primary role is to address challenges related to human-wildlife conflict, conservation and community welfare while promoting effective and sustainable management of the sanctuary.

SSC will have following structure:

- Conservator of Forests/ Deputy Conservator of Forests– Chairperson
- Assistant Conservator of Forests (ACF) – Member
- Central Pollution Control Board **-** 1 representative
- Delhi Pollution control Committee – 1 representative
- Municipal Corporation of Delhi (MCD) **-** 1 representative
- Jal Board **-** 1 representative
- Health Department **-** 1 representative
- Veterinary Department **-** 1 representative

- Community Institutions/Committees (CICs) - 2 representatives from each group.
- Self-Help Groups (SHGs) **-** 2 women's representatives
- NGOs and the research community **-** 1 representative
- Range Officer (RO) – Member Secretary

The committee will work closely with local communities to address issues such as human–wildlife conflict, pollution, settlement pressures, sewage discharge into the sanctuary, contamination of sanctuary lakes, and improper waste disposal, while also supporting conservation activities. In addition, it will regulate activities in line with conservation rules, promote initiatives such as eco- tourism, habitat restoration, and species protection, monitor progress, encourage community participation, and prepare strategies for future management to ensure both ecological integrity and community well-being.

7.3.3 Empowerment of Youth & Women.

Support of women and youth is very critical for the long-term conservation of ABWS. For this purpose, focused initiatives for empowerment of youth and women will be initiated by sanctuary management through Women Self Help Groups (SHGs) and Youth Clubs. To begin with, a total of four SHGs and four youth clubs will be established (2 each in Bhatti village and Devli village), in consultation with CIC based on objective criteria (to be decided by management) and the interest shown by the community. As part of ecodevelopment initiatives, women SHGs will be provided awareness, livelihood training as well as some seed funding for running of these groups as per the standard procedures and protocols of such programmes being implemented by Rural Development Department. Focus of these SHGs will be to cultivate habit of community working, saving among members and improve their livelihoods. These groups will also be involved in the programmes of Sanctuary periodically. Management can take the help of NGO volunteers for running these SHGs. Number of these groups can enhance gradually depending upon the experience and success initial SHGs. Members of the Youth clubs can be given different trainings like eco-tourism guides, visitor management, and other areas of enterprise development, which could help them in getting suitable employment opportunities either in ABWS or outside. Depending upon their skills and performance, few of these youth could be employed as ecotourism guides, nature education volunteers or other support staff for the sanctuary. Members of Youth Clubs will also receive hands-on training in practical aspects of conservation, helping them build technical skills, environmental awareness, and a sense of responsibility for the sanctuary's ecosystems. These youth clubs can be provided free access to some of the programmes of ABWS. In long-term these clubs will act as ambassadors for long-term security of ABWS in particular and nature conservation of Delhi in general**.**

7.3.4 Eco-Tourism through community participation

Eco-tourism can be promoted as a community-based conservation initiative by actively involving local residents, particularly those from fringe villages, through Eco-Development Committees (EDCs) under departmental supervision. Local communities can be engaged through livelihood opportunities such as trained nature guides, eco-tourism facilitators, interpretation center assistants, eco-shop operators, waste-management staff, nursery development for native plants, and participation in habitat restoration activities. Capacity-building programmes, skill training, and conservation awareness initiatives can help communities develop sustainable income sources while fostering stewardship towards the sanctuary. Such community-linked eco-tourism not only supports local livelihoods but also strengthens conservation outcomes by reducing anthropogenic pressures and encouraging long-term community participation in sanctuary management.

CHAPTER- 8

TOURISM, INTERPRETATION AND CONSERVATION EDUCATION

8.1 TOURISM

Tourism is the movement of people to places outside their usual surroundings for leisure, education, or cultural experiences. It provides economic benefits by creating jobs and supporting local livelihoods, while also promoting the protection of natural and cultural heritage. When managed responsibly, tourism not only entertains visitors but also helps communities to preserve their traditions and conserve valuable landscapes and biodiversity. However, tourist satisfaction remains a significant component of tourism sustainability (Hadassa, 2024). Globally, tourism remains a major tool for socioeconomic development and nature conservation. Delhi continues to hold a strong position as one of India's major tourism hubs. In 2022, the city recorded **0.82** million foreign tourist visits**,** contributing 9.5% of India's total Foreign Tourist Arrivals**.** On the domestic side, Delhi registered 27.18 million domestic **tourist** visits in 2022**,** a sharp recovery of over **155%** from the previous year, while in 2023 arrivals further peaked at 39.41 million, the highest ever reported as per Ministry of tourism (Fig 8.1).

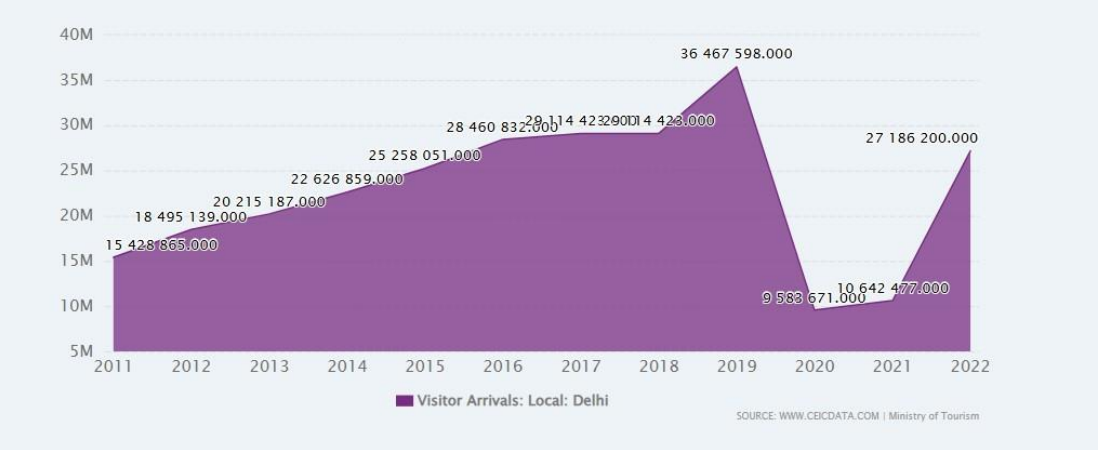

Fig 8.1: Visitor Arrivals in Delhi 2011–2022

Delhi attracts tourist arrivals in India, due to accessibility and availability of many historical and cultural sites. ABWS can become another important destination of Delhi due to its ecotourism potential. As Delhi's only protected natural landscape, it can emerge as a flagship site, giving both residents and international visitors an accessible wilderness experience while directly contributing to conservation and education.

8.1.1 ECOTOURISM

Ecotourism, an emerging niche within the larger global tourism sector, has developed both from the widespread interest in the natural environment and from the recognition of the need to conserve it. It promotes responsible travel that combines recreation with conservation and community benefits. In this context, ABWS holds great potential to become an important eco- tourism destination in Delhi. Its location within the National Capital Territory gives additional advantage as it is surrounded by a large number of schools, colleges, universities, and research institutions that can be directly engaged through nature education and outreach. The sanctuary already receives visitors, and its proximity to Delhi,

Gurgaon and Faridabad makes it easily accessible to tourists, families, and corporates.

Over the years, ecotourism in ABWS has gradually evolved. The 1996 Management Plan was forward-looking for its time, proposing education-based initiatives such as nature study centres, interpretation trails, guided activities, and outreach programmes. The 2014 Plan, prepared by the Forest Research Institute, built further on this vision by suggesting visitor zoning, cycle tracks, watchtowers, gazebos, the Butterfly Park, and the restoration of Neeli Jheel, which were significant steps toward improving visitor experience and accessibility. These measures reflected a strong intent to promote ecotourism and positive engagement of public in ABWS. While both plans contributed valuable ideas and initiatives, certain aspects such as ecological carrying capacity, systematic impact assessment, and benefit-sharing to community received limited emphasis, leaving scope for further strengthening in the present plan.

One of the key problems in ABWS is the limited visitor experience. At present, most tourists simply take an eco-cart ride from the entrance to Neeli Jheel and return, with little opportunity for deeper engagement or learning. This not only reduces the benefit for visitors but also fails to create meaningful awareness about the sanctuary's biodiversity and conservation value. Although previous management plans suggested several initiatives and some of which have been implemented, there are still significant gaps in planning, management, and interpretation; leaving ecotourism potential largely underutilized.

The new plan aims to learn from the past and attempts to strengthen the ecotourism programmes by better management, regular monitoring, and inclusive governance. In this regard, a stakeholder's workshop was organized on July 15-16, 2025 to review the ongoing ecotourism programmes and understand the associated challenges. Discussions in this workshop helped to shape the objectives and priorities tourism of this plan, ensuring that it is based on both science and community participation.

8.1.2 Bombay Natural History Society (BNHS) Initiatives at ABWS

The BNHS has played a key role in promoting conservation education and ecotourism at Sanctuary. With the support of the Forest Department, the Conservation Education Centre (CEC) was established in 2005 and has since become a vital hub for nature learning in Delhi- NCR. Between 2005 and September 2023, CEC has reached out to over two lakh children and citizens through field-based programmes, awareness events, and outreach activities. In 2023- 24 conducted programmes in over 300 schools, directly involving nearly 9,000 students as per BNHS Report.

CEC has also fostered citizen science initiatives, with students and volunteers contributing to bird and butterfly checklists, while regular surveys have enriched knowledge of the sanctuary's biodiversity. The establishment of the Butterfly Park (3 acres), along with the Aravalli Forest Centre and Jungle Walk trails, has further enhanced visitor engagement. Through the Delhi Seed Bank, CEC has mobilized citizens to collect and conserve native seeds for ecological restoration, while also supporting the development of urban forest pockets like Aaya Nagar City Forest and Mandir Marg City Forest. In addition, BNHS has produced a wide range of educational materials such as trail guides, species lists (birds, snakes, mammals), brochures, and programme handouts, strengthening conservation awareness across diverse audiences. Together, these initiatives by BNHS have attempted to establish ABWS as a model for conservation education and community participation, complementing the sanctuary's ecotourism vision. However, in 2023 BNHS's work at ABWS was discontinued, and since then, most of these programs have gradually declined in consistency and impact. The present plan therefore emphasizes the need to revive, adapt, and institutionalize such initiatives to realize their full potential.

8.1.3 Visitor statistics

The sanctuary does not have comprehensive visitor records for the past decade. The following are the only data provided by the Forest Department, covering the most recent three years (2022–2025). The following table presents the visitor footfall and revenue data of ABWS for the last three years;

Table 8.1: Footfall Data of Asola Bhatti Wildlife Sanctuary (2022-2025)

Footfall Data of Asola Bhatti Wildlife Sanctuary (2022-2025)			
Year	**Ticket Details**	**No. of Footfall**	**Amount (Rs.)**
2022-2023	Butterfly, Aravalli Park & Sanctuary	6950	89079
	Neeli Jheel & Sanctuary	2572	214838
2023- 2024	ABWS	33897	427125
2024- 2025	ABWS	26954	341965

These statistics reveal that visitor record-keeping in ABWS is poor, with only three years of reliable data available. Despite this limitation, the figures indicate that ecotourism already generates considerable revenue and steady visitor interest, which, if properly managed, could become a strong foundation for building a conservation constituency, enhancing outreach, and creating sustainable financial support for sanctuary management.

8.1.4 Objectives:

As discussed above, and based on the deliberations during the stakeholder workshop, the following objectives were framed for ecotourism in ABWS;

- Encourage low-impact ecotourism that offers enjoyable wilderness experiences while protecting habitats and wildlife.
- To build a strong conservation constituency by engaging citizens, schools, corporates, and communities through responsible ecotourism, thereby creating long-term support and advocacy for the protection of ABWS.

8.1.5 SWOT Analysis for Stakeholders in Ecotourism

The success of ecotourism in ABWS depends on the active engagement of a wide range of stakeholders working in partnership. The following table outlines the key stakeholders in ABWS ecotourism, highlighting their strengths, weaknesses, and suggested measures for improvement.

Table 8.2: SWOT Analysis for Stakeholders in Ecotourism

Stakeholder	Strengths	Weaknesses	Suggestions
Forest Department	Lead role in protection, regulation, and management; institutional authority; enforcement capacity.	Limited staff, weak monitoring, insufficient training, often bureaucratic delays.	Strengthen capacity through training, recruit more staff, adopt modern monitoring tools (GIS, drones, mobile apps).
Local Communities	Traditional ecological knowledge, cultural connection to land, potential for eco-guiding and livelihood generation.	Limited awareness of ecotourism practices, risk of over-dependence, lack of formal training.	Conduct regular training, create community engaged committees, ensure equitable benefit-sharing.
NGOs & Civil Society Groups	Strong outreach capacity, awareness campaigns, education, citizen science initiatives.	Limited funding, fragmented efforts, dependence on external donors.	Build long-term partnerships with Forest Department, coordinate campaigns, seek CSR funding.
Schools, Colleges & Universities	Large student base, research and field studies, youth engagement.	Activities often ad-hoc, lack of coordination with sanctuary needs.	Structured MoUs for research/education, internships, eco-clubs linked with sanctuary.
Tour Operators & Hoteliers	Potential to attract more visitors, market ABWS as eco-tourism hub.	Risk of commercialization, unsustainable visitor numbers, limited regulation.	Strict eco-tourism guidelines, certification for responsible operators, visitor caps.
Ecotourists & General Visitors	Provide revenue, support conservation if sensitized, act as ambassadors.	Often unaware of rules, cause disturbance, littering, or demand recreational over conservation activities.	Pre-visit orientation, awareness signage, strict enforcement of rules, guided experiences.
Municipal Corporation of Delhi (MCD)	Expertise in waste management, sanitation, and infrastructure.	Weak coordination with Forest Department, poor implementation of waste segregation, lack of accountability.	Establish joint monitoring teams, regular waste collection, install eco-friendly waste disposal units inside sanctuary.
Research Institutions	Provide scientific data, long-term monitoring, conservation insights.	Research outputs not always translated into management action, lack of coordination.	Create research–management interface, publish simplified findings for managers and public.

8.1.6 Strategies

8.1.6.1 Identification of zone

In developing ecotourism strategies for ABWS, it is essential to balance visitor experience with the ecological integrity of the landscape. Being located within the Delhi interface, the sanctuary faces unique challenges of high visitor pressure alongside sensitive habitats that require careful protection. Zoning of activities can provide an effective technique, where the more intensive and recreational uses are concentrated near the entry points and interpretation centres, while quieter, low-disturbance activities such as birdwatching and nature walks are placed deeper inside the sanctuary. This not only reduces stress on wildlife but also allows visitors to enjoy the sanctuary in different ways according to their interests.

The natural flow of visitors can also be self-regulating: families with children may prefer the central hub with its facilities and interpretation services, while students, researchers, and nature enthusiasts are more likely to explore trails and restored wetlands such as Neeli Jheel for a deeper wilderness experience. Such spatial planning supports wildlife conservation by minimizing disturbance, while simultaneously enhancing the quality of visitor engagement. Careful design of access routes, viewing points, and guided trails will therefore be central to ensuring that ecotourism in ABWS strengthens both conservation outcomes and visitor satisfaction.

8.1.6.2 Proposed Zoning for Ecotourism and Interpretation in ABWS

To balance visitor experience with ecological integrity, two zones are proposed within ABWS:

1. **Tourism Zone**

This zone covers the stretch from the main entrance to Neeli Jheel, which is the prime attraction of ABWS. Activities here will focus on nature-based recreation such as birdwatching, cycle tracks, eco-cart rides, and guided walks. Key attractions include Neeli Jheel, viewpoints, and watchtowers that showcase the restored landscapes and wetland habitats. To ensure sustainability, visitor access to Neeli Jheel will be strictly regulated. A carrying capacity assessment will be conducted, and only a limited number of tourists per day will be permitted beyond certain points. This will minimize disturbance to wildlife while still offering meaningful experiences.

2. **Interpretation cum Education Zone**

This zone extends from the main entrance of ABWS up to the nursery area and includes facilities such as the Interpretation Centre, Butterfly Park, and DCF Office. It will act as the hub for orientation, conservation education, and awareness activities. Educational trails, thematic walks, and awareness programmes will be conducted here, making it suitable for school groups, families, and first-time visitors. This zone will partially overlap with the Tourism Zone, especially in areas like the Butterfly Park and certain trails, where both recreational and educational objectives can be met. By concentrating most learning activities here, visitors gain an understanding of the sanctuary's values before moving into more sensitive areas.

8.1.6.3 Infrastructure development for ecotourism zone:

a) **Shifting of Ticket Counter**

At present, ABWS does not have a well-maintained and dedicated ticket counter, and the existing arrangement is inadequate for managing visitors efficiently. It is proposed to shift and upgrade the ticket counter to a more suitable location within the Ecotourism Zone, preferably near the main entrance, where it can serve as the first point of visitor interaction. The new counter should be designed with eco-friendly construction materials, proper shade, seating arrangements, drinking water facilities, and clear

queuing space. It should also integrate digital ticketing systems, including QR-based entry and online booking verification, to streamline visitor flow. This upgraded facility will help in creating a professional and welcoming entry point, reducing congestion and enhancing the overall visitor experience.

b) Cafeteria

Currently, ABWS only has a small shed that serves tea and basic snacks, which is insufficient to meet the needs of growing visitor numbers. It is proposed to develop a proper cafeteria within the Ecotourism Zone, located close to the main visitor hub but away from sensitive wildlife areas. The cafeteria should be constructed with eco-friendly design principles using natural ventilation, solar power for basic utilities, and waste segregation facilities. It should provide light meals, snacks, beverages, and safe drinking water, with a focus on locally sourced and healthy food options. Seating should include both indoor and shaded outdoor areas, offering visitors a comfortable resting place. Additionally, a second cafeteria at Neeli Jheel is recommended, as this is one of the most visited spots within ABWS. Like the main cafeteria, this unit must also be well-maintained and strictly managed, with systems in place for waste collection, recycling, and eco-friendly operations. To strengthen community participation, the cafeteria can be managed by local self-help groups creating livelihood opportunities while ensuring quality services. This cafeteria will not only serve as a refreshment point but also as a social and educational space, where conservation- themed posters, videos, or displays can be used to spread awareness among visitors

c) Improvement of Toilet Facilities

The existing toilet facilities in ABWS are inadequate and poorly maintained, which affects the overall visitor experience. It is essential to construct new, well-designed, eco-friendly toilets at key visitor nodes such as the entrance area, near the cafeteria, and close to major visitor attractions like Neeli Jheel which is one of the most frequently visited spots. These toilets should be gender-segregated, accessible for differently-abled visitors, and equipped with handwashing stations, safe water supply, and proper lighting. To ensure cleanliness and hygiene, it is proposed to hire dedicated housekeeping staff responsible for regular cleaning, waste disposal, and upkeep. Use of bio-toilets or eco-sanitation systems should be encouraged to minimize environmental impact, and facilities must include separate waste bins for sanitary and biodegradable waste. Clear signage in both Hindi and English should guide visitors to the nearest toilet facilities. Properly managed toilets will not only improve visitor comfort but also reflect the sanctuary's commitment to high standards of eco-tourism infrastructure and hospitality.

d) Strengthening Souvenir Shop

At present, ABWS does not have a dedicated souvenir shop, which is an important feature in a well-managed sanctuary. It is proposed to establish a shop near the main entrance, close to the Information & Ticketing Centre and Cafeteria, so that visitors can easily access it during entry or exit. The shop should be designed in line with the sanctuary's eco-tourism ethos, using eco-friendly construction and plastic-free operations. The souvenir shop can stock a variety of locally made and conservation-themed products, such as:

- Illustrated postcards, bookmarks, posters, and wildlife photographs from ABWS.
- T-shirts, caps, and cloth bags with conservation messages and ABWS branding.
- Eco-friendly products like bamboo items, recycled paper stationery, or handicrafts made by local communities.
- Educational material including plant/tree guides, species checklists, and activity books for children.

- Small wildlife-themed souvenirs such as keychains, mugs, magnets, and stickers.

The shop can also act as a point of outreach, displaying upcoming events, conservation messages, and promoting "plastic-free sanctuary" initiatives. To enhance community participation, the shop can be managed by women's self-help groups, or local youth, ensuring that revenue supports both conservation and livelihoods.

e) Cycle Track Upgradation

The existing cycle track in ABWS is underutilized, largely due to limited promotion and lack of supporting facilities. It is proposed to upgrade and expand the cycle track network, ensuring that routes are well-marked, safe, and connected to key visitor attractions such as the Butterfly Park, Neeli Jheel, and major nature trails. To increase visibility, the cycle track should be highlighted in brochures, visitor maps, and the sanctuary website, with clear signages and directional boards placed along the route. Additional bicycles of good quality should be made available for hire, including options suitable for children and women, with safety gear such as helmets. A dedicated cycle stand and repair station should be provided near the entrance for convenience. Awareness campaigns and promotions, such as "Cycle for Nature" days or guided cycling tours, can encourage visitors to use the facility. Cycle tracks also help in reducing vehicle movement inside the sanctuary, promoting eco-friendly mobility and enhancing visitor experience. To make cycling more attractive, interpretive panels can be placed at intervals along the track, sharing information about flora, fauna, and restoration stories.

f) Greenhouse for Aravalli Diversity

To showcase and conserve the unique plant diversity of the Aravalli's, it is proposed to establish a Greenhouse in ABWS. This facility will serve as a living repository for rare, threatened, and ecologically significant species such as orchids, medicinal plants, ferns, succulents, and hydrophytes. The greenhouse will not only help in the propagation and conservation of native flora but also act as a valuable tool for education and research, allowing students, researchers, and visitors to learn about the ecological role and uses of these plants. Interpretive panels inside the greenhouse can explain the habitat requirements, cultural importance, and medicinal value of these species. It can also serve as a demonstration centre for habitat restoration, nursery techniques, and sustainable use of medicinal plants, which can be linked to local community livelihoods.

g) Butterfly Park Upgradation

The Butterfly Park at ABWS is already being maintained well, but some upgradation measures will enhance both visitor experience and conservation awareness. From the entry point, attractive posters and panels should be displayed, explaining the ecological importance of butterflies, their role as pollinators, and their presence as indicators of habitat health. These posters can be designed in a storyline format, showing the butterfly life cycle, host plants, and their connection to the Aravalli ecosystem. All existing butterfly information boards should be updated with current species records, and new posters prepared to highlight both common and rare butterfly species of the sanctuary. Clear dos and don'ts posters should also be displayed (e.g., no plucking flowers, no chasing butterflies, silence inside the park), to ensure that visitor activities remain respectful. To create a more interactive experience, a "Butterfly-Friendly Area" can be developed, where nectar-rich plants are grown in controlled enclosures. This will allow butterflies to settle on flowers close to visitors, offering a chance to observe them up close. Interpretive guides or naturalists may also conduct short sessions here, showing how butterflies can be gently observed without harm.

Additional improvements can include:

- QR codes on boards linking to butterfly checklists or short videos.

- A small demonstration corner on host plants and butterfly gardening for schools.
- Seasonal butterfly festivals or awareness events to attract families and students.

h) Rescue and Rehabilitation Centre for injured or displaced wildlife

A dedicated facility will be developed within ABWS for the treatment, recovery, and rehabilitation of injured or displaced wild animals. The centre will include holding enclosures, a veterinary treatment unit, and quarantine facilities, managed by trained staff under the supervision of the Veterinary Officer. At present, the existing arrangements are inadequate, with limited equipment, medical supplies, and rescue vehicles, as well as insufficient trained manpower. Strengthening of infrastructure, provision of modern rescue equipment, and recruitment of qualified veterinary and support staff are therefore essential to ensure efficient, humane, and science-based wildlife rescue and rehabilitation operations within the sanctuary.

i) Watchtowers

ABWS currently has about five watchtowers located at key points including the Office area, Fogi Pitch, Hiran Pahadi, Neeli Jheel, and Leopard Pahadi. These structures play an important role in wildlife observation, visitor safety, and monitoring of sensitive habitats. However, many of them require upgradation and better maintenance to make them more useful for both eco- tourism and management. The proposed improvements include:

- Structural strengthening of existing watchtowers to ensure safety and durability.
- Installation of shade roofs, seating benches, and railings for visitor comfort.
- Provision of binocular stands, spotting scopes, and information boards highlighting the wildlife that can be observed from each tower (e.g., Neeli Jheel)
- Directional signage leading to each watchtower so visitors can find them easily.
- Accessibility improvements, such as safe steps and handrails, especially for elderly visitors and children.
- Development of a visitor map and brochure section that clearly marks the watchtowers and the best times/seasons to use them.
- Use of towers for management purposes such as fire monitoring, patrolling, and visitor regulation during high footfall days.

j) Emergency & Safety Facilities

To ensure visitor safety, ABWS should have the following essential facilities:

- First Aid Centres at the entrance and near Neeli Jheel, equipped with basic medicines and anti-venom for snakebites.
- Emergency Contact Boards displaying important phone numbers at key visitor points.
- Rescue and Evacuation Routes clearly marked with assembly points for emergencies.
- Communication Equipment like walkie-talkies for beat staff and guides.
- Fire Safety Measures including extinguishers at entry points and watchtowers.

k) Parking & Visitor Flow Management

To reduce congestion and disturbance to wildlife, ABWS needs a well-planned parking and visitor circulation system. Parking areas should be located outside or near the entrance, with space for cars, buses, and two-wheelers, along with shaded waiting areas. From the parking zone, visitors should use eco-carts, cycles, or guided walking trails to move inside the sanctuary. Visitor flow should follow a clear circulation plan: entry through the Information & Ticketing Centre, orientation at the Interpretation Centre, movement along designated eco- tourism trails, and exit through the same hub. Proper directional signages, maps, and staff guidance will ensure smooth visitor movement, prevent overcrowding, and keep sensitive habitats undisturbed.

l) Vehicles (Eco-carts and Minibuses)

ABWS currently has six eco-carts, which are inadequate during peak days. It is proposed to increase the fleet to at least ten, all battery-operated and supported by solar charging. To improve safety and manage larger groups, battery-operated minibuses should also be introduced. These will reduce congestion, provide comfort for school groups and families, and ensure safer, more efficient visitor movement while minimizing disturbance to wildlife.

m) Gazebo (Resting Shelters and Benches)

To improve visitor comfort, it is proposed to establish eco-friendly gazebos, resting shelters, and benches at key points inside ABWS, including along nature trails, near Neeli Jheel, and at major watchtowers. These structures should provide shade, seating, and drinking water points where feasible, using natural materials like bamboo, stone, or wood to blend with the surroundings. Inside the Butterfly Park, additional small gazebos and benches are needed so visitors, especially school groups and families, can comfortably observe butterflies without disturbing their habitat. Clear do's and don'ts boards should also be placed at these rest spots to guide visitor behavior.

n) Building a Cadre of Tourism Guides

To enhance visitor experience and ensure accurate information sharing, a dedicated cadre of trained tourism guides should be developed. These guides, drawn from local communities and youth, can be trained in biodiversity interpretation, visitor management, first aid, and eco- friendly practices. Such a system not only creates employment opportunities but also strengthens community ownership, while ensuring that tourism activities remain informative, safe, and aligned with conservation values.

o) Capacity Building and Developing Programmes

The success of ecotourism in ABWS depends on strengthening the skills of forest staff, eco- cart drivers, local youth, guides, and volunteers. Training should cover biodiversity knowledge, visitor management, first aid, communication, and waste handling, ensuring professional and conservation-oriented services.
Special programmes can include:

- Nature Guide Certification for local youth.
- Eco-Cart Driver Orientation – if drivers are well-trained in basic interpretation and visitor guidance, the need for a separate tourism guide may be reduced.
- Forest Staff Upgradation – refresher courses in monitoring, GIS, and ecotourism regulation.
- Volunteer & Citizen Science Workshops – bird counts, butterfly monitoring, restoration activities.
- Exposure Visits to successful ecotourism models

To diversify visitor experiences and strengthen awareness, ABWS should introduce a range of structured ecotourism and education programmes. These may include:

- Thematic Nature Walks – guided walks on topics like *Birds of ABWS*, *Butterflies and Pollinators*, *Medicinal Plants of Aravalli's*.
- Birdwatching Camps – seasonal events during peak migratory bird season at Neeli Jheel.
- Butterfly Day & Bird Week – annual festivals that celebrate sanctuary biodiversity.
- Photography & Nature Art Workshops – for students, enthusiasts, and professionals.
- Citizen Science Initiatives – involving visitors in bird surveys, butterfly counts, and seed collection for restoration.
- School Nature Camps – half-day or full-day immersive experiences for children.
- Corporate Eco-Retreats – team-building activities combined with habitat restoration or clean-up drives.
- Awareness Campaigns & Film Screenings – on conservation and the ecological role of ABWS.

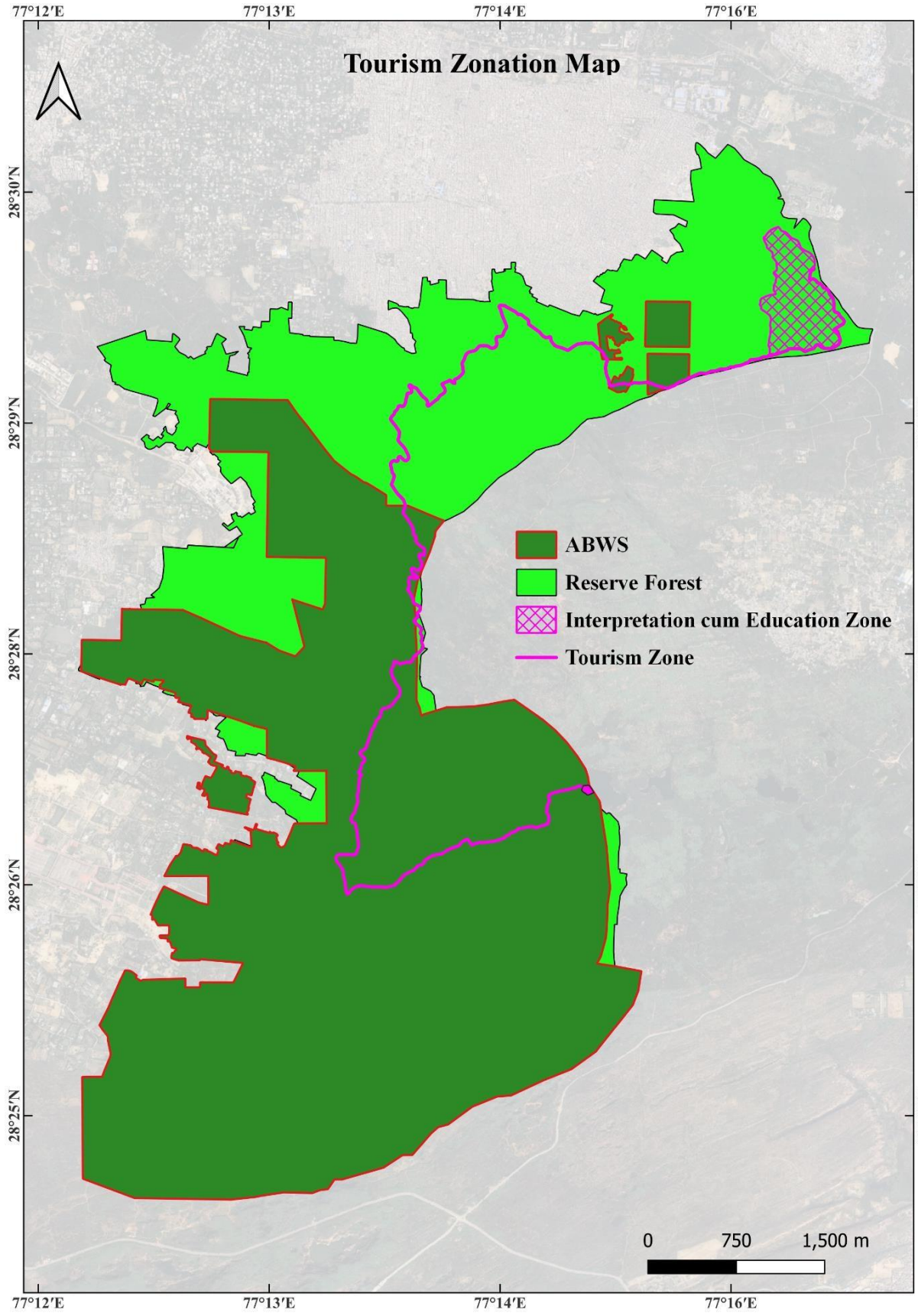

Fig 8.2: Map showing the ecotourism zonation

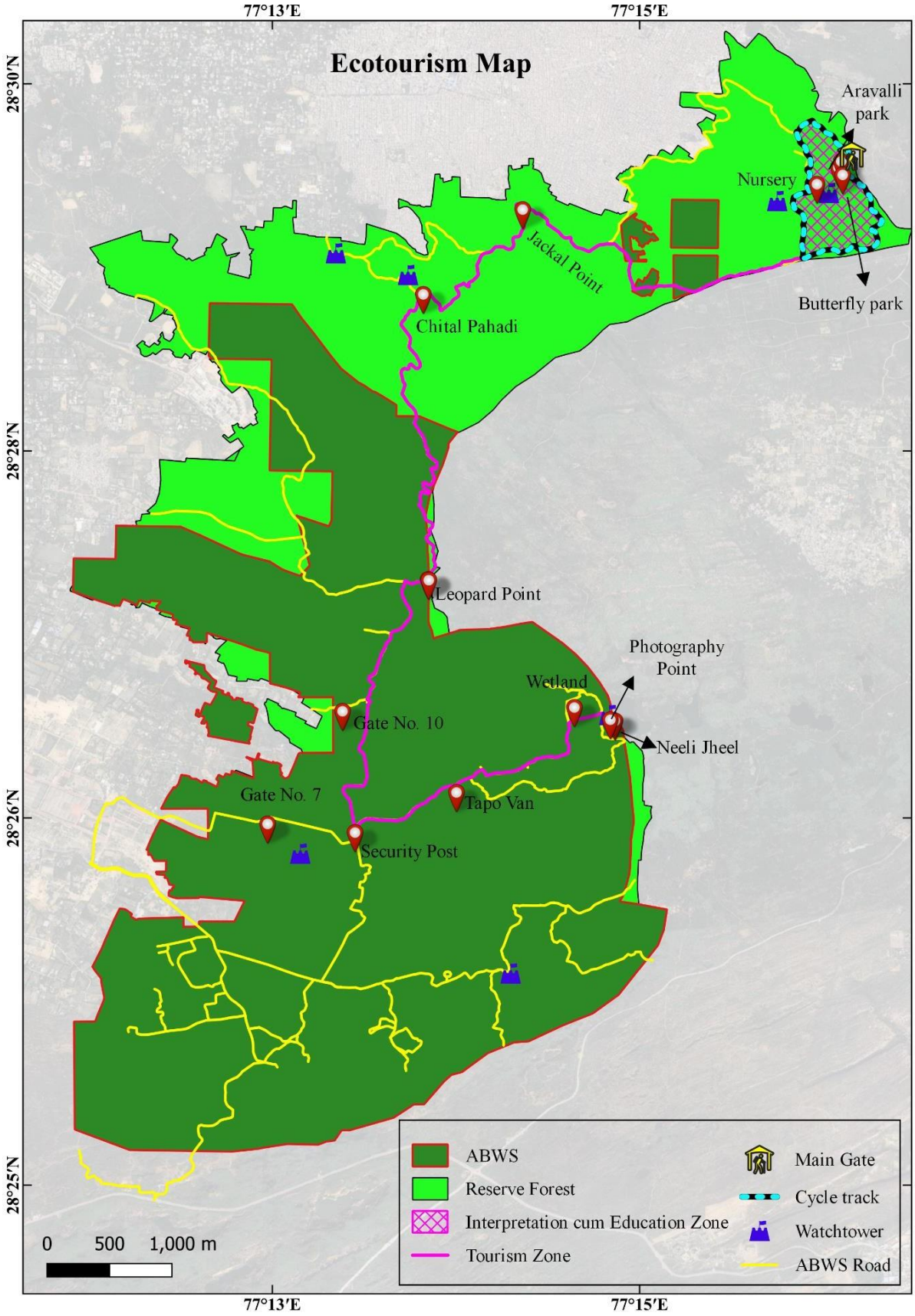

Fig 8.3: Map showing the Eco-tourism in ABWS

8.2 INTERPRETATION

Interpretation is more than providing information, it is an educational process that helps visitors understand the deeper meanings and relationships of nature through direct experience, original objects, and illustrative media (Tilden, 1977). In a landscape like ABWS, which combines restored mine pits, forests, grasslands, and wetlands within an urban setting, interpretation becomes a crucial tool for both visitor management and conservation awareness.

Visitors arriving at ABWS seek guidance on the facilities available, the activities permitted, and the rules for safety and protection. As they explore, their curiosity naturally extends to the flora, fauna, and ecological restoration of the Aravalli's. Well-planned interpretation through centers, trails, signages, and guided activities can channel this curiosity into respectful behavior, deeper learning, and stronger support for conservation, making their visit not only enjoyable but also meaningful.

8.2.1 Objectives:

As discussed above, and based on the deliberations during the stakeholder workshop, the following objectives were framed for interpretation in ABWS;

1. Educate visitors about the importance of ABWS and its conservation work.
2. Encourage visitors to respect wildlife and habitats.
3. Involve local communities in interpretation for livelihood support.
4. Reach out to schools and people in Delhi-NCR to build awareness.

8.2.2 Interpretation zone

An area near the main entrance of ABWS extending up to the nursery is designated as the Interpretation Zone. This serves as the first point of contact for visitors, where they can explore and learn about the sanctuary's values without having to venture deep into forest trails. A self- guided nature trail with signages and interpretive materials will help visitors understand and enjoy the landscape. Key facilities in this zone include the Butterfly Park, Interpretation Centre, nursery, and the DCF Office, which also functions as the administrative hub. To enhance the visitor experience, this zone is equipped with watchtowers, waterholes, and designated monkey feeding points for controlled management of primates. A small refreshment shop and parking area are also provided, ensuring that basic visitor needs are met in a regulated manner. By concentrating these amenities at the entrance, the zone makes orientation and education easily accessible while keeping deeper forest areas undisturbed.

8.2.3 Infrastructure development for interpretation zone

A. Interpretation Centre:

At present, ABWS does not have a dedicated Interpretation Centre building. What currently exists is a single hall, fitted with a few display panels prepared by BNHS, which feature general flora and fauna of the region many of which are not even found in the sanctuary. This space is also used as a multipurpose hall for educational programmes, workshops, and meetings, but it does not serve the true function of interpretation. It is therefore proposed to establish a separate, purpose-built Interpretation Centre that reflects the actual biodiversity, landscapes, and cultural values of the sanctuary.

The centre should include permanent and updated exhibits on the sanctuary's flora, fauna, ecological restoration history, geology of the Aravalli's, and ongoing conservation initiatives. To make learning immersive, facilities such as interactive displays, dioramas, touchscreens, audio-visual sections, and a mini resource library should be incorporated, ensuring that both students and general visitors remain engaged. Beyond static exhibits, the centre should adopt a storytelling approach presenting the history

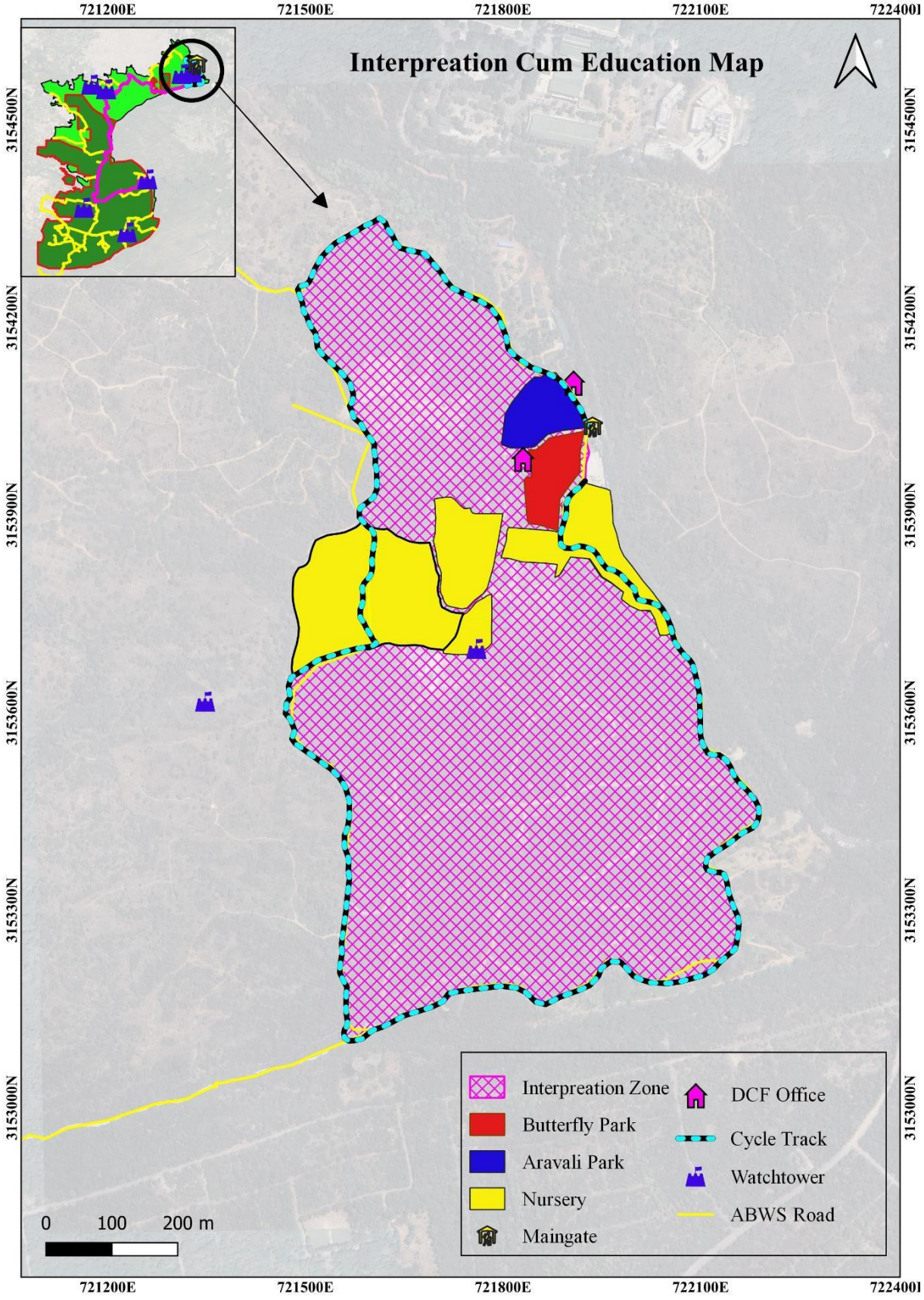

Fig 8.4: Map showing the interpretation cum education zone

of the sanctuary, its cultural significance, and the journey of transformation from abandoned mining pits to a thriving urban biodiversity refuge. By weaving together ecological, historical, and cultural narratives, the Interpretation Centre can not only educate but also emotionally connect visitors with the sanctuary, inspiring a sense of pride and responsibility.

It is proposed to establish one well-equipped Interpretation Centre building that integrates:

- An exhibit gallery for storytelling, displays, and dioramas, and
- A multipurpose hall for sessions, classes, workshops, and educational programmes.

It will also function as the hub for guided walks, orientation sessions, and nature education activities, ensuring that every visitor experience sanctuary's conservation story as a living, unfolding tale of resilience and coexistence.

B. Visitor Information Centre:

At present, Sanctuary does not have a dedicated Information Centre. It is proposed to establish one near the main entrance, which will serve as the first point of orientation for visitors. The centre will provide brochures, maps, and displays about the sanctuary's biodiversity, landscapes, and management initiatives. It will also house publicity materials such as booklets, pamphlets, stickers, and postcards, preferably available on a payment basis to generate revenue and spread awareness. Designed as a welcoming space, the Information Centre will help visitors understand the layout of the sanctuary, available facilities, permitted activities, and safety guidelines before they begin their visit. This facility can also be incorporated with the ticket counter, creating a single, streamlined point where visitors purchase entry passes, receive orientation materials, and are briefed on the dos and don'ts of the sanctuary.

C. Interpretation Programmes

1. Pre-Visit Orientation Programme – mandatory short film or briefing at the entrance before eco-cart rides.
2. Bird & Butterfly Festivals – annual events at Neeli Jheel and Butterfly Park.
3. Community-Led Storytelling Walks –involving local communities in narrating Aravalli history, culture, and ecology.
4. Junior Naturalist Programme – activity-based interpretation for schoolchildren (nature games, treasure hunts, biodiversity clubs).
5. Interpretation through Art & Craft – workshops with local artisans; display boards designed as creative art installations.
6. Thematic Trails with Interpretation Boards/QR Codes – plant trail, butterfly trail, and restoration trail with interactive explanations.
7. Citizen Science Kiosks – interactive boards/screens at the Interpretation Centre showing live data from bird surveys, butterfly monitoring, and seed bank contributions.

D. Signs and Visitor Circulation for ABWS

1. Entrance and Orientation Signage

- Large welcome board at the main gate with map of the sanctuary, zones, and key rules/dos & don'ts.
- Digital display panel near the Information & Ticketing Centre for daily updates

(Weather, events, wildlife sightings, notices)

2. Pathway and Directional Signs

- Clear directional boards for trails, Neeli Jheel, Butterfly Park, Interpretation Centre, watchtowers, and exit routes.
- Distance markers (e.g., "Neeli Jheel – 1.2 km") to help visitors plan walks.

3. Interpretive Signages

- Panels explaining flora, fauna, geology of the Aravalli's, and ecological restoration.
- Before-and-after visuals of mining pits vs. restored wetlands (e.g., Neeli Jheel).
- Wildlife behavior signs (e.g., jackal activity, bird migration routes).
- Cultural/historical context boards about the Ridge and mining history.

4. Thematic Installations

- Rock and mineral models to explain Aravalli geology.
- Fossil replicas (if feasible) to connect with the area's natural history.
- 3D relief/elevation model of ABWS showing forest patches, wetlands, and visitor zones.

5. Temporary & Event Signage

- Temporary signages can be placed to highlight seasonal wildlife sightings such as migratory birds, mammals, amphibians, or insects and removed once the season is over.
- Banners and boards for nature camps, workshops, and seasonal events (e.g., World Environment Day, Bird Festival).
- Movable signages to guide large groups during peak seasons.

6. Regulatory and Safety Signs

- Boards with do's & don'ts at entry and sensitive points (no littering, no loud noise, no feeding animals).
- Safety markers at steep trails, near waterbodies, and viewing points.

7. Interactive & QR-based Signage

- QR codes on key signages linking to short videos, audio guides, or species checklists.
- Interactive "scan to learn more" boards for youth and students.

E. Publicity materials

Publicity materials should be prepared with professional support to effectively showcase the values of Sanctuary. Materials such as brochures, booklets, pamphlets, stickers, and postcards may be made available at the Information Centre, preferably on a payment basis, to generate revenue and spread awareness. In addition, greater emphasis must be placed on online publicity and advertisement through websites, social media platforms, and tourism portals to reach a wider audience, particularly urban residents of Delhi-NCR who are often unaware of the sanctuary's existence and opportunities. While an online booking system for entry already exists, it is underutilized due to lack of visibility; therefore, proper promotion and integration of this system with outreach campaigns is essential. A well-planned

publicity strategy combining printed materials, digital media, and online advertisements will significantly improve awareness, visitor numbers, and support for conservation.

1. ABWS Brochure

A professionally-designed brochure should introduce visitors to the sanctuary's unique biodiversity, history, and visitor facilities while also acting as a quick reference guide during their visit. It should clearly mention the opening and closing timings, the visiting season/period, and the rules and regulations that all visitors must follow. The brochure should also include a small, easy-to-read map showing the entry points, trails, waterbodies, and designated visitor zones. This will help visitors plan their trip in advance and navigate the sanctuary responsibly while understanding what areas are accessible and what activities are permitted.

2. Checklist of Mammals, Birds, Reptiles, and Amphibians

A pocket-friendly checklist should be developed to help visitors, students, and birdwatchers identify and record the species they observe inside ABWS. To make it widely accessible, the checklist should be prepared in both Hindi and English, ensuring that it caters to local communities as well as tourists and researchers. The Forest Department may engage subject experts, naturalists, and wildlife researchers for example, birdwatching groups, BNHS specialists, or local biodiversity experts to prepare and periodically update this list. Such a resource will not only enhance the visitor experience but also strengthen citizen participation in wildlife monitoring and conservation awareness.

3. Plant and Tree Identification Guide

Since many parts of ABWS will be explored through self-guided visits, it is essential to provide visitors with a resource that helps them understand the local vegetation. A Plant and Tree Identification Guide will serve as a handy reference to the sanctuary's flora. The guide should be pictorial, using photographs and line drawings for easy recognition, and should include details such as the botanical and common names, flowering and fruiting periods, ecological role in the habitat, value to wildlife, and cultural or economic uses for people. Such a guide will not only help visitors appreciate the richness of the Aravalli vegetation but also connect them with the sanctuary's role in supporting both biodiversity and human communities.

4. Posters and Infographics

A series of pictorial posters and infographics should be developed for display at the Information Centre, Interpretation Centre, and other visitor nodes in ABWS. These should be designed to be visually appealing, easy to understand, and bilingual (Hindi and English). Recommended themes include:

- Mammals of ABWS – highlighting key species such as leopard, jackal, nilgai, hyena, and porcupine.
- Avifauna – showcasing both resident and migratory birds, with emphasis on Neeli Jheel as a bird habitat.
- Reptiles and Amphibians – featuring snakes, lizards, turtles, and frogs found in the sanctuary.
- Flora of the Aravalli's – common and important plant and tree species of ABWS, with their ecological value.
- Conservation and Heritage of ABWS – explaining the history of the Aravalli's, restoration of abandoned mines, and the role of local communities, schools, and visitors in protecting the sanctuary.

5. Visitor Outreach Material (Pamphlets, Stickers, Postcards, Souvenirs)

Since students, local residents, and youth will form a large part of ABWS visitors, it is important to reach out to them through simple and engaging materials. Pamphlets, stickers, postcards, and small souvenirs can be distributed during special events such as World Environment Day (5 June), Wildlife Week (2–8 October), and World Wetlands Day (2 February) to spread awareness and encourage participation. Activity-based materials like draw- and-colour sheets, activity cards, and short booklets should be prepared in easy-to-understand language for schoolchildren. On completing these activities, children may be awarded certificates, motivating them to learn more about their environment. Environment clubs in nearby schools and colleges can also be supported with these materials to sustain awareness and engagement throughout the year.

6. Digital Outreach Content (e-brochures, social media, QR-linked Info Sheets)

Online content to reach wider audiences in Delhi-NCR, including downloadable brochures, social media campaigns, and QR codes placed along trails to provide instant digital information.

a) Website

ABWS already has an official website, but it needs better management and regular updates. Information on flora, fauna, visitor facilities, timings, rules, and ticketing should be kept current. The site can also share seasonal wildlife sightings, conservation work, research, and upcoming events, along with downloadable maps, brochures, and checklists. With proper upkeep, the website can become a key tool for publicity, education, and visitor engagement.

b) Nature Guides:

At present, visitors in ABWS are taken around mainly by eco-cart drivers, but many of them are not trained to share information about the sanctuary's biodiversity. To improve the visitor experience, these drivers can be given basic orientation and training so they can at least explain the rules, point out key landmarks, and direct visitors responsibly. In addition, it is important to train a group of local educated youth as nature guides, who can provide deeper interpretation about the sanctuary's flora, fauna, restoration history, and cultural values. These guides can accompany eco-carts or lead small groups on trails and birdwatching walks. Regular training and refresher sessions should be organized to update their knowledge and improve communication skills. As visitor numbers grow, nature guides will become essential for both educating tourists and creating livelihood opportunities for nearby communities.

c) Specialized Staff

For effective conservation education and interpretation in Asola–Bhatti Wildlife Sanctuary, it is proposed to create the post of a Wildlife Assistant dedicated to education and interpretation programmes. This staff member will be responsible for managing the Interpretation Centre, coordinating school and college visits, and guiding awareness activities. In addition, a panel of resource persons comprising experts from universities, NGOs, and conservation organizations will be formed to support nature camps, guided walks, and training sessions. Their involvement will ensure that visitors and participants receive accurate, engaging, and updated knowledge about the sanctuary's biodiversity, restoration efforts, and conservation challenges.

d) Audio-Visual:

Films are an effective medium for reaching a wide range of audiences and can greatly enhance conservation education in ABWS. It is proposed to prepare a series of short films (15–20 minutes) on the sanctuary, covering its ecological importance, biodiversity, restoration of abandoned mining pits,

cultural history of the Aravalli's, and ongoing conservation challenges and solutions. These films should be professionally produced with strong visual content to engage both visitors and local communities. The primary commentary can be in Hindi for use in villages and schools, while English subtitles can be added for visitors, students, and researchers from outside. These films can be screened at the Interpretation Centre, Orientation Centre, and during nature camps, ensuring that every visitor gains a visual and emotional connection to the sanctuary's conservation story.

e) **Research & Citizen Science Corner**

To strengthen the role of ABWS as a learning sanctuary, it is proposed to establish a Research & Citizen Science Corner near the Interpretation Centre. This space can serve as a small hub where students, researchers, and visitors engage with ongoing scientific studies and contribute to data collection. Key features may include:

- Display boards and digital screens showing recent wildlife sightings (camera trap images, bird checklists, butterfly records).
- Citizen science initiatives like eBird, iNaturalist, or sanctuary-specific mobile apps where visitors can log species sightings.
- A reference library with field guides, checklists, and research summaries of past and ongoing projects in ABWS.
- Interactive exhibits explaining methods like camera trapping, bird banding, or ecological restoration monitoring.
- Opportunities for volunteers, interns, and students to participate in biodiversity surveys, habitat restoration activities, and environmental awareness campaigns.
- This corner will create a strong bridge between scientific research and public engagement, allowing visitors not only to enjoy the sanctuary but also to contribute to its knowledge base and conservation goals.

8.2.4 Differential Pricing for ABWS

At present, Sanctuary charges a nominal entry fee of ₹10 per person, which is appropriate given the limited awareness and low visitor numbers. The immediate focus should remain on publicity, infrastructure development, and increasing visitor engagement. However, as ABWS develops into a major ecotourism hub with improved facilities such as guided trails, eco-cart rides, interpretation programmes, and community-led activities a differential pricing system should gradually be introduced. This will not only generate revenue for conservation and management but also create livelihood opportunities for local communities. Revision of differential pricing from time to time based on management requirements, subject to approval of Chief Wildlife Warden/Competent Authority, may be allowed. A detailed differential pricing for the development of tourism in ABWS is shown in the table 8.3 given below:

Table 8.3 - Differential Pricing for ABWS for tourism

Visitors	Fee (₹) per person per day	Remarks
Indians – Adults	50	To remain affordable in early stages; can be revised later.
Children (5–18 yrs.)	20	Free entry for children below 5 yrs.
Foreign Visitors	300	At par with other NCR- based eco-tourism sites.
School/College Groups (minimum 10 people, with institution ID)	20 per student	To encourage student visits and nature education.
Guide Charges for Nature Trail	100 per person (minimum group of 5)	If less than 5 visitors, fixed ₹500 per group.
Vehicle safari	500 per person	Separate from entry fee, for those opting.

8.3 Rules and Regulations

- Visitor Access: Entry permitted during official sanctuary hours with valid tickets/passes.
- Permitted Activities: Visits to the Interpretation Centre, Butterfly Park, Neeli Jheel, nature trails, birdwatching, cycling on designated tracks, and guided tours.
- Prohibited Activities: Littering, smoking, alcohol consumption, loud music, vandalism, or graffiti. Feeding or disturbing wildlife strictly prohibited.
- Mobility: Walking, cycling, and electric carts only on marked routes; private motor vehicles not allowed beyond the parking area.
- Behaviour: Silence to be maintained at wildlife viewing points; flash photography discouraged. Visitors must follow staff instructions and signage.
- Waste Management: All waste to be carried back or disposed of in designated bins; zero tolerance for plastic littering.
- Education & Awareness: All interpretation and conservation education activities to be coordinated with the Forest Department to ensure consistency of messaging.
- Monitoring: Visitor numbers, group sizes, and ecological impacts to be regularly recorded, with carrying capacity limits enforced when necessary.

8.4 Conservation Education Programme

Conservation education in ABWS is currently very limited, with few structured activities, weak publicity, and low public awareness. Most visitors leave without understanding the sanctuary's ecological value, and its potential as a centre for learning remains underused. To address this, the proposed programme will introduce innovative approaches such as technology-based tools, hands-on conservation work, citizen science, and outreach to schools, colleges, NGOs, and communities. These initiatives aim to create eco-literate citizens, inspire youth, and build stronger public ownership of the sanctuary.

8.4.1 BNHS Initiatives on Conservation Education at ABWS:

As mentioned earlier, the BNHS has played a key role in shaping conservation education at ABWS through the establishment of the Conservation Education Centre (CEC). Along with outreach and citizen science, CEC also introduced a series of innovative programmes such as:

- Volunteer for Habitat Restoration
- Green Workshops
- Walk in the Woods
- Gardens for Birds and Butterflies
- Tree Plantation Drives
- Green Birthday Celebrations
- Family Day Out
- Kitchen Garden Workshops
- Junior & Senior Nature Nuts Camps

These initiatives successfully engaged students, families, and citizens, but due to lack of continuity many of them have declined over time. The present plan therefore recommends reviving and institutionalizing these programmes so they become a permanent part of ABWS activities rather than temporary projects. To strengthen this, the Forest Department may also consider entering into a formal MoU with BNHS, which would not only help sustain these initiatives but also support capacity building of staff, resource persons, and local youth. Such an approach will ensure that conservation education in ABWS grows stronger and more impactful over time.

8.4.2. Nature Learning Camps

ABWS can organize short, interactive camps that emphasize exploration and problem-solving. Activities may include:

- Biodiversity walks with QR-coded signages linking to digital guides.
- Bird counts and butterfly monitoring, contributing directly to citizen science databases like eBird or iNaturalist.
- Hands-on conservation tasks like habitat clean-ups, native tree planting, or wetland observation.
- Storytelling sessions on the cultural and ecological history of the Aravalli's.

Unlike traditional camps, ABWS will integrate eco-games, photography contests, and interactive exhibitions to keep participants engaged.

8.4.3 Target Groups

1. School children (with separate modules for primary, middle, and senior levels).
2. College and university students for research and volunteering.
3. Teachers and educators through training-of-trainers workshops.
4. Corporates through CSR-linked eco-volunteering.
5. Urban families and resident welfare associations (RWAs).
6. NGOs, eco-clubs, and youth networks across Delhi–NCR.

7. Media professionals to enhance outreach.

8.4.4 Duration & Formats

- Half-day trails (for schools and families).
- Full-day immersion camps (for colleges, corporates, NGOs).
- Thematic weekends – e.g., "Bird Week," "Butterfly Day," "Aravalli Trek Day."

8.4.5 Venue:

The primary venues will be the Interpretation Centre, Butterfly Park, and Neeli Jheel, with nature trails and watchtowers serving as outdoor classrooms. Camps can also partner with Delhi-based institutions and schools to take ABWS's message beyond the sanctuary boundaries.

8.4.6 Curriculum Themes: Instead of generic topics, ABWS camps will focus on real urban–nature issues:

1. Wildlife in a megacity – leopards, jackals, and human coexistence.
2. The story of mined landscapes and ecological restoration (Neeli Jheel).
3. Delhi's changing climate, pollution, and urban biodiversity.
4. Waste and plastic-free living – lessons for schools and homes.
5. Role of Aravalli's in water security and clean air.
6. Citizen's role in conservation – what individuals can do.

8.4.7 Infrastructure & Tools

- Digital kiosks, interactive displays, and VR/AR modules on wildlife.
- Open-air Amphitheatre for screenings and cultural activities.
- Citizen science kits – binoculars, field guides, bird-call apps.
- Clean eco-toilets, water points, and safe shelters.
- "Green classrooms" – shaded gazebos and outdoor seating.
- Solar-powered charging stations for equipment.

8.4.8 Resource Persons: The programme will draw upon:

- Forest Department staff.
- Experts from BNHS, WII, SACCON and other scientific institutes.
- Local naturalists, photographers, and storytellers.
- Community leaders and EDC representatives.

8.4.9 Publicity and Outreach

- Social media campaigns to reach Delhi-NCR schools and youth.
- Partnerships with Eco-clubs, NSS, and NCC groups.
- Dedicated Nature Education Calendar posted online.
- Hosting public events on World Environment Day, Wildlife Week, and Wetlands Day.
- Mobile nature education units (small vans with exhibits) to reach schools that cannot visit ABWS.

CHAPTER 9

RESEARCH, MONITORING AND TRAINING

9.1 Introduction

The first Management Plan for ABWS (1996) did not provide a dedicated framework for research, monitoring and staff training. While the second plan (2014) made some recommendations for these components. However, during the plan period there had been very limited implementation. The problem of habitat degradation and poor soil & water conditions still continue in the sanctuary and there is limited effort on creating baseline information on ecological parameters and supportive scientific monitoring. Ecological management has largely remained unscientific, with restoration efforts focused on uprooting *Prosopis juliflora* and planting a mix of native & non-native species without proper planning or monitoring. This unscientific approach seems to have made some habitat alterations and reduced carnivore movement in designated core areas. Rescue and release operations for stray animals also lack a scientific approach with respect to disease screening and follow-up monitoring protocols. Feeding of macaques continues under the presumption that this should contain these animals with in the sanctuary. Scientific studies on hydrology, prey–predator relationship and connectivity issues remain as major gaps. There are practically no studies with respect to lesser- known species. From a managerial perspective, the sanctuary lacks structured digital experience platforms for visitors and underdeveloped nature education programs for schools, colleges, local communities as well as visitors. Opportunities for training and capacity-building of staff are minimal with no structured certification courses or continuous professional development. Ultimately, for effective management of ABWS, a science-based, adaptive approach based on targeted research, robust monitoring, and continuous capacity building is essential. This has also been emphasized during the stakeholder workshop held on 15-16 July 2025.

Based on the discussions during the workshop with frontline staff, following priority actions were identified for strengthening research and monitoring in ABWS:

- Prioritize research activities relevant to ABWS's unique ecological situation and urban interface.
- Adopt standardized protocols for long-term research and biodiversity monitoring.
- Build adequate capacities among staff and volunteers for scientific management, research, data collection, and ecological interpretation.
- Establish an effective institutional mechanism for long term research and monitoring within ABWS which could also help in retaining the institutional memories.
- Ensure the availability of adequate financial and human resources for research and monitoring in ABWS

9.2 Research

ABWS research has so far covered limited studies on vegetation, flora, species inventories, human macaque conflict, etc. However, more work needs to be done to strengthen the inventories of different taxa and ecological status of major species. Specific focus also needs to give to lesser-known taxa, invertebrates, herpeto-fauna, fish diversity, soil & water quality, prey-predator dynamics, and human dimensions. Some of the research has been conducted many years ago, and in the light of ecological changes driven by habitat modification, invasive species management, climate variability, and urbanization, it is highly likely that earlier documentation and inventories have undergone significant changes. This highlights the urgent need for updated, comprehensive studies using modern scientific tools and standardized protocols to provide accurate, current data for effective management and

conservation planning in ABWS. Mechanism for conducting research should include networking with universities, institutions, technical experts, civil society, and research organizations. Research programmes should also actively involve field staff in data collection and ground-truthing.

A comprehensive and dynamic research priority matrix need to be developed for long- term research through a consultative process between management and members of proposed research advisory committee. However, few priority areas for research are given as follows:

- Detailed surveys and ecological studies in the peripheral and extended buffer.
- Movement patterns, home range, and habitat use studies of key carnivore and herbivore species within and around ABWS
- Strengthening baseline information on flora, fauna (especially birds, mammals, herpetofauna, and insects), and their conservation status in ABWS and adjoining landscape.
- Preparation of seasonal checklists and photo-documentation of resident and migratory bird species.
- Focused studies on under-researched groups such as insects, herpetofauna (reptiles and amphibians), fish and other invertebrates.
- Investigation of predator–prey relationships to understand ecological balance and food web dynamics in the sanctuary.
- Assess fish diversity, abundance, and habitat health in natural and artificial water bodies of ABWS.
- Development of GIS-based habitat maps covering vegetation types, water sources, animal movement corridors, and human use zones.
- Detailed assessment of habitat quality, including spread of invasive species such as *Prosopis juliflora* and *Lantana camara*.
- Study of ecological succession and vegetation regeneration in restored quarries and plantation areas.
- Evaluation of soil and moisture conservation programmes to maintain habitat integrity.
- Documentation and analysis of traditional ecological knowledge and resource management practices of local communities for integration into conservation planning
- Socio-economic profiling of communities in surrounding villages and urban fringes, and their dependencies on the sanctuary.
- Perception and awareness of local residents, visitors, and institutional stakeholders regarding wildlife conservation and sanctuary management.
- Assessment and documentation of human-wildlife conflict, particularly macaque- related issues and cattle intrusion.
- Documentation of the cultural, spiritual, and historical significance of the Delhi Ridge landscape.
- Ethnographic studies on history and evolution of ABWS and adjoining landscape
- Evaluation of ecotourism potential, including visitor impact studies, carrying capacity assessment, and nature education strategies.

- Comprehensive study of ecosystem services (e.g., air purification, carbon sequestration, groundwater recharge) provided by ABWS to Delhi-NCR.
- Ground water studies in and around ABWS.

9.3 Monitoring

Monitoring is an internal exercise of gathering periodic information on different parameters so as to understand whether management is going in the right direction for achieving the plan objectives. This also helps in making required managerial corrections if there are any problems encountered during execution. It is proposed that the Departmental staff (both field staff and technical staff) will be responsible for regular monitoring of critical parameters like land use changes, habitat condition, soil & water quality, ground water, forest vegetation dynamics, and the status of key wildlife species within the sanctuary. This monitoring should also be extended to the adjoining extended buffer zones and urban fringe landscapes, with a longer frequency of monitoring in the landscape.

Most of the data will have to collected at regular intervals by the staff. However, use of tools such as remote sensing, GIS mapping, camera traps, and community-based reporting should be integrated into the monitoring system. This data will provide critical feedback for evaluating the effectiveness of management actions and ensuring the long-term conservation of ABWS and the Northern Aravalli corridor. A detailed protocol is given in the table 9.1.

Main consideration in design of monitoring program: The primary focus of the monitoring program will be on the ecological values of the sanctuary, including key habitats and major wildlife species. Initial baselines will be generated by trained field staff of the Forest Division, with support and guidance from ecologists, researchers, and domain experts. Subsequent periodic data collection on different parameters will be carried out by field staff as part of their routine duties. Data compilation, analysis and preparation of monitoring reports will be done by the technical staff of proposed Asola Bhatti Conservation Foundation (ABCF).

The following monitoring strategies are to be taken up during the plan period;

- Annual population estimation and monitoring of major faunal species, including leopards, jackals, nilgai, and hyena.
- Seasonal bird surveys along fixed transects to document migratory and resident bird populations.
- Monitoring of reptile, amphibian, and invertebrate populations, particularly in water bodies, restored zones, and undisturbed habitats.
- Tracking human-macaque conflict through geo-referenced incident logging and mapping of hotspots.
- Monitoring of problematic or injured animals, including response time, conflict resolution, and release outcomes.
- Assessment of the spatial and seasonal availability of water in check dams, natural depressions, and artificial waterholes, with mapping updates.
- Monitoring the spread and impact of invasive plant species, mainly *Prosopis juliflora*.
- Forest fire occurrence monitoring, including mapping of fire-prone areas, fire incidence logs, and post-fire ecological assessments.
- Wildlife health surveillance, including periodic assessments for zoonotic risks, disease

outbreaks, and rescue interventions.

- Monitoring of mortality events in wild fauna, including cause of death and temporal- spatial patterns.
- Geo-referenced documentation of livestock incursions and grazing pressure.
- Monitoring visitor impact and tourism pressure.
- Community perception and socio-ecological monitoring, to understand trends in awareness, dependency, and attitudes toward ABWS.
- Regular collection of meteorological data, including temperature, rainfall, humidity, wind speed and ground water levels

Table 9.1- Protocols for monitoring in ABWS

Broad Parameter	**Protocols for Monitoring**	**Frequency of Monitoring**	**Means of Verification**	**Agencies to be Involved**
Ecological	Land use and land cover mapping using remote sensing & GIS	Once a year during the month of December	Baseline GIS data and field validation	Delhi Forest Dept., Remote Sensing & GIS cell, CEC
	Air and water quality monitoring at key sites in and around ABWS	Three times a year (summer, monsoon, winter)	Standard pollution parameters (BIS norms)	Delhi Pollution Control committee, CPCB
Biodiversity	Habitatquality Monitoring using permanent vegetation plots and invasive species assessment	Each season in core zones; once annually in buffer areas	Baseline vegetation plots and invasive species mapping	Delhi Forest Dept., WII, BNHS, local colleges, NGOs
	Large Mammalian species- large cats, Hyena and other major herbivores (Sambar, Spotted Dear, Wild-bore, Nilgai, etc.	Every day	recorded sighting database	Field staff of Forest Department and technical staff of ABCF
	Camera trap and direct observation-based monitoring of mammals, birds, herpetofauna and invertebrates	Once a year per taxa group	Photographic and recorded sighting database	Forest Dept., WII, WWF, WTI local colleges, NGOs
	Seasonal bird surveys using point count and line transect methods	Twice a year (Monsoon and Winter)	Survey records and field datasheets	BNHS, Forest Dept., birdwatching groups, local colleges

Socio-economic	Assessment of community dependency on sanctuary resources (fuelwood, fodder, water, etc.)	Twice a year (Summer and Winter) in first two years and once a year in subsequent period	Interview forms, focus group discussion notes	Delhi Forest Dept., academic institutions and volunteers
	Socio-economic survey of nearby villages and awareness/perception toward wildlife	Once every two years	Structured household survey data and comparative reports	Forest Dept., academic institutions, NGOs and volunteers
Ecosystem Services	Monitoring of ecosystem services: air purification, groundwater recharge, carbon sequestration	Once every year	Annual reports based on service indicators and satellite data	Delhi Forest Dept., Environment Dept., CPCB

9.4 Training

Training is a critical tool for capacity building and enhancing the professionalism of field staff, officials, and associated stakeholders involved in the management of ABWS. While frontline staff perform daily operational duties, it is equally important for them to build a deeper understanding of ecological principles, conservation laws, species behavior, and public interface. Improving the skills and knowledge base of the staff brings several benefits: it enhances awareness and confidence, strengthens field performance, and fosters better engagement with local communities, visitors, and stakeholders. This, in turn, improves the quality and productivity of conservation outcomes across the sanctuary.

Suggested Training Areas for ABWS Field and Office Staff:

a) **Ongoing training programmes for Executive and Controlling Officers:**

- Ten-months Advanced Diploma Course in Wildlife Management for officers of the level of DCFs/ACFs. (WII)
- Three-month certification program for Range Officers focused on wildlife management. (WII)

b) **Tailor made programmes for field and other technical staff on:**

- Identification and knowledge of wild animal and bird **species** found in ABWS and the larger Northern Aravalli landscape, including their habitat use and behavior.
- Identification of native flora, including medicinal plants and species under threat from invasive competitors.
- Understanding plant-animal interactions and the ecological significance of each species within the dry deciduous ecosystem.

- Training on population estimation techniques and biodiversity monitoring methods, including transects, point counts, and camera traps.
- Forest and wildlife laws
- Anti-poaching skills, offense detection, seizure documentation, and Wildlife Crime Control Bureau (WCCB) protocols.
- Conflict resolution and communication skills for engaging effectively with local residents and urban fringe communities.
- Practical use of field instruments such as binoculars, GPS devices, compasses, digital cameras, and audio recording equipment.
- Basic computer literacy, data entry, and management of digital monitoring logs and reports.
- First Aid devices, procedures and disaster management

c) **Training for Local Nature Guides, field staff, Stakeholders, and Tourism Operators:**

To ensure responsible tourism and community-based conservation, local guides and other community stakeholders should be regularly trained and empowered. Refresher courses and new modules should be designed in partnership with institutions such as the Wildlife Institute of India (WII), BNHS, or local colleges.

Suggested Training Topics:

- Skills in handling and guiding tourists, including responsible behavior and emergency response.
- Interpretation and storytelling techniques for nature education and wildlife tourism.
- Identification of mammals, birds and other wildlife species and their calls, using visual and auditory cues.
- Basics of dry deciduous forest and urban ecology, including threats such as invasive species and pollution.
- Microplanning techniques for local eco-development activities.
- Leadership development, team building, and facilitation of conservation dialogues.

d) **Training programmes should be conducted through a collaboration of:**

- Delhi Forest Department
- Professional organizations and academic institutions
- NGOs and national training institutes (e.g., WII, BNHS, WWF, WTI)

Staff should also be exposed to good practices of wildlife management on other Protected Areas of the country through short field visits.

9.5 Institutional arrangements

Following institutional arrangements will be put in place for anchoring the agenda of Research, Monitoring and Trainings:

A. **Asola Bhatti Conservation Foundation (ABCF):** Details provided in Chapter 10 on Organization and Administration

B. **Research, Monitoring, and Training Advisory Committee (RMTAC)**

A Research, Monitoring, and Training Advisory Committee (RMTAC) is proposed for providing advisory support ABWS. This committee will serve as a multi-stakeholder platform to guide science-based management of the sanctuary.

C. **Composition of Committee (RMTAC)**:

- Principal Chief Conservator of Forests (PCCF) – Chairman
- Deputy Conservator of Forests (DCF) – Member Secretary

- Assistant conservator of forest (ACF) - Member
- Range Officer (RO) – Member
- Two representatives of local Wildlife NGOs
- A representative from Biodiversity Park, Delhi
- One representative from Sankala Foundation, New Delhi
- A representative from Biodiversity Park, Delhi
- One representative from a local scientific institute or prominent wildlife professional

Roles and Responsibilities:

- Wildlife Guards– Collect daily, periodic and annual biodiversity data in designated formats.
- Technical staff of ABCF- Analyze the data and prepare reports, manage database, conduct trainings and provide technical support to field staff.
- Veterinarian – Monitor animal health, oversee rescue and release protocols.
- Ecotourism & Nature Education Officer – Design and conduct visitor education programs, digital engagement tools.
- NGOs and volunteers– Help Ecotourism and Nature Education Officer of ABCF for awareness and outreach programs; assist in citizen science initiatives.
- Ecotourism & Nature Education Officer – Design and conduct visitor education programs, digital engagement tools

Table 9.2 - Institutional Framework and Roles under the Committee

Chairman	**Members**	**Operational Teams**
PCCF	DCF, RO, NGO Reps, Veterinarian, Local/ Scientific Institute Rep, Biodiversity Park Rep	Technical Staff of ABCF, Ecotourism & Nature Education Officer, Wildlife Guards, Support Team
Overall advice and Policy decisions	Day to day guidance & Supervision	Field Implementation and database creation/ management

CHAPTER 10
ORGANIZATION AND ADMINISTRATION

10.1 Introduction

The effective management of Asola Bhatti Wildlife Sanctuary (ABWS) requires a well-defined administrative framework that ensures protection, ecological monitoring, visitor regulation, and engagement of civil society. Over the time, the responsibilities of sanctuary management have expanded far beyond traditional protection duties to include complex aspects such as landscape-level planning, stakeholder coordination, ecotourism development, research, and conservation education. Moreover, managerial and interface issues often arise not only with local communities but also among multiple stakeholders and agencies, directly or indirectly, related to sanctuary governance. Therefore, an integrated and collaborative organizational structure is essential for effective management of ABWS. The administrative setup must prioritize clarity of roles, effective communication, and accountability, ensuring that human resources are deployed efficiently to meet both conservation and developmental objectives of ABWS.

10.2 Existing Structure

As in any state, Chief Wildlife Warden (CWLW) is the overall legal and administrative authority for wildlife matters of NCT of Delhi. In the administrative hierarchy, Chief Conservator of Forests (CCF), Conservator of Forests (CF) and other officers at the headquarters support CWLW in day-to-day administration. The primary responsibility for the sanctuary lies with the Deputy Conservator of Forests (DCF), South Division, who functions as the Sanctuary Manager and holds overall charge of planning, implementation, and supervision of all activities within ABWS. Supporting the DCF is a team of Range Officers who oversee field operations, protection duties, habitat management, and coordination of eco-tourism activities within designated ranges of the sanctuary. Range Officers are supported by Deputy Range Officers. Each Range is further managed through teams of Foresters and Beat Officers (Forest Guards/ Wildlife guards), who are directly responsible for ground level patrolling, monitoring, and community interface issues. In addition to the regular forest staff, the management also draws support from watch and ward staff, eco-task force, and daily-wage workers employed for patrolling and habitat restoration. Existing organization structure of South Division is provided as figure 10.1.

Activities of ABWS are increasing day-by-day and therefore, additional, staff is required for effective management of the sanctuary. Vacancies at middle and lower level of the field staff also need to be filled immediately. In the light of multifarious activities of the sanctuary, redeployment of staff with clear roles and responsibilities is a need of the hour. New structure has also to address the issue of interface with the surrounding habitations as well as networking with stakeholders.

10.3 Objectives

Broad objectives of new organizational structure are provided as follows:

- To ensure focused protection, clear field-level accountability and efficient coordination for effective management of ABWS.
- To strengthen law enforcement measures through adequate staffing, training, infrastructure, and inter-agency cooperation.
- To enhance human resource development by building the capacity of frontline staff, eco-guides, and support personnel.

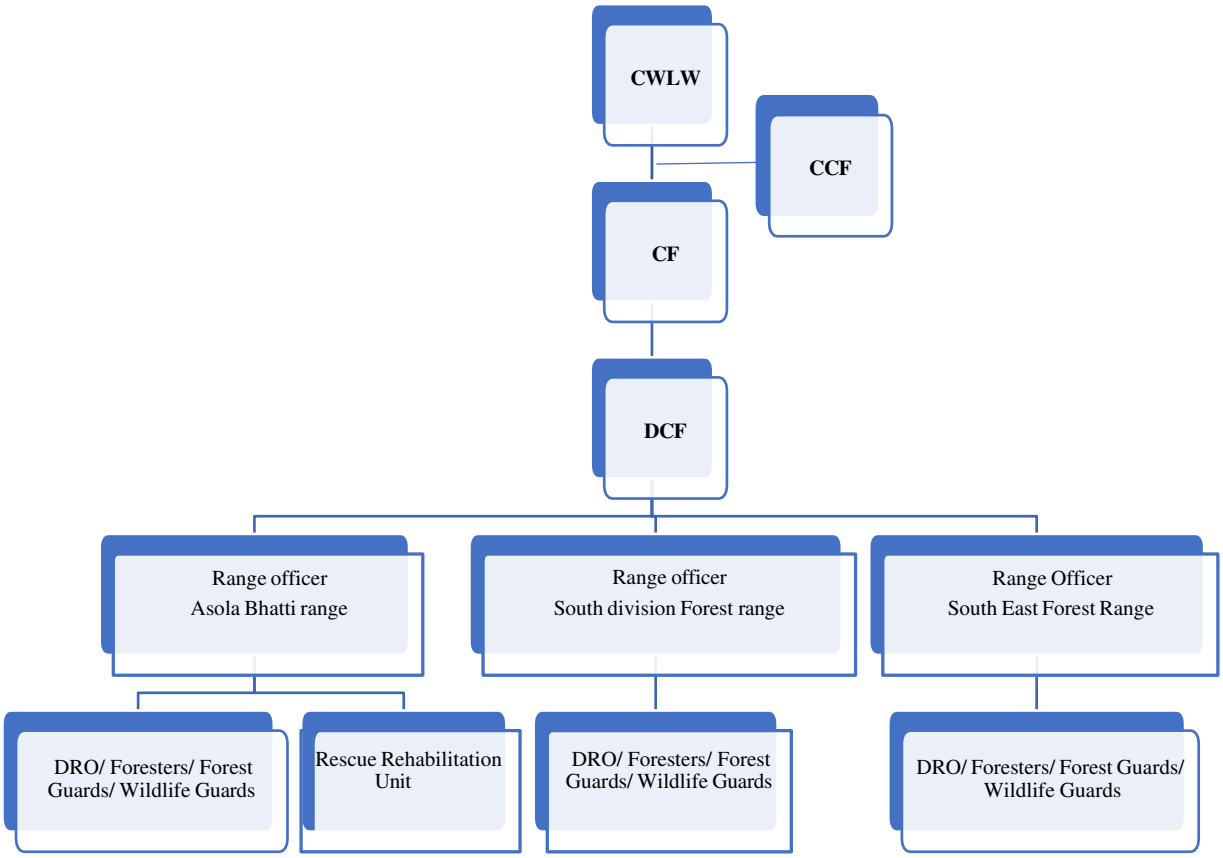

Fig 10.1: The existing organizational set up of South Forest division, Delhi

10.4 Strategies

1. Re-organization of Beats

ABWS and adjoining RF, which are currently being managed as a single unit of wildlife reserve, form the part of Asola Bhatti Range (Annexure V). The range is divided into eight beats; Bhatti, Asola, Sahoorpur, Satbari, Maidan Garhi, Devli, Tughlaqabad, and Pul Pehladpur. However, the administrative boundaries of these beats extend much beyond the boundary of the wildlife reserve for which this plan is being prepared (See figure 10.3). This is leading to reduced focus of staff on the sanctuary, as they have to work for wildlife reserve as well as areas outside this reserve. To give an enhanced focus on wildlife reserve, streamline administration and strengthen accountability; it is proposed to reorganize the existing beat structure so that all duties are clearly defined for both wildlife reserve area and outside. Separate beats are proposed to be designated for zones lying inside and outside the wildlife reserve boundary. Accordingly, the following restructured beats are proposed:

- Bhatti–I (inside ABWS) and Bhatti–II (outside sanctuary)
- Asola–I (inside) and Asola–II (outside)
- Sahoorpur –I (inside) and Sahoorpur –II (outside)
- Satbari–I (inside) and Satbari–II (outside)
- Maidan Garhi–I (inside) and Maidan Garhi–II (outside)

- Devli–I (inside) and Devli–II (outside)
- Tughlaqabad–I (inside) and Tughlaqabad–II (outside)
- Pul Pehladpur Beat (Totally outside the wildlife reserve)

For effective supervision and clarity in responsibilities, the beat system of the Asola Bhatti Range is proposed to be reorganized into six sections, three for wildlife reserve and another three for areas outside the wildlife reserve. Details of these sections is provided as follows:

Within Wildlife Reserve:

- Asola–Bhatti Section I
- Sahoorpur –Satbari–Maidan Section I
- Devli–Tughlaqabad–Pehladpur Section I

Outside Wildlife Reserve:

- Asola–Bhatti Section II
- Sahoorpur –Satbari–Maidan Section II
- Devli–Tughlaqabad–Pehladpur Section II

Each section will be managed by a Section Officer (Forester) under the supervision of the respective Range Officer (RO). This restructuring ensures clear jurisdiction, improved field coordination, and focused management efforts both inside and outside the Wildlife Reserve. Each beat will be placed under the charge a Beat Officer (Forest /Wildlife Guard) responsible for regular patrolling, reporting, and coordination. The Range Officer of Asola-Bhatti Range will manage the beats lying inside ABWS and handle legal and wildlife-related matters, while the Range Officer of South Forest Range will oversee the external beats, including coordination with adjoining jurisdictions and managing encroachment or external pressures. This reorganization will create a clear division of labour, eliminate jurisdictional overlaps, and ensure dedicated protection of both the sanctuary and adjoining forest areas, thereby improving efficiency, accountability, and field-level monitoring.

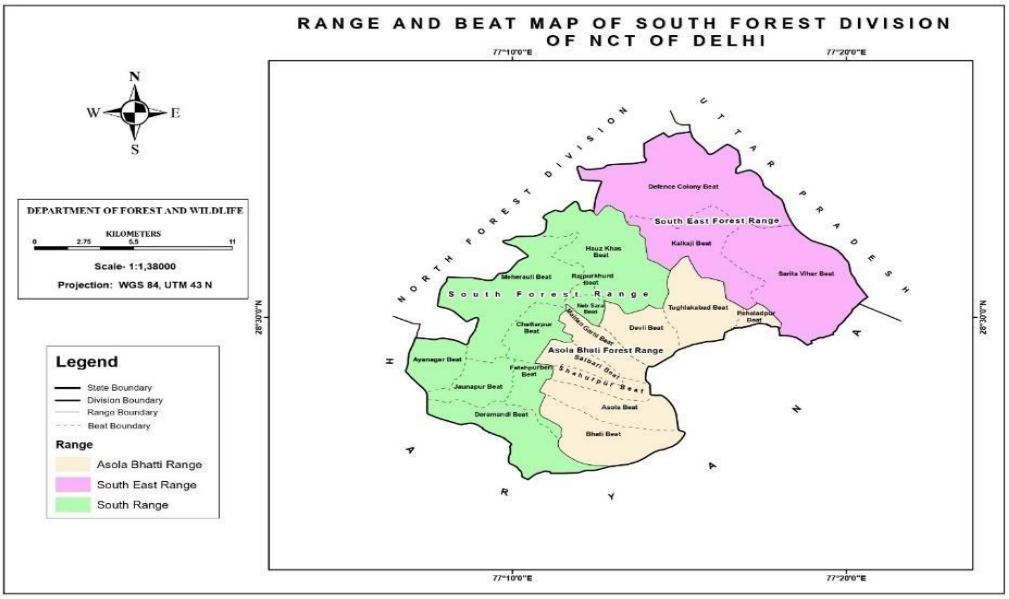

Fig 10.2: Map showing existing ranges and beats of South Forest Division, Delhi

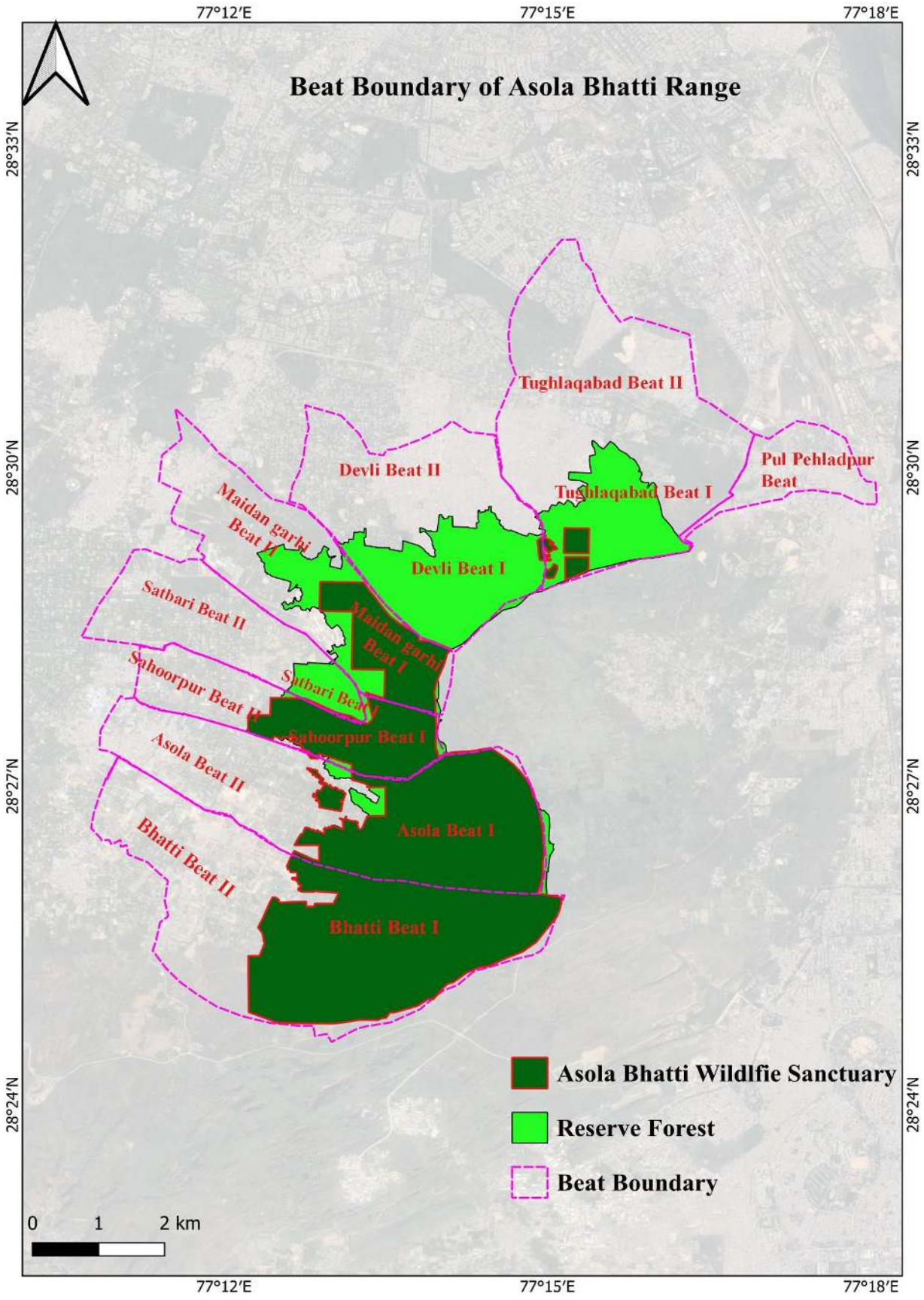

Fig 10.3: Map showing proposed Beat Boundaries

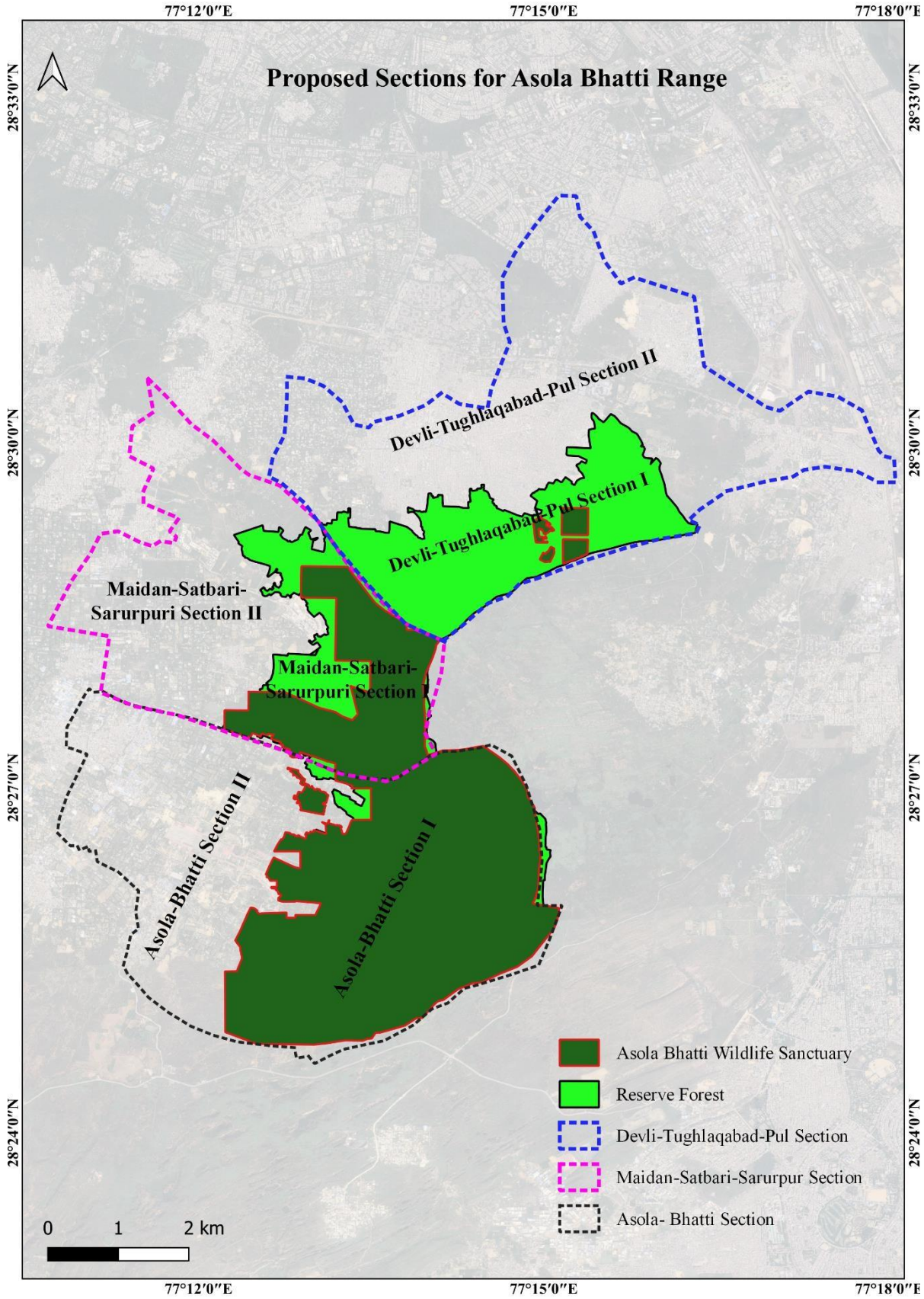

Fig 10.4: Map showing the proposed Section Boundaries for Asola Bhatti Range

2. Filling of existing vacancies and creation of new posts:

a. Filling of existing vacancies

The management of ABWS is currently constrained by a significant number of vacant posts across various levels, which adversely affects protection, monitoring, and day-to-day operations. Out of 186 sanctioned positions, only 112 are presently filled**,** leaving 74 vacancies. It is therefore proposed that all sanctioned posts be filled at the earliest to ensure smooth functioning and effective management of the sanctuary. At present, one post of ACF is vacant and should be filled immediately to strengthen field supervision and coordination. Similarly, among Deputy Range Officers (DROs), out of a sanctioned strength of six, only two positions are filled, leaving four vacancies, which must be urgently filled to improve overall supervision. The remaining vacant positions across other categories are given in the table below and should also be filled immediately for their respective designations to ensure adequate manpower and operational efficiency.

Table 10.1: Existing staff strength and vacancies

Designation	**Sanction Strength**	**Filled**	**Vacant**
Field Staff			
DCF	1	1	0
ACF	1	0	1
Forest ranger	2	2	0
DRO	6	2	4
Forester	16	10	6
Forest Guards	73	59	14
Wildlife Guards	3	2	1
Labourer/ Mali	78	31	47
Driver	1	1	0
Office staff			
SO	1	1	0
ASO	1	1	0
Senior Assistant	2	2	0
Junior Assistant	1	0	1
Total	186	112	74

b) Creation of new posts and work allocation

At present, the DCF, South Division, holds responsibility for both the ABWS and the extensive surrounding forest areas. Despite his best efforts, the wide span of administrative duties often limits the focused attention required for sanctuary-specific management. Therefore, it is proposed to position one officer of the level of ACF to oversee the functioning of ABWS under the overall supervision of DCF.

Further, to enhance field-level management and ensure adequate coverage across the large and ecologically diverse area of the sanctuary, it is proposed to create two additional posts of Range Officers (ROs). At present, only two Range Officers are in position. One RO is holding the charge of two ranges. Current strength of ROs is insufficient to effectively manage the multiple areas and spectrum of management activities. With the creation of two new RO positions, three ranges could be assigned individual each Range Officer and another RO should be provided as a technical support to the ACF. Therefore, ACF will have four ROs under his charges.

- Three Territorial Range Officers will independently manage three ranges i.e., Asola Bhatti Range, South Forest Range, and South-East Forest Range.
- One Range Officer will act as a technical officer to ACF and look after legal matters, land issues, ecological monitoring and any other matters of management as decided by CWLW. This officer will be assisted by one Deputy Range Officer (DRO).

Each Territorial Range Officer will be supported by a Deputy Range Officer (DRO), along with Foresters, Forest Guards, and Wildlife Guards responsible for field-level duties such as patrolling, habitat management, and visitor regulation. The sanctuary is proposed to be divided into three Sections, each under the supervision of a Section Officer (Forester). Every Beat within these sections will be under a Beat Officer (Forest Guard/Wildlife Guard), supported by temporary or daily-wage staff for ground-level operations. In addition, the Range Officer of Asola Bhatti Range will also serve as the In-Charge of the Rescue and Rehabilitation Unit, which will comprise of a Veterinary officer, Assistant Veterinary officer (under ABCF), Beat Officers (Wildlife Guards), and temporary supporting staff to handle wildlife rescue and rehabilitation issues. The same Range Officer will also oversee the Tourism, Education, and Interpretation Unit, staffed by four Forest Guards and other supporting personnel to manage visitor services, awareness programs, and interpretation facilities. This proposed staffing structure aims to bring greater specialization, accountability, and coordination in sanctuary management, ensuring that the DCF's directives are implemented effectively while strengthening on-ground protection, rescue operations, and eco- tourism services. Additionally, to support the increased number of official and rescue vehicles, it is essential to create at least 20 new driver positions for running the fleet of vehicles. These will include one driver each for the DCF and ACF, four drivers for the Range Officers, and four additional drivers for pool and rescue vehicles under the direct control of the DCF. This will ensure that all official, patrolling, and rescue vehicles are adequately staffed and can operate efficiently without delays during emergencies or field movements.

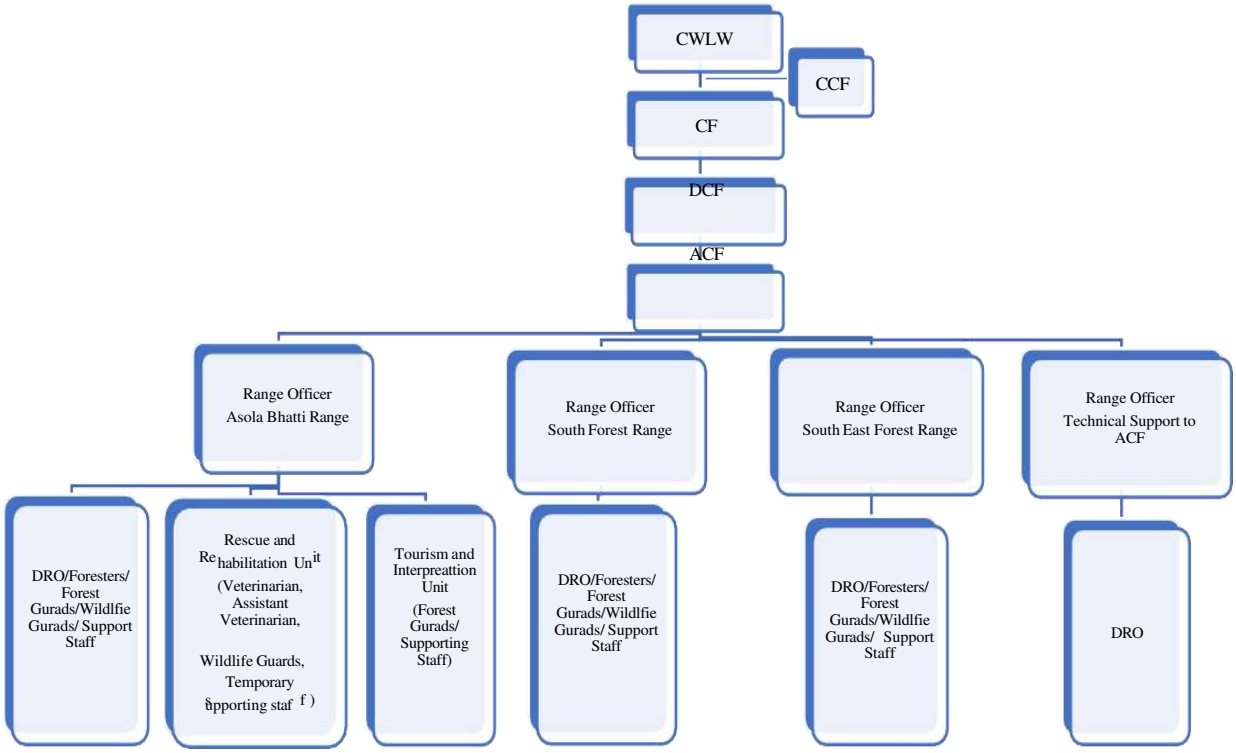

Fig 10.5: Proposed Organizational Setup for South Forest

3. Capacity Building of the Staff

The existing staff have undergone only the regular forestry trainings but have not received adequate exposure to wildlife-specific training programmes. Therefore, it is proposed that all staff members should be trained through a short-term wildlife induction training programme (each of three weeks' duration) over the next two years. Capacity building should not be treated as a one-time exercise but as a continuous process. Staff will require regular upgradation of their knowledge and skills in areas such as wildlife monitoring, use of GPS and camera traps, eco-tourism management, first aid, and communication techniques. Hence, it is proposed that in addition to the wildlife training programme proposed above, one short refresher training programme on wildlife and one thematic workshop on wildlife conservation be conducted every six months. This will ensure that each staff member has the opportunity to upgrade his knowledge and skills in the latest wildlife matters twice a year.

4. Exposure Visits for Staff

Effective management of ABWS depends not only on adequate staffing but also on the skills, knowledge, and motivation of frontline personnel. Forest Guards, Foresters, and other staff often have limited opportunities to learn from successful models of PA management in other landscapes. To strengthen their capacity, exposure visits should be organized to well-managed protected areas where staff can learn from successful management practices. Such visits will allow staff to observe best practices in patrolling, visitor regulation, eco-tourism management, community involvement, and conflict mitigation, and to adapt these lessons to the context of ABWS. Regular participation in training workshops, field demonstrations, and peer learning exchanges will also improve staff confidence and efficiency.

By investing in exposure and capacity building, the sanctuary can ensure a motivated, skilled, and knowledgeable frontline team capable of addressing the complex challenges of managing a protected area within an urban landscape.

10.5 Duties and Responsibilities

1. Deputy Conservator of Forests (DCF), South Division – ABWS

The overall responsibility for the management of the Sanctuary lies with the DCF (South Division), who functions as the Wildlife Warden of the sanctuary under the guidance of the Chief Wildlife Warden (CWLW), Delhi. The DCF will:

- Supervise and coordinate all matters related to wildlife protection, habitat restoration, eco-tourism, and conservation education in ABWS.
- Ensure strict implementation of the Wildlife Protection Act, 1972 and other relevant laws, rules, and government directives.
- Oversee the preparation and execution of management plans, budgets, and annual conservation programmes.
- Supervise habitat restoration initiatives, watershed management, and ecological monitoring within the sanctuary.
- Coordinate with stakeholders, including Municipal Corporation of Delhi (MCD), Irrigation Department, NGOs, research institutions, and local communities.
- Monitor and regulate eco-tourism activities, ensuring carrying capacity limits and minimizing ecological impacts

- Review and guide research, surveys, and conservation education programmes conducted within the sanctuary.
- Exercise financial and administrative powers, including recruitment, discipline, and staff welfare.
- Ensure timely submission of reports, accounts, and audit compliance.
- Provide leadership, guidance, and operational instructions to all staff working under ABWS.
- To supervise the activities of ABCF

2. Assistant Conservator of Forests (ACF)

The **Assistant Conservator of Forests (ACF)** will play a key role in coordinating technical, administrative, and field functions of the Asola Bhatti Wildlife Sanctuary under the supervision and guidance of the Deputy Conservator of Forests (DCF), South Division. The ACF will primarily ensure that all management activities are implemented efficiently and in alignment with the objectives of the management plan. Major job functions of ACF will be as follows:

- Supervise and coordinate the day-to-day operations of all Ranges within ABWS, ensuring effective protection, habitat management, and eco-tourism regulation.
- Oversee the preparation and implementation of annual work plans, progress reports, and monitoring documentation.
- Provide technical support to Range Officers in ecological monitoring, wildlife rescue, habitat restoration, and research-based conservation activities.
- Legal and land issues with the support of RO
- Facilitate inter-departmental coordination with other agencies including the Municipal Corporation of Delhi (MCD), Delhi Jal Board, and NGOs for integrated landscape management.
- Manage financial and administrative matters at the sanctuary level, including budgeting, expenditure tracking, and maintenance of records.
- Oversee staff capacity building, including organization of workshops and training programmes in collaboration with technical institutions such as BNHS, WII, and WWF.
- Act as the Member Secretary of the Executive Committee under the Asola Bhatti Conservation Foundation (ABCF).
- Report regularly to the DCF on field progress, staff performance, and emerging management issues requiring higher-level intervention.
- To look after the day-to-day activities of ABCF.
- Any other activity as approved by CWLW.

3. Range Officers / Rangers

Range Officers are directly responsible for the day-to-day protection and management of designated ranges within ABWS under the supervision of the DCF. Their duties include:

- Supervise Deputy Range Officers (DROs), Foresters, Beat Officers, and other staff within their range.
- Ensure patrolling and surveillance to prevent poaching, illegal grazing, encroachment, and

extraction of resources.

- Oversee habitat improvement measures like plantation, wetland maintenance, and fire management.
- Implement eco-tourism management activities, such as regulating visitor entry, maintaining infrastructure (watchtowers, trails, signages), and enforcing rules.
- Coordinate with communities for conflict mitigation, awareness, and participation in conservation activities.
- Oversee the record keeping of wildlife sightings, mortalities, visitor statistics, and other data relevant to sanctuary management.
- Report regularly to the ACF and assist in execution of management plan objectives.
- Any other activity as approved by CWLW.

4. Deputy Range Officers (DROs)

- Assist the Range Officer in day-to-day field operations, protection, and patrolling.
- Supervise Foresters, Beat Officers and frontline staff within their jurisdiction.
- Ensure implementation of management activities such as plantation, fire prevention, and habitat improvement.
- Verify field records (patrolling diaries, fire registers, boundary verification reports, etc.) before submission to the Range Officer.
- Oversee maintenance of infrastructure, vehicles, and equipment within the range.
- Support in rescue operations, conflict management, and law-enforcement duties.
- Oversees data collection for monitoring of wildlife, vegetation, and ecological restoration.
- Submit monthly progress reports and incident summaries to the Range Officer.
- Act as in-charge of the range in the absence of the Range Officer.
- Any other activity as approved by CWLW.

5. Section Officers (Foresters)

- Supervise and guide Beat Officers in their respective sections for effective implementation of management works.
- Maintain section-wise records on plantation, fire, and wildlife sightings.
- Conduct regular field inspections to ensure proper maintenance of boundary pillars, signage, and fire lines.
- Ensure daily patrolling schedules and attendance of Beat staff.
- Assist in micro-planning and execution of eco-development and awareness activities.
- Facilitate data recording for habitat monitoring, photo-point documentation, and wildlife sightings.
- Liaise with local communities and coordinate minor maintenance or outreach work.
- Submit weekly field inspection reports to the DRO/Range Officer for review.

- Any other activity as approved by CWLW.

6. Beat Officers

Forest Guards form the frontline force of ABWS and are the first point of contact for wildlife protection and visitor regulation. Their responsibilities include:

- Conduct regular patrolling of beats to prevent illegal activities such as poaching, tree felling, grazing, or encroachment, while simultaneously monitoring wildlife presence through sightings, tracks, and camera trap data, and promptly reporting any unusual observations to superiors.
- Undertake data collection on flora, fauna, and visitor movement as per approved protocols for ecological monitoring
- Carry out habitat improvement activities, fire prevention, and control operations.
- Guide and regulate visitors, ensuring compliance with sanctuary rules and maintaining order during eco-tourism activities.
- Act as community liaisons, creating awareness and reporting conflict situations to RO.
- Maintain discipline, follow instructions of the Ranger/Forester, and ensure the safety of sanctuary property and resources.
- Any other activity as approved by CWLW.

10.6 Basic Amenities and Facilities

For effective management of ABWS, adequate facilities and infrastructure are essential to ensure staff welfare, mobility, safety, and efficiency. The following basic amenities are proposed:

1. Accommodation and Residential Facilities

- Construction of staff quarters for Dy. ROs, Foresters and Beat Officers near the sanctuary to ensure round-the-clock presence.
- Development of a residential complex near Lal Park or any other suitable area, which will accommodate DCF, ACF and Range Officers.
- Renovation and maintenance of existing staff accommodation to provide safe, hygienic, and functional living spaces.
- Provision of Office for Asola Bhatti Conservation Foundation (ABCF) cum training hostel for visiting researchers, trainers, and field officials and a guest house for officers on duty.

2. Vehicles and Mobility

Mobility is critical for patrolling, wildlife rescue, and visitor regulation. The following vehicles are proposed:

- Patrolling Vehicles: Increase the number of official vehicles from the current five to eight. One to the DCF, one vehicle will be assigned to the ACF and each Range Officer will be allotted one independent vehicle (four in total). Remaining two will function as pooled vehicles under the direct control of the DCF for shared use during special operations, rescue activities, and emergencies.
- Special Patrolling Vehicle: One high-performance vehicle for the DCF to supervise sensitive operations and night patrols.
- Wildlife Rescue and Eco-Vehicles: Currently, only one rescue vehicle is available for the entire

sanctuary, which limits timely response to conflict or emergency situations. It is therefore proposed to increase the number to three dedicated wildlife rescue vehicles, each equipped with cages, nets, stretchers, tranquilizing kits, and first-aid supplies to ensure effective and safe animal rescue operations. In addition, five small battery-operated eco-vehicles are proposed for rapid mobility during rescue missions and for movement within sensitive eco-zones where fuel-based vehicles may not be permitted or suitable.

- Motorbikes: 15 motorbikes for quick patrolling by Beat Officers, especially in rough terrain where four-wheelers cannot reach.
- Minibus/Staff Carrier: One minibus for staff transport and for moving teams during special drives, training programmes, or workshops.
- Ambulance: One wildlife-equipped ambulance for emergencies involving both staff and rescued animals.

3. Other Essential Amenities

- Wireless Communication System: Handheld radios for Forest Guards and Foresters to ensure seamless communication across beats.
- Field Equipment: Binoculars, GPS devices, camera traps, drones (for monitoring difficult areas), and night vision equipment.
- Safety Gear: Snake-bite kits, first-aid boxes, protective boots, and uniforms for frontline staff under the guidance of veterinary officer
- Work Sheds and Tool Stores: For storage and maintenance of field equipment, traps, and rescue gear.
- Drinking Water and Sanitation Facilities: Safe water points and clean toilets for staff across field posts.

4. Incentives, Welfare and Recognition of Staff

Frontline protection staff play a crucial role in the management and conservation of Asola Bhatti Wildlife Sanctuary. To ensure their sustained motivation, safety, and wellbeing, a comprehensive welfare and incentive system should be instituted. Field staff such as Range Officers, Deputy Range Officers, Foresters, Forest Guards and Wildlife Guards often work under challenging and risky conditions, including extreme heat, wildlife encounters, and field hazards. Therefore, periodic recognition through *awards, certificates of appreciation, and monetary incentives* should be provided for exemplary service, effective protection efforts, successful rescue operations, and outstanding community engagement. Additionally, a structured Annual Performance-based Reward System should be introduced at the Range and Section levels to encourage healthy competition and promote efficiency. Exemplary staff may also be nominated for state-level or national wildlife protection awards to acknowledge their contribution publicly. To ensure long-term security and morale, comprehensive welfare and insurance facilities should be made available to all staff. Every permanent and contractual field staff should be covered under health and accident insurance, including emergency medical coverage for field injuries, snakebites, or accidents during patrols. A group life insurance policy should be provided to cover unforeseen fatalities during duty, with immediate compensation to dependents. It is also recommended that a Special Welfare Fund be created under the Asola Bhatti Conservation Foundation (ABCF) for emergency medical assistance and other welfare activities. Regular medical check-ups, vaccination drives, and counselling sessions should be organized in collaboration with local health departments. Together, these measures will not only safeguard staff wellbeing but also reinforce

their sense of pride, accountability, and dedication towards the protection of the sanctuary.

10.7 ABWS Management Committee

To ensure coordinated and transparent management of ABWS, a Management Committee is proposed to be constituted. This committee will serve as the central platform for reviewing progress, identifying challenges, and recommending improvements in protection, eco-tourism, and community engagement. The committee should meet at least once every six months. However, special meetings could be convened as needed in case of urgent matters.

Proposed Structure

Chairperson: Chief Wildlife Warden (CWLW), Delhi Co-chairperson: CF/CCF, Delhi

Member Secretary: Deputy Conservator of Forests (DCF), South Division – ABWS Members:

- ACF
- Range Officers (ROs)
- A prominent representative of wildlife management
- Representative from veterinary department
- Representative from ETF
- Representatives from BNHS/partner NGOs – for conservation education and citizen science.
- Academic/Research Institution representatives to contribute expertise and research inputs.

Functions of the Committee

- Review and monitor the implementation of the Management Plan.
- Identify management gaps and recommend corrective actions.
- Coordinate with multiple departments and stakeholders for better efficiency.
- Promote eco-tourism, conservation education, and community-based initiatives.
- Ensure financial transparency and proper use of funds.
- Assess visitor statistics, revenue, and ecological monitoring reports to guide adaptive management.

10.8 Asola Bhatti Conservation Foundation (ABCF)

Given the ecological importance of ABWS, there is a strong need to establish an institutional mechanism that ensures long-term conservation, stakeholder participation, and financial sustainability. For this purpose, the creation of the Asola Bhatti Conservation Foundation (ABCF) is proposed.

The Asola Bhatti Conservation Foundation (ABCF) will function through a two-tier institutional structure, comprising: a Governing Body (GB), responsible for policy-level decisions, strategic planning, and inter-departmental coordination; and an Executive Committee (EC), responsible for field-level implementation, monitoring, and operational decisions. The detailed composition and functions of each tier are provided below.

Governing Body (GB): The GB will be responsible for policy level decisions. It will approve the APO and accept the annual reports of the Foundation. GB will also provide strategic guidance to the Foundation and ensure high-level coordination across sectors. Structure of the GB will be as under:

- **Chairperson:** Minister (Forest & Wildlife, Government of NCT Delhi)
- **Member Secretary:** CWLW, Delhi

Members:

- Local MLA(s)
- Chief Conservator of Forests (CCF), Delhi
- Conservator of Forests (Wildlife), Delhi
- Deputy Conservator of Forests (South Division, ABWS)
- Representative from Finance Department
- Representative from NGOs / Prominent Wildlife Expert
- Representative from Management /Research Institution

Executive Committee (EC): The EC will be responsible for field level decisions for implementation, monitoring, and review of activities. Structure of EC will be as follows:

- **Chairperson:** Deputy Conservator of Forests (DCF), South Division – ABWS
- **Member Secretary:** Assistant Conservator of Forests (ACF), ABWS
- **Members:**
- Range Officers (ROs)
- One representative from frontline staff (Forest Guards/Foresters)
- One representative from local communities
- Technical Staffs of the foundation

Executive Director and Executive Secretary will look after day-to-day functioning of the Foundation as follows

Executive Director: Deputy Conservator of Forests (DCF), South Division

Member Secretary: Assistant Conservator of Forests (ACF), ABWS

Technical Staff: Foundation will have following technical staff on contractual basis for running of its various programmes:

- Ecologist – Conducts ecological surveys, monitors habitat and species health, and provides inputs for habitat management.
- Ecotourism & Nature Education Officer – Manages eco-tourism activities, interpretation centers, and awareness programs.
- Conservation Biologist – Supports wildlife research, species monitoring, and preparation of technical reports.
- Veterinary Officer- To look after the activities of rescue & rehabilitation of wild animals, wildlife health monitoring, immunization of fringe area livestock and other issues related to wildlife health.
- Assistant Veterinary Officer- To assist Veterinary officer in various designated activities.
- Sociologist / Community Outreach Officer – Coordinates with local communities, conducts awareness and livelihood programmes and also will have the responsibility for maintain the available research records and library.
- GIS & Data Management Expert – Maintains spatial and ecological databases, prepares maps, and analyses field data.
- Finance & Administrative Assistant – Handles budgeting, accounts, procurement, and

administrative support for foundation activities.

10.8.1 Financial Resources: All gate receipts from tourism, education, and other visitor programmes within the sanctuary will form the income of the Foundation. In the beginning, these resources will be limited and therefore, Foundation will have to rely on government support for its functioning. Over time, attempts should be made to diversify the sources of income for Foundation, to achieve long-term financial sustainability and autonomy.

10.8.2 Proposed sources of funding include:

- Grants from Government of NCT Delhi, MoEFCC and any other ministry of state Government or GOI
- Revenue from eco-tourism activities (entry fees, guided tours, eco-camps, souvenirs)
- Donations from citizens, philanthropies, and CSR contributions from corporates in Delhi–NCR
- Income from research, training, and conservation awareness programmes
- Support from collaborative projects with NGOs, academic institutions, and international conservation agencies

10.8.3 Functions of the Trust

The ABCF will serve as the technical wing of ABWS, providing dedicated support for scientific management, planning, and implementation of conservation initiatives in ABWS. Its main function is to offer technical, research, and administrative assistance to strengthen on- ground management and promote evidence-based decision-making. Specific functions of ABCF will be as follows:

1. Monitoring and Evaluation- ABCF will be responsible for long term monitoring of ecological, social, and managerial aspects of sanctuary management, including habitat status, wildlife health, visitor impact, and community participation. It will also undertake periodic evaluations of the programmes.
2. Database Management – Maintain and regularly update a comprehensive information system on biodiversity, tourism, socio-economic linkages, and management activities, including GIS database and a library.
3. Academic and Scientific Support – Facilitate research collaborations, provide technical expertise, and generate scientific evidence for adaptive management.
4. Tourism and Interpretation Management – Plan, regulate, and monitor ecotourism, interpretation, and awareness programmes to ensure they align with conservation objectives.
5. Rescue and rehabilitation programme- To look after the rescue and rehabilitation programme of the sanctuary by following technical protocols and guidelines.
6. Capacity Building – Conduct regular training, workshops, and exposure visits for staff, local communities, and associated stakeholders to enhance skills and knowledge.
7. Networking and Partnerships – Build linkages with NGOs, academic institutions, corporates, and international agencies for technical and financial support.

The overall job responsibilities, financial operations, and accountability mechanisms of the Trust will evolve suitably for the Asola Bhatti Wildlife Sanctuary on the pattern of guidelines issued for Tiger Conservation Foundations by the NTCA (National Tiger Conservation Authority).

CHAPTER – 11

THE BUDGET

11.1. The Plan Budget

Details of the budget has to be prepared by the department looking at the current government schedules of rates or market rates. However, tentative budget for different activities proposed in the plan is provided as under:

Table 11.1 Budget for Management of ABWS.

Sl. No	Description of Work	Quantity	Year wise financial Outlay (In lakhs.)									
			Ist	IInd	IIIrd	IVth	Vth	VIth	VIIth	VIIIth	IXth	Xth
1.	**Infrastructure development**											
i.	Foundation Office and Guest house		100	80	-	-	-	-	-	-	-	-
ii.	Development of Boundary & Internal Trails (5.2m width)		30	50	50	50	20	20	20	20	20	20
iii.	Construction of Interpretation and Visitor Information Centre		20	80	-	-	-	-	-	-	-	-
iv.	Visitor facilities (Ticket Counter, Cafeteria, Eco-toilets, etc.)		70	40	-	-	-	-	-	-	-	-
v.	Construction, Upgradation and maintenance of Watchtowers, Cycle Track, Butterfly Park and Aravalli Park)		90	80	80	50	50	50	50	50	50	50
vi.	Section Chowkies and Guard sheds		20	50	50	10	10	10	10	10	10	10
vii.	Residential and office buildings		200	500	500	200	100	50	50	50	50	50

	(Extension of existing office, housing for officers and staff, etc.)											
viii	Upgradation of rescue and relief center		20	20	10							
2.	**Habitat Restoration**											
2.a	**Eco Restoration**											
i.	Habitat Enrichment- Removal of invasive species (*Prosopis*, *Lantana,* etc.) and regeneration of native vegetation including fruit-bearing plants)		50	50	50	50	50	50	50	50	50	50
2.b	**Soil -Moisture Conservation**											
i.	Check Dams, Percolation Tanks & Contour Trenches		25	25	25	25	25	25	25	25	25	25
ii.	Waterhole Creation & Desilting (Desilting existing ponds, Creating new artificial waterholes)		25	25	25	25	25	25	25	25	25	25
3.	**Mobility and Communication (Patrolling and Tourism)**											
i.	Walkie-Talkies & GPS Sets		4	4	3	3	3	3	2	2	2	2
ii.	Mobility and equipment (vehicles, field tools, Battery-Operated Eco-carts, Minibuses)		30	50	50	50	20	-	-	-	-	-
iii.	GIS & Remote Sensing Equipment		20	30	20	20	10	10	10	10	10	10
iv.	Camera Trap & Field Survey Equipment		10	10	10	10	8	8	8	8	8	8
4.	**Fire protection**											
i.	Maintenance of Fire Lines & Trails		25	25	25	25	25	25	25	25	25	25

ii.	Fire-fighting equipment & Protective Gears		5	5	5	5	5	5	4	4	4	4
5.	**Rescue and Relief**											
i.	Population Estimation & Carrying Capacity Study		05	05	05	05	-	-		-	-	-
ii.	Sterilization Program (Veterinary)			10	10	10	8	8	8	5	5	5
iii.	Maintenance of Rescue and Relief center		10	10	10	10	10	10	10	10	10	10
6.	**Wildlife Health**											
i.	Regular Health Surveillance & Lab Analysis		2	2	2	2	2	2	2	2	2	2
ii.	Veterinary Equipment & Sampling Kits		10	10	10	10	10	05	05	05	05	05
7.	**Community Interface**											
i.	Eco-Development programme-interface committees and SHGs.		4	4	4	4	4	4	4	4	4	4
ii.	Awareness & Outreach Campaigns		5	5	5	5	5	6	6	6	6	6
iii.	Capacity Building and Empowerment Initiative (Youth clubs, SHGs)		4	4	4	4	4	4	4	4	4	4
8.	**Research Monitoring**											
i.	Wildlife and Environmental Monitoring Programmes		5	5	5	5	5	6	6	6	6	6
ii.	Hiring services of expert institutions/ individuals		15	15	15	15	15	15	15	15	15	15
9.	**Tourism & Visitors**											
i.	Directional & Interpretive Signage System		10	10	10	10	10	05	05	05	05	05
ii.	Publicity & Awareness Materials (Short Films, Brochures, Posters)		15	15	15	15	15	15	15	15	15	15
10.	**Education Extension**											

i.	Conservation Education and Outreach Activities & Citizen Science Workshops		5	5	5	5	5	5	5	5	5	5
11.	**Capacity Building**											
i.	Induction Training programs (All Staff)		5	5	5	5	5	5	5	5	5	5
ii.	Refresher's training/Workshop's/Exposure Visits		10	10	10	10	10	10	10	10	10	10
iii.	Other's trainings and Capacity Building		5	5	5	5	5	5	5	5	5	5
12.	**Administration**											
i.	Salary/Maintenance/Office Expenditure etc.		10	10	10	10	10	10	10	10	10	10
ii.	Staffing and HR	as per dep. norms										
13.	Rehabilitation	Norms of the GNCTD, the National Rehabilitation, Resettlement Policy (2007).										
	SUBTOTAL	**864**	**1174**	**1033**	**653**	**474**	**396**	**394**	**391**	**391**	**391**	
	TOTAL	**6164**										

11.2. Sources of Funding:

The primary source of funding for ABWS will be the Department of Forests and Wildlife, GNCTD; however, following other sources of funds could be explored. Likely sources are provided as follows:

1. **Forest Department (GNCTD)**

The regular budget of the Forest Division can provide funds through both State Plan allocations and Government of India support for Protected Area management. These funds may cover activities related to habitat improvement, protection, research, and awareness under the routine annual plan of operations.

1. **Compensatory Afforestation Fund Management and Planning Authority (CAMPA)**

A significant portion of ecological restoration and habitat management works can be financed through CAMPA funds, which support compensatory afforestation, soil and moisture conservation, invasive species management, and eco-restoration programs. CAMPA may also assist in infrastructure development, wildlife protection, and monitoring activities.

2. **Other Government Departments**

Agencies like DDA, MCD, and departments such as Tourism, Environment, Education, and Flood Control can support through convergent funding and technical inputs for habitat restoration, eco-infrastructure, community waste and drainage management, eco-tourism, awareness, and pollution control initiatives.

Conservation-focused NGOs can provide technical expertise, volunteer support, and co- funding for biodiversity conservation, waste management, and community awareness programs.

3. **Donors and Corporate Social Responsibility (CSR)**

Individual donors and corporate CSR initiatives can fund conservation, education, and infrastructure activities, with ABWS's proximity to Delhi's institutional hubs enabling strong private partnerships.

4. **Local Urban Bodies and Community Institutions**

Local governing bodies and Resident Welfare Associations (RWAs) near the sanctuary can support clean-up drives, awareness campaigns, and buffer area maintenance, fostering local ownership and reducing external pressure.

CHAPTER 12

THE SCHEDULES

Schedules are important records of any PA which not only guide systematic implementation of activities but also provide an understanding of the complete history of management of area. Following schedules are proposed to be maintained for ABWS:

12.1 Annual Plan of Operation (APO)

PA Management will prepare the Annual Plan of Operation (APO) for next financial year in the last quarter of the current financial year. APO will be prepared based on the prescriptions of this Management Plan and inputs received from field officers Management Committee, CICs and other stakeholders. This will then be forwarded by DCF to the Chief Wildlife Warden (CWLW) for approval through Conservator of Forests (CF). Activities as per the approved APO will be implemented by DCF through Assistant Conservator of Forests (ACF), concerned Range Officers (ROs) and other designated staff. DCF shall oversee execution of activities, ensure fund mobilization, and report periodic progress to the CF and CWLW. The APO shall include annual actions on protection, habitat restoration, eco-development, research, education, and tourism as prescribed in this Plan.

12.2 Reserve Records

Proper record maintenance is essential for transparency, accountability, and long-term monitoring. All records and registers shall be maintained by the Range Officers under the supervision of the ACF and DCF. The ACF and DCF will periodically verify and countersign these records to ensure accuracy, completeness, and timely updating.

12.2.1 Reserve History (Wildlife Sanctuary and adjoining Reserve History)

A comprehensive record of past history, sanctuary activities, wildlife sightings, habitat conditions, regeneration, fire events, and rainfall will be maintained. This register will be maintained by ROs and verified monthly by the ACF and countersigned by the DCF.

12.2.2 Plantation Journals

All plantations and soil & water conservation works carried out within ABWS shall be recorded in standard departmental formats. The Range Officer, with the help of field staff, shall maintain these records, including details such as location, species, date of planting, and survival rate. The entries shall be periodically verified by the ACF and DCF to ensure accuracy and completeness.

12.2.3 Fire Records

All forest fire occurrences shall be recorded in the prescribed format, including the date, area affected, probable cause, and action taken. The Range Officer, with the help of field staff, shall maintain these records and submit monthly updates to the ACF. The entries shall be periodically verified by the ACF and DCF to ensure that preventive and remedial actions are properly documented. This record will form the fire register of ABWS.

12.2.4 Disease and Incidence Records

All cases of wildlife mortality, disease outbreaks, or rescue incidents shall be entered in a dedicated register maintained by the Range Officer in coordination with the Veterinary Officer and supported by field staff. Details such as species affected, location, cause (if known), and treatment or action taken shall be recorded. These records shall be reviewed and verified periodically by the ACF and DCF for monitoring wildlife health and guiding preventive measures.

12.2.5 Boundary Records

A Boundary Register containing details of all boundary pillars, fences, GPS coordinates, and inspection reports shall be maintained by the Range Officer with the assistance of field staff. Verification of boundary structures shall be carried out twice a year, and the updated records shall be checked and countersigned by the ACF and DCF to ensure maintenance of clear and protected sanctuary limits.

12.2.6 Other Records

- Revenue and expenditure registers - These shall be maintained by the Range Officer for the respective range and by the ACF for the entire division, under the overall supervision of the DCF to ensure financial transparency and accountability.
- Monitoring and field inspection reports - These shall be maintained by the Range Officer for each respective range, with consolidated reports prepared by the ACF for the entire division, under the overall supervision of the DCF to ensure systematic tracking and evaluation of management activities.
- Copies of research papers and technical studies - These shall be maintained by the respective technical staff of the ABCF under the supervision of the Executive Committee Secretary (ACF) to ensure proper documentation, accessibility, and use of research outputs for management and decision-making.
- Records of visitors and feedback forms - These shall be maintained by the Range Officer responsible for tourism and interpretation activities, under the supervision of the ACF and periodically verified by the DCF to ensure accurate documentation of visitor statistics, revenue, and feedback.
- Minutes of meetings of different committees - These shall be prepared and maintained by the ACF with the assistance of the Range Officers, ensuring that all proceedings of Management Committee and other official meetings are properly documented, approved, and archived for reference.
- Records of nature education programmes and other documents as prescribed by the Government from time to time

12.3 Periodic Reporting

All field activities, protection efforts, and monitoring observations shall be compiled monthly by the Range Officers and reviewed by the ACF. Monthly progress reports shall be prepared by the ACF and submitted to the DCF for consolidation and review. The DCF shall forward the consolidated monthly progress report to the Conservator of Forests (CF), with a copy to the CWLW for information and record. Quarterly progress summaries will also be prepared, and an Annual Progress Report shall present the overall achievements, financial utilization, challenges, and recommendations for the following year, duly signed by the DCF.

12.4 Monitoring of Prey–Predator and Habitat

Regular ecological monitoring shall be undertaken to assess habitat quality, prey–predator balance, and overall biodiversity health.

Habitat Monitoring: Seasonal vegetation sampling, photo-point monitoring, and invasive species mapping.

12.5 Population estimation:

Use of camera traps, line transects, and opportunistic sightings. Data will be compiled and analysed annually to guide adaptive management. Population Estimation of major faunal groups, particularly ungulates, carnivores, and key avifauna, shall be conducted annually using standard methodologies such as distance sampling, camera trap–based capture–recapture, and waterhole counts. The Foundation staff

shall assist in data collection and analysis under the guidance of the Range Officer, and submit compiled results to the ACF through the RO. The ACF and DCF shall verify, authenticate, and incorporate the findings into annual monitoring and reporting frameworks.

12.6 Fire Protection

A Fire Protection Register shall record all fire events, causes, and mitigation measures. Preventive actions such as creation of fire lines, controlled burning, and community awareness programmes shall be undertaken regularly. The field staff shall report all fire incidents and related data to the ACF through the Range Officer. The entries shall be reviewed and verified by the ACF and DCF to ensure prompt action and accurate documentation of fire management activities.

12.7 Financial Reporting

Financial transparency and proper utilization of funds are essential for effective sanctuary management. All financial records shall be maintained by the Foundation staff and Range Officers for their respective ranges and submitted to the Assistant Conservator of Forests (ACF) through the RO. The ACF shall consolidate these records for the entire division under the supervision of the DCF, ensuring timely review, budget tracking, and audit compliance.

12.8. Record of Employment Potential

It is important to maintain a record of man-days created annually through various works undertaken within ABWS. This not only reflects the local employment generation through sanctuary activities but also provides insight into the expenditure incurred under different management themes such as habitat restoration, eco-development, tourism infrastructure, and protection works.
The data on employment and expenditure will assist in planning future works and optimizing resource allocation for maximum conservation and livelihood benefits. The concerned Range Officers shall maintain a register for recording labour generation under various schemes and submit monthly summaries to the ACF and DCF. The consolidated data will be reviewed during Management Committee meetings and included in the Annual Plan of Operation (APO). A suggested format for maintaining this record is given in the table below:

Table 12.1- Table for maintaining the record

Sl. No.	Name of Range	Month	Nature of Work	Total No. of Man-days Generated	Approx. Expenditure (₹)	Remarks
1						
2						
3						

The entries should reflect all labour-based activities undertaken under various heads such as habitat improvement, plantation and maintenance, boundary strengthening, tourism facility upkeep, fire line clearance, and community-based initiatives. This data will form the basis for assessing the socio-economic contribution of ABWS towards local livelihood enhancement and community participation in conservation.

Note: The records, registers, and reporting formats prescribed in this chapter are indicative and may be modified, expanded, or improved as required for effective management of Asola Bhatti Wildlife Sanctuary. The CWLW shall have the authority to prescribe additional registers, reporting mechanisms, or documentation formats as deemed necessary for improved monitoring, administration, or statutory compliance. Any such additions or revisions shall automatically form part of the operational framework of this Management Plan.

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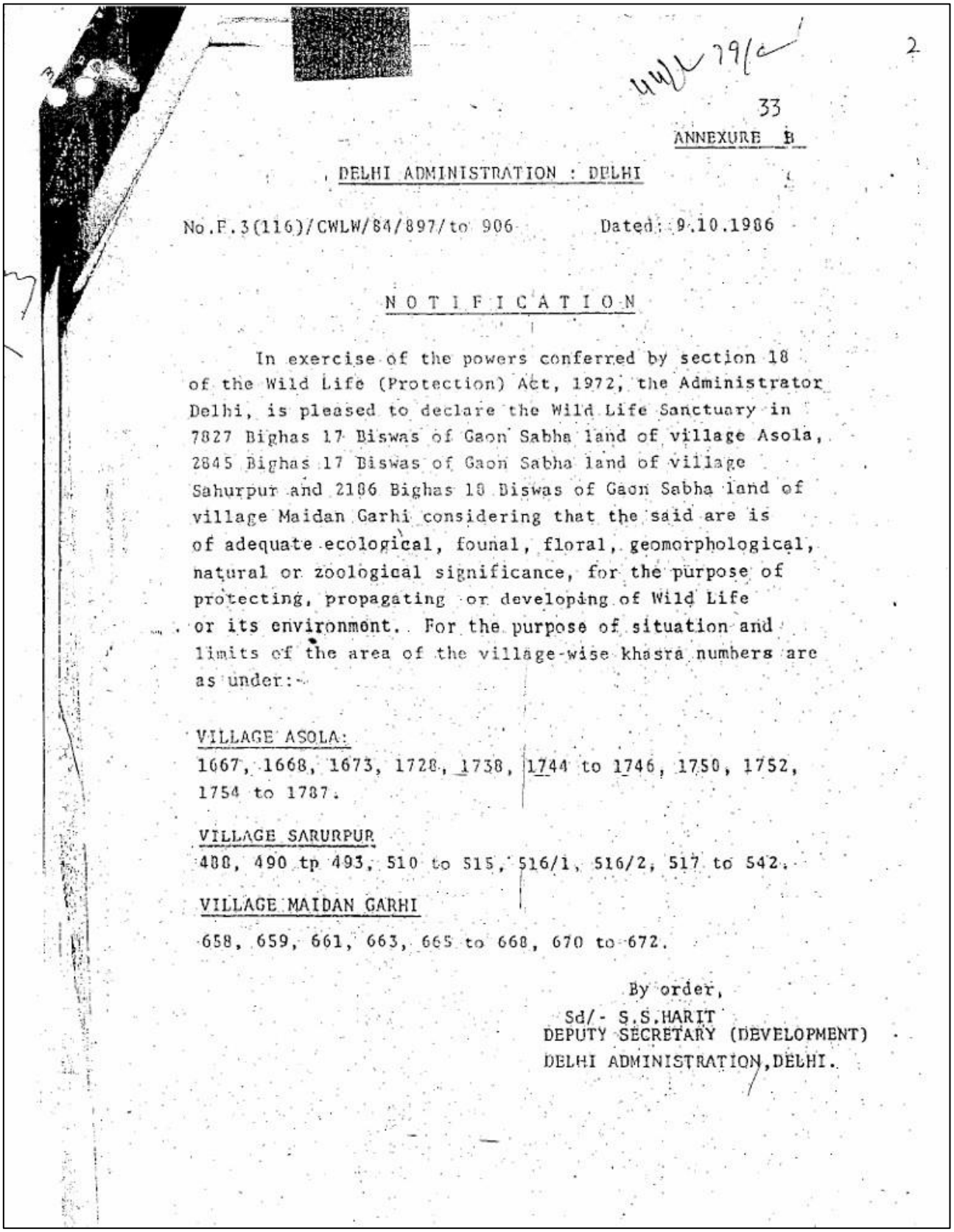
Annexure I – Notification of ABWS



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ANNEXURE B

DELHI ADMINISTRATION : DELHI

No.F.3(116)/CWLW/84/897/to 906 Dated: 9.10.1986

NOTIFICATION

In exercise of the powers conferred by section 18 of the Wild Life (Protection) Act, 1972, the Administrator Delhi, is pleased to declare the Wild Life Sanctuary in 7827 Bighas 17 Biswas of Gaon Sabha land of village Asola, 2845 Bighas 17 Biswas of Gaon Sabha land of village Sahurpur and 2186 Bighas 18 Biswas of Gaon Sabha land of village Maidan Garhi considering that the said are is of adequate ecological, founal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating or developing of Wild Life or its environment. For the purpose of situation and limits of the area of the village-wise khasra numbers are as under:-

VILLAGE ASOLA:

1667, 1668, 1673, 1728, 1738, 1744 to 1746, 1750, 1752, 1754 to 1787.

VILLAGE SARURPUR

488, 490 tp 493, 510 to 515, 516/1, 516/2, 517 to 542.

VILLAGE MAIDAN GARHI

658, 659, 661, 663, 665 to 668, 670 to 672.

By order,

Sd/- S.S.HARIT
DEPUTY SECRETARY (DEVELOPMENT)
DELHI ADMINISTRATION,DELHI.

ANNEXURE – B 1991

DELHI ADMINISTRATION: DELHI

F.3(2)(P)/DCF/90-91/1303-07 Dated : 15-04-1991

NOTIFICATION Dated:

(To be published in Gazette of Delhi)

In continuation of Notification No.3(116)/CWLW/84/697-6 dated 9.10.86. In exercise of the powers conferred by ction-18 of the Wildlife(Protection) Act, 1972, the Lt. vernor, (Administrator), Delhi is pleased to declare the eas in the schedule below as Wildlife Sanctuary in Bhatti llage, Total Area: 2166.28acres; considering that the said ea is of adequate ecological, faunal, floral, geomophological d natural significance for the purpose of propagating and/ developing of Wildlife and/or its environment.

SCHEDULE

Village	(Khasra Nos.)	Area
BATTI	708,712,713,715, 1895 to 1900, 1903 to 1938, 1940 to 1942.	2166.28 Acres.

By Order

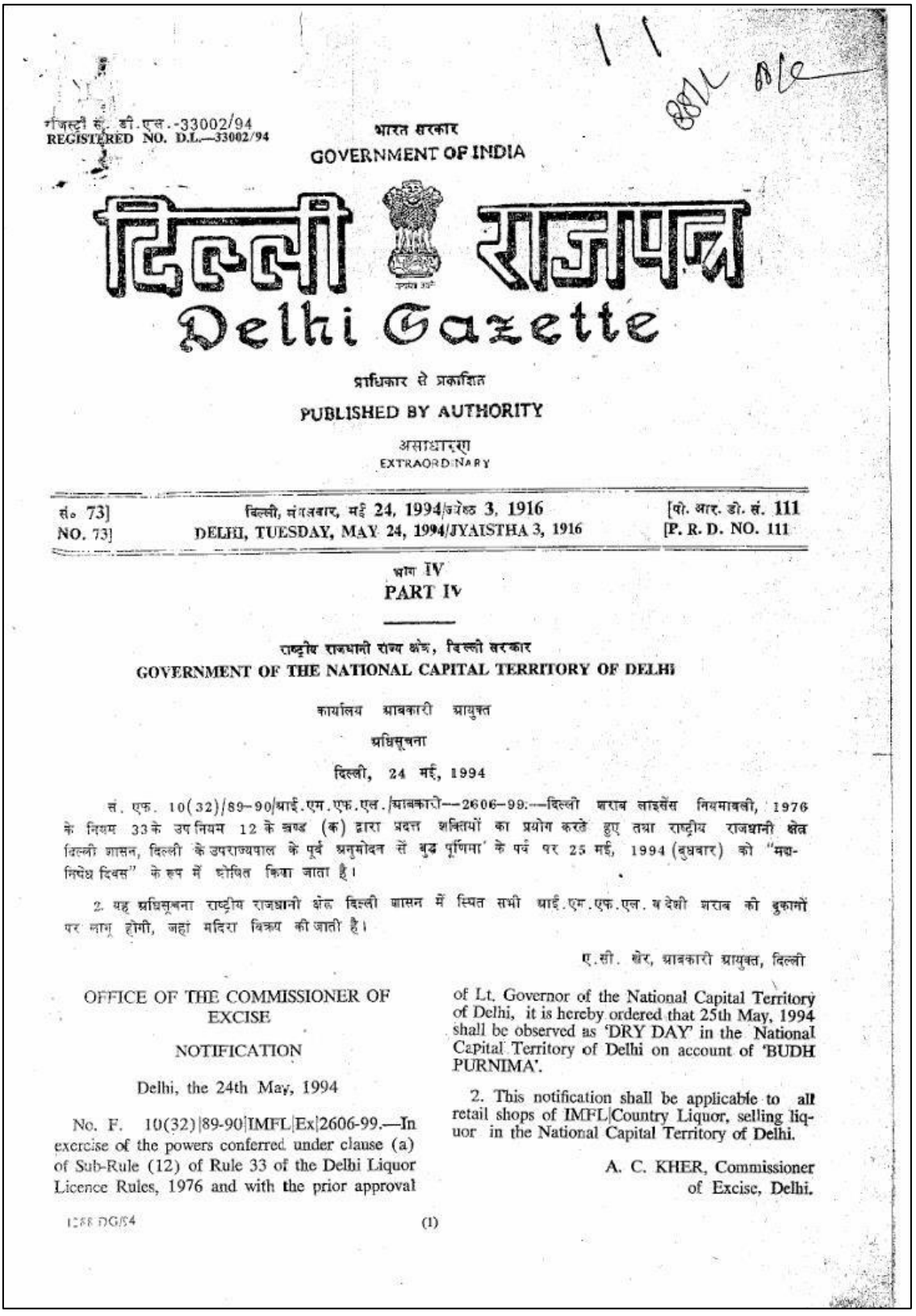
DY.SECRETARY (FORESTS)
DELHI ALMINISTRATION: DELHI.

Copy to: 1989 dt - 15-4-91

1. A.D.M(R), for psysical demarcation.
2. Development Commissioner, Delhi.
3. CWLW, Delhi.
4. Dy.Conservator of Forests, Delhi.
5. Director, Wildlife Preservation, G.O.I., Bikaner Hours.
6. Law & Jud.Deptt., Delhi Admn.
7. Director, P.R.Department, Delhi Admn. (Ad Secy)
8. Members, Delhi W.L.Adv. Board.
9. Director, Delhi Gazetteer with request to publish in Delhi Gazette.

DY.SECRETARY(FORESTS)
DELHI ADMINISTRATION: DELHI.

Annexure II – Notification 1994



रजिस्ट्री सं. डी.एल.-33002/94
REGISTERED NO. D.L.—33002/94

भारत सरकार
GOVERNMENT OF INDIA

दिल्ली राजपत्र
Delhi Gazette

प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

असाधारण
EXTRAORDINARY

सं० 73] दिल्ली, मंगलवार, मई 24, 1994/ज्येष्ठ 3, 1916 [पी. आर. डी. सं. 111
NO. 73] DELHI, TUESDAY, MAY 24, 1994/JYAISTHA 3, 1916 [P. R. D. NO. 111

भाग IV
PART IV

राष्ट्रीय राजधानी राज्य क्षेत्र, दिल्ली सरकार
GOVERNMENT OF THE NATIONAL CAPITAL TERRITORY OF DELHI

कार्यालय आबकारी आयुक्त

अधिसूचना

दिल्ली, 24 मई, 1994

सं. एफ. 10(32)/89-90/आई.एम.एफ.एल./आबकारी—2606—99.—दिल्ली शराब लाइसेंस नियमावली, 1976 के नियम 33 के उपनियम 12 के खण्ड (क) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए तथा राष्ट्रीय राजधानी क्षेत्र दिल्ली शासन, दिल्ली के उपराज्यपाल के पूर्व अनुमोदन से बुद्ध पूर्णिमा के पर्व पर 25 मई, 1994 (बुधवार) को "शुष्क-निषेध दिवस" के रूप में घोषित किया जाता है।

2. यह अधिसूचना राष्ट्रीय राजधानी क्षेत्र दिल्ली शासन में स्थित सभी आई.एम.एफ.एल. स्वदेशी शराब की दुकानों पर लागू होगी, जहां मदिरा विक्रय की जाती है।

ए.सी. खेर, आबकारी आयुक्त, दिल्ली

OFFICE OF THE COMMISSIONER OF EXCISE

NOTIFICATION

Delhi, the 24th May, 1994

No. F. 10(32)/89-90/IMFL/Ex/2606-99.—In exercise of the powers conferred under clause (a) of Sub-Rule (12) of Rule 33 of the Delhi Liquor Licence Rules, 1976 and with the prior approval of Lt. Governor of the National Capital Territory of Delhi, it is hereby ordered that 25th May, 1994 shall be observed as 'DRY DAY' in the National Capital Territory of Delhi on account of 'BUDH PURNIMA'.

2. This notification shall be applicable to all retail shops of IMFL/Country Liquor, selling liquor in the National Capital Territory of Delhi.

A. C. KHER, Commissioner of Excise, Delhi.

1288 DG/94 (1)

विकास विभाग

अधिसूचनाएं

दिल्ली, 24 मई, 1994

संख्या सं. फाइल 10(42)/I/पी.ए./उ.व.स./93/2012(I)—भारतीय वन अधिनियम, 1927 (1927 का अधिनियम क्रमांक 16) की धारा 4 के उपबन्धों के अनुसरण में राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली के उप राज्यपाल एतद्द्वारा निम्न "क" अनुसूची में उल्लिखित भूमि को आरक्षित वन घोषित करते हैं।

अनुसूची —"क"

सारी वन भूमि तथा बंजर भूमि की जो सरकार की सम्पत्ति है या जिस पर सरकार का मालिकाना अधिकार है।

1. राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली में उत्तरी पहाड़ी (रिज) की विभिन्न दिशाओं में सीमाएं	उत्तर में :	जुबली हाल, सरकारी पैट्रोल पंप, मस्जिद, मालरोड।
	दक्षिण में :	पुरानी जी.टी. रोड तथा रानी झांसी मार्ग का चौराहा, पुरानी सब्जी मंडी।
	पूर्व में :	माल रोड, राजपुर रोड, दिल्ली नगर निगम के कार्यालय के पीछे।
	पश्चिम में :	बर्फखाना, मलकागंज, धोबीघाट, और विश्व विद्यालय मार्ग।
(अनुमानित क्षेत्रफल 87 हैक्टर)		
2. राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली में मध्यवर्ती पहाड़ी (रिज) की विभिन्न दिशाओं में सीमाएं	उत्तर में :	लिंक रोड के साथ संस्थागत एरिया।
	दक्षिण में :	धोला कुआं, मिलिटरी फार्म, सरदार पटेल मार्ग।
	पूर्व में :	मंदिर मार्ग, संस्थागत एरिया तथा विलिंग्डन क्रैसेंट अस्पताल।
	पश्चिम में :	इंदर पुरी रोड, एवं नारायणा औद्योगिक क्षेत्र।
(अनुमानित क्षेत्रफल 864 हैक्टर)		
3. राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली में दक्षिण मध्यवर्ती पहाड़ी (रिज) की विभिन्न दिशाओं में सीमाएं।	उत्तर में :	कुतुब संस्थागत एरिया।
	दक्षिण में :	बसंत कुंज, किशन गंज।
	पूर्व में और	अरविंद मार्ग, नजारिका बाग।
(अनुमानित क्षेत्रफल 626 हैक्टर)	पश्चिम में :	जवाहरलाल विश्वविद्यालय रोड, बसंत कुंज, महरौली।
4. राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली में दक्षिण पहाड़ी (रिज) की विभिन्न दिशाओं में सीमाएं।	उत्तर में :	पावर लाइन, महिपालपुर से सुलतान गौरी, मकबरा तक टेलीफोन लाइन, सुल्तानपुर, गौरी मकबरा से मेन पावर लेन व रोड के चौराहे तक घटोरनी की पश्चिमी सीमा, आया नगर की पश्चिमी सीमा, जौनपुर की दक्षिण सीमा, असोला गांव की पूर्वी सीमा, शाहपुर की पूर्वी सीमा, चांदन होला की पूर्वी सीमा, सतबड़ी की पूर्वी सीमा, मैदान गढ़ी की पूर्वी सीमा, नायबसराय की दक्षिणी सीमा, देवली की दक्षिणी सीमा, पूर्वी सीमा तथा आदिलाबाद के खंडहरों।
	दक्षिण में :	हरियाणा राज्य की सीमा।
	पूर्व में :	सूरज कुंड रोड तथा हरियाणा राज्य की सीमा।
	पश्चिम में :	हरियाणा राज्य रजोकरी की पूर्वी सीमा, मलिकपुर करोही बरंगपुरी की पूर्वी सीमा।
(अनुमानित क्षेत्रफल 6200 हैक्टर)		

DEVELOPMENT DEPARTMENT

NOTIFICATIONS

Delhi, the 24th May, 1994

No. F.10(42)-I/PA/DCF/93/2012-17(I)—In pursuance of the provisions of Section-4 of the Indian Forest Act, 1927 (Act No. 16 of 1927) the Lt. Governor, of National Capital Territory of Delhi hereby declares the lands mentioned in Schedule 'A' below as reserved forest.

SCHEDULE 'A'

All forest lands and wastelands which is the prpoerty of the government of over which government has proprietary rights in:

I. Northern Ridge in National Capital Territory of Delhi, surrounded on	North by	Jubilee Hall, Govt. Petrol Pump, Masjid, Mall Road.
	South by	Crossing of Old G.T. Road and Rani Jhansi Marg, Old Subzi Mandi.
	East by	Mall Road, Rajpur Road, Behind MCD Office.
	West by	Ice Factory, Malka Ganj, Dhobighat, and University Road.
(Approximate area 87 ha.)		
II. Central Ridge in NCT of Delhi, surrounded on	North by	Link Road along Institutional area.
	South by	Dhaulakuan Military Farm, Sardar Patel Marg
	East by	Mandir Marg, Institutional area and Willingdon Crecent.
	West by	Inderpuri Road and Naraina Industrial area.
(Approximate area 864 ha.)		
III. South Central Ridge in NCT of Delhi, surrounded on	North by	Qutab Institutional area.
	South by	Vasant Kunj, Kishan Ganj.
	East by	Aurobindo Marg, Nazarika Bagh.
	West by	Jawahar Lal University Road, Vasant Kunj, Mehrauli.
(Approximately area 626 ha.)		
IV. Southern Ridge in NCT of Delhi	North by	Power line from Mahipalpur to Sultan Gauri Tomb, Telephone Line from Sultan Pur Ghauri Tomb to crossing of Main Power Line & Road, Western Boundary of Ghatorni, Western boundary of Aya Nagar, Southern Boundary of Jaunapur, Southern Boundary of Fatehpur Beri, Eastern Boundary of Asola Village, Eastern Boundary of Shahpur, Eastern Boundary of Chandanhola, Eastern Boundary of Satbari, Eastern Boundary of Maidan Garhi, Southern Boundary of Naib Sarai, South Eastern Boundry of Deoli and Adilabad ruins.
	South by	State of Haryana.
	East by	Surajkund Road and State of Haryana.

West by State of Haryana, Eastern. Boundary of Rajokari, Eastern Boundary of Malikpur, Kohi & Rangpuri.

(Approximate area 6200 ha.)

संख्या फाइल 10(42)/I/पी.ए./उ.व.स./93/2018-23(II).—भारतीय वन अधिनियम, 1927 (1927 की अधिनियम संख्या 17) की धारा 4 की उपधारा 1के खंड (ग) के अनुसरण में राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली के उप राज्यपाल अतिरिक्त जिला मजिस्ट्रेट (ए.डी.एम.) को राजपत्र की अधिसूचना संख्या एफ. 10(42)/I/पी.ए./उ.व.स./93(I) दिनांक 24 मई, 1994 में वर्णित सीमाओं के भीतर पड़ने वाली भूमि में या उस पर होने वाले वन उत्पाद में या उस पर किसी व्यक्ति के किन्हीं अधिकारों के अस्तित्व स्वरूप एवं विस्तार को निर्धारित करने एवं भारतीय वन अधिनियम, 1927 के अध्याय 2 में दी गई व्यवस्था के अनुसार उसे निबटाने के लिये बन्दोबस्त अधिकारी सहर्ष नियुक्त करते हैं।

राष्ट्रीय राजधानी राज्य क्षेत्र दिल्ली के
उपराज्यपाल के आदेश एवं नाम से,

जी.सी. जोशी, उप सचिव

No. F. 10(42)-I|PA|DCF|93|2018-23 (ii).—In pursuance of the provision of clause (c) of sub-section (1) of section 4 of the Indian Forest Act, 1927 (Act No. 16 of 1927), the Lt. Governor of National Capital Territory of Delhi is pleased to appoint A.D.M. (Revenue) to be the Forest Settlement Officer to enquire into and determine the existence, nature and extent of any rights alleged to exist in favour of any person in or over any land comprised within such limits, as notified vide Notification No. 10(42)-IPA|DCF|93|(I) dated 24th May, 1994 or in or over any forest produce and to deal with the same as provided in Chapter II of the Indian Forest Act, 1927.

By order and in the name
of the Lt. Governor of
National Capital Territory
of Delhi.

G. C. JOSHI, Dy. Secy.

Annexure III- Eco sensitive Zone Notification

7	गोथरा (मोहताबाद)	28°24'31.583"उ	77°12'50.826"पू
8	बदखाल	28°25'15.27"उ	77°15'12.166"पू
9	अंखीर	28°25'50.819"उ	77°15'29.727"पू
10	मेवला महराजपुर	28°26'2.925"उ	77°15'39.335"पू
11	अनांगपुर	28°26'29.823"उ	77°15'17.235"पू

उपाबंध-IV

कार्रवाई की रिपोर्ट का प्रपत्र:

1. बैठकों की संख्या और तारीख ।
2. बैठकों का कार्यवृत्त : (कृपया मुख्य उल्लेखनीय बिंदुओं का वर्णन करें । बैठक के कार्यवृत्त को एक पृथक उपाबंध में प्रस्तुत करें) ।
3. पर्यटन महायोजना सहित आंचलिक महायोजना की तैयारी की स्थिति ।
4. भू-अभिलेखों की स्पष्ट त्रुटियों के सुधार के लिए निबटाए गए मामलों का सार (पारिस्थितिकी संवेदी जोन वार)। विवरण उपाबंध के रूप में संलग्न करें।
5. पर्यावरण समाघात निर्धारण अधिसूचना, 2006 के अधीन आने वाली गतिविधियों से संबंधित संवीक्षा किए गए मामलों का सार । (विवरण एक पृथक उपाबंध के रूप में संलग्न करें) ।
6. पर्यावरण समाघात निर्धारण अधिसूचना, 2006 के अधीन न आने वाली गतिविधियों से संबंधित संवीक्षा किए गए मामलों का सार । (विवरण एक पृथक उपाबंध के रूप में संलग्न करें) ।
7. पर्यावरण (संरक्षण) अधिनियम, 1986 की धारा 19 के अधीन दर्ज की गई शिकायतों का सार ।
8. कोई अन्य महत्वपूर्ण मामला ।

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 31st May, 2019

S.O. 1911(E).—WHEREAS, a draft notification was published in the Gazette of India, Extraordinary, *vide* notification of the Government of India in the Ministry of Environment, Forest and Climate Change number S.O. 4110 (E), dated the 28th December, 2017, inviting objections and suggestions from all persons likely to be affected thereby within the period of sixty days from the date on which copies of the Gazette containing the said notification were made available to the public;

AND WHEREAS, copies of the Gazette containing the said draft notification were made available to the public on the 29th December, 2017;

AND WHEREAS, no objections and suggestions were received from persons and stakeholders in response to the draft notification;

AND WHEREAS, Asola Bhatti Wildlife Sanctuary is situated in south-eastern part of the southern ridge of Delhi - National Capital Territory and the south-east boundary of the Sanctuary is spreading upto Delhi-Haryana border; the Sanctuary is located between 77°7' E to 77°15' E longitude and 28°30' N latitude as reported by Chief Wildlife Warden Delhi and the said Sanctuary covers an area of about 32.71 square kilometres;

AND WHEREAS, the surrounding area toward Haryana side of the Sanctuary is an ecologically important area with reference to the floral and faunal value of the oldest mountain range of India (Aravalli) and this Sanctuary is the only protected area of National Capital Territory Delhi and the Sanctuary is at fag end of an important wildlife corridor which starts from Sariska National Park of Alwar district Rajasthan and the corridor after passing through Mewat, Gurgaon and Faridabad districts of Haryana ends at the Sanctuary;

AND WHEREAS, various important species like leopard (*Panthera pardus*), jackal (*Canis aureus*), striped hyena (*Hyaena hyaena*), etc. are found in this area; and major fauna represent rich biological significance of this Sanctuary and the fauna species found in the protected area are as jungle cat (*Felis chaus*), small Indian civet (*Viverra zibetha*), common mongoose (*Herpestes edwardsii*), Indian porcupine (*Hystrix indica*), nilgai (*Boselaphus tragocamelus*), Rhesus monkey (*Macaca mulatta*), hare (*Lepus nigricollis*), etc. and around 200 species of resident and migratory birds; the faunal diversity is represented by 17 species of mammals, around 201 species of birds, 12 species of reptiles, 5 species of amphibians, 63 species of butterflies and 05 species of dragonflies etc. and the major flora found in the sanctuary are dhak (*Butea monosperma*), inderjao (*Holarrhena pubescens*), Indian elm (*Holoptelea integrifolia*), kadamb (*Mitragyna parvifolia*), jhand (*Prosopis cineraria*), jal (*Salvadora oleoides*), lasura (*Cordia myxa*), mesquite (*Prosopis juliflora*), dhok (*Anogeissus pendula*), salai (*Boswellia serrata*), etc.;

AND WHEREAS, it is necessary to conserve and protect the area, the extent and boundaries of Asola Bhatti Wildlife Sanctuary which are specified in paragraph 1 as Eco-sensitive Zone from ecological, environmental and biodiversity point of view and to prohibit industries or class of industries and their operations and processes in the said Eco-sensitive Zone;

NOW, THEREFORE, in exercise of the powers conferred by sub section (1) and clauses (v) and (xiv) of sub-section (2) and sub-section (3) of Section 3 of the Environment (Protection) Act 1986 (29 of 1986) (hereafter in this notification referred to as the Environment Act) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies an area to an extent varying from 100 meters to 1000 meters around the boundary of the Asola Bhatti Wildlife Sanctuary, in Faridabad and Gurugram districts in the State of Haryana as the Eco-sensitive Zone (hereafter in this notification referred to as the Eco-sensitive Zone) details of which are as under, namely: -

1. **Extent and boundaries of Eco-sensitive Zone. –** (1) The Eco-sensitive Zone shall be to an extent of 100 meters to 1000 metres from the boundary of the protected area, that is the Asola Bhatti Wildlife Sanctuary and the total area of the Eco-sensitive Zone is about 12.17 square kilometres, out of which 0.35 square kilometres falls in Gurugram district and 11.82 square kilometres in Faridabad district.

   (2) The map of the Asola Bhatti Wildlife Sanctuary demarcating Eco-sensitive Zone along with boundary details and latitudes and longitudes is appended as **Annexure-I.**

   (3) List of geo-coordinates of Eco-sensitive Zone of Asola Bhatti Wildlife Sanctuary are given in **Annexure-II.**

   (4) The list of villages falling in the Eco-sensitive Zone along with their geo co-ordinates at prominent points is appended as **Annexure-III.**

2. **Zonal Master Plan for Eco-sensitive Zone.-** (1) The State Government shall, for the purposes of the Eco-sensitive Zone prepare a Zonal Master Plan within a period of two years from the date of publication of this notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification for approval of the competent authority in the State.

(2) The Zonal Master Plan for the Eco-sensitive Zone shall be prepared by the State Government in such manner as is specified in this notification and also in consonance with the relevant Central and State laws and the guidelines issued by the Central Government, if any.

(3) The Zonal Master Plan shall be prepared in consultation with the following Departments of the State Government, for integrating the ecological and environmental considerations into the said plan:-
(i) Environment;
(ii) Forest and Wildlife;
(iii) Agriculture;
(iv) Revenue;
(v) Urban Development;
(vi) Tourism;
(vii) Rural Development;
(viii) Irrigation and Flood Control;
(ix) Municipal;
(x) Panchayati Raj; and
(xi) Public Works Department.

(4) The Zonal Master Plan shall not impose any restriction on the approved existing land use, infrastructure and activities, unless so specified in this notification and the Zonal Master Plan shall factor in improvement of all infrastructure and activities to be more efficient and eco-friendly.

(5) The Zonal Master Plan shall provide for restoration of denuded areas, conservation of existing water bodies, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, needs of local community and such other aspects of the ecology and environment that need attention.

(6) The Zonal Master Plan shall demarcate all the existing worshipping places, villages and urban settlements, types and kinds of forests, agricultural areas, fertile lands, green area, such as, parks and like places, horticultural areas, orchards, lakes and other water bodies with supporting maps giving details of existing and proposed land use features.

(7) The Zonal Master Plan shall regulate development in Eco-sensitive Zone and adhere to prohibited and regulated activities listed in the Table in paragraph 4 and also ensure and promote eco-friendly development for security of local communities' livelihood.

(8) The Zonal Master Plan shall be co-terminus with the Regional Development Plan.

(9) The Zonal Master Plan so approved shall be the reference document for the Monitoring Committee for carrying out its functions of monitoring in accordance with the provisions of this notification.

3. Measures to be taken by State Government.- The State Government shall take the following measures for giving effect to the provisions of this notification, namely:-

(1) Land use. – (a) Forests, horticulture areas, agricultural areas, parks and open spaces earmarked for recreational purposes in the Eco-sensitive Zone shall not be used or converted into areas for commercial or residential or industrial activities:

Provided that the conversion of agricultural and other lands, for the purpose other than that specified at part (a) above, within the Eco-sensitive Zone may be permitted on the recommendation of the Monitoring Committee, and with the prior approval of the competent authority under Regional Town Planning Act and other rules and regulations of the Central Government or State Government as applicable and *vide* provisions of this notification, to meet the residential needs of the local residents and for activities such as -

(i) widening and strengthening of existing roads and construction of new roads;

(ii) construction and renovation of infrastructure and civic amenities;

(iii) small scale industries not causing pollution;

(iv) cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stay; and

(v) promoted activities given in paragraph 4:

Provided further that no use of tribal land shall be permitted for commercial and industrial development activities without the prior approval of the competent authority under Regional Town Planning Act and other rules and regulations of the State Government and without compliance of the provisions of article 244 of the Constitution or the law for the time being in force, including the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007):

Provided also that any error appearing in the land records within the Eco-sensitive Zone shall be corrected by the State Government, after obtaining the views of Monitoring Committee, once in each case and the correction of said error shall be intimated to the Central Government in the Ministry of Environment, Forest and Climate Change:

Provided also that the correction of error shall not include change of land use in any case except as provided under this sub-paragraph:

(b) Efforts shall be made to reforest the unused or unproductive agricultural areas with afforestation and habitat restoration activities.

(2) Natural water bodies.-The catchment areas of all natural springs shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan and the guidelines shall be drawn up by the State Government in such a manner as to prohibit development activities at or near these areas which are detrimental to such areas.

(3) Tourism or eco-tourism.- (a) All new eco-tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be as per the Tourism Master Plan for the Eco-sensitive Zone.

(b) The Tourism Master Plan shall be prepared by the State Department of Tourism in consultation with State Departments of Environment and Forests.

(c) The Tourism Master Plan shall form a component of the Zonal Master Plan.

(d) The activities of eco-tourism shall be regulated as under, namely:-

(i) new construction of hotels and resorts shall not be allowed within one kilometre from the boundary of the Asola Bhatti Wildlife Sanctuary or upto the extent of the Eco-sensitive Zone whichever is nearer:

Provided that beyond the distance of one kilometre from the boundary of the said Wildlife Sanctuary till the extent of the Eco-sensitive Zone, the establishment of new hotels and resorts shall be allowed only in pre-defined and designated areas for eco-tourism facilities as per Tourism Master Plan;

(ii) all new tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be in accordance with the guidelines issued by the Central Government in the Ministry of Environment, Forest and Climate Change and the eco-tourism guidelines issued by the National Tiger Conservation Authority (as amended from time to time) with emphasis on eco-tourism;

(iii) until the Zonal Master Plan is approved, development for tourism and expansion of existing tourism activities shall be permitted by the concerned regulatory authorities based on the actual site specific scrutiny and recommendation of the Monitoring Committee and no new

hotel, resort or commercial establishment construction shall be permitted within Eco-sensitive Zone area.

(4) Natural heritage.- All sites of valuable natural heritage in the Eco-sensitive Zone, such as the gene pool reserve areas, rock formations, waterfalls, springs, gorges, groves, caves, points, walks, rides, cliffs, etc. shall be identified and a heritage conservation plan shall be drawn up for their preservation and conservation as a part of the Zonal Master Plan.

(5) Man-made heritage sites.- Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic, and cultural significance shall be identified in the Eco-sensitive Zone and heritage conservation plan for their conservation shall be prepared as part of the Zonal Master Plan.

(6) Noise pollution. - Prevention and control of noise pollution in the Eco-sensitive Zone shall be carried out in accordance with the provisions of the Noise Pollution (Regulation and Control) Rules, 2000 under the Environment Act.

(7) Air pollution.- Prevention and control of air pollution in the Eco-sensitive Zone shall be carried out in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder.

(8) Discharge of effluents.- Discharge of treated effluent in Eco-sensitive Zone shall be in accordance with the provisions of the General Standards for Discharge of Environmental Pollutants covered under the Environment Act and the rules made thereunder or standards stipulated by State Government whichever is more stringent.

(9) Solid wastes.- Disposal and management of solid wastes shall be as under:-

(a) the solid waste disposal and management in the Eco-sensitive Zone shall be carried out in accordance with the Solid Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number S.O. 1357 (E), dated the 8th April, 2016; the inorganic material may be disposed in an environmentally acceptable manner at site identified outside the Eco-sensitive Zone;

(b) safe and Environmentally Sound Management (ESM) of solid wastes in conformity with the existing rules and regulations using identified technologies may be allowed within the Eco-sensitive Zone.

(10) Bio-medical waste.– Bio-medical waste management shall be as under.-

(a) the bio-medical waste disposal in the Eco-sensitive Zone shall be carried out in accordance with the Bio-Medical Waste Management, Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number GSR 343 (E), dated the 28th March, 2016;

(b) safe and Environmentally Sound Management of Bio-Medical Wastes in conformity with the existing rules and regulations using identified technologies may be allowed within the Eco-sensitive Zone.

(11) Plastic waste management.- The plastic waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the Plastic Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R. 340(E), dated the 18th March, 2016, as amended from time to time**.**

(12) Construction and demolition waste management.- The construction and demolition Waste Management in the Eco-sensitive Zone shall be carried out as per the provisions of the Construction and Demolition Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change *vide* notification number G.S.R. 317(E), dated the 29th March, 2016, as amended from time to time.

(13) E-waste.- The e-waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the E-Waste Management Rules, 2016, published by the Government of India in the Ministry of Environment, Forest and Climate Change, as amended from time to time.

(14) Vehicular traffic.– The vehicular movement of traffic shall be regulated in a habitat friendly manner and specific provisions in this regard shall be incorporated in the Zonal Master Plan and till such time as the Zonal Master plan is prepared and approved by the Competent Authority in the State Government, the Monitoring Committee shall monitor compliance of vehicular movement under the relevant Acts and the rules and regulations made thereunder.

(15) Vehicular pollution.- Prevention and control of vehicular pollution shall be in accordance with applicable laws and efforts shall be made for use of cleaner fuels.

(16) Industrial units.– (i) On or after the publication of this notification in the Official Gazette, no new polluting industries shall be permitted to be set up within the Eco-sensitive Zone.

(ii) Only non-polluting industries shall be allowed within Eco-sensitive Zone as per the classification of Industries in the guidelines issued by the Central Pollution Control Board in February, 2016, unless so specified in this notification, and in addition, the non-polluting cottage industries shall be promoted.

(17) Protection of hill slopes.- The protection of hill slopes shall be as under:-

(a) the Zonal Master Plan shall indicate areas on hill slopes where no construction shall be permitted;

(b) construction on existing steep hill slopes or slopes with a high degree of erosion shall not be permitted.

4. List of activities prohibited or to be regulated within Eco-sensitive Zone.- All activities in the Eco sensitive Zone shall be governed by the provisions of the Environment Act and the rules made there under including the Coastal Regulation Zone, 2011 and the Environmental Impact Assessment Notification, 2006 and other applicable laws including the Forest (Conservation) Act, 1980 (69 of 1980), the Indian Forest Act, 1927 (16 of 1927), the Wildlife (Protection) Act 1972 (53 of 1972), and amendments made thereto and be regulated in the manner specified in the Table below, namely:-

TABLE

S. No. (1)	Activity (2)	Description (3)
	A. Prohibited Activities	
1.	Commercial mining, stone quarrying and crushing units.	(a) All new and existing mining (minor and major minerals), stone quarrying and crushing units shall be prohibited with immediate effect except for meeting the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing and for other activities. (b) The mining operations shall be carried out in accordance with the order of the Hon'ble Supreme Court dated the 4th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. UOI in W.P.(C) No.202 of 1995 and dated the 21st April, 2014 in the matter of Goa Foundation Vs. UOI in W.P.(C) No.435 of 2012.

2.	Setting of industries causing pollution (Water, Air, Soil, Noise, etc.).	New industries and expansion of existing polluting industries in the Eco-sensitive Zone shall not be permitted: Provided that non-polluting industries shall be allowed within Eco-sensitive Zone as per classification of Industries in the guidelines issued by the Central Pollution Control Board in February, 2016, unless otherwise specified in this notification and in addition the non-polluting cottage industries shall be promoted.
3.	Establishment of major hydro-electric project.	Prohibited (except as otherwise provided) as per the applicable laws.
4.	Use or production or processing of any hazardous substances.	Prohibited (except as otherwise provided) as per the applicable laws.
5.	Discharge of untreated effluents in natural water bodies or land area.	Prohibited (except as otherwise provided) as per the applicable laws.
6.	Setting up of new saw mills.	New or expansion of existing saw mills shall not be permitted within the Eco-sensitive Zone.
7.	Setting up of brick kilns.	Prohibited (except as otherwise provided) as per the applicable laws.
	B. Regulated Activities	
8.	Commercial establishment of hotels and resorts.	No new commercial hotels and resorts shall be permitted within one kilometer of the boundary of the protected area or upto the extent of Eco-sensitive Zone, whichever is nearer, except for small temporary structures for eco-tourism activities: Provided that, beyond one kilometer from the boundary of the protected area or upto the extent of Eco-sensitive Zone, whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable.
9.	Construction activities.	(a) New commercial construction of any kind shall not be permitted within one kilometer from the boundary of the protected area or upto extent of the Eco-sensitive Zone, whichever is nearer: Provided that, local people shall be permitted to undertake construction in their land for their use including the activities mentioned in sub-paragraph (1) of paragraph 3 as per building bye-laws to meet the residential needs of the local residents: Provided further that the construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any. (b) Beyond one kilometer it shall be regulated as per the Zonal Master Plan.
10.	Small scale non-polluting industries.	Non-polluting industries as per classification of industries issued by the Central Pollution Control Board in February, 2016 and non-hazardous, small-scale and service industry,

		agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the competent authority.
11.	Felling of trees.	(a) There shall be no felling of trees in the forest or Government or revenue or private lands without prior permission of the competent authority in the State Government. (b) The felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Act and the rules made thereunder.
12.	Collection of Forest Produce or Non-Timber Forest Produce.	Regulated as per the applicable laws.
13.	Erection of electrical and communication towers and laying of cables and other infrastructures.	Regulated under applicable laws (underground cabling may be promoted).
14.	Infrastructure including civic amenities.	Taking measures of mitigation as per the applicable laws, rules and regulations available guidelines.
15.	Widening and strengthening of existing roads and construction of new roads.	Taking measures of mitigation as per the applicable laws, rules and regulations and available guidelines.
16.	Undertaking other activities related to tourism like over flying the Eco-sensitive Zone area by hot air balloon, helicopter, drones, microlites, etc.	Regulated as per the applicable laws.
17.	Protection of hill slopes and river banks.	Regulated as per the applicable laws.
18.	Movement of vehicular traffic at night.	Regulated for commercial purpose under applicable laws.
19.	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries.	Permitted as per the applicable laws for use of locals.
20.	Establishment of large-scale commercial livestock and poultry farms by firms, corporate and companies.	Regulated (except otherwise provided) as per the applicable laws except for meeting local needs.
21.	Discharge of treated waste water or effluents in natural water bodies or land area.	The discharge of treated waste water or effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated waste water. Otherwise the discharge of treated waste water or effluent shall be regulated as per the applicable laws.
22.	Commercial extraction of surface and ground water.	Regulated as per the applicable laws.

Annexure IV – Notification on villages in and around ABWS

GOVERNMENT OF FOREST AND WILDLIFE
DEPARTMENT OF FOREST & WILDLIFE
O/O DY. CONSERVATOR OF FORESTS
SOUTH FOREST DIVISION

F.No.83/DCF(S)/Legal/2023-24/595-97 Date:29.04.2024

To,

The Dy. Conservator of Forests (P&M)
Department of Forest & Wildlife
Govt. of NCT of Delhi.

Subject: Information in respect of order dated 11.01.2024 of the Hon'ble High Court of Delhi in WPC No. 1346/2015 "Court on its own Motion Vs. UoI & Ors." – regarding.

Sir

Please find enclosed herewith the desired information in compliance of the above mentioned order of the Hon'ble High Court of Delhi and as per the prescribed format received from your office.

Encl.as above.

Yours faithfully,

(Vipul Pandey, IFS)
Dy. Conservator of Forest (South)

Copy to:

1. PS to the APCCF/ HOD. GNCTD
2. PA to the CF, GNCTD.

(Vipul Pandey, IFS)
Dy. Conservator of Forest (South)

SL. No.	Village(Asola Bhatti Wildlife Sanctuary)	Khasra No.	Action taken by Department	Petitioner claiming land on/stay on the land	Type of Encroachment	Stay granted by the Hon'ble Court (High/Revenue Court etc.)	Case no.	Order dated
1	Asola	1668	26-03 bigha–biswa areas have been made encroachment free by Department and possessions have been taken under by Department. Remaining encroached area is Kaladhi Mandir (Religious Encroachment) on some portion.	Khasra Nos. 1517(17-19),1528(8-0),1752(103-8),1750(170-0),1573(1-0), 1748(28-16), 1736(11-01), ,1735(0-19), 1746(36-0), 1744(2511), 1728(131-0), 1354(25-10), 1348(11-13), 1435(43-05), 1437(40-17), 1632(3-11), 1082(0-11), 1593(28-5), 654(8-0), 1552(23-10), 1479(3-14), 1547(5-4), 1576(19-12), 1740(5-7), 1742(4-0), 447(4-16), 1334(13-4), 1498(29-10)	Mandir (Religious Insitution). 26-03 bigha–biswa area have been made encroachment free by Department and possessions have been taken under by Department.	High Court	WP(C) 6579/2018 Radha Soami Satsang Beas & Anr Vs GNCTD	11.06.2018 (Stay)
		1738			Farm House encroachment	High Court	WP(C) 6579/2018 Radha Soami Satsang Beas & Anr Vs GNCTD	11.06.2018 (Stay)

			1749(6-5), 1500(31-19), 1506(17-14), 1495, 1643(32-15), 1667(38-1), 1668(28-15), 1661(0-15), 1332(58-7), 1601(0-8), 1521(14:9), 1523(32-14), 1590(0-7), 1586(1-12), 1582(1-9), 1510(15-17), 1490(2-8), 1724(59-06), 1738(0-14), 46(1-0), 447(4-16), 1082(0-11), 1437(40-17), 1435(43-05), 1632(3-11), 1513 (08-06), 1517 (17-19) and 1510 (15-17)			

		1752	Khasra under Court Stay in case no. WP © 9606/2022 and title Dev Aditya Khosla and Anr Vs GNCTD in Hon'ble High Court of Delhi.	Rambagh Farm, 12 Bighas and 4 Biswas of Khasra No.1535 (7-4), 1530 (3-0), 1534 (2-0) and 1752 (6-0) and in possession of Khasra No.1535 (7-4), 1530 (3-0), 1534 (2-0) and 1752(6-0) with structure and boundary wall etc., situated in the Revenue Estate of Village Asola, Tehsil Saket, New Delhi	Farm House encroachment	High Court	WP © 9606/2022 and title Dev Aditya Khosla and Anr Vs GNCTD W.P. (C) no. 9564/2022 Yogen Khosla Vs GNCTD	20.06.2022 (Status quo)

				R/o Ashray Farm Kh. No. 1523 admeasuring 5 bigha (area measuring 10 bigha)		High Court	W.P.(C) 9577/2022RAVINDRA DHARIWAL & ANR Vs GNCTD	22.06.2022 (Stay)
		1754		1754	Farm House Encroachment	Forest Settlement Officer	Case no. 46/2014 and title RUMALI BIJENDER versus Dy. Conservator of Forest (South) before FSO.	--
		1756		--	Shamshan Bhoomi in Sanjay Colony.	--	--	--
		1757			Under encroachment as Sanjay Colony.			
		1763		C-2 /A Asola at Khasra no. 1922/1314 (8-8), 1315 (4-4), Total ad-measuring 12 bigha 12 biswas	Farm House encroachment as per affidavit filed by Revenue Department on 05.04.2019 in OA no. 58/2013 in the matter of Sonya Ghosh Vs GNCTD	High Court	W.P.(C) no. 12218/2015 M/S SWASTIK CONSTRUCTION & BUILDERS PVT LTD versus UNION OF INDIA & ORS	07.02.2018 (Status quo)
2	Sahoorpur	488 490 492	Under encroachment as Raj Vidya Kendra	--	--	--	--	--

		491						
3	Bhatti	1910 1911 1912 1913 1914 1915 1916 1917	Under encroachment as Sanjay Colony as per affidavit filed by Revenue Department on 05.04.2019 before Hon'ble NGT in the OA no. 58/2013 in the case of Sonya Ghosh Vs GNCTD.	--	Under encroachment as Sanjay Colony as per affidavit filed by Revenue Department on 05.04.2019 before Hon'ble NGT in the OA no. 58/2013 in the case of Sonya Ghosh Vs GNCTD.	District Court (Saket)	CS SCJ No. 482/2017 Rajender Singh V/s Rajbir of Anr	No Stay has been granted
4	Tughlakabad	1624 2397/1625 2398/1625 2407/1625	Kabristan inside Asola Bhatti Wildlife Sanctuary.	--	Kabristan inside Asola Bhatti Wildlife Sanctuary.	--	--	--

Annexure V – Beat Boundary Notification

GOVT. OF NCT OF DELHI
OFFICE OF THE DY. CONSERVATOR OF FORESTS (SOUTH)
NEAR DR. KARNI SINGH SHOOTING RANGE
TUGHLAKABAD NEW DELHI -110044

F. No. 62/DCF(S)/Notification/Range-Beat/2020-21/ 1648 3 – 91 **Dated:** 10/11/23

OFFICE ORDER

The boundary of South Forest Division was modified vide gazette notification no F. 11(69)/DCF/PA/96/Pt I/8328-44 dated 20th Jan 2021. As a result of this reorganizing of boundary of South Forest Division, the present demarcation of Range and Beat boundaries are required to be modified to meet the present challenges faced by the Department of Forests & Wildlife. Hence, following ranges and beats are hereby constituted for smooth functioning of the South Forest Division.

Description of Ranges and Beats of South Forest Division

District: South & South East

Range	Beat	Tehsil	District	Remarks
(1)	(2)	(3)	(4)	(5)
Asola Bhatti Range	1. Pul PehladPur	Kalkaji	South-east District	Boundaries of these beats will be as per Revenue boundaries of each village.
	2. Tughlakabad	Kalkaji		
	3. Devli	Saket	South District	
	4. Maidangarhi			
	5. Satbari			
	6. Sahoorpur			
	7. Asola			
	8. Bhatti			
South Range	1. Saidulajaib	Saket	South District	Boundaries of these beats will be as per Revenue boundaries of each village.
	2. Chattarpur			
	3. Nebsarai			
	4. Rajpur Khurd			
	5. Hauz Khas	Hauz Khas		
	6. Ayanagar	Mehrauli		
	7. Jaunapur			
	8. Dera Mandi			
	9. Mehrauli			
	10. Fatehpur Beri			
South –East Range	1. Defence Colony.			(Entire area of South-east District except area of area falling in Tughlakabad & Pul Pehladpur villages in kalkaji Tehsil.)
	2. Sarita Vihar			
	3. Kalkaji			
Wildlife Rescue and Rehabilitation Range	Area in AsolaBhati Wildlife Sanctuary Range and Rescue centre in South Forest Division			
	All area in South Range			
	All area in South East Range			
Survey & Settlement Range	All area under jurisdiction of South Forest Division.			

Annexure VI –Memorandum approving the Management Plan of Asola Bhatti Wildlife Sanctuary (2024–25 to 2034–35)

DEPARTMENT OF FORESTS AND WILDLIFE
GOVERNMENT OF NCT OF DELHI
VIKAS BHAWAN, A-BLOCK, 2nd FLOOR, I.P. ESTATE, NEW DELHI-110002.
Email: dcfhq.gnctd@delhi.gov.in, wlo.gnctd@delhi.gov.in

Memorandum

Subject: Approval of Management Plan of the Asola Bhatti Wildlife Sanctuary for the period of 2024-25 to 2034-35.

Whereas; the Draft Management Plan of the Asola Bhatti Wildlife Sanctuary has been prepared by the Wildlife Institute of India, Dehradun.

Whereas; the draft of said Management Plan has undergone various reviews at different levels. A meeting was also held on 17th Feb, 2026 at 3.30 PM for finalization of the draft Management Plan wherein the participants provided inputs and suggestions.

Whereas; the DCF/ Wild Life Warden, South Forest Division, vide Letter No. F.01/DCF(S)/PA/ABWS/2025-26/8055-59 dated 19.02.26 submitted chapter-wise inputs to the WII, Dehradun to be considered for incorporation in the Management Plan.

Whereas; the revised Draft Management Plan was submitted by Dr. B.S. Adhikari, Principal Investigator with suggestions/inputs incorporated vide Email dated Feb 23, 2026.

Whereas; the DCF/Wild Life Warden, South Forest Division vide File No. F.27/DF(S)/Wildlife/ManagementPlan/ABWLS/2025-26 has submitted the revised Draft of the Mangement Plan for approval.

Therefore, in exercise of the powers under Section 33 of the Wild Life (Protection) Act, 1972, the undersigned accords approval to the Management Plan of the Asola Bhatti Wildlife Sanctuary for the period of 2024-25 to 2034-35, subject to the condition that all activities as per the prescriptions in the management Plan shall be strictly undertaken in accordance with the provisions of the Wild Life (Protection) Act, 1972 and orders of the Hon'ble Supreme Court/High Court of Delhi as well as the Delhi Ridge Management Board issued from time to time.

(S.S. Kandpal, IFS)
Pr. Chief Conservator of Forests/
Chief Wild Life Warden,
Govt. of NCT of Delhi.

F.27/DF(S)/Wildlife/ManagementPlan/ABWLS/2025-26/142-150 **Dated:** 27.02.2026

Copy to the:

1) The Secretary (E&F), Ministry of Environment & Forests, Govt. of NCT of Delhi for kind information.
2) The Director, Wildlife Institute of India, Dehradun for kind information.
3) The CCF(Admin), Department of Forests and Wildlife, Govt. of NCT of Delhi.
4) The Joint Director (WL), Wildlife Division, MoEFCC, 6th Floor, Vayu Wing, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi-110003.
5) The Member Secretary, Delhi Ridge Management Board.
6) The CF, Department of Forests and Wildlife, Govt. of NCT of Delhi.
7) The DCF (HQ)/Wild Life Officer, Department of Forests and Wildlife, Govt. of NCT of Delhi.
8) The DCF/ Wild Life Warden, South Forest Division, Department of Forests and Wildlife, Govt. of NCT of Delhi.

(S.S. Kandpal, IFS)
Pr. Chief Conservator of Forests/
Chief Wild Life Warden,
Govt. of NCT of Delhi.

Annexure VII- Minutes of Meeting held on 17th regarding the Management Plan of Asola Bhatti Wildlife Sanctuary

DEPARTMENT OF FORESTS AND WILDLIFE
GOVERNMENT OF NCT OF DELHI
VIKAS BHAWAN, A-BLOCK, 2nd FLOOR, I.P. ESTATE, NEW DELHI-110002.
Email: dcfhq.gnctd@delhi.gov.in, wlo.gnctd@delhi.gov.in
****

F.No. 11(106)/CF/2008/Pt-II/1738 **Dated:** 24/02/2026

Minutes of Meeting held on 17th February, 2026 regarding finalization of the Management Plan of Asola Bhatti Wildlife Sanctuary

A meeting was convened on 17th February, 2026 in the Conference Room of the Department of Forests and Wildlife, GNCTD, under the chairmanship of the Chief Wildlife Warden, Delhi, to review the Management Plan of Asola Bhatti Wildlife Sanctuary.

The meeting was attended by the following officers:

1. Sh. Shyam Sunder Kandpal, PCCF & CWLW
2. Dr. A. K. Bhardwaj, Consultant
3. Dr. B. S. Adhikari, Principal Investigator
4. Dr. P. Vishwakannan, CCF
5. Sh. Jabestin A., CF
6. Sh. Vipul Pandey, DCF (HQ & West)
7. Sh. Ankit Kumar, DCF (South)
8. Sh. Amit Gemawat, DCF (P&M)
9. Sh. Puneet Kumar Tiwari, Range Officer (South)
10. Sh. Ramesh Yadav, Range Officer (HQ)
11. Sh. Bakshinder Pal Singh, Range Officer (South)

Dr. A. K. Bhardwaj, Consultant, presented the key highlights of the draft Management Plan to the Department. While the report comprehensively addresses the salient aspects and challenges pertaining to the sanctuary and is broadly satisfactory, certain specific observations and inputs emerged during the deliberations. These inputs are required to be duly incorporated by the Wildlife Institute of India in the revised draft of the Management Plan.

Key Highlights of the Management Plan Emphasized by Dr. A. K. Bhardwaj

a) The Management Plan report represents an improved and updated database of ABWLS and is the outcome of substantial field data collection, ecological assessments, and social surveys conducted during the course of preparation.

b) Active involvement of field-level forest officials, including Deputy Conservators of Forests, Range Officers, Forest Guards and Wildlife Guards, was observed throughout the project implementation process.

c) The observations and recommendations from previous inspections regarding restoration works have been duly incorporated. The Core Zones have been clearly delineated. Plantation efforts are ongoing, with focused emphasis on native tree species to support habitat restoration. Additionally, appropriate water conservation measures have been integrated into the restoration plan and are being implemented accordingly.

d) The responsibilities of the DCF are proposed to be streamlined with specific implementation roles assigned to ACF. While the DCF shall retain overall supervision and control, the ACF shall play a key role in execution and monitoring of activities.

Observations and Inputs of the Conservator of Forests

a) The procedures outlined under the Phased Plantation Approach require further elaboration and detailing for clarity of implementation.
b) Regarding habitat development in Core Zone, it was suggested that instead of limiting eco-restoration in the Core Zone, eco-restoration with limited mechanization and minimum disturbance may be adopted, considering that a substantial portion of restoration areas fall within the Core Zone.

Additional observations and inputs by officials of the forest department

a) A formal coordination measure with the Municipal Corporation of Delhi (MCD) to effectively address the issue of stray cattle in and around the sanctuary.
b) Provision may be made for grassland development, including the removal of unsuitable or invasive vegetation within the Core Zone, wherever necessary, to restore and maintain the habitat character.
c) The number of Community Interface Committees may be increased from two (2) to five (5) in order to strengthen stakeholder engagement, enhance local participation in conservation activities, and ensure more effective coordination at the field level.

The Chief Wildlife Warden finally suggested that the respective divisions may submit details of any modifications required to facilitate incorporation into the Management Plan.

DCF (HQ)/WLO

Annexure VIII – Temperature of ABWS over 10 years

Mean_LST_Celsius	Year
33.91641468	2014
33.10439021	2015
33.50644898	2016
33.43400055	2017
32.36373029	2018
35.05399817	2019
32.65995084	2020
32.67081328	2021
31.9744988	2022
30.70877725	2023
32.38072126	2024
30.74376951	2025

Annexure IX – Precipitation of ABWS over 10 years

Mean_precip_mm	year
521.2907	2014
832.2085	2015
820.0368	2016
689.4139	2017
639.9879	2018
745.0707	2019
672.664	2020
828.3357	2021
822.7236	2022
746.5538	2023
946.3614	2024
771.7775	2025

Annexure X - Checklist of Mammal Species in ABWS

S.No	English Name	Scientific Name	IUCN Status	CITES Status	WPA, 1972 Schedule
1	Rhesus Macaque	*Macaca mulatta*	Least Concern	Appendix II	Schedule II
2	Sambar	*Rusa unicolor*	Vulnerable	Not Listed	Schedule III
3	Spotted Deer (Chital)	*Axis axis*	Least Concern	Not Listed	Schedule III
4	Nilgai	*Boselaphus tragocamelus*	Least Concern	Not Listed	Schedule III
5	Wild Pig	*Sus scrofa cristatus*	Least Concern	Not Listed	Schedule III
6	Indian Leopard	*Panthera pardus*	Vulnerable	Appendix I	Schedule I
7	Jungle Cat	*Felis chaus*	Least Concern	Not Listed	Schedule II
8	Common Palm Civet	*Paradoxurus hermaphroditus*	Least Concern	Not Listed	Schedule II
9	Small Indian Civet	*Viverricula indica*	Least Concern	Not Listed	Schedule II
10	Indian Grey Mongoose	*Herpestes edwardsii*	Least Concern	Not Listed	Schedule II
11	Ruddy Mongoose	*Herpestes smithii*	Least Concern	Not Listed	Schedule II
12	Striped Hyena	*Hyaena hyaena*	Near Threatened	Not Listed	Schedule III
13	Golden Jackal	*Canis aureus*	Least Concern	Not Listed	Schedule III
14	Indian Hare	*Lepus nigricollis*	Least Concern	Not Listed	Schedule IV
15	Indian Crested Porcupine	*Hystrix indica*	Least Concern	Not Listed	Schedule IV
16	Five-striped Palm Squirrel	*Funambulus pennantii*	Least Concern	Not Listed	Schedule IV
17	Indian Bush Rat	*Golunda ellioti*	Least Concern	Not Listed	Schedule V
18	Indian Flying Fox	*Pteropus giganteus*	Least Concern	Not Listed	Schedule V
19	Cow	*Bos taurus*	Domesticated	Not Listed	Domesticated
20	Dog	*Canis lupus familiaris*	Domesticated	Not Listed	Domesticated
21	Domestic Cat	*Felis catus*	Domesticated	Not Listed	Domesticated
22	Buffalo	*Bubalus bubalis*	Domesticated	Not Listed	Domesticated
23	Goat	*Capra aegagrus hircus*	Domesticated	Not Listed	Domesticated

Annexure XI - Checklist of Bird species of ABWS

Order	Family	Scientific Name	Common Name
Accipitriformes	Accipitridae	*Accipiter nisus*	Eurasian Sparrowhawk
		Butastur teesa	White-eyed Buzzard
		Elanus caeruleus	Black-winged Kite
		Milvus migrans	Black Kite
		Neophron percnopterus	Egyptian Vulture
		Pernis ptilorhynchus	Oriental Honey-buzzard
		Tachyspiza badia	Shikra
	Anatidae	*Anas poecilorhyncha*	Indian Spot-billed Duck
		Spatula clypeata	Northern Shoveler
		Tadorna ferruginea	Ruddy Shelduck
	Apodidae	*Apus affinis*	Little Swift
Bucerotiformes	Bucerotidae	*Ocyceros birostris*	Indian Gray Hornbill
	Upupidae	*Upupa epops*	Eurasian Hoopoe
Caprimulgiformes	Caprimulgidae	*Caprimulgidae sp.*	nightjar sp.
		Caprimulgus affinis	Savanna Nightjar
Charadriiformes	Burhinidae	*Burhinus indicus*	Indian Thick-knee
		Esacus recurvirostris	Great Thick-knee
	Charadriidae	*Vanellus indicus*	Red-wattled Lapwing
	Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt
	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper
		Tringa ochropus	Green Sandpiper
Columbiformes	Columbidae	*Columba livia (Feral Pigeon)*	Rock Pigeon (Feral Pigeon)
		Spilopelia chinensis	Spotted Dove
		Spilopelia senegalensis	Laughing Dove
		Streptopelia decaocto	Eurasian Collared-Dove
		Streptopelia tranquebarica	Red Collared-Dove
		Treron phoenicopterus	Yellow-footed Green-Pigeon
Coraciiformes	Alcedinidae	*Alcedo atthis*	Common Kingfisher
		Ceryle rudis	Pied Kingfisher
		Halcyon smyrnensis	White-throated Kingfisher
	Coraciidae	*Coracias benghalensis*	Indian Roller
		Coracias garrulus	European Roller
	Meropidae	*Merops orientalis*	Asian Green Bee-eater
		Merops philippinus	Blue-tailed Bee-eater
Cuculiformes	Cuculidae	*Cacomantis passerinus*	Gray-bellied Cuckoo
		Centropus sinensis	Greater Coucal
		Clamator jacobinus	Pied Cuckoo
		Eudynamys scolopaceus	Asian Koel

		Hierococcyx varius	Common Hawk-Cuckoo
		Taccocua leschenaultii	Sirkeer Malkoha
Falconiformes	Falconidae	*Falco subbuteo*	Eurasian Hobby
		Falco tinnunculus	Eurasian Kestrel
Galliformes	Phasianidae	*Ortygornis pondicerianus*	Gray Francolin
		Pavo cristatus	Indian Peafowl
Gruiformes	Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen
		Fulica atra	Eurasian Coot
		Gallinula chloropus	Eurasian Moorhen
Passeriformes	Acrocephalidae	*Acrocephalus dumetorum*	Blyth's Reed Warbler
		Acrocephalus stentoreus	Clamorous Reed Warbler
	Alaudidae	*Eremopterix griseus*	Ashy-crowned Sparrow-Lark
		Plocealauda erythroptera	Indian Bushlark
	Campephagidae	*Lalage melanoptera*	Black-headed Cuckooshrike
		Pericrocotus cinnamomeus	Small Minivet
	Cisticolidae	*Orthotomus sutorius*	Common Tailorbird
		Prinia hodgsonii	Gray-breasted Prinia
		Prinia inornata	Plain Prinia
		Prinia socialis	Ashy Prinia
		Prinia sylvatica	Jungle Prinia
	Corvidae	*Corvus macrorhynchos*	Large-billed Crow
		Corvus splendens	House Crow
		Dendrocitta vagabunda	Rufous Treepie
	Dicruridae	*Dicrurus caerulescens*	White-bellied Drongo
		Dicrurus leucophaeus	Ashy Drongo
		Dicrurus macrocercus	Black Drongo
	Estrildidae	*Amandava amandava*	Red Avadavat
		Euodice malabarica	Indian Silverbill
	Hirundinidae	*Hirundo rustica*	Barn Swallow
		Hirundo smithii	Wire-tailed Swallow
		Riparia chinensis	Gray-throated Martin
	Laniidae	*Lanius schach*	Long-tailed Shrike
		Lanius vittatus	Bay-backed Shrike
	Leiothrichidae	*Argya caudata*	Common Babbler
		Argya malcolmi	Large Gray Babbler
		Argya striata	Jungle Babbler
	Monarchidae	*Terpsiphone paradisi*	Indian Paradise-Flycatcher
	Motacillidae	*Anthus roseatus*	Rosy Pipit
		Motacilla cinerea	Gray Wagtail

	Muscicapidae	*Copsychus fulicatus*	Indian Robin
		Copsychus saularis	Oriental Magpie-Robin
		Eumyias thalassinus	Verditer Flycatcher
		Ficedula albicilla	Taiga Flycatcher
		Oenanthe fusca	Brown Rock Chat
		Phoenicurus ochruros	Black Redstart
	Nectariniidae	*Cinnyris asiaticus*	Purple Sunbird
	Oriolidae	*Oriolus kundoo*	Indian Golden Oriole
	Paridae	*Parus cinereus*	Asian Tit
		Parus cinereus [cinereus Group]	Asian Tit (Cinereous)
	Passeridae	*Gymnoris xanthocollis*	Yellow-throated Sparrow
		Passer domesticus	House Sparrow
	Phylloscopidae	*Phylloscopus collybita*	Common Chiffchaff
		Phylloscopus griseolus	Sulphur-bellied Warbler
		Phylloscopus humei	Hume's Warbler
		Phylloscopus trochiloides	Greenish Warbler
	Ploceidae	*Ploceus philippinus*	Baya Weaver
	Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul
		Pycnonotus jocosus	Red-whiskered Bulbul
		Pycnonotus leucotis	White-eared Bulbul
	Rhipiduridae	*Rhipidura aureola*	White-browed Fantail
	Stenostiridae	*Culicicapa ceylonensis*	Gray-headed Canary-Flycatcher
	Sturnidae	*Acridotheres tristis*	Common Myna
		Gracupica contra	Indian Pied Starling
		Pastor roseus	Rosy Starling
		Sturnia pagodarum	Brahminy Starling
	Sylviidae	*Chrysomma sinense*	Yellow-eyed Babbler
		Curruca curruca	Lesser Whitethroat
		Curruca curruca	Lesser Whitethroat (Lesser)
		Sylviidae sp. (Old World warbler sp.)	old world warbler sp.
	Tephrodornithidae	*Tephrodornis pondicerianus*	Common Woodshrike
	Zosteropidae	*Zosterops palpebrosus*	Indian White-eye
	Ardeidae	*Ardea cinerea*	Gray Heron
		Ardea coromanda	Eastern Cattle-Egret
		Ardeola grayii	Indian Pond-Heron
		Egretta garzetta	Little Egret
		Nycticorax nycticorax	Black-crowned Night Heron
	Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis
		Pseudibis papillosa	Red-naped Ibis
Piciformes	Megalaimidae	*Psilopogon haemacephalus*	Coppersmith Barbet

		Psilopogon zeylanicus	Brown-headed Barbet
	Picidae	*Dinopium benghalense*	Black-rumped Flameback
		Leiopicus mahrattensis	Yellow-crowned Woodpecker
		Picidae sp.	woodpecker sp.
Podicipediformes	Podicipedidae	*Tachybaptus ruficollis*	Little Grebe
Psittaciformes	Psittaculidae	*Psittacula cyanocephala*	Plum-headed Parakeet
		Psittacula eupatria	Alexandrine Parakeet
		Psittacula krameri	Rose-ringed Parakeet
Pterocliformes	Pteroclidae	*Pterocles indicus*	Painted Sandgrouse
Strigiformes	Strigidae	*Athene brama*	Spotted Owlet
		Bubo bengalensis	Rock Eagle-Owl
		Otus bakkamoena	Indian Scops-Owl
		Strigidae sp.	owl sp.
	Tytonidae	*Tyto javanica*	Eastern Barn Owl
Suliformes	Phalacrocoracidae	*Microcarbo niger*	Little Cormorant
		Phalacrocorax carbo	Great Cormorant

Annexure XII- Checklist of Amphibians and reptiles in ABWS

Species	Habitat				Conservation status	
	Plantation	Water body	*P. juliflora*	Rocky patch	Global	National
AMPHIBIANS Anurans Microhylidae						
Microhyla cf. nilphamariensis (Howlader, et al., 2015)		•			LC	
Uperodon systoma (Schneider, 1799)	•				LC	
Bufonidae						
Duttaphrynus melanostictus (Schneider 1799)	•	•			LC	
Firouzophrynus stomaticus (Lütken, 1864)	•	•			LC	
Dicroglossidae						
Hoplobatrachus tigerinus (Daudin 1803)	•	•			LC	Sch II
Euphlyctis cyanophlyctis (Schneider, 1799)	•	•			LC	Sch II
Sphaerotheca cf. *maskeyi (Schleich & Anders, 1998)*	•	•			LC	
Minervarya cf. agricola (Jerdon, 1853)	•	•			LC	
REPTILES Squamates Gekkonidae						
Hemidactylus cf. *brookii (*Gray, 1845)	•	•	•	•	LC	
Hemidactylus cf. *flaviviridis (Rüppell, 1835)*		•	•		LC	
Agamidae						
Calotes versicolor (Daudin 1812)	•	•	•	•	LC	
Sitana cf sivalensis (Deepak et al., 2021)	•					
Scincidae						
Eutropis macularia (Blyth, 1853)	•				LC	
Riopa punctata (Linnaeus, 1758)			•		LC	
Eutropis trivittata (Hardwicke & Gray, 1827)	•				LC	

Eublepharidae						
Eublepharis macularius (Blyth, 1854)				•	LC	Sch I
Varanidae						
Varanus bengalensis (Daudin 1802)	•	•			LC	Sch I
Lacertidae						
Ophisops jerdonii (Blyth, 1853)	•	•			LC	
Pythonidae						
Python molurus (Linnaeus, 1758)	•	•		•	NT	Sch I
Viperidae		•				
Echis carinatus (Schneider, 1801)					LC	Sch II
Typhlopidae						
Indotyphlops braminus (Daudin, 1803)	•				LC	Sch II
Boidae						
Eryx johnii (Russell, 1801)	•				NT	Sch I
Elapidae						
Naja naja (Linnaeus, 1758)	•				LC	Sch I
Bungarus caeruleus (Schneider, 1801)	•				LC	Sch II
Colubridae						
Ptyas mucosa (Linnaeus 1758)	•	•			LC	Sch I
Lycodon aulicus (Linnaeus 1754)	•				LC	Sch II
Lycodon striatus (Shaw, 1802)	•				LC	Sch II
Fowlea piscator (Schneider, 1799)		•			LC	Sch I
Oligodon taeniolatus (Jerdon, 1853)	•				LC	Sch II
Spalerosophis atriceps (Fischer, 1885)				•	LC	Sch II

Annexure XIII - Checklist of Butterfly's species in ABWS

S. No.	Common Name	Species Name	Family	Relative Abundance	
				Monsoon	Post monsoon
1	African Babul Blue	*Azanus jesous* (Guérin,1847)	Lycaenidae		
2	Blue Pansy	*Junonia orithya* (Linnaeus,1758)	Nymphalidae	1.87	1.46
3	Blue Tiger	*Tirumala limniace* (Cramer,1775)	Nymphalidae	0.24	0.08
4	Bright Babul Blue	*Azanus ubaldus* (Stoll,1782)	Lycaenidae		
5	Common Albatross	*Appias albina* (Boisduval, 1836)	Pieridae	0.56	0.08
6	Common Banded Awl	*Hasora chromus* (Cramer, 1782)	Hesperiidae	2.07	1.62
7	Common Castor	*Ariadne merione* (Cramer, 1777)	Nymphalidae	1.03	1.62
8	Common Crow	*Euploea core* (Cramer, 1780)	Nymphalidae	0.28	0.85
9	Common Emigrant	*Catopsilia pomona* (Fabricius, 1775)	Pieridae	8.23	6.69
10	Common Evening Brown	*Melanitis leda* (Linnaeus, 1758)	Nymphalidae	0.04	0.15
11	Common Grass Yellow	*Eurema hecabe* (Linnaeus, 1758)	Pieridae	8.75	9.69
12	Common Gull	*Cepora nerissa* (Fabricius, 1775)	Pieridae	1.63	2.77
13	Common Jay	*Graphium doson* (C. & R. Felder, 1864)	Papilionidae		0.08
14	Common Jezebel	*Delias eucharis* (Drury,1773)	Pieridae		
15	Common Leopard	*Phalanta phalantha* (Drury,1773)	Nymphalidae	0.84	0.23
16	Common Mime	*Papilio clytia* (Linnaeus, 1758)	Papilionidae		
17	Common Mormon Swallowtail	*Papilio polytes* (Linnaeus, 1758)	Papilionidae	0.84	1.00
18	Common Pale Blue	*Polyommatus icarus* (Rottemburg, 1775)	Lycaenidae	0.16	
19	Common Pierrot	*Castalius rosimon* (Fabricius, 1775)	Lycaenidae	1.83	1.92
20	Common Rose	*Pachliopta aristolochiae* (Fabricius, 1775)	Papilionidae		
21	Common Silverline	*Cigaritis vulcanus* (Fabricius, 1775)	Lycaenidae	0.04	1.62
22	Common Three Ring	*Ypthima asterope* (Klug, 1832)	Nymphalidae	0.04	
23	Danaid Eggfly	*Hypolimnas misippus* (Linnaeus, 1764)	Nymphalidae	7.48	7.08
24	Dingy Swift	*Gegenes nostrodamus* (Fabricius, 1793)	Hesperiidae		
25	Forget Me Not	*Catochrysops strabo* (Fabricius, 1793)	Lycaenidae	0.52	0.62
26	Gram Blue	*Euchrysops cnejus* (Fabricius, 1798)	Lycaenidae	0.91	2.69

27	Great Eggfly	*Hypolimnas bolina* (Linnaeus, 1758)	Nymphalidae	0.24	0.15
28	Indian Grizzled Skipper	*Spialia galba* (Fabricius, 1793)	Hesperiidae	0.08	0.15
29	Indian Palm Bob	*Suastus gremius* (Fabricius, 1798)	Hesperiidae		
30	Large White	*Pieris brassicae* (Linnaeus, 1758)	Pieridae		
31	Lemon Pansy	*Junonia lemonias* (Linnaeus, 1758)	Nymphalidae	3.90	3.62
32	Lesser Three Ring	*Ypthima inica* (Hewitson, 1865)	Nymphalidae	0.20	
33	Lime Swallowtail	*Papilio demoleus* (Linnaeus, 1758)	Papilionidae	1.59	2.69
34	Mottled Emigrant	*Catopsilia pyranthe* (Linnaeus, 1758)	Pieridae	3.70	3.23
35	Painted Lady	*Vanessa cardui* (Linnaeus, 1758)	Nymphalidae		0.69
36	Pale Grass Blue	*Pseudozizeeria maha* (Kollar, 1844)	Lycaenidae	0.36	1.15
37	Pea Blue	*Lampides boeticus* (Linnaeus, 1767)	Lycaenidae	0.08	0.15
38	Peacock Pansy	*Junonia almana* (Linnaeus, 1758)	Nymphalidae	0.20	
39	Plain Cupid	*Luthrodes pandava* (Horsfield, 1829)	Lycaenidae	1.59	2.31
40	Plain Orange Tip	*Colotis aurora* (Cramer, 1780)	Pieridae	0.12	
41	Plain Tiger	*Danaus chrysippus* (Linnaeus, 1758)	Nymphalidae	12.97	8.77
42	Red Pierrot	*Talicada nyseus* (Guerin, 1843)	Lycaenidae	0.08	0.15
43	Rice Swift	*Borbo cinnara* (Wallace,1866)	Hesperiidae	1.07	1.38
44	Small Cupid	*Chilades parrhasius* (Fabricius, 1793)	Lycaenidae	0.28	0.38
45	Small Grass Yellow	*Eurema brigitta* (Cramer,1780)	Pieridae	17.98	16.23
46	Spotless Grass Yellow	*Eurema laeta* (Boisduval, 1836)	Pieridae	1.67	1
47	Small Orange Tip	*Colotis etrida* (Boisduval, 1836)	Pieridae		
48	Striped Tiger	*Danaus genutia* (Cramer,1779)	Nymphalidae	2.23	2.23
49	Tawny Coster	*Acraea terpsicore* (Linnaeus, 1758)	Nymphalidae		1.00
50	White Orange Tip	*Ixias pyrene* (Cramer,1779)	Pieridae	10.54	10.23
51	Yellow Orange Tip	*Ixias marianne* (Linnaeus, 1764)	Pieridae	2.03	2.00
52	Yellow Pansy	*Junonia hierta* (Fabricius, 1798)	Nymphalidae	0.52	0.38
53	Zebra Blue	*Leptotes plinius* (Fabricius, 1793)	Lycaenidae	1.23	1.85

Annexure XIV – Photographs of Herpetofauna species in ABWS

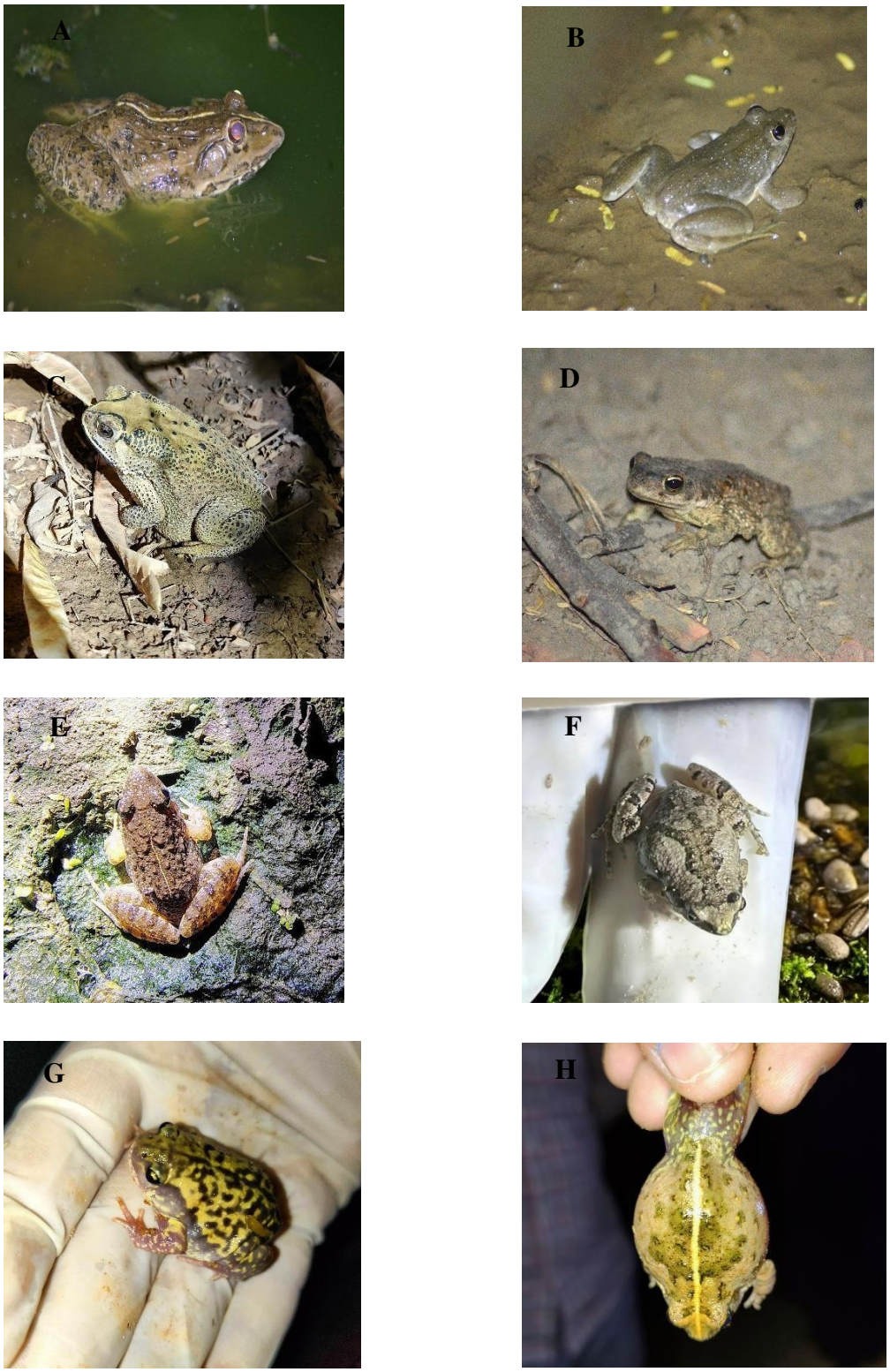


Figure 8: A. *Hoplobatrachus tigerinus,* B. *Euphlyctis* cf. *cyanophlyctis,* C. *Duttaphrynus melanostictus,* D. *Firouzophrynus stomaticus,* E. *Minervarya* cf. *agricola,* F. *Microhyla nilphamariensis,* G. *Uperodon systoma,* H. *Sphaerotheca* cf. *maskeyi*

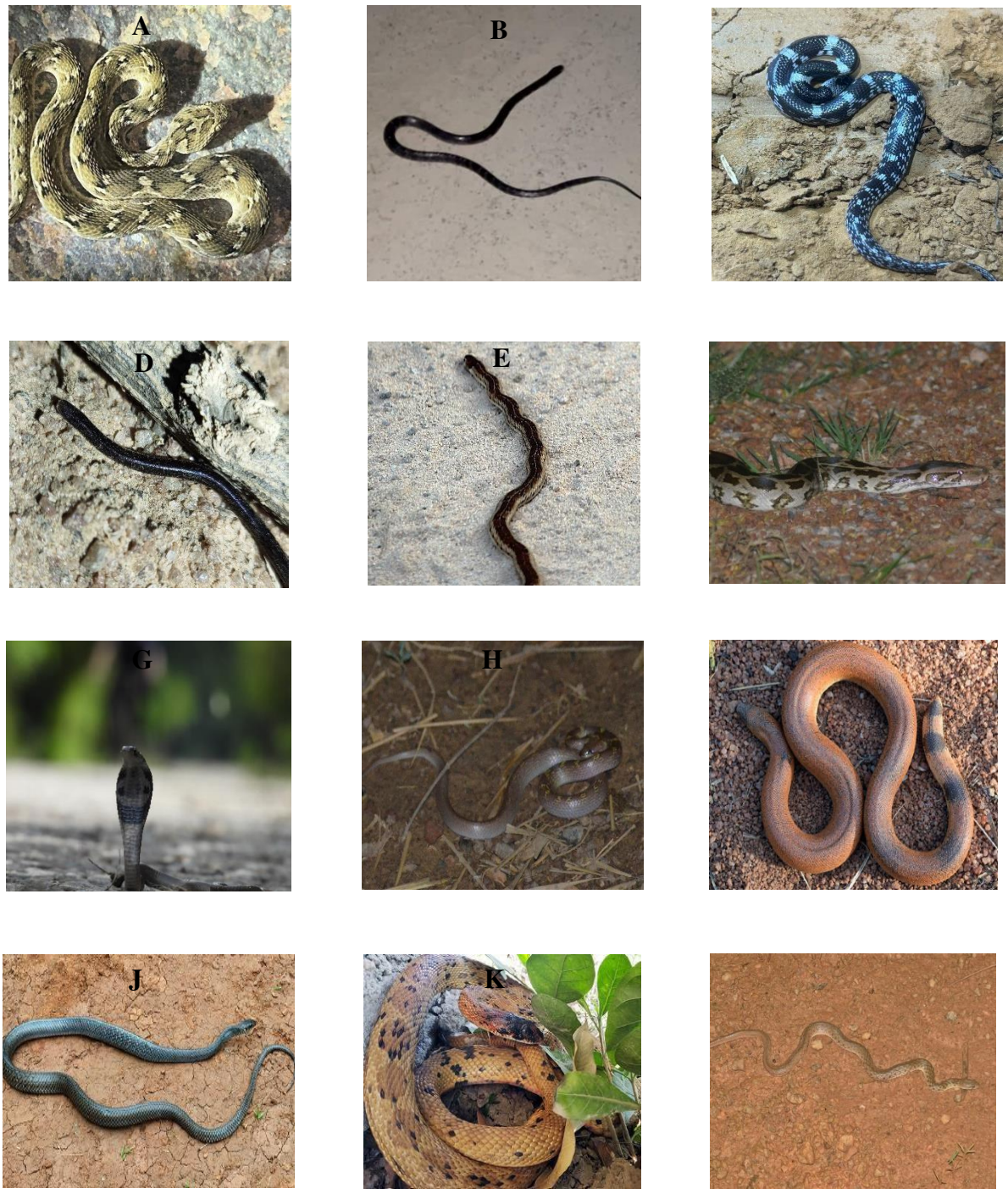


Figure 9*:* A. *Echis carinatus,* B. *Bungarus caeruleus,* C. *Lycodon striatus,* D. *Indotyphlops braminus, E. Oligodon taeniolatus,* F. *Python molurus,* G. *Naja naja,* H. *Lycodon aulicus,* I. *Eryx johnii,* J. *Ptyas mucosa,*

Figure 5: A. *Calotes versicolor*, B. *Eublepharis macularius*, C. *Hemidactylus* cf. *brookii*, D. *Hemidactylus* cf. *flaviviridis*, E. *Sitana* cf. *sivalensis*, F. *Ophisops jerdonii*, G. *Eutropis macularia*, H. *Eutropis trivittata*, I. *Varanus bengalensis*

Annexure XV – Photographs of Butterfly species in ABWS

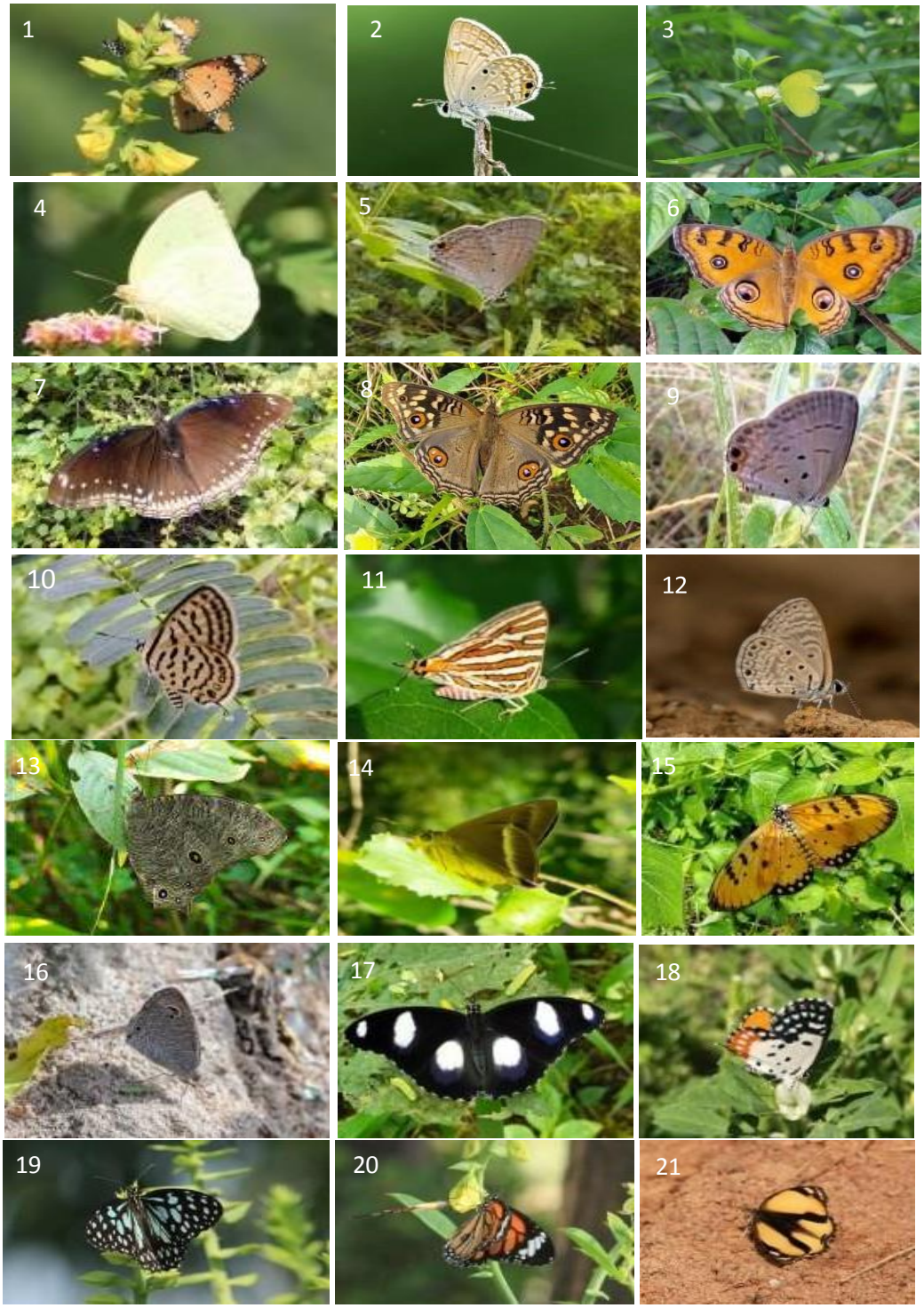


Figure 10: *Butterflies of Asola Bhatti Wildlife Sanctuary* ***1-*** *Danaus chrysippus,* ***2-*** *Chilades parrhasius,* ***3-*** *Eurema brigitta,* ***4-*** *Catopsilia pomona,* ***5-*** *Catochrysops strabo,* ***6-*** *Junonia almana,* ***7-*** *Hypolimnas bolina,* ***8-*** *Junonia lemonias,* ***9-*** *Euchrysops cnejus,* ***10-*** *Leptotes plinius,* ***11-*** *Cigaritis vulcanus,* ***12-*** *Azanus jesous,* ***13-*** *Melanitis leda,* ***14-*** *Hasorachromus,* ***15-*** *Acraea terpsicore,* ***16-*** *Ypthima inica,* ***17-*** *Hypolimnas misippus,* ***18-*** *Talicada nyseus,* ***19-*** *Tirumala limniace,* ***20-*** *Danaus genutia,* ***21-*** *Junonia hierta*

Figure 11*: Butterflies of Asola Bhatti Wildlife Sanctuary 22- Phalantha phalantha, 23- Spialia galba, 24- Junonia orithya, 25- Papilio demoleus, 26- Catopsilia pyranthe, 27-Borbo cinnara, 28- Azanus ubaldus, 29- Pseudozizeeria maha, 30- Appias albina, 31-Ariadne merione, 32- Euploea core, 33- Cepora nerissa, 34- Graphium doson, 35- Papilio polytes, 36- Castalius rosimon, 37- Pieris brassicae, 38- Vanessa cardui, 39- Luthrodes pandava, 40- Colotis aurora, 41- Ixias pyrene, 42- Ixias marianne*